FHWA-NC-EIS-11-01-F
Federal Highway Administration
Region 4

ADMINISTRATIVE ACTION
FINAL ENVIRONMENTAL IMPACT STATEMENT
VOLUME I OF II

U.S. Department of Transportation, Federal Highway Administration
North Carolina Department of Transportation

US 70 Havelock Bypass
Craven County, NC

Federal Aid Project No. NHF-70(49)
WBS No. 34360
S.T.I.P ID No. R-1015

Submitted Pursuant to the National Environmental Policy Act
42 U.S.C. 4332 (2)(c)

Cooperating Agencies:
United States Department of the Army, Corps of Engineers
United States Department of Agriculture, Forest Service

10/20/15
Date of Approval

FOR Richard Hancock, PE, Manager
North Carolina Department of Transportation
Project Development and Environmental Analysis Branch

10/27/15
Date of Approval

for John F. Sullivan, III, PE
Division Administrator
Federal Highway Administration

The following persons may be contacted for additional information concerning this document:

Mr. John F. Sullivan, III, PE
Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, NC 27601
(919) 747-7000

Mr. Richard Hancock, PE, Manager
Project Development and Environmental Analysis Branch
NC Department of Transportation
1548 Mail Service Center
Raleigh, NC 27699-1548
(919) 707-6000

COMMENTS DUE DATE
01/22/16

The proposed action is the construction of a US 70 bypass of the City of Havelock in Craven County, North Carolina. This statement documents the need for improvements to the existing US 70 corridor and evaluates alternatives with respect to cost, and social, economic, and environmental consequences. Current and projected future traffic conditions in the study area are described. A preferred alternative is identified.

ADMINISTRATIVE ACTION
FINAL ENVIRONMENTAL IMPACT STATEMENT

U.S. Department of Transportation, Federal Highway Administration
North Carolina Department of Transportation

Federal Aid Project No. NHF-70(49)
WBS No. 34360
S.T.I.P ID No. R-1015

Documentation Prepared by:
STANTEC CONSULTING SERVICES INC.

Oct. 20, 2015
Date

Paul R. Koch, PE, AICP
Principal

Oct. 20, 2015
Date

Amy C. Sackaroff, AICP
Project Manager

Documentation Prepared for:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Project Development and Environmental Analysis Unit

10/20/15
Date

Robert P. Hanson, PE
Eastern Project Development Engineer

10.20.15
Date

Brian F. Yamamoto, PE
Eastern Project Engineer

10-20-15
Date

John G. Conforti, REM
Project Planning Engineer

PROJECT COMMITMENTS

US 70, Havelock Bypass
Craven County
Federal Aid Project No. NHF-70(49)
WBS No. 34360
STIP ID No. R-1015

The following Project Commitments are either updated or newly-added since distribution of the DEIS. Any clarifying or status comments are indicated by text in *italics*.

Project Development and Environmental Analysis Unit (PDEA)

1. After the selection of the Least Environmentally Damaging Practicable Alternative (LEDPA), NCDOT will refine the preliminary design for the selected alternative and complete a Biological Assessment (BA) concerning the red-cockaded woodpecker (RCW). The BA will be submitted to the USFWS to initiate formal consultation regarding Section 7 of the Endangered Species Act. The USFWS may request additional information and/or subsequent surveys to amend the BA before issuing their Biological Opinion (BO) to conclude formal consultation under Section 7. If an Incidental Take occurs, the USFWS will also issue an initial take statement, indicating terms and conditions, and/or reasonable and prudent measures it believes necessary to minimize the impacts to RCWs. Any such terms and conditions, and/or reasonable and prudent measures to minimize impacts to RCWs will be included in the Final Environmental Impact Statement (FEIS).

   An RCW assessment was performed, in conjunction with a NCDOT/USFS agreement of a Prescribed Burning Plan that would benefit RCW habitat. In addition, the highway footprint was reduced to less than 200-feet for 1.04 mile in the area of RCW habitat. As a result, USFWS determined that a formal consultation was not necessary. Appropriate coordination ensued with USFWS in accordance with Section 7 of the Endangered Species Act, and the USFWS concurred with the biological conclusions of "May Affect, Not Likely to Adversely Affect" for the red-cockaded woodpecker and rough-leaved loosestrife and that the project would have "No Effect" on any other federally-listed Endangered, Threatened, or Proposed plant species. Any future coordination with the USFS on red-cockaded woodpecker (RCW) will be documented in the Record of Decision (ROD).

2. Prior to construction, NCDOT will coordinate with the U. S. Forest Service (USFS) to collect spring flowering goldenrod seeds from areas to be affected by the project and distribute them in an area of the Croatan National Forest (CNF) where there is appropriate habitat but the species does not currently occur, in coordination with the USFS.

   Seed collection began in 2010 and will continue up to construction. Mitigation will include planting seeds and/or plugs as well as monitoring for successful survival. Planting failures will be replanted until USFS and NCDOT staff concur that further plantings would not be beneficial. Additional details will be finalized as part of ongoing coordination with the USFS.

3. NCDOT will collect seed from existing Leconte's thistle populations and coordinate with the USFS to develop a seed increase bed for augmentation in occupied or previously occupied habitat.

   Seed collection began in 2013 and will continue through 2016. Mitigation will include monitoring for successful be accomplished by NCDOT growing plugs from collected seeds then planting at locations identified by the USFS. Mitigation will also include monitoring for successful survival. Planting failures will be replanted until USFS and NCDOT staff concur that further plantings would not be beneficial. Additional details will be finalized as part of ongoing coordination with the USFS.

4. NCDOT will collect seed from existing awned mountain mint populations and coordinate with the USFS to identify sites to seed to establish new populations.

   Seed collection began in 2014 and will continue up to construction. Mitigation will be through planting seeds at locations identified by the USFS.

5. The final Memorandum of Understanding (MOU) between the Federal Highway Administration (FHWA), NCDOT, USACE, and USFS regarding the Croatan Wetland Mitigation Bank (CWMB) will be included in the ROD.

6. NCDOT will continue to coordinate appropriately with USFWS to determine if the project has the potential to affect the proposed-listed Endangered Northern long-eared bat (*Myotis septentrionalis*) and how to address these potential effects, if necessary.

7. The status of the Craven County Waste Transfer Facility relocation will be updated in the ROD to ensure that the USFS and Craven County coordinate to develop recommendations for a "site restoration plan" that return the current site to preexisting conditions. Any NCDOT actions related to the site restoration plan will be identified in the ROD.

8. Prior to construction, NCDOT will coordinate with the USFS to identify USFS Rare Plant Species on NFS lands occurring near the project's construction limits and install high visibility protective fencing to be removed after completion of construction.

9. During final design, NCDOT will coordinate with the USFS on the location of any staging areas on NFS lands to avoid impacts to USFS Rare Plant Species. Where practicable, NCDOT will require contractors to place staging areas 250 feet away from USFS Rare Plant Species occurrences. To avoid unintentional impacts to USFS Rare Plant Species within powerline corridors on NFS lands, specifications will prohibit the contractor from placing heavy equipment outside the project's construction limits without prior approval from the USFS.

PDEA Human Environment Section, Archaeology Group

Archaeological Site 31CV302 is approximately 300 feet away from the project limits and for added protection of the site during construction, the NCDOT will:

1. Before final design is completed, Roadway Design will verify that Site 31CV302 is avoided by any right-of-way or easement. If final design plans change, thereby causing an adverse impact to the site, then Roadway Design will immediately notify the PDEA

project manager and the NCDOT Archaeologist to initiate additional coordination to comply with historic preservation laws.

2. Final design plans identify the installation of high-visibility fencing around Site 31CV302, which is to be labeled as: "PROTECTED AREA." Final design plans will indicate the fence boundary and also provide an adjacent table of Northing and Easting coordinates. Project specifications should indicate that high-visibility fencing will be installed along the site boundary, prior to any clearing and grubbing operations. The contractor must pre-coordinate with NCDOT Archaeology (tel. 919-707-6000) so that an archaeologist field-verifies fence location or is on-site when the fence is installed. The fence will be maintained for the construction duration, and will be removed by the HES Archaeology Group only just before final project inspection. No construction equipment or personnel shall enter the fenced area.

Roadway Design & PDEA & Structures Management Unit

1. The Preferred Alternative includes a grade-separated crossing of the Camp Lejeune Railroad on NFS lands (operated by the Norfolk Southern Corporation). Final design will be developed to provide a 23foot vertical clearance and adequate horizontal clearances; however, should the railroad desire additional clearances, NCDOT will coordinate with the USFS, US Government, and Norfolk-Southern regarding the review of the final design plans for this crossing.

Right-of-Way Unit & Location and Surveys & Roadway Design & Construction

1. NCDOT will pay the USFS, or their approved contractor, to measure to USFS specifications, the volume of timber on NFS lands within the proposed right-of-way limits. NCDOT will then pay the USFS for the measured timber volume at which time the timber will become property of the NCDOT. The USFS and NCDOT will agree on the precise monetary value of the timber through appraisal at rates effective at the time of the timber sale contract.

2. No borrow or disposal sites related to this project are to be located on NFS lands without express written permission from the USFS and completion of all required environmental studies.

3. Before construction, a preconstruction conference will be held involving the contractor, pertinent local officials, the U.S. Forest Service, and NCDOT Division of Highways to discuss various construction procedures, including precautionary steps to be taken during construction that will minimize the interruption of public utility and traffic services.

Utilities & Right-of-Way Unit

1. NCDOT will coordinate with the USFS if previously undisclosed utilities are encountered during the right-of-way acquisition and construction phases of the project.

Roadway Design & Hydraulics Unit & PDEA & Construction & Division 2

1. As agreed upon by the NEPA/404 Merger Team [*Concurrence Meeting for Corridor Selection (Concurrence Point 3 Revisited) Meeting Summary, 10/23/2012*], the East Prong of Slocum Creek will be crossed with a 1,620-foot bridge. The Tucker Creek tributary will be crossed with a double 10-foot by 8-foot reinforced concrete box culvert that is 400 feet in length perpendicular to the proposed roadway. The Southwest Prong of Slocum Creek will be crossed with a 945-foot bridge. Existing triple 9-foot by 7-foot reinforced concrete box culvert on Tucker Creek will be extended approximately 25 feet

upstream and 78 feet downstream with a triple 9-foot by 7-foot reinforced concrete box culvert. Temporary work bridges will be required to construct the proposed bridge structures, which will be addressed in the Permit Application Package.

2. In order to minimize the fragmentation of red-cockaded woodpecker (RCW) habitat, plan sheets will show that the right-of-way limits (and clearing limits) do not exceed 200-feet wide for the 5,500-foot (1.04-mile) section from Station 338+00 to Station 393+00. In addition and to avoid clearing trees outside the 200-foot limits, only hand clearing will occur at the edge of the right-of-way limits of this section.

3. Project special provisions should indicate an in-water work moratorium for February 15 to June 15 for East Prong Slocum Creek, Southwest Prong Slocum Creek, and Tucker Creek at the proposed extension of the existing culvert at US 70. The unnamed tributaries within the project study alignments are not considered anadromous fish habitat and are not subject to anadromous fish moratoria. Design of these structures will adhere to Stream Crossing Guidelines for Anadromous Fish Passage (NCDOT, 2012).

Roadside Environmental Unit & Roadway Design

1. NCDOT will continue to coordinate with the USFS to address landscaping, fencing, and access needs on NFS lands.

    - Detailed plans for these design elements will be included in the ROD.

    - The Landscaping Plan will, among other normal aspects, detail appropriate native seeding mixes for erosion control and site specific control methods for nonnative invasive species (NNIS), including a suite of acceptable herbicides for the corridor and adjacent natural habitats.

    - The Landscaping Plan will also outline a plan for ongoing coordination between NCDOT and USFS personnel to maintain vegetation diversity and ensure no long-term impacts to rare species along the bypass corridor.

2. NCDOT will utilize rolled matting or weed-free mulch for erosion control and revegetation on NFS lands. If erosion becomes problematic in any area post-construction, turfgrass may have to be judiciously utilized to limit soil disturbance.

4. No borrow or disposal sites related to this project are to be located on NFS lands without express written permission from the USFS and completion of all required environmental reviews. Contractors will coordinate with regulatory and resource agencies during the final permitting stage to ensure that other areas of non-disturbance (i.e., borrow pits, temporary access roads, staging areas, etc.) are set to minimize impacts to natural and cultural resources.

Roadside Environmental Unit & Division 2

1. Management of Non-Native Invasive Species (NNIS): NCDOT will work within adjacent NCDOT right-of-way to prevent the encroachment of NNIS onto NFS lands and commits to the following measures:

    - Native vegetation will be retained as much as possible. Exposed soils would be promptly revegetated to avoid re-colonization by NNIS or potential soil erosion. Only approved seed mixtures and weed seed-free mulch would be used. In consultation

with the USFS, NCDOT will use seed mixes of native grasses and forbs or other non-native, non-invasive species on NFS lands for erosion control and revegetation.

- To prevent the spread of NNIS on NFS lands, NCDOT will require contractors to pressure wash all off-road equipment, including cranes, graders, pans, excavators, and loaders, prior to being brought into the CNF construction areas. Equipment would be cleaned thoroughly before moving from treatment sites to ensure that seeds or other propagules are not transported to other sites.

- To control the spread of NNIS on NFS lands, NCDOT, in coordination with the USFS, will locate and flag areas of targeted NNIS. If any of these areas are within areas of proposed fill, those areas will be cleared and grubbed, and the material disposed of outside the limits of the CNF. If NNIS are located in areas of proposed cuts, then the material and actual thickness of root mat or other defined amount will be disposed of outside the limits of the CNF.

- Use of mowing as a control method for NNIS should be timed to avoid spreading seeds (e.g. before seed set) to the extent possible.

- Herbicide Treatments:

  - NCDOT will only use herbicides in specific areas on National Forest System lands in consultation with the USFS. All guidelines and mitigation measures presented in Forest Manual 2150, Pesticide-Use Management and Coordination, and Forest Service Handbook 2109.14, Pesticide Use Management and Coordination Handbook, would be followed. If any new herbicides come onto the market, NCDOT will coordinate with USFS before using on NFS lands.

  - NCDOT will contact the USFS for non-routine maintenance and use of herbicides on NFS lands.

  - Prior to treatment, proposed actions will be reviewed by forest resource specialists in the areas of wildlife biology, botany, aquatics, soils, recreation, and heritage resources.

  - NCDOT will not use broadcast sprays for herbicides and pesticides on NFS lands. Herbicides and pesticides will only be used in specific areas on National Forest System lands in consultation with the USFS. In addition, NCDOT will coordinate with the USFS on any mechanical methods that would be allowed.

  - Along stream edges and banks, wide-angle cone tip nozzle guards will be used on the end of herbicide applicator wands. All herbicides will be sprayed away from any water in ephemeral and perennial streams, vernal pools, or lakes. Aquatic-labeled herbicides will be used when within 150 feet of any live water. Only surfactants/adjuvants with low toxicity to aquatic species, such as Agri-dex, will be used in these areas.

  - When conducting chemical control of targeted NNIS within 10 feet of any identified USFS Rare Plant Species populations, the following guidelines apply:

- All the rare plant species occurrences would be flagged or marked prior to treatment to avoid any off-target effects.

- No chemical treatment will occur within 1 foot of the rare plant.

- Prior to applying herbicide within 1-10 feet of these plants cover the rare plants or place an appropriate barrier adjacent to them.

- For vining species, pull the vines outside one foot of adjacent rare plants.

- For larger woody stems, diameters 1 inch or greater, apply herbicide to cut stem surfaces. Apply herbicides to the cut stems with a small wick applicator if possible or with a small spray bottle to minimize drift.

- For smaller woody NNIS stems, if broadcast treatment is the only feasible treatment, cut the stems and only treat after re-sprouting from 6-inches to 1 foot in height.
- While spraying the re-sprouting foliage, place a barrier (such as an appropriately sized cardboard sheet) next to the rare plant species or cover the rare plant species with an appropriate container.

- NCDOT will post "No Treatment" signs at rare plant sites along the roadway.

- When conducting mechanical control by hand, NNIS capable of starting new plants (seeds, rhizomes, root mats, etc.) require proper disposal outside the limits of the CNF. Plants should be bagged and moved off site. Bagged plants will receive standard garbage disposal. For large woody bushes that would be difficult to move, treatments will be scheduled prior to seed set as practical. NCDOT will coordinate with the USFS on any mechanical methods that would be allowed for NNIS.

- NCDOT commits to treating roadside NNIS in the CWMB prior to turning over the site to USFS. An initial treatment, followed by a second spot application, will address NNIS growing along or adjacent to the existing roads within the CWMB and will cover species on the USFS list of NNIS.

- NCDOT Division 2 will work with USFS staff on a periodic basis to control the presence of priority NNIS along the NCDOT right-of-way on NFS lands. In turn, USFS will work cooperatively with NCDOT to identify and effectively control prioritized NNIS. The current list of prioritized NNIS species is below; it is subject to change as new plant threats are identified.

- *Lespedeza cuneata,* Sericea Lespedeza
- *Lespedeza bicolor,* Bicolor Lespedeza
- *Albizia julibrissin,* Mimosa
- *Ligustrum sinense,* Privet
- *Rosa multiflora,* Multiflora Rose
- *Ailanthus altissima,* Tree-of-Heaven
- *Miscanthus sinensis,* Chinese Silver Grass
- *Lonicera maacki or morrowii,* Amur or Morrow's Honeysuckle
- *Lonicera japonica,* Japanese Honeysuckle
- *Sorghum halepense,* Johnson Grass
- *Arthraxon hispidus,* Basket Grass
- *Elaeagnus umbellata,* Autumn Olive
- *Pueraria montana var. lobata,* Kudzu
- *Hedera helix* var. *helix,* English Ivy
- *Vinca minor,* Periwinkle
- *Kummerowia striata,* Japanese-clover
- *Youngia japonica,* Asiatic Hawk's-beard
- *Wisteria sinensis,* Chinese Wisteria

- *Verbena brasiliensis,* Brazilian vervain
- *Imperata cylindrica,* Cogongrass
- *Persicaria perfoliata,* Mile-a-minute
- *Cayratia japonica,* Bushkiller
- *Pyrus calleryana,* Bradford Pear
- *Solanum viarum,* Tropical Soda Apple
- *Centaurea stoebe ssp. micranthos,* Spotted Knapweed
- *Commelina communis,* Common Dayflower
- *Baccharis hamlimifolia,* Eastern baccharis*

* Native but considered invasive

Geotechnical Engineering Unit

1. If excavation work is required at the Craven County Waste Transfer Site, NCDOT will collect and analyze background soil samples to confirm the presence or absence of soil impact from arsenic, in accordance with NCDOT Policy on hazardous materials.

Hydraulics Unit

1. The NCDOT Hydraulics Unit will coordinate with the NC Floodplain Mapping Program (FMP), to determine the status of the project with regard to applicability of NCDOT's Memorandum of Agreement, or approval of a Conditional Letter of Map Revision (CLOMR) and subsequent final Letter of Map Revision (LOMR).

Hydraulics Unit & Construction & Division 2

1. As this project involves construction activities on or adjacent to FEMA-regulated streams, the Division shall submit sealed as-built construction plans to the Hydraulics Unit upon the completion of project construction, certifying that the drainage structures and roadway embankment that are located within the 100-year floodplain were built as shown in the construction plans, both horizontally and vertically.

2. Fueling or oiling of mechanical equipment would occur away from aquatic habitats.

Division 2

1. NCDOT Division 2 staff will coordinate in future years with the USFS to allow for prescribed burns on NFS lands during construction and in the future, as detailed in Appendix A of this FEIS. Details of the prescribed burn plan will also be documented in the ROD.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER PAGE

CHAPTER PAGE

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER PAGE

TABLES

CHAPTER PAGE

EXECUTIVE SUMMARY

S.1 FEDERAL HIGHWAY ADMINISTRATION

( ) Draft (X) Final

S.2 TYPE OF ACTION

This Final Environmental Impact Statement (FEIS) has been prepared for the Federal Highway Administration (FHWA) and the North Carolina Department of Transportation (NCDOT) in accordance with the requirements of the National Environment Policy Act (NEPA) of 1969, as amended, and the North Carolina State Environmental Policy Act (SEPA G.S. 113A, Article 1), for the purpose of evaluating the potential impacts of this proposed transportation improvement project. This is an informational document intended for use by both decision-makers and the public. As such, it represents a disclosure of relevant environmental information concerning the proposed action as well as all viable alternatives.

This document conforms to the Council on Environmental Quality (CEQ) guidelines that provide direction regarding implementation of the procedural provisions of NEPA, and the FHWA's *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (Technical Advisory T6640.8A, 1987). The Federal Highway Administration is the Lead Federal Agency on this project. A large portion of the proposed project would traverse the Croatan National Forest; as such, the United States Forest Service (USFS) is a cooperating agency in accordance with CEQ guidelines contained in 40 CFR 1501.6.

S.3 CONTACTS

The following individuals may be contacted for additional information concerning this Final Environmental Impact Statement (FEIS):

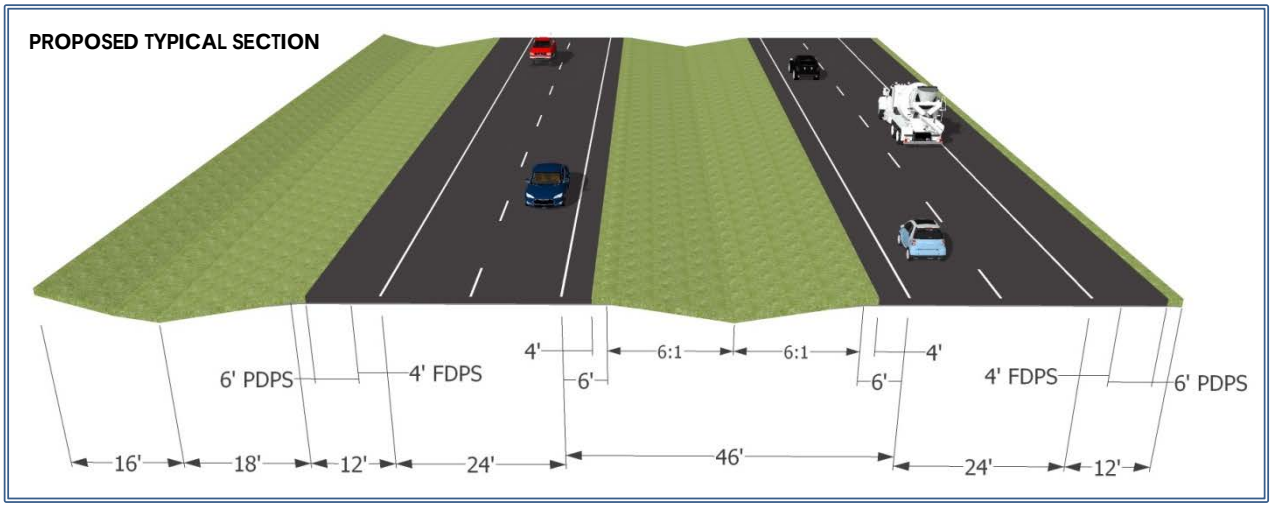
Federal Highway Administration (FHWA)
John F. Sullivan, III, PE, Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601
Telephone: (919) 747-7000

North Carolina Department of Transportation (NCDOT)
Richard Hancock, PE, Manager
North Carolina Department of Transportation
Project Development and Environmental Analysis Branch
1548 Mail Service Center
Raleigh, North Carolina 27699-1548
Telephone: (919) 707-6000

S.4 DESCRIPTION OF THE PROPOSED ACTION

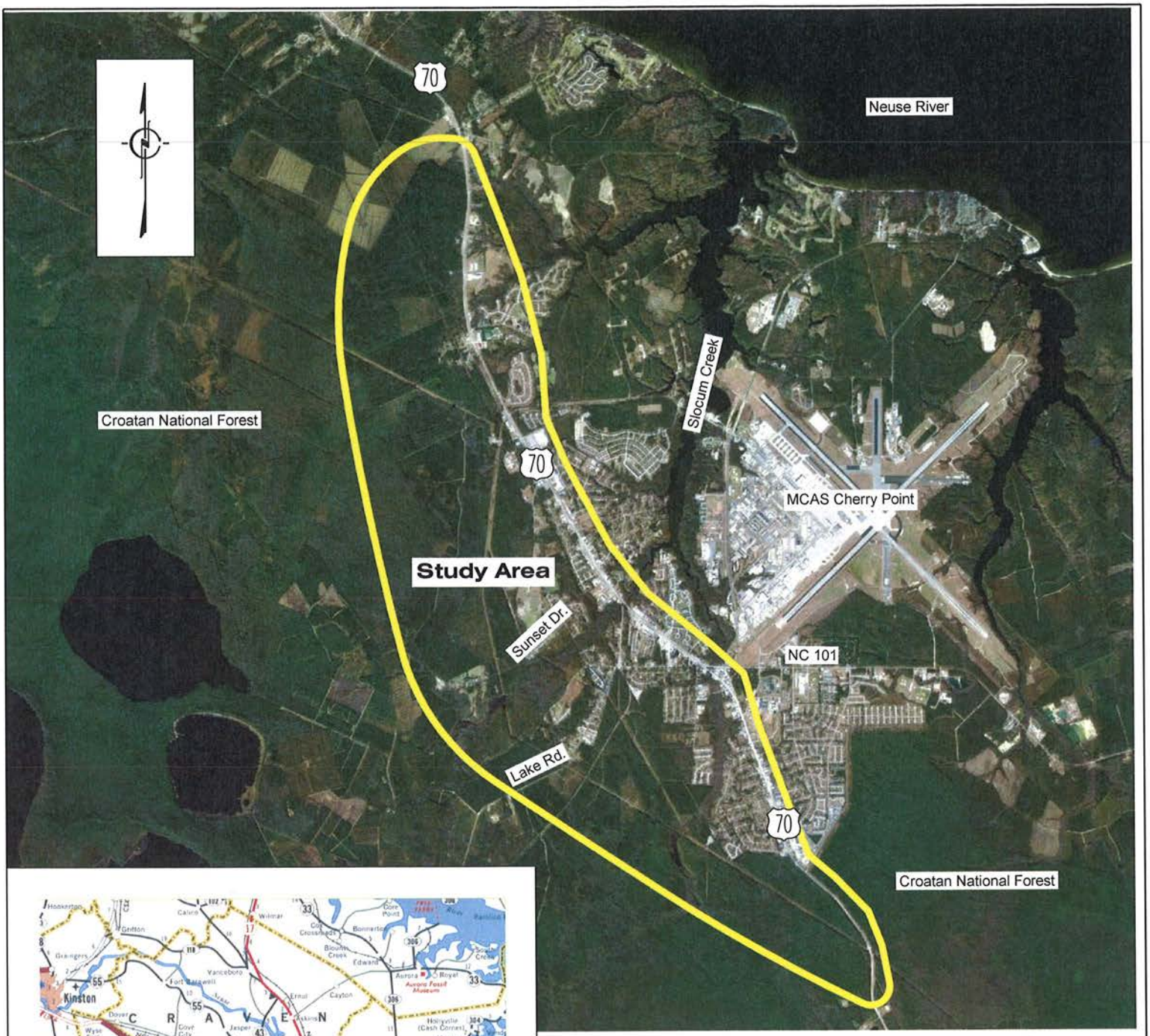
The North Carolina Department of Transportation (NCDOT) proposes to construct a new US 70 bypass of Havelock, North Carolina in Craven County. This transportation improvement project is identified in the Statewide Transportation Improvement Program (STIP) as Project No. R-1015. Exhibit S-1 shows the project location.

The roadway typical section consists of four 12-foot travel lanes, placed on fill material. As shown below, the highway has 12-foot outside shoulders (10-feet paved) and grass-lined ditches with slopes ranging from 6:1 to a 3:1 maximum. The inside shoulders are 6-foot shoulders (4-foot full-depth of pavement). The medians are depressed downward to the center of the median at a 6:1 slope. The total depressed-median width (paved and grass) is 46 feet. Two interchanges will connect the bypass to existing US 70 on the north and south ends of the project, and a new interchange will be constructed just west of central Havelock - to provide access from SR 1756 (Lake Road). A minimum of 23 feet of vertical clearance will be held over railroads and a minimum of 17 feet vertical clearance above intersecting roadways.

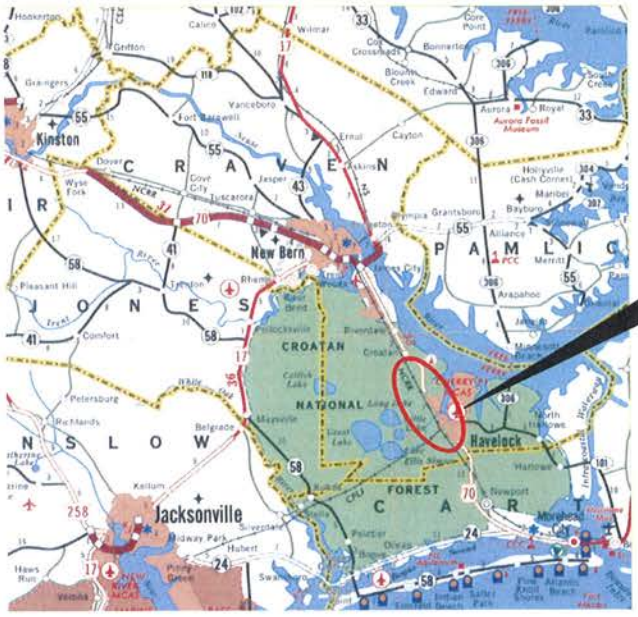


S.5 PURPOSE AND NEED

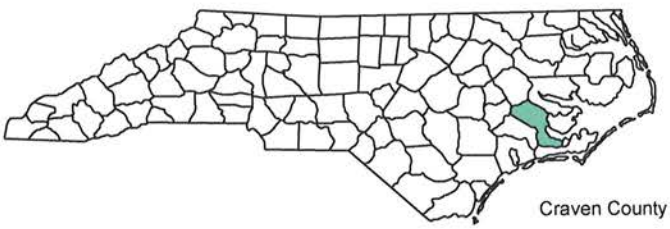
The proposed project's purpose is to improve traffic operations along the US 70 corridor and enhance regional connectivity in eastern North Carolina. The US 70 corridor connects Raleigh, Smithfield, Goldsboro, Kinston, New Bern, Havelock and Morehead City. Regionally, US 70 provides connectivity with the Port of Morehead City, Global TransPark (a 2,500-acre multimodal industrial park in Kinston, NC), industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and it functions as a primary route for seasonal beach traffic.



Note: Aerial photo from Google Earth Pro.



Project Location



Craven County

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Project Vicinity
Not to Scale
Exhibit S-1

This page intentionally left blank to facilitate double-sided printing.

Because US 70 is the state's primary connection to the Port of Morehead City and a main route between military facilities and the port, the NCDOT Strategic Highway Corridors (SHC) Program vision to provide a freeway on this section of US 70 is particularly important to regional and state decision makers.

Commercial, institutional, and residential growth in the City of Havelock and an increasing regional reliance on US 70 has led to deteriorating traffic operations along the existing route. The traffic-carrying capacity of US 70 in Havelock is currently limited by the operational capabilities of its many signalized intersections. By the design year 2035, only five of the thirteen signalized intersections will operate at an acceptable level of service.

The lack of access control on US 70, with its signalized intersections and numerous unsignalized street and driveway connections, substantially reduces the mobility of this corridor. In addition to improving regional mobility, the proposed controlled-access bypass would provide travelers with a safer facility than the existing route. Median-divided, access-controlled roadways greatly reduce the typical conflict points found along undivided roadways with no access control. By eliminating a large volume of through-traffic on existing US 70, the proposed bypass would also provide congestion relief and a more relaxed driving experience through the City of Havelock. Chapter 1 of this FEIS describes the project's Purpose and Need in greater detail.

S.6 PROJECT CHARACTERISTICS AND ALTERNATIVES CONSIDERED

This section provides a discussion of the alternatives considered in the DEIS and discussed in Chapter 2.0 of this FEIS.

The project study area is located Craven County, along the western edge of Havelock, North Carolina. A large portion of the project study area traverses the Croatan National Forest (CNF) and privately-owned forested lands that are primarily used for silviculture and hunting. The CNF and adjacent forested areas contain habitat for a number of protected species, including the red-cockaded woodpecker. There are also large stream and wetland systems present in the project study area. Additionally, the project study area is just east of the 4,035-acre Croatan Wetland Mitigation Bank (CWMB). The NCDOT purchased the CWMB in 1998 with the purpose of providing compensatory mitigation to streams and wetlands, the CNF, and for habitat fragmentation. A discussion of the CWMB is contained in Chapter 4.14.2.

Although a new location bypass has been recommended to fulfill the regional traffic needs in the study area, other alternatives were considered, including a No-Build Alternative, Multi-modal Alternatives, Transportation Systems Management (TSM) Alternatives, and Mass Transit Alternatives. Detailed discussion of these alternatives is included in Chapters 2.1

through Chapter 2.4. In summary, the No-Build Alternative does not meet the purpose and need for this project because congestion on the existing route would contribute to travel time delays that collectively have regional and statewide effects. Multi-modal alternatives were eliminated from further study due to the fact that the large volume of through-traffic (including a large amount of truck traffic) would not be able to benefit from multimodal options through Havelock. TSM improvements do not meet the purpose and need for the project because the existing mixture of through and local traffic along US 70 does not allow TSM measures to substantially improve traffic flow.

Improve Existing US 70 Alternatives

Two alternatives to improve existing US 70 through Havelock were considered and then eliminated. The alternatives extend a distance of approximately six miles from the signalized intersection at Slocum Road south to the signalized intersection at McCotter Boulevard (SR 1824). Two preliminary build alternatives, an Expressway alternative and a freeway alternative, were considered to improve existing US 70. Both Improve Existing Alternatives proposed an additional through lane in each direction and would include a 22-foot median and two-way service roads to serve adjacent properties currently served by driveways. A right-of-way width of 360 feet was anticipated with additional right-of-way needed at signalized intersections or interchanges for these improvements.

In addition to creating 59 business relocation impacts, the Expressway Alternative would not be able to accommodate the high traffic volumes projected on US 70 and would constrain average speeds to only 22 to 25 mph. These characteristics would not fulfill the vision of the Strategic Highway Corridors Program. The Freeway Alternative would provide an adequate LOS for through traffic; however, it would not provide a design suitable for accommodating local traffic nor would it meet local community planning objectives. The Freeway Alternative would also relocate 59 businesses and impact the historic Needham B. White House. As such, the alternatives to improve US 70 on its existing alignment were not considered practicable. An interagency team comprised of federal and state regulatory and resource agencies eliminated alternatives to improve US 70 on its existing alignment from further consideration on February 15, 1996.

Bypass Alternatives

Development of bypass alternatives involved a two-phase process. First, land suitability mapping (LSM) was developed to show physical and natural resources and characteristics that would influence the location of the bypass alternatives. The project team then identified ten short corridors with minimal adverse impacts; these corridor segments were then connected to form the corridors for the bypass alternatives. Exhibit S-2 shows the short segments and preliminary bypass alternatives.

Based on impact evaluations, public comments, and analysis by the Federal and State resource agencies, less desirable segments were either eliminated from additional study or modified to minimize impacts. Exhibit S-3 shows the alternatives that moved forward to more detailed study. The westernmost Preliminary Bypass Alternative C was renamed Alternative 1. Preliminary Bypass Alternative A (which is closer to Havelock) was renamed as Alternative 2. During alternative selection and development, the team noted that Alternative 1 minimizes impacts to existing development but had substantial impacts to natural resources while Alternative 2 minimizes impacts to the Croatan National Forest, but had substantial impacts to neighborhoods and businesses in Havelock. Therefore, a new alternative corridor (Alternative 3) was developed to balance the impacts of Alternatives 1 and 2. These three bypass alternatives were carried forward for detailed study and the eventual selection of a Preferred Alternative. Chapter 2 contains detailed descriptions of the alternatives and the study process. Table S.1 shows impacts for the three bypass alternatives at the time Alternative 3 was selected as the Least Environmentally Damaging Practicable Alternative (LEDPA) (2011) and the Preferred Alternative after additional refinement of the preliminary design (2014).

TABLE S.1
COMPARISON OF BYPASS ALTERNATIVES

ENVIRONMENTAL FEATURES	REFINED ALT. 3 (PREFERRED) (2014)	ALT. 3 (2011)	ALT. 1 (2011)	ALT. 2 (2011)
Length (miles)	10.3	10.3	10.85	9.91
Relocations Residential	16	16	13	133
Business	1	1	1	3
Non-profit [1]	1	1	1	1
Minority/Low Income Populations - Disproportionate Impact	No	No	No	No
Historic Properties (adverse effect)	No	No	No	No
Community Facilities Impacted [1]	No	No	No	No
Section 4(f) Impacts	No	No	No	No
Noise Receptor Impacts	43 [2]	31	31	31
Prime Farmlands	71	71	66	112
NFS Lands – acres [3]	240	240	189	225
Forested Acres *(NFS lands)* [4]	332 (204)	354 (244)	343 (188)	258 (213)
CNF Habitat Fragmentation [5]	534	699	1,412	240
Wetland Acres *(NFS lands)* [6]	131 (93) [7]	140 (102)	135 (96)	109 (87)
Streams *(NFS lands)* – linear feet [8]	2,948 [9] (1,825)	2,505 (1,387)	2,581 (1,012)	3,094 (1,764)
Riparian Buffer Impacts – sq feet *(NFS lands)* [6] Zone 1	129,402 (54,884)	135,930 (69,698)	124,823 (46,344)	172,705 (91,341)
Zone 2	81,142 (33,524)	79,168 (36,949)	75,232 (23,190)	108,019 (50,684)
Total Buffer Impacts	210,544 (88,408)	215,098 (106,647)	200,055 (69,534)	280,724 (142,025)
100 Year Floodplain and Floodway Impacts – acres	1.6	1.6	1.3	1.3

TABLE S.1 cont.
COMPARISON OF BYPASS ALTERNATIVES

ENVIRONMENTAL FEATURES	REFINED ALT. 3 (PREFERRED) (2014)	ALT. 3 (2011)	ALT. 1 (2011)	ALT. 2 (2011)
Federally Protected Species	May Affect Not Likely To Adversely Affect (1 species: RCW)	Unresolved: RCW May Affect, Not Likely To Adversely Affect: Bald Eagle		
Right of Way Cost	$11,425,000	$11,425,000	$9,800,000	$28,975,000
Utility Relocation Cost	$951,440	$951,440	$1,649,280	$2,773,680
Construction Cost	$160,000,000	$161,000,000	$156,400,000	$138,800,000
Total Cost [10]	$172,376,440	$173,376,440	$167,849,280	$170,548,680

NOTES:

1. NCDOT will compensate Craven County for relocation expenses associated with the displacement of the Waste Transfer Facility; however it is the County's decision whether to build a new facility. Thus, the County accepts responsibility to locate and obtain a new site, conduct any appropriate environmental studies, and obtain permits for a new facility. The Craven County Solid Waste & Recycling Department informed NCDOT that it is presently coordinating with the County Planning Department to search for a new replacement facility location for the center. DENR Solid Waste Management is also aware of the planning effort. In coordination with USFS, the County must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on this effort is ongoing and the results will be documented in the ROD.
2. The noise analysis presented in the DEIS was prepared in 2006, prior to the 2011 update of NCDOT's Traffic Noise and Abatement Manual. The updated manual requires a more sophisticated "validation model" and noise contours are no longer used to determine impacts. These more detailed models often pick up additional receptors as impacts as compared to the noise contour method. As such, noise impacts for the Refined Preferred Alternative increased due to the new methodology. It is noted that the new analysis indicates that the number of build-condition impacts is lower than the number of no-build condition impacts (49) because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.
3. Impacts to NFS lands are based on proposed right-of-way limits.
4. Impact quantities for the Refined Preferred Alternative are based on the proposed right-of-way. Impacts for the build alternatives at LEDPA selection are based on the construction limits of the Preferred Alternative plus an additional 35-foot buffer. Direct impacts are projected to be less than those shown in the table.
5. The amount of NFS lands disconnected from contiguous NFS lands based on the detailed study alternative corridors. For Alternative 1, this total also includes the isolated portion of the NFS parcel remaining west of the corridor, just north of the SR 1756 (Lake Road) interchange. These acreages do not include areas that would be the same for all alternatives.
6. Impact quantities are based on the proposed construction limits plus an additional 25 feet, in accordance with current NCDOT impact analysis guidelines.
7. A systematic error in the calculation of wetland impacts was discovered subsequent to the publication of the DEIS. The error resulted from conversion/scaling issues in transferring data between GIS and Microstation. The miscalculation resulted in reporting the wetland impacts for each of the Preliminary Alternatives lower than actual measured areas. The conversion error only applied to wetland impacts.
8. Impact quantities are based on the proposed construction limits plus an additional 25 feet, in accordance with current NCDOT impact analysis guidelines.
9. Because the Preferred Alternative was further refined after its selection as the LEDPA, similar avoidance and minimization measures were not developed for Alternatives 1 and 2. It can be noted, however, that S7 would be an additional impact for Alternative 1. These updates would not affect the LEDPA decision, as stream impacts were secondary to other decision-making factors, particularly habitat fragmentation.
10. The difference between the construction cost estimates in the 2011 DEIS and the current construction cost estimate for the Refined Preferred Alternative is due to updated quantities and unit prices. In addition to unit price increases, outside shoulder widths increased from 10 feet to 12 feet with paved shoulders increasing from 4 feet to 10 feet.

S.7 PREFERRED ALTERNATIVE

After evaluating the potential impacts associated with the detailed study alternatives, Alternative 3 was identified as the Preferred Alternative for the proposed project, as shown in Exhibit S-4.

The Preferred Alternative (Alternative 3) originates at an interchange with existing US 70, just north of SR 1760 (Hickman Hill Loop Road) and extends to the southwest. The proposed bypass continues in a southwesterly direction and crosses the North Carolina Railroad and Tucker Creek. It then turns southeastward and crosses SR 1747 (Sunset Drive) and the Southwest Prong of Slocum Creek to an interchange at SR 1756 (Lake Road). From the proposed SR 1756 (Lake Road) interchange, the Preferred Alternative continues southeastward over a grade separation at the Camp Lejeune Railroad before crossing over the East Prong of Slocum Creek. The alignment continues in a southeasterly direction to terminate at an interchange with existing US 70 southeast of SR 1824 (McCotter Boulevard).

Basis for Selection

Alternative 3 was first recommended by NCDOT as the Preferred Alternative in the January 1998 Environmental Assessment. Concurrence from resource agencies resulted in the approval of Alternative 3 as the Least Environmentally Damaging Practicable Alternative (LEDPA). The NCDOT Corridor Selection Committee endorsed the selection of Alternative 3 as the NCDOT Preferred Alternative on August 27, 1998. This decision was revisited in subsequent studies and later reaffirmed by the NEPA/404 Merger Team in 2012. These decisions are discussed in detailed in Chapter 2.10.2.

Alternative 3 was selected as the Preferred Alternative because it provides the best balance of minimizing impacts to natural and human environment resources, the Croatan National Forest and the City of Havelock, while offering a cost-effective solution that will satisfy the need for the project. Table S-1 contains the comparison of the bypass alternatives that was utilized during the Preferred Alternative selection process.

Avoidance and minimization strategies were considered and implemented during preliminary and detailed alternative development. As alternatives were developed, the project team also understood that land management aspects could comprise a necessary component of the proposed project and could, in fact, influence alternative selection. For example: if an alternative is not conducive to prescribed burns for RCW management, then that constraint affected alternative selection. At the NEPA/404 Merger Team meeting on April 10, 2012 (CP3 Revisited), USFS staff indicated that Alternative 1 would have a greater effect on RCWs because it would make prescribed burning extremely difficult and that it would make it more difficult to manage RCW clusters and to access/manage lands.

As impacts then began to crystallize, mitigation opportunities and strategies were developed concurrent with alternative studies. For example, decision-makers were aware

that the 4,035-acre Croatan Wetland Mitigation Bank (Exhibit S-5) was available to mitigate impacts to streams and wetlands, the Croatan National Forest, and for habitat fragmentation. Discussions also considered a prescribed burn plan, which is vital to red-cockaded woodpecker (RCW) management in the area.

Alternative 3 was selected as the Preferred Alternative because it provides the best opportunity to collectively minimize impacts to both the human and natural environments. Alternative 3:

- ***Is the least cost alternative*** – primarily due to its shorter length (than Alternative 1) and because it would require less relocations than Alternative 2;

- ***Causes a minimal number of relocations (18)*** – as compared to 15 with Alternative 1 and 137 with Alternative 2;

- ***Minimizes habitat fragmentation effects*** – by following the power line corridor west of Havelock and is the alternative most conducive to a prescribed burning plan, which provides essential habitat management for the endangered RCW and other forest species of concern;

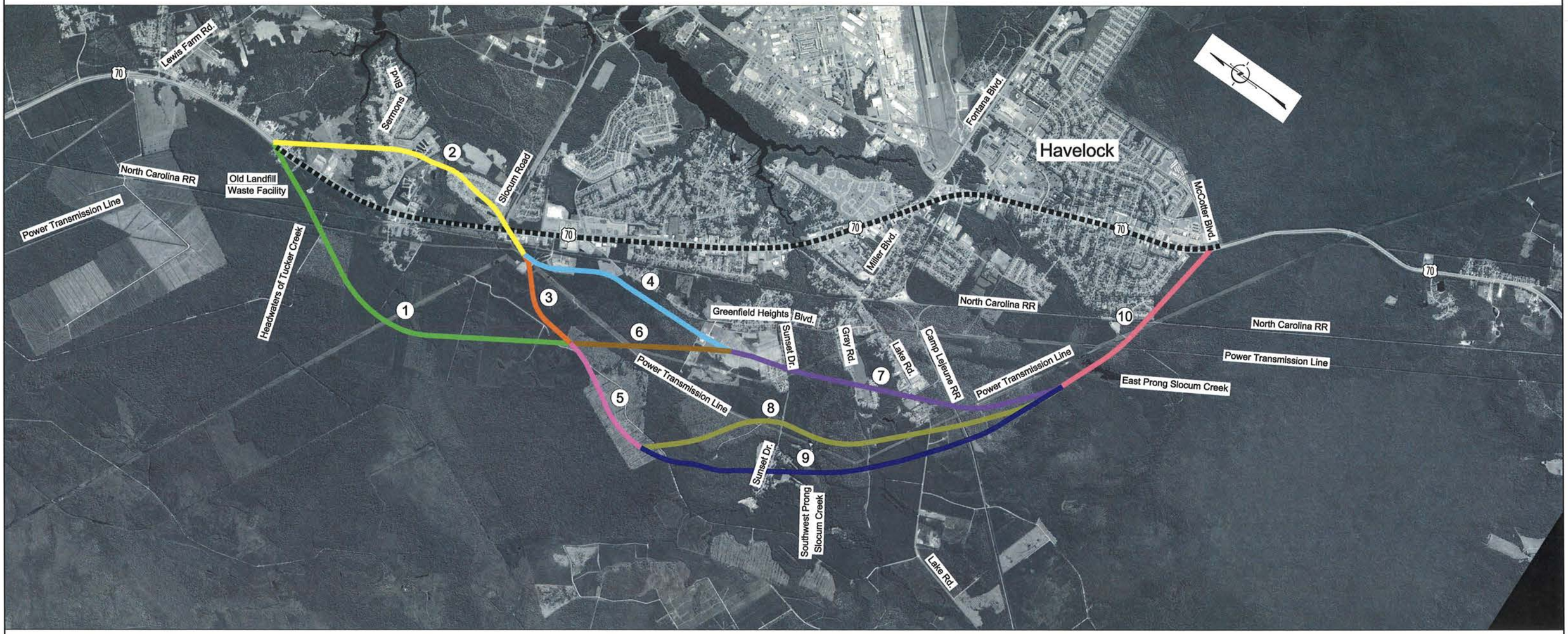
- ***Causes the least amount of stream impact*** – 589 linear feet less than Alternative 1 and 76 linear feet less than Alternative 2;

- ***Causes a "middle ground" impact to prime farmlands*** – Alternative 3 affects five more farmland acres than Alternative 1 but 41 less farmland acres than Alternative 2;

- ***Causes a "middle ground" impact to riparian buffers***– Alternative 3 affects 15,043 square feet more buffers impacts than Alternative 1 but 65,626 square feet less than Alternative 2;

- ***Is the best compromise between impacts to the CNF and the City of Havelock*** – Alternative 3 impacts the highest amount of wetlands (140 acres) and has the highest impacts to NFS lands (240 acres) but these impacts must be considered alongside Alternative 3's lower impacts in other areas, in particular habitat fragmentation and relocations.

As explained in Chapter 2.10.2, Alternative 3 is the most practicable alternative for a number of reasons. Alternative 1 is not considered the least environmentally-damaging alternative because it fragments a large amount of CNF habitat, and because the USFS has stated that conducting prescribed burns would be extremely difficult, resulting in considerable long-term habitat fragmentation effects on RCW populations within the CNF.



Preliminary Alternatives Improve Existing	Segments
A	1-6-7-10
B	2-4-7-10
C	1-5-9-10
D	2-3-5-9-10
E	1-5-8-10
F	2-3-5-8-10

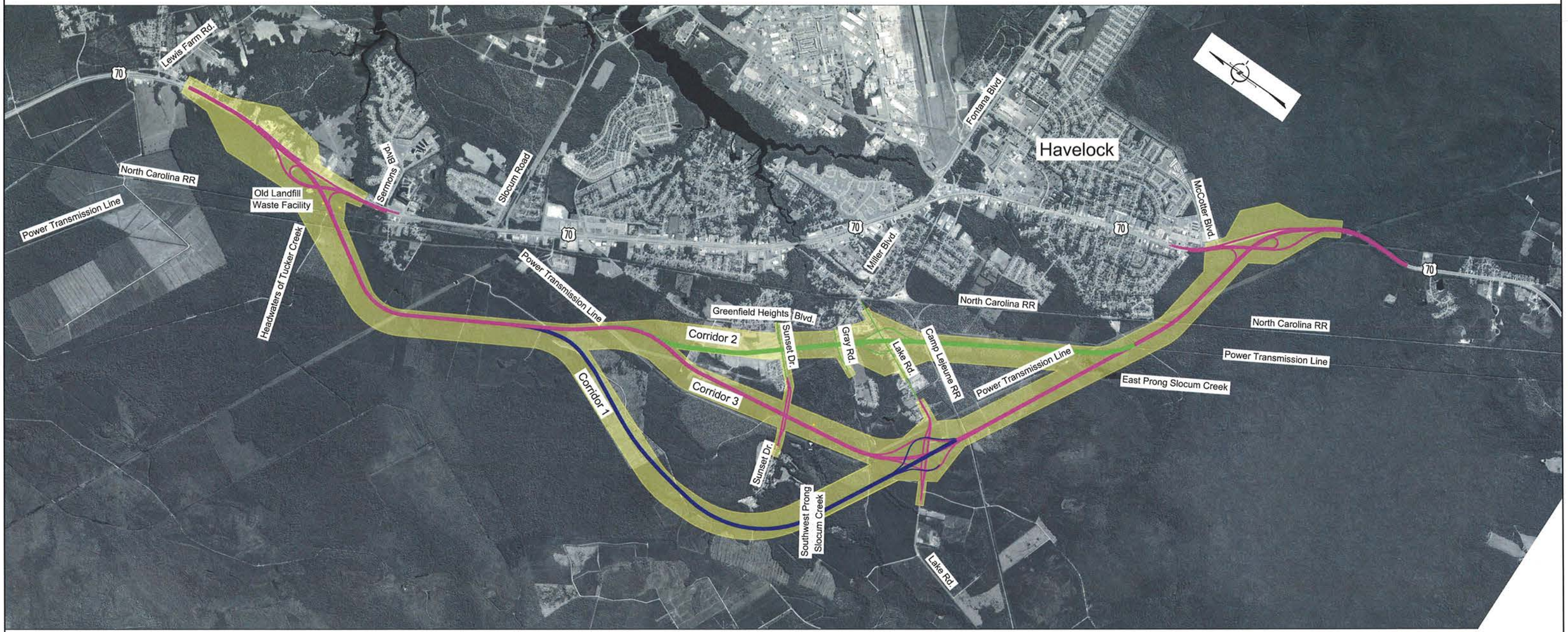
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Preliminary Alternatives
October, 1994
Scale: 1" = 1 mile
Exhibit S-2

This page intentionally left blank to facilitate double-sided printing.



Legend

- Alternative 1
- Alternative 2
- Alternative 3

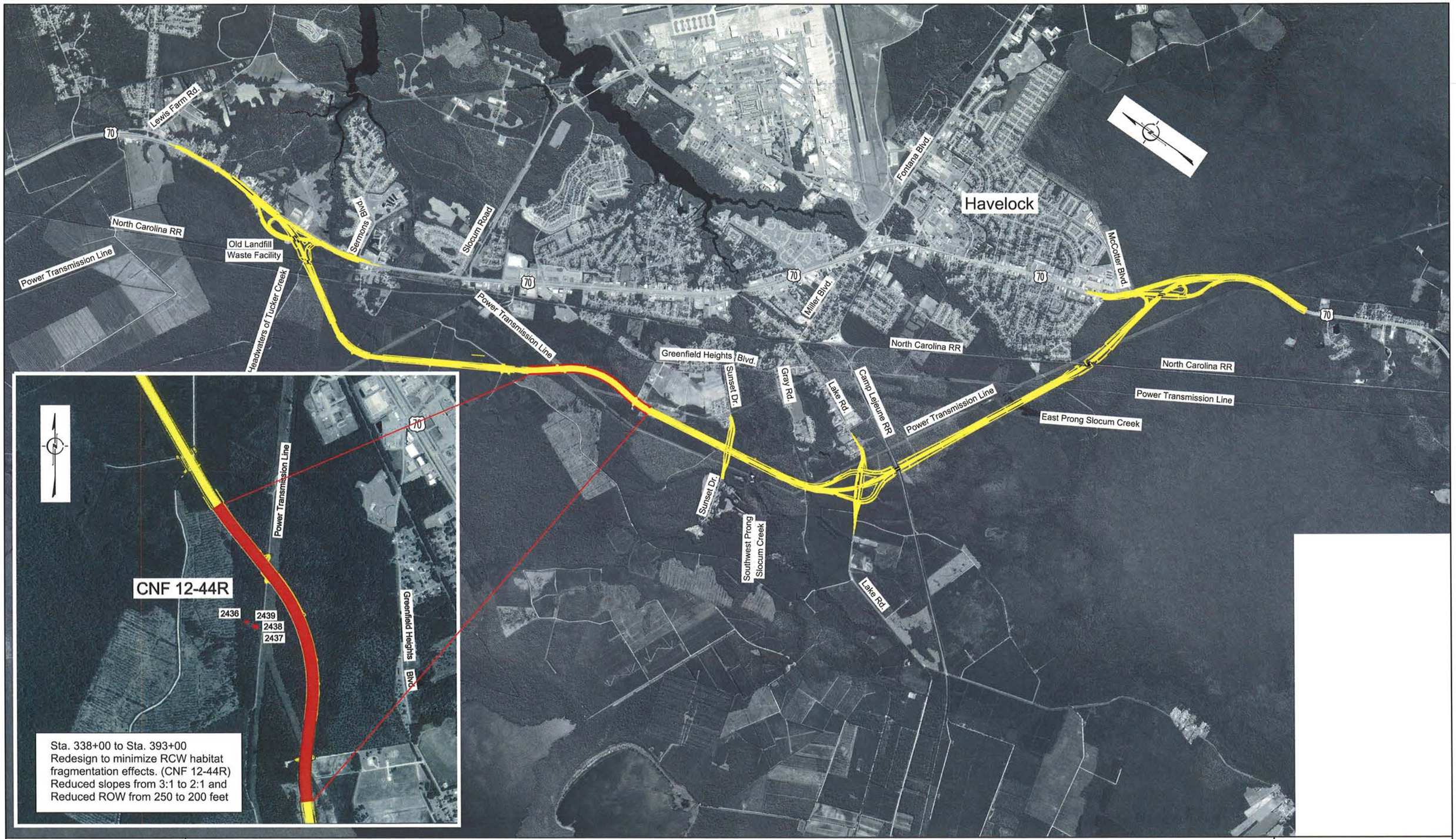
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Detailed Study Corridors and Study Alternatives
Scale: 1" = 1 mile
Exhibit S-3

This page intentionally left blank to facilitate double-sided printing.



US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Preferred Alternative
Scale: 1" = 1 mile
Exhibit S-4

This page intentionally left blank to facilitate double-sided printing.

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Croatan Wetland
Mitigation Bank
Scale: 1" = 1 mile
Exhibit S-5

This page intentionally left blank to facilitate double-sided printing.

Alternative 2 is not considered the least environmentally-damaging alternative because it would create a very high number of business and residential relocations, including minority relocations, and is also not conducive to burning. The high number of business relocations associated with the improve existing alternatives preclude its selection as the Preferred Alternative.

Refinement of the Preferred Alternative

In 2013, NCDOT completed additional design studies to further minimize fragmentation of RCW foraging habitat. NCDOT reduced the proposed roadway cross section to result in a maximum 200-foot cleared width for a distance of 5,500 feet along the Preferred Alternative from Station 338+00 to Station 393+00 (shown in Exhibit S-4). The reduced width was accomplished by re-design of the slopes, but maintains the median and shoulder widths required by the design criteria for this facility.

S.8 SUMMARY OF IMPACTS FROM THE PREFERRED ALTERNATIVE

This section addresses impacts associated with the Preferred Alternative (Alternative 3), based on current socioeconomic and demographic data and updated natural resources surveys.

Land Use – Construction of the proposed project would create relocations and direct impacts to current land uses within the Preferred Alternative corridor. The Preferred Alternative would require a 250-foot right-of-way for most of its length, with additional right-of-way required at the proposed interchanges. Based on this width, the Preferred Alternative (Alternative 3) would require approximately 430 acres of land. The majority of land traversed by the Preferred Alternative is within the CNF (URG, 2009) and the remaining portions of the Preferred Alternative cross privately-owned forested lands that are primarily used for silviculture and hunting and residential areas along roadways crossed by the project corridor. Of the total 431 acres, 240 acres fall on NFS lands (including rural/urban modifications); the remaining 190 acres include privately-owned lands, public right-of-ways, and other human-dominated land uses.

Relocations – The Preferred Alternative would relocate an estimated 16 residences and three small businesses. One of the residences is occupied by owner and 15 are occupied by tenants. Four of these are minority residences. Two residents are estimated to make more than $50,000 per year. The majority of residents (14) have income levels between $25,000 and $50,000 per year. None of the residents are estimated to make less than $25,000 per year. According to the relocation report (Appendix G), it is anticipated that adequate relocation replacement facilities for the residences and businesses are available for the proposed project. Relocations are discussed in Chapter 4.2.1.

Community Facilities – The Craven County Waste Transfer Facility would be displaced by the Preferred Alternative. NCDOT will compensate Craven County for relocation expenses; however, it is the County's decision where to relocate. The County is aware of the impact and is currently evaluating alternative sites. Additional information on this site can be found under the Hazardous Materials discussion. No other impacts to community facilities such as schools, parks or recreation facilities are associated with the Preferred Alternative.

Community Cohesion – Due to the predominantly rural character of the study area and the presence of the CNF, community cohesion effects would be limited to areas around the existing routes that cross the Preferred Alternative. Among the anticipated 16 residential relocations, a small community consisting of six properties at the proposed northern terminus would be relocated by the new interchange. Three relocations would occur in the southwest corner of the Greenfield Mobile Estates along SR 1747 (Sunset Drive).

The proposed bypass could create a physical barrier between existing houses on SR 1747 (Sunset Drive) and SR 1756 (Lake Road); however, the grade separations proposed at these locations would minimize this effect. Community cohesion effects would also be limited due to the more rural nature of residential development in this area.

Environmental Justice – There are no disproportionately high adverse impacts to minority, low-income or elderly populations. Benefits and burdens resulting from the proposed project are anticipated to be equitably distributed throughout the community.

Indirect and Cumulative Effects – An Indirect and Cumulative Effects (ICE) Analysis was completed in 2008 and was updated in 2011 to provide an assessment of the potential long-term, induced impacts of the proposed project (HNTB, 2008 and NCDOT, 2011). In 2013, studies were conducted to update future land use scenarios based on current data and to develop an ICI water quality modeling analysis that would quantify the project's potential indirect and cumulative impacts (ICIs) on water resources. The focus of the analysis is on the potential increases in stormwater runoff and non-point source loads of nitrogen, phosphorus, sediment, and fecal coliform resulting from a future development scenario associated with the bypass.

Indirect effects are primarily associated with natural resources. These effects include: the potential spread of non-native, invasive species and habitat fragmentation. To minimize the potential for indirect effects, NCDOT has developed, in consultation with the USFS, appropriate measures that will contribute to the future viability of the CNF. In summary, these measures include:

- Periodic closure of the bypass to facilitate prescribed burns on NFS lands;
- Identification, propagation, and protection of rare plant species;
- Herbicide use specifications for right-of-way (ROW) maintenance;

- Non-native invasive plant species management; and,
- Transfer of the CWMB to the USFS.

Indirect and cumulative effects on natural resources are discussed throughout this FEIS and summarized in Chapter 4.16.2. Chapters 4.16.3 through 4.16.8 discuss the ICI water quality modeling analysis. A summary of conclusions related to indirect and cumulative effects on the human and natural environment is contained in Chapter 4.16.9.

Cumulative effects could result from the development of private property in the vicinity of the Preferred Alternative and at the Lake Road interchange, construction of other roads, and timber harvesting on private lands in the area. Future development potential is primarily limited to the privately-owned lands surrounding the Lake Road interchange due to the proposed project's location within the CNF and the highway's full control of access. When considered in the context of other past, present and foreseeable actions, cumulative effects on natural resources are expected to be low.

Cultural Resources – Based on the results of the historic architectural resources survey conducted for this project, no properties listed in or eligible for listing in the National Register of Historic Places would be impacted by the Preferred Alternative.

Archaeology surveys, discussed in Chapter 3.4.2 indicate that there are two archaeological sites on NFS lands near the Preferred Alternative corridor (Sites 31CV170** and 31CV302). The preliminary designs of the Preferred Alternative were developed to avoid these sites and as such, no impacts to archaeological resources are associated with the proposed project.

Although no archaeological sites would be affected by the proposed project, Site 31CV302 is located roughly 300 feet away from the construction limits of the project. NCDOT is taking additional precautions to ensure that Site 31CV302 is protected throughout the duration of the project's construction. The project commitments include specific instruction regarding the delineation and fencing of the site to avoid accidental disturbance from construction-related activities.

Through the Federal Highway Administration, tribal coordination has been initiated which requests a Tuscarora Nation review of the proposed project and the Preferred Alternative. Coordination with the Tuscarora Nation is discussed in Chapter 7.1.4 and included in Appendix F.

Section 4(f) and Section 6(f) Resources – Although the CNF would be impacted by the Preferred Alternative, no impacted areas are designated as recreational areas or national wildlife refuge lands. The project does not encroach on or use land from any of the types of

specifically designated areas described above and consideration under Section 4(f) is not required.

The proposed project will not require any lands subject to either the United States Code (USC) Title 23 in Section 138 (Section 4(f)), or 16 USC 460, the Land and Water Conservation Fund Act (Section 6(f)).

Utilities – The Preferred Alternative crosses high-voltage electric power transmission lines at three locations. No disruption in service is expected. If relocations or upgrading of these facilities is required as a result of this project, coordination with the USFS and Duke Energy will be required.

Water and sewer service by the City of Havelock does not currently extend into the City's extraterritorial jurisdiction. The County's water and sewer systems do not extend into the project study area. As such, these services would not be affected by construction of the Preferred Alternative.

No natural gas lines traverse the Preferred Alternative corridor. The proposed project would not affect natural gas service.

Water Quality – In 2013, a water quality modeling analysis was conducted to quantify the project's potential indirect and cumulative impacts (ICIs) on water resources. The focus of the analysis was on the potential increases in stormwater runoff and non-point source loads of nitrogen, phosphorus, sediment, and fecal coliform resulting from future development scenarios with and without the proposed bypass.

The analysis predicted that non-point source loading is increased slightly in the Build scenario relative to the No-Build scenario, though the increases are reduced by the stormwater regulations governing the jurisdictions. The greatest percent increase in pollutant loads is estimated to occur in undeveloped watersheds with low baseline loads, and in subbasins where direct impacts from the proposed bypass or development along the proposed interchanges is expected to occur.

Air Quality – The project is located in Craven County, which has been determined to comply with the National Ambient Air Quality Standards. The proposed project is located in an attainment area: therefore, 40 CFR, Parts 51 and 93 are not applicable. This project is not anticipated to create any adverse effects on the air quality of this attainment area.

Mobile Source Air Toxics (MSATs)

This project has low potential for MSATs because it is intended to improve the operations of a highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions, and the Design Year traffic is not

projected to meet or exceed the 140,000 to 150,000 AADT criterion. In the design year, it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs.

The travel lanes contemplated as part of the proposed Havelock Bypass will have the effect of moving some traffic closer to nearby homes, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under the Preferred Alternative than under the No-Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along Lake Road and Sunset Drive, where the proposed bypass will create new intersections/interchanges with existing roads near residential areas. However, the magnitude and the duration of these potential increases, when compared to the No-Build alternative, cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Noise – Traffic noise is predicted to create a total of 43 impacts in the design year from 2035 build-condition noise levels that will approach or exceed FHWA noise abatement criteria. The number of build-condition impacts (43) is lower than the number of no-build condition impacts (49) because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.

Based upon the presently available project description, mitigation measures are considered unlikely for the predicted traffic noise impacts in the vicinity of the proposed bypass. The recommendation of the Traffic Noise Analysis is that additional detailed study of potential mitigation measures shall not be necessary subsequent to final design.

Hazardous Materials – A geoenvironmental investigation of the Craven County Waste Transfer Facility, discussed in Section 3.8, indicates that there are no hazardous materials concerns associated with the site or the adjacent closed landfill (GEL Engineering of NC, Inc., 2013). The assessment recommends that background soil samples be collected and analyzed for arsenic as part of any planned excavation at the Transfer Station in order to confirm the presence or absence of soil impact from arsenic; however, earthwork associated with the proposed project would be limited to the placement of fill material; no major excavation is planned at the Craven County Waste Transfer Facility.

NCDOT will compensate Craven County for relocation expenses associated with the displacement of the Waste Transfer Facility; however it is the County's decision whether to build a new facility. Thus, the County accepts responsibility to locate and obtain a new site,

conduct any appropriate environmental studies, and obtain permits for a new facility. The Craven County Solid Waste & Recycling Department informed NCDOT that it is presently coordinating with the County Planning Department to search for a new replacement facility location for the center. DENR Solid Waste Management is also aware of the planning effort. In coordination with USFS, the County must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on this effort is ongoing and the results will be documented in the ROD.

No other impacts to hazardous material sites are associated with the Preferred Alternative. In accordance with NCDOT Policy on hazardous materials, if any additional contaminated sites or underground storage tanks are discovered on the project, they will be assessed and recommendations for right-of-way and construction will be provided.

Mineral Resources – As stated in Section 3.9, one inactive mine is located in the project study area. The former use of the site as a landfill precludes its future use a mine. No other mining sites are located in the project area. The proposed project would not impact the availability of mineral resources in the Havelock area.

Biotic Communities – As shown in Table 4.12.1, the majority of impacts on private lands outside the CNF fall within upland (non-hydric) terrestrial communities. In total, roughly 72% of impacts are in upland areas. Approximately 28% of terrestrial community impacts outside the CNF fall within hydric terrestrial communities. Excluding human-dominated terrestrial communities (i.e., Rural/Urban Modifications, Successional /Ruderal Habitat, Powerline Corridor), the Preferred Alternative would impact approximately 123 acres of land categorized as natural vegetative communities outside the CNF. These totals include 92 acres of pine plantation (mesic and hydric). Upland terrestrial communities represent 53% of the total terrestrial impacts on NFS lands. Impacts to wetland terrestrial communities on NFS lands comprise 47% of terrestrial community impacts on NFS lands. Excluding human-dominated terrestrial communities (i.e., Rural/Urban Modifications, Successional /Ruderal Habitat, Powerline Corridor), the Preferred Alternative would impact approximately 209 acres of NFS lands categorized as natural vegetative communities. These totals include 15 acres of pine plantation (mesic and hydric).

Wildlife Communities – In addition to direct impacts to habitat, construction of the proposed bypass would create other impacts including loss of organisms due to construction and roadway mortality. Open habitat created along the roadside and the highway itself will affect the movements of organisms to varying degrees. Movements including migration, home-range movements for food and shelter, and the dispersal of young from their natal area could all be affected by the bypass, which could act as a barrier or filter to some species.

More edge habitat and open habitat would be created by construction of the Preferred Alternative. This could result in the local loss or displacement of organisms that require forest interior habitat. Effects to bird species may include changes in density and diversity near the bypass. Interior forest bird species may be adversely affected by habitat loss. Studies indicate a correlation between hardwood wetland corridor width and density/diversity of interior neotropical migratory bird species. Some small mammal species may be excluded by species that are better adapted to the road verge habitat (Goosem, 1997). If small mammal populations increase along the bypass, they may attract predators such as foxes and red-tailed hawks (*Buteo jamaicensis*).

Fencing may direct animals towards bridges proposed at the East Prong and Southwest Prong of Slocum Creek which would span the floodplain and provide passage for animals beneath the bypass. These crossings would provide connectivity to NFS lands fragmented by the bypass near the southern and central portions of the project. The proposed culvert at Tucker Creek may provide passage for small and medium-sized animals, as long as one culvert barrel remains dry.

The Preferred Alternative is the most practicable alternative for minimizing and mitigating habitat fragmentation effects because it best facilitates the conducting of prescribed burns on NFS lands. Conducting prescribed burns would help maintain the Pine Flatwood (i.e., long-leaf pine savanna) natural community and its associated niche species, including RCWs.

Although the purpose and function of the 4,035-acre Croatan Wetland Mitigation Bank (CWMB) is to provide compensatory mitigation for the proposed project and other projects in the region, it also connects to thousands of acres of black bear sanctuary and other natural areas within the CNF. The conversion of the CWMB from its former silviculture use and its preservation in perpetuity will help mitigate habitat alteration effects along the Preferred Alternative corridor by creating a substantial amount of wetland interior habitat to counter the amount of edge habitat created by the proposed project.

Aquatic Communities – Long term effects to aquatic communities can include displacement of organisms in the vicinity of road crossings over waterways. This can be caused by channel scour downstream of bridge footings or culverts, or by aggradation, which can bury macroinvertebrates upstream of structures, particularly culverts (Wellman et al., 2000). Aquatic wildlife may be temporarily displaced during the construction of bridges proposed for crossing streams. Most adverse effects should only be temporary if permanent impacts to stream channels are avoided.

Structures such as culverts may create flow depths and velocities that aquatic organisms cannot negotiate. Blocking movements of aquatic organisms may prevent access to feeding areas, refuge from predators, areas for spawning and breeding, and areas that

remain inundated in dry periods; it also increases population isolation. The level terrain of the project study area would not contribute to creating high velocity flow due to large elevation changes, which would help minimize the potential for perching. In addition, the bottoms of NCDOT culverts are typically buried to prevent perching from occurring. The use of sills in single barrel box culverts and high flow/low flow barrels in multiple barrel culverts can also help maintain adequate flow for the passage of organisms.

Changes to water temperature from tree removal, nutrient loading, and toxins from stormwater runoff could affect species distribution. The construction of roadside ditches may increase drainage in some areas, reducing aquatic habitat. Permanently inundated ditches may increase aquatic habitat for some organisms, but may increase their exposure to pollutants from highway runoff. Measures to maximize sediment and erosion control during construction will be implemented to protect water quality for aquatic organisms.

A portion of the Southwest Prong of Slocum Creek within the project study area is identified as anadromous fish spawning area; however, this reach does not extend into the Preferred Alternative alignment. No other anadromous fish habitat has been identified in the project corridor.

As detailed in the project commitments, NCDOT has committed to an in-water work moratorium for February 15 to June 15 for East Prong Slocum Creek, Southwest Prong Slocum Creek, and Tucker Creek at the proposed extension of the existing culvert at US 70. Goodwin Creek and Tucker Creek upstream of the existing US 70 structures will not require a moratorium. No other streams are subject to the anadromous fish construction moratorium.

Endangered Species – Biological conclusions for each protected species are detailed in Chapter 4.14.4. With the exception of the RCW, the proposed project would have **No Effect** on any federally protected species. The biological conclusion for the RCW is **May Affect, Not Likely to Adversely Affect**; this conclusion was reached in consideration of the NCDOT's agreement to periodically close the bypass to conduct prescribed burns and NCDOT's commitment to a 200-foot clearing limit width for the refined 5,500-foot section of the project, so that forested areas to the east can be considered habitat for the RCW. The USFWS concurred with the biological conclusion for the red-cockaded woodpecker (RCW) in a letter dated November 19, 2013, contained in Appendix B.

USFS Rare Species – Targeted surveys for USFS rare plants, terrestrial wildlife, and aquatic wildlife species were initiated in 2003. In subsequent years (January 2005, September 2007, May 2008, October 2010, and October 2013), the USFS amended/revised its list of rare species and additional surveys for selected species were conducted, most recently in 2013. The USFS will continue to modify its rare species list as new scientific data regarding species distributions on the CNF becomes available.

Surveys conducted from 2003-2013, in combination with records available from NCNHP and the USFS, resulted in the identification of potentially suitable habitat for 72 USFS rare plant species. Subsequent botanical studies confirmation of the presence of 21 USFS rare plant species within the CNF evaluation area and the absence of 51 rare species. Potential indirect effects associated with the project's construction include the potential spread of non-native invasive species (NNIS) and increased sun exposure to currently shaded areas. The project commitments include measures to minimize these indirect effects, notably the periodic closure of the bypass to allow for prescribed burns and a number of measures associated with managing NNIS during and post construction. A complete discussion of USFS rare species is contained in Chapter 4.14.5.

Farmland Impacts – The Natural Resources Conservation Service (NRCS) Farmland Conversion Impact Rating Form (Form AD-1006), is included in DEIS Appendix A.1. NRCS has completed their review and the Preferred Alternative received a total point value of 116.8. Therefore, this alternative falls below the NRCS minimum criteria rating of 160 points and will not be evaluated further for farmland impacts. These alternatives will not have a significant impact to farmland.

Wetland and Stream Impacts – The Preferred Alternative crosses streams and wetlands considered to be jurisdictional under Section 404 of the Clean Water Act. The impacts presented for the Preferred Alternative are based on current minimization measures and calculated using preliminary design construction limits plus an additional 25 feet either side in accordance with NCDOT impact analysis guidelines. Actual impacts may be less than those shown once final design is completed. The Preferred Alternative would create 2,948 linear feet of impact to jurisdictional streams and 131 acres of impact to jurisdictional wetlands. To date, the additional minimization of impacts due to the refined design includes impacts to wetlands (reduction of 9 acres).

As discussed in Chapter 2.10.3, a systematic error in the calculation of wetland impacts was discovered subsequent to the publication of the DEIS. The error, corrected in this document, resulted from conversion/scaling discrepancies in transferring data between GIS and Microstation. The miscalculation resulted in reporting the wetland impacts for each of the Preliminary Alternatives lower than actual measured areas. The conversion error only applied to wetland impacts.

Cost Estimates – The total cost of the Preferred Alternative (updated in 2013) is estimated to be $172,376,440. The estimated construction cost is $160,000,000. Right-of-way costs are estimated to be $11,425,000. Utility relocation is estimated to be $951,440.

Table S.2 includes a summary of impacts for the Preferred Alternative.

S.9 ACTIONS REQUIRED BY OTHER FEDERAL AND STATE AGENCIES

A Section 404 Dredge and Fill permit from the U.S. Army Corps of Engineers (USACE) will be required for the encroachment into wetland communities as a result of the proposed project. A Section 401 Water Quality Certification from the N.C. Department of Environment and Natural Resources (DENR), Division of Water Quality will also be required prior to issuance of the Section 404 permit.

The N.C. Coastal Area Management Act (CAMA) provides for jurisdictional review of impacts affecting Areas of Environmental Concern (AEC) in 20 designated coastal counties, including Craven County (GS 113A-113). The proposed project would not impact any CAMA AECs; however, because the project is in a coastal zone, a consistency determination was completed in accordance with the State's coastal management program. Section 4.1.2 includes a review of the project consistency with the NC Coastal Management Program and applicable CAMA land use plans.

Authorization for use of lands owned by the United States of America and administered by the USFS approved for use as part of the project, will be through a highway easement deed issued to the North Carolina Department of Transportation under the provisions of 23 USC Section 107 (d) and Section 317. Mitigation for these lands is a condition of the land transfer under the provisions of 23 U.S.C. Section 317(b). Mitigation details are being finalized as part of ongoing coordination with the USFS.

S.10 SUBSEQUENT ACTIONS

The approval of this FEIS does not complete the project implementation process. The following is a summary of actions, events, and studies to be completed prior to project construction. Coordination with resource agencies will be maintained throughout the entire process.

The FEIS will be circulated to environmental agencies and made available for public review. Comments received through the FEIS review processes will be thoroughly considered in FHWA and NCDOT's final design of the Preferred Alternative. The final designs for the Preferred Alternative will be further refined during which time NCDOT will look for additional opportunities to minimize impacts to the human and natural environments. A public involvement event will be held to receive public comments on the refined preliminary design for the Preferred Alternative.

TABLE S.2
IMPACT SUMMARY TABLE FOR THE PREFERRED ALTERNATIVE

ENVIRONMENTAL FEATURES		PREFERRED ALTERNATIVE (Alternative 3)
Length (miles)		10.31
Relocations	**Residential**	16
	Business	1
	Non-profit [1]	1
Minority/Low Income Populations - Disproportionate Impact		No
Historic Properties (adverse effect)		No
Community Facilities Impacted [1]		Yes
Section 4(f) Impacts		No
Noise Receptor Impacts [2]		43
Prime Farmlands		71 acres
Forested Acres *(NFS lands)* [3]		332 (221) acres
Wetlands *(NFS lands)* [4]		131 (103) acres
Streams *(NFS lands)* [4]		2,948 (1,825) linear feet
Riparian Buffer Impacts *(NFS lands)* [4]	**Zone 1**	129,402 (54,884) sq ft
	Zone 2	81,142 (33,524) sq ft
	Total Buffer Impacts	210,544 (88,408) sq ft
100 Year Floodplain and Floodway Impacts		1.6 acres
Federally Protected Species [5]		May Affect Not Likely To Adversely Affect (1 species: RCW)
Right of Way Cost		$11,425,000
Utility Relocation Cost		$951,440
Construction Cost		$160,000,000
Total Cost		$172,376,440

NOTES:

1. NCDOT will compensate Craven County for relocation expenses associated with displacement of the Waste Transfer Facility; however it is the County's decision whether to build a new facility. Thus, the County accepts responsibility to locate and acquire a new site, conduct appropriate environmental studies, and obtain permits for a new facility. The Craven County Solid Waste & Recycling Department informed NCDOT that it is presently coordinating with the County Planning Department to search for a replacement facility location. DENR Solid Waste Management is also aware of the planning effort. In coordination with USFS, the County must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on this effort is ongoing and the results will be documented in the ROD.
2. The total number of predicted impacts is not duplicated if receptors are predicted to be impacted by more than one criterion. The number of build-condition impacts is lower than the number of no-build condition impacts (49) because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.
3. Impacts to vegetative communities are based on proposed right-of-way limits. The total right-of-way required for the project is 430 acres (240 acres of NFS lands). The totals shown for forested areas include 92 acres of pine plantation outside the CNF and 15 acres within the CNF. The NCDOT will pay the USFS, or their approved contractor, to measure to USFS specifications, the volume of timber on USFS land within the right-of-way limits. The USFS and NCDOT will determine the precise monetary value of the timber through an appraisal at rates effective at the time of the timber sale contract.
4. Impact quantities are based on the construction limits of the Preferred Alternative plus an additional 25 feet buffer, in accordance with current NCDOT impact analysis guidelines. Direct impacts are projected to be less than those shown in the table.
5. The proposed project may affect, but is not likely to adversely affect, the red-cockaded woodpecker. USFWS concurrence with this biological conclusion is based, in part, on NCDOT's agreement to allow periodic closures of the Preferred Alternative in order for CNF staff to conduct prescribed burns as management for the RCW. Without this agreement, the USFS would be unable to conduct the necessary prescribed burns in the vicinity of the project thus causing an indirect adverse effect on the RCW.

Other actions that must be completed prior to the start of project construction include, but are not limited to, the following:

- Preparation of sedimentation and erosion control plans incorporating NCDOT's *Best Management Practices for Protection of Surface Waters* (NCDOT, 1997).

- Coordination with the City of Havelock and Craven County for relocation and reconfiguration of utility systems.

- Implementation of the Relocation Assistance Program.

- Approval of all required permits and certifications.

- Complete mitigation activities with the USFS, likely culminated by a Memorandum of Agreement between NCDOT and USFS and USACE with regard to the transfer of the 4,035-acre Croatan Wetland Mitigation Bank.

- Obtain easement for federal land use via FHWA/USFS actions.

1.0 PURPOSE OF AND NEED FOR PROJECT

1.1 INTRODUCTION

The proposed project addresses improvements to the US 70 corridor in the vicinity of the City of Havelock in Craven County, North Carolina. The project will improve mobility and through-capacity in a manner consistent with the Strategic Highway Corridors vision adopted by the NC Board of Transportation in 2004.[1] This project is included in the NCDOT STIP as Project No. R-1015, with right-of-way acquisition anticipated to begin in 2016 and construction anticipated to begin in 2018.

The North Carolina Department of Transportation (NCDOT) is the lead agency, with the Federal Highway Administration (FHWA) acting as the federal lead agency. A Notice of Intent to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on September 28, 1992.

This Final Environmental Impact Statement (FEIS) documents the environmental and design studies conducted for the proposed project. It includes an evaluation of the environmental, economic, and social characteristics of the project study area and the impacts the project alternatives would have on these characteristics. This document was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and is intended for use by both decision-makers and the public. It includes the disclosure of relevant environmental information regarding the proposed project and conforms to the requirements of the Council on Environmental Quality (CEQ), which provide direction regarding implementation of the procedural provisions of NEPA, and the FHWA's *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA, 1987).

Chapter 1.0 of this FEIS discusses the purpose of and need for this project. Chapter 2.0 provides a description of all the transportation alternatives considered as well as those retained for detailed study. A preferred study alternative is then identified, which meets the purposes for the project while seeking to minimize impacts. Chapter 3.0 details the current existing social, cultural, economic, natural and physical environments within the project study area. Chapter 4.0 outlines the environmental consequences (impacts) and mitigative actions that might be anticipated with the implementation of the Preferred Alternative. Chapter 5.0 provides a list of preparers of this document. Chapter 6.0 lists the agencies, organizations, and persons to whom copies of the document were distributed for review and comment. Chapter 7.0 discusses the agency coordination and public involvement efforts. Chapter 8.0 provides an index of important terms and the subsequent page

1 NCDOT is currently in the process of developing an update to the Strategic Highways Corridor Program; this transition and the new policy is discussed in Chapter 1.8.2.

number where the terms are discussed. Chapter 9.0 provides a list of references utilized in the preparation of this document as well as those used in the preparation of the original Havelock Bypass Environmental Assessment (EA) in 1998 and Draft EIS (DEIS) in 2011; some portions of which are used directly in this FEIS.

This FEIS includes and refers to information contained in the Draft Environmental Impact Statement (DEIS) (NCDOT, 2011), incorporated herein by reference (40 CFR 1500.4(j)), updated as appropriate to identify the Preferred Alternative, additional environmental studies, public involvement activities, and responses to comments on the DEIS. In response to agency comments on the DEIS, the FEIS was reorganized in some areas to improve, clarify and/or provide supplemental data in certain discussions.

1.1.1 Project Background

The proposed bypass was initially included in the 1979 Havelock Thoroughfare Plan, and then included in the NCDOT State Transportation Improvement Program (STIP) in 1983. Environmental studies began in 1992 and the Environmental Assessment was approved in January 1998 and a Corridor Public Hearing was held in May 1998. Based on the project context and significant jurisdictional impacts presented in the EA, the decision was made in 2003 to prepare an EIS. In late 2011, the DEIS was completed and a second Corridor Public Hearing was held.

1.1.2 NEPA/ 404 Merger Process

In 1997, in an effort to streamline the NEPA process, the NCDOT, Federal Highway Administration (FHWA), and the US Army Corps of Engineers (USACE) developed an interagency agreement that merged/combined the NEPA process and the Section 404 permitting process. This "NEPA/404 Merger Process" allows federal and state environmental regulatory and resource agencies to participate in the transportation decision making process. The NEPA/404 Merger Process is structured with milestones called "concurrence points" that occur at key decision points in the NEPA process. The NEPA/404 Merger Team meets and seeks agreement on each of the following concurrence points: 1) Purpose & Need and Project Study Area; 2) Development of Study Alternatives; 2A) Alternative Bridging Decisions & Alignment Review; 3) Selection of the Least Environmentally Damaging Practicable Alternative (LEDPA) which is also referred to as the "Preferred Alternative"; 4A) Section 401/404 Avoidance & Minimization; 4B) 30% Hydraulic Review; and, 4C) Permit Drawings Review.

Concurrence Point 2 has one sub-point: 2A, in which the NEPA/404 Merger Team decides on bridge locations and the approximate bridge lengths for each detailed study alternative. Concurrence Point 4 includes three sub-points, 4A, 4B, and 4C, which focus on the project's alignment, hydraulic design, and permit drawings. Concurrence Points 3 and

4A occur after the distribution of the draft environmental document and the Public Hearing. Concurrence Points 4B and 4C occur during the final design and permitting phases of the project.

Prior to the creation of the NEPA/404 Merger Process, an interagency coordination process was utilized to ensure the systematic analysis of impacts to both the social and natural environment. Interagency meetings held as part of this process were called Steering Committee meetings. Studies before the DEIS incorporated the earlier model of agency coordination. The DEIS presented decisions and studies resulting from agency coordination efforts, many of which pre-dated the NEPA/404 Merger Process. A formal NEPA/404 Merger Process team was assembled in 2008 to "reinitiate" the Merger Process for the Havelock Bypass project. The team agreed not to re-visit previous agreements and to re-convene after updated studies were completed for the Draft Environmental Impact Statement. Information contained in this FEIS is comprised of the decisions and studies resulting from both Steering Committee meetings and the NEPA/404 Merger Process team meetings.

1.2 PROPOSED ACTION

The NCDOT proposes to construct a new four-lane, median-divided highway with full access control that will bypass existing US 70 in the City of Havelock in Craven County, North Carolina. The length of the project is 10.1 miles. Exhibit 1.1.1 shows the project location. This transportation improvement project is identified in the Statewide Transportation Improvement Program (STIP) as Project No. R-1015.

1.3 SUMMARY OF NEED FOR THE PROPOSED ACTION

The need for improvements to the US 70 corridor through the City of Havelock is demonstrated by the following summary of existing and projected conditions:

- ***Regional Mobility*** – The lack of access control on US 70 through Havelock, with its 13 signalized intersections and numerous unsignalized street and driveway connections, substantially reduces the mobility of this corridor.

  Because US 70 is the state's primary connection to the Port of Morehead City and a main route between military facilities and the port, the NCDOT Strategic Highway Corridors (SHC) Program goal to enhance mobility and connectivity of critical highway facilities is particularly relevant to the proposed project.[1] The SHC plan calls for US 70 (Corridor 46) to be upgraded to a freeway between Morehead City and Raleigh. The North Carolina Maritime Strategy Final Report (NCDOT, 2012) identifies the proposed Havelock Bypass as one of a number of recommended infrastructure projects to improve the regional transport of goods. US 70's function as part of the US Department of Defense Strategic Highway Network for moving military personnel and equipment also illustrates a regional need for the proposed project.

As discussed in Chapter 2.8, travel time models were developed for three population growth scenarios to present a sensitivity analysis of forecasted travel times. The analysis found that the Build scenario showed a travel time reduction over the No-Build scenario for each of the growth scenario presented. Travel time savings in the Build scenario ranged between 7.9 and 31.4 minutes.

In addition, regional improvements to the US 70 corridor are projected to result in a travel time savings of 68 minutes between Morehead City and Raleigh (Cambridge Systematics, Inc., 2014). Collectively, these regional improvements would provide more efficient access to the Global TransPark, Port of Morehead City, and I-95, which would enhance competitiveness by reducing freight traffic logistics.

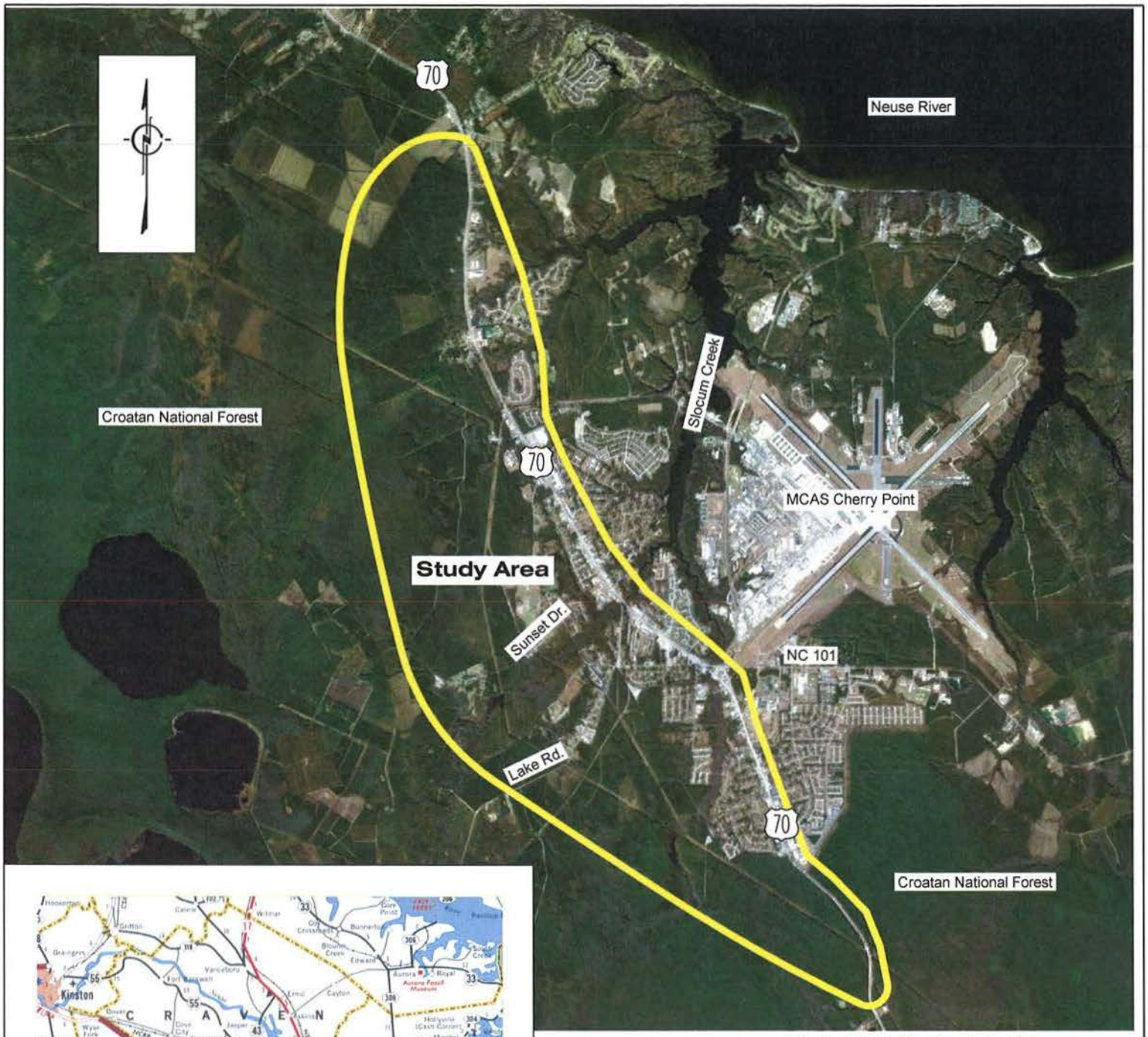
- ***Regional Connectivity*** – In eastern North Carolina, the US 70 corridor connects the population centers of Raleigh, Smithfield, Goldsboro, Kinston, New Bern, Havelock and Morehead City. Regionally, US 70 provides connectivity with commerce centers at the Port of Morehead City, Global TransPark (a 2,500-acre multimodal industrial park in Kinston, NC), industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and it functions as a primary route for seasonal beach traffic.

- ***Traffic Operations*** – Commercial, institutional, and residential growth in the City of Havelock and an increasing regional reliance on US 70 have led to a deterioration of traffic operations along the existing route. The capacity of US 70 is currently limited by the operational capabilities of its signalized intersections. In 2008, the level of service (LOS) of two of the major signalized intersections: SR 1763 (Miller Boulevard/NC 101 (Fontana Avenue) and SR 1765 (Catawba Road) were already undesirable. By the design year 2035, only five of the thirteen signalized intersections through Havelock will operate at an acceptable LOS if the proposed bypass is not built.

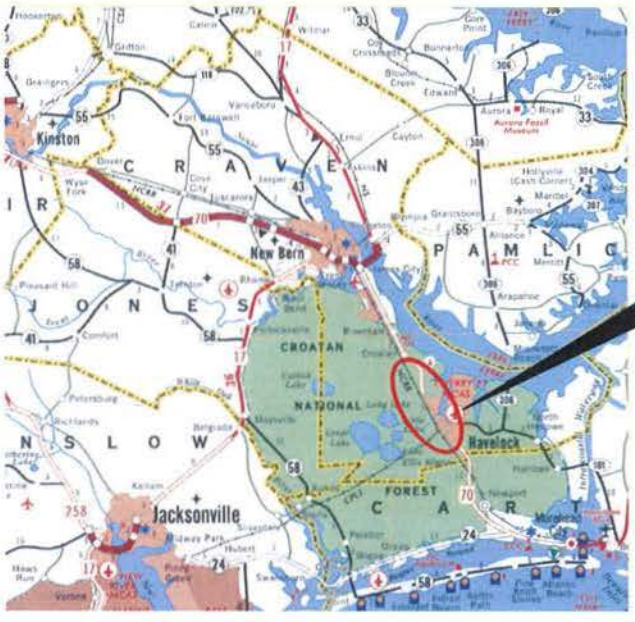
1.4 PURPOSE OF PROPOSED ACTION

Primary Purposes of the Proposed Action

- ***Improve Regional Connectivity and Mobility*** – The project's purpose is to improve traffic operations for regional and statewide traffic along the US 70 corridor and enhance the ability of US 70 to serve a regional transportation function.



Note: Aerial photo from Google Earth Pro.



Project Location

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Project Vicinity
Not to Scale
Exhibit 1.1.1

This page intentionally left blank to facilitate double-sided printing.

- ***Enhance the ability of US 70 to serve the regional transportation function in accordance with the Strategic Highway Corridors Plan[1]*** - Because US 70 is the state's primary connection to the Port of Morehead City and a main route between military facilities and the port, the Strategic Highway Corridors (SHC) Program goal to enhance the mobility and connectivity of a critical highway facility is relevant to the proposed project. From a regional vantage point, the SHC Program acknowledges existing and future regional traffic demands and therefore identifies US 70 with a functional purpose of providing high mobility for regional users of US 70.

  The proposed project would improve the connection to the state capitol and points west, improve access to regional military facilities by enhancing the mobility of the country's armed forces, and improve the state's ability to efficiently transport goods to and from the port at Morehead City.

Secondary Purposes of the Proposed Action

- ***Enhanced Safety*** – In addition to improving regional mobility, the proposed controlled-access bypass would provide travelers with a safer facility than the existing route. Median-divided, access-controlled roadways greatly reduce the typical conflict points found along undivided roadways with no access control. During the period between October 1, 2009 and September 30, 2012, the crash rate for the studied portion of US 70 was 312.02 crashes per 100 million vehicle miles of travel (100MVM). Comparatively, the statewide accident rate on urban US routes with median-divided highways of four or more lanes, with partial control of access, during this same period, was 170.91 per 100MVM. A rural US route, median-divided highway with four or more lanes and with full control of access has a crash rate of 74.19 accidents per 100 MVM. Therefore, it is expected that the proposed bypass facility would perform similar to other rural median-divided four-lane facilities which typically experience much lower crash rates than urban or other rural facility types. By eliminating a large volume of through-traffic on existing US 70, the proposed bypass would also provide congestion relief and a more relaxed driving experience within the City of Havelock. A detailed accident analysis, including a discussion of critical crash rates, is contained in Chapter 1.10.

- ***Hurricane Evacuation*** – The US 70 corridor from Morehead City to Raleigh has been identified by the North Carolina Division of Emergency Management as a major hurricane evacuation route. The proposed project will improve public safety by enhancing the area's hurricane evacuation ability with more capacity - especially during the summer vacation season when the demands are highest. This benefits both seasonal and local travelers alike.

- ***Improve the National Highway System*** – US 70 from Raleigh to Morehead City has been designated as part of the National Highway System (NHS) by the Federal Highway Administration and is included in the Principal Arterial and Strategic Highway Network subsystems of the NHS. The US 70 corridor is part of the Department of Defense's Strategic Highway Network for moving military personnel and equipment. The project will improve the mobility of the Nation's armed forces by improving the connection to the Port of Morehead City. As well, providing a new bypass facility combined with congestion relief on existing US 70 will improve the connection between the Cherry Point U.S. Marine Corps Air Station and Camp Lejeune in Jacksonville.

- ***Reduce Travel Time*** – The project will reduce the travel time from central and western North Carolina to the Carteret County beaches and the Port of Morehead City. Reducing the travel time to these major recreational and commercial areas could increase their attractiveness and enhance economic opportunities for the region. As discussed in Chapter 4.1.3, travel time models were developed for three population growth scenarios to present a sensitivity analysis of forecasted travel times. The analysis found that the Build scenario showed a travel time reduction over the No-Build scenario for each of the growth scenario presented. Travel time savings in the Build scenario ranged between 7.9 and 31.4 minutes. The study also found that a bypass will reduce local traffic travel time along existing US 70 by 14 to 22 minutes (a 33 - 38% reduction) in 2035.

- ***Improved Local Access*** – By removing through-traffic, the project will improve commuter access to the Cherry Point US Marine Corps Air Station and Naval Aviation Depot, the principal employer for civilian as well as military personnel in Craven County and the City of Havelock.

1.5 PROJECT BACKGROUND

1.5.1 Project Setting

As shown in Exhibit 1.1.1, the project study area is in Havelock, North Carolina. Havelock is located in Craven County, near the Neuse River, and is bordered by the Cherry Point Marine Corps Air Station and portions of the Croatan National Forest. Havelock lies approximately 20 miles from New Bern, 100 miles from Wilmington, and 130 miles from Raleigh.

1.5.2 Project History

In 1992, project studies were initiated and a project steering committee was formed. Similar to the current NEPA/404 Merger Team (discussed in Chapter 1.1.2), the project steering committee consisted of federal and state regulatory and resource agencies, including U.S. Army Corps of Engineers (USACE), FHWA, U. S. Coast Guard, U. S. Forest Service (USFS),

National Park Service (NPS), U. S. Environmental Protection Agency, (USEPA), U. S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), NCDOT, North Carolina Department of Environment and Natural Resources (NCDENR), NC Wildlife Resources Commission (NCWRC), and NC Department of Cultural Resources (NCDCR) as well as local officials from Craven County and the City of Havelock.

Early Planning and Design Studies

As a result of early coordination, the project steering committee determined that significant impacts on the environment were likely due to the proximity of existing development, the Croatan National Forest, and the Cherry Point U.S. Marine Corps Air Station (MCAS). In compliance with CEQ regulations (40 CFR 1500-1508) and FHWA regulations regarding the implementation of NEPA (23 CFR 771), a Notice of Intent to prepare an Environmental Impact Statement (EIS) was published in the Federal Register (FR) on September 28, 1992.

In February 1996, after environmental studies and public involvement, the project steering committee reviewed and concurred with team decisions to eliminate the improve existing US 70 alternatives from consideration. In November 1996, the USFWS concurred that the project was "not likely to adversely affect" the red-cockaded woodpecker or any other federally-protected species.

In December 1996, the steering committee concurred on Alternative 3 as the Preferred Alternative; primarily because it was a compromise between Alternative 1 (located farthest away from Havelock and within the Croatan National Forest) and Alternative 2 (located within populated areas of the City of Havelock). In 1997, NCDOT established the Croatan Wetland Mitigation Bank to mitigate impacts to wetlands and the Croatan National Forest, for this and other projects.

After the 1997 implementation of the NEPA/404 Merger Process, the project steering committee was renamed the NEPA/404 Merger Team. After substantial environmental review of the project and the Croatan Mitigation Bank by the NEPA/404 Merger Team in mid-1997, it was agreed that the project's environmental impacts would be documented in an Environmental Assessment (EA).

Environmental Assessment

Project studies were documented in an Environmental Assessment, approved in January 1998. The EA also included NCDOT's recommendation of Alternative 3 as the Preferred Alternative. Concurrence from resource agencies resulted in the approval of Alternative 3 as the Least Environmentally Damaging Practicable Alternative (LEDPA). Alternative 3 was presented as the Preferred Alternative at a Corridor Public Hearing in May 1998. The NCDOT Corridor Selection Committee endorsed the selection of Alternative 3 as the Preferred Alternative on August 27, 1998.

Preliminary designs for the Preferred Alternative were further refined, using the new NEPA/404 Merger Process, to include bridge length decisions. On January 18, 2001, the NEPA/404 Merger Team approved avoidance and minimization measures for the revised project design. Hydraulic designs were also reviewed in 2002. Final designs were then produced.

Red-cockaded Woodpecker Assessments

A red-cockaded woodpecker (RCW) assessment (Carter, 1996) was conducted to determine the potential impact of each alternative on RCW nesting and foraging habitat. Alternatives 1 and 2 were located approximately 2,500 feet west and east respectively from a known (and then active) cluster of the federally-protected RCW in the Croatan National Forest. This assessment determined that Alternatives 1 and 2 would not impact RCW foraging habitat. It also concluded that Alternative 3 would result in a loss of foraging habitat, but the remaining habitat would be sufficient to sustain the group in accordance with the USFWS guidelines in effect at the time. After a review of this assessment in 1996, the USFWS determined that Alternative 3 is not likely to adversely affect the red-cockaded woodpecker (USFWS letter dated November 13, 1996). Due to subsequent changes in USFWS guidelines, the original RCW assessment was revised by Dr. J. H. Carter III & Associates, Inc., in 2003, indicating results similar to those of the previous assessment. The second assessment concluded that suitable RCW foraging habitat would be taken by any of the alternatives. However, using both suitable and potentially suitable foraging habitat, all of the impacted RCW clusters would have enough foraging habitat to meet the USFWS Standard for Managed Stability (SMS). No cavity trees will be taken by Alternative 3 (nor any of the other proposed project alternatives) and none of the cleared right of way is located within 200 feet of any RCW cavity tree. Chapters 3.15.3 and 4.14.4 include additional information on recent RCW studies.

Additional Studies and Decision to Develop a Draft Environmental Impact Statement

During ongoing discussions subsequent to preparation of the NEPA decision document, the combination of additional natural environment studies, environmental regulation considerations, and ongoing negotiations with USFS concerning the management of the Croatan Wetland Mitigation Bank (CWMB) resulted in a decision that natural and human environmental impacts collectively rose to a level of significance. In December 2003, FHWA directed that an EIS be prepared for the project under the original Federal Register Notice of Intent, pursuant to 23 CFR 771.123. It was determined that much of the documentation developed for the EA was suitable for inclusion in (and updated for) the DEIS. Earlier decisions to eliminate improving the existing US 70 corridor from detailed study were reviewed by the team and remained valid. The three new location options originally developed and assessed in detail in the EA were revisited by the NEPA/404 Merger Team during the DEIS development. The team agreed that an adequate range of alternatives

had been developed for the EA and no additional alternatives beyond the three options originally considered were brought forward by the team members. A DEIS was approved by FHWA on September 6, 2011.

Public Hearings and Revisit of Preferred Alternative and LEDPA

DEIS distribution was followed by a document comment period and a Public Hearing. After reviewing public and agency comments, the NEPA/404 Merger Team met on April 10, 2012 and re-affirmed Alternative 3 as the LEDPA. As detailed in the project commitments, it was determined that the footprint of a 5,550-foot section (from Station 338+00 to Station 393+00) of the Preferred Alternative would be reduced to a width of 200-feet in the vicinity of Red Cockaded Woodpecker habitat. Because the gap in habitat (due to the roadway) would be limited to 200 feet, this design change would avoid a "take" under ESA regulations. Designs were revised accordingly, and environmental impacts were recalculated for presentation in this FEIS.

These decisions were fully coordinated with the State and Federal review agencies who remain involved in the reviews of the updated information as summarized in the DEIS and this FEIS. A synopsis of the project's timeline is included below.

1979	A southwest bypass of Havelock shown on City-approved Thoroughfare Plan
1983	Project proposed in the NCDOT TIP in November 1983.
1992	Formal Scoping Meeting for R-1015 held on July 29, 1992.
	Notice to Proceed R-1015 Study completed on August 5, 1992
	Notice of Intent to prepare an Environmental Impact Statement published in Federal Register on September 28, 1992
1993	Steering Committee established on March 26, 1993.
	1st Steering Committee Meeting on scoping and project approach held on May 14, 1993.
1994	2nd Steering Committee Meeting held on October 19, 1994 to discuss alternatives. Alternatives east of US 70 and Improve Existing US 70 Alternatives dropped from further study.
1995	1st Citizens Informational Workshop held on January 15, 1995.
	3rd Steering Committee Meeting held on December 19, 1995 to discuss feasible and reasonable alternatives. Improve Existing US 70 returned to study and Alternative 3 added to study.
1996	Interagency Meeting held on February 15, 1996 to reach concurrence on alternatives to be carried forward for detailed study. Improve Existing US 70 Alternative removed from further consideration. Alternatives 1, 2, and 3 carried forward.
	4th Steering Committee Meeting held on December 18, 1996. Alternate 3 presented as the Preferred Alternative.

1997	NCDOT purchased Croatan Wetland Mitigation Bank (CWMB) on January 28, 1997.
	2nd Citizens Information Workshop held on March 17, 1997.
	Determination to publish environmental documentation as Environmental Assessment in August 1997.
1998	Environmental Assessment approved on January 27, 1998.
	Corridor Public Hearing on Environmental Assessment held on May 26, 1998.
	Corridor Selection Committee – Alternative 3 chosen as Preferred and LEDPA on August 27, 1998.
1999	NEPA/404 Merger Team Meeting held on December 16, 1999 to reach concurrence on preliminary design alignments of Preferred Alternative.
2000	NEPA/404 Merger Team Meeting held on April 20, 2000 to determine bridge lengths.
2001	Concurrence Point 4A (Avoidance and Minimization) reached on January 18, 2001.
2002	Concurrence Point 4B (Hydraulic Design Review) reached on June 20, 2002.
	Memorandum of Understanding (MOU) executed between USFS, NCDOT and USACE on September 5, 2002 regarding long-term management of the CWMB.
2003	FHWA determines a DEIS is appropriate NEPA documentation on December 8, 2003.
2004	Strategic Highway Corridors (SHC) Plan including project was adopted by the NC Board of Transportation on September 2, 2004.
2007	Revised Natural Systems Technical Report completed for DEIS on May 29, 2007.
	Biological Alternatives Analysis for RCW and Bald Eagle Impacts completed for DEIS on December 11, 2007.
2008	US 70 Havelock PETS study completed for DEIS on May 14, 2008, at the request of the U.S. Forest Service.
	Indirect and Cumulative Effects/Community Impact Assessment completed for DEIS on July 15, 2008.
	Merger Process Team Informational Meeting - Reinitiate the Merger Process
2011	DEIS approved by FHWA on September 6, 2011.
	Comment period on DEIS from September 9, 2011 through November 21, 2011.
	Pre-Hearing Open House and Corridor Public Hearing held on December 6, 2011.
2012	NEPA/404 Merger Team Meeting held on April 10, 2012 to revisit LEDPA selection. Agencies re-affirmed Alternative 3 as the LEDPA and that the minutes of this meeting would be sufficient documentation (i.e., a new Concurrence Point 3 form was not circulated for signatures). EPA did not oppose Alternative 3 as the LEDPA, but abstained from concurrence stating that more clarity is needed in the documentation of the decision factors. [See USEPA comments on the DEIS].
	NCDOT submitted correspondence to the USFS containing a Prescribed Burn Plan Agreement (Jan. 2012)
	NCDOT updated spring species (*Solidago verna*) report (Sept. 2012); RCW Management Plan for CWMB (Nov. 2012); and prepared a Geoenvironmental Site Assessment for the Hickman Hill Convenience Center (Dec. 2012)

2013	NCDOT updated rare species/PETS report (Jan. 2013); Summer species report (Aug. 2013); Fall species (Paspalum) report (Aug. 2013); Rare Plant Mitigation/Non-native Invasive Species Analysis (Oct. 2013); Updated project commitments (Oct. 2013); Indirect and Cumulative Impacts Assessment (Sept. 2013); Bryophyte report (Nov. 2013); RCW Biological Assessment (Nov. 2013); USFWS Concurrence on RCW (Nov. 2013); updated Draft Updated MOU for the CWMB Bank (Dec. 2013)
2014	NCDOT prepared response to USFS comments on the DEIS (Jan. 2014)
	NCDWQ Approval of Indirect & Cumulative Impact Assessment (Jan. 2014)
	USFWS Concurrence on Biological Evaluation (Jan. 2014)
2015	Reevaluation of the DEIS (Apr. 2015)

1.6 SYSTEM LINKAGE

1.6.1 Existing Road Network

US 70 is a primary east-west arterial route from the State of Tennessee through the center of the State of North Carolina to the Atlantic Coast. The route generally parallels Interstate 40 from Asheville, in the western part of the State, to the State Capital in Raleigh. East of Raleigh, the US 70 corridor connects the cities/towns of Raleigh, Smithfield, Goldsboro, Kinston, New Bern, Havelock and Morehead City, running a total length of approximately 148 miles. US 70 provides the only direct principal arterial connection to the coastal port at Morehead City and thus serves a substantial volume of commercial traffic. The section of US 70 from Raleigh to Morehead City is designated as a North Carolina Strategic Highway Corridor and is part of the North Carolina Intrastate System and the Department of Defense's Strategic Highway Network. US 70 is also identified by the North Carolina Division of Emergency Management as a major hurricane evacuation route.

Regionally, US 70 provides the principal connection from the City of Havelock to the Craven County seat in New Bern. US 70 also provides the principal access to the beaches of Carteret County serving large volumes of seasonal tourist traffic and providing the area's primary hurricane evacuation route during the summer vacation season when the demands on the route are highest. Locally, US 70 is the main roadway corridor through the City of Havelock's commercial district. As this commercial corridor grew, additional traffic signals were warranted to provide safe access to and across the route. Of the thirteen existing traffic signals along US 70 through Havelock, five were added since 1990.

US 70 is one of only three routes providing highway access into the City of Havelock and the Cherry Point MCAS. The other two are NC 101 and SR 1756 (Lake Road), both of which terminate in Havelock. Other than NC 101, which provides access from the southeast, and SR 1756 (Lake Road), which provides access from the southwest, only local routes serve the project study area.

The State-maintained secondary roads that intersect existing US 70 or cross the project study area include:

SR 1733 (Hollywood Boulevard)
SR 1735 (Cunningham Boulevard)
SR 1737 (Roosevelt Boulevard)
SR 1739 (Belltown Road)
SR 1746 (Gray Road)
SR 1745 (Greenfield Heights Boulevard)
SR 1747 (Sunset Drive)
SR 1756 (Lake Road)
SR 1757 (Ketner Drive)
SR 1759 (Hickman Hill Loop Road)
SR 1763 (Miller Boulevard)
SR 1765 (Catawba Road)
SR 1772 (Pine Grove Road)
SR 1781 (Slocum Road)
SR 1800 (Manila Street)
SR 1824 (McCotter Boulevard)
SR 1826 (Gurganus School Road)

There are several other local streets that are also mentioned in this document. These include:

Stonebridge Trail
Stratford Road
Chadwick Avenue
Holly Drive
Trader Avenue
Jackson Drive
Forest Hill Drive
Nunn Street
Shepard Street
E. Stirrup Lane
Webb Blvd

1.6.2 Modal Interrelationships

Railroads – There are two railroads serving freight carriers through the project study area: the Norfolk Southern (NS) Corporation operates the North Carolina Railroad (NCRR) that serves coastal North Carolina from New Bern, through the City of Havelock to the Port of Morehead City. This line generally parallels US 70 to the west and serves an average of eight freight train movements per day.

The Camp Lejeune Railroad is a government-owned railroad also operated by NS. It runs from the Camp Lejeune Marine Base in Jacksonville, North Carolina, to the NCRR in Havelock. According to Camp Lejeune officials, an average of one train per day uses this route, but usage can be heavier during periods of increased military activity. Since the abandonment of the CSX railroad into Jacksonville from New Bern, this line provides the only railroad access to Camp Lejeune. Occasionally, hazardous materials, such as jet fuel, may be transported on these rail lines.

The railroads through Havelock are on the US Department of Defense Strategic Rail Corridor Network (STRACNET) serving the Cherry Point MCAS, Camp Lejeune, and the Port of Morehead City.

There is currently no passenger rail service in the region; however, Amtrak does provide a bus connection to its passenger rail service in Wilson, NC. In October 2012, Amtrak established

the new Thruway Motor Coach service that connects Greenville, New Bern, Havelock, and Morehead City with the Amtrak station in Wilson. This station is along the Amtrak Palmetto route, which serves 20 stations twice daily between New York and Savannah, GA. This route does not include Raleigh or other points west. The Amtrak Thruway Motor Coach service utilizes US 70 through Havelock to and from Morehead City.

Airports – Landing strips for military use are located at Cherry Point MCAS. Commercial air service is not available in the City of Havelock. The closest available commercial airport is the Coastal Carolina Regional Airport in New Bern. This airport offers commercial freight and passenger service through Delta Atlantic Southeast Airlines (ASA) Connection and US Airways Express. Other regional airports include the Kinston Regional Jetport in Lenoir County and the Albert J. Ellis Airport in Jacksonville. The Hickory Hill Airport is a private landing strip northwest of Havelock which is located approximately 1,300 feet northeast of existing US 70.

Transit – No local, fixed-route, fixed-schedule mass transit systems operate in the City of Havelock. Public transportation in the City of Havelock is currently provided by the Craven Area Regional Transit Services (CARTS), which operates out of New Bern, approximately 20 miles northwest of Havelock. CARTS provides transportation services to the general public with special priority to paratransit services to the elderly and/or disabled residents of Craven, Jones, and Pamlico Counties. Currently the system operates a fleet of 32 vehicles, including 12 specially-modified vans to accommodate the elderly and/or disabled, 12 standard vans, four mini-buses, and four sedans. CARTS provides a daily subscription service with morning and evening trips along US 70 between New Bern and Havelock with ranging fares according to zoned distances. Two scheduled routes serve local human service agencies, including Social Services, Craven Evaluation and Training Center, Coastal County Enterprises, Neuse Mental Health Center, and several senior citizen and employment assistance centers. This demand/response service is provided on a limited basis with an emphasis on the elderly and persons with disabilities. CARTS also provides a subscription service for dialysis patients in Havelock three times a week and an appointment service between Havelock and New Bern is available on Wednesdays.

As stated above, Amtrak has recently established a Thruway Motor Coach service that twice-daily connects Havelock and other eastern communities with the Amtrak station in Wilson. Although it does not connect to Raleigh and other points west, this route provides connectivity with 20 stations between New York and Savannah, GA.

Sidewalks, Bicycle Routes, and Greenways – As stated in the City of Havelock Comprehensive Plan (USG, 2009), Havelock currently has a small number of bicycle routes and sidewalks. The Plan also notes that these routes are primarily used for recreation, not transportation. The Plan discusses residents' desire for more bicycle and pedestrian facilities

and notes that the City plans to develop additional bicycle and pedestrian accommodations in the future. In addition, the state's Mountain to Sea Trail loosely parallels US 70 west of Havelock through the Croatan National Forest. Additional discussion of bicycle and pedestrian facilities is contained in Chapters 1.8.5 and 3.1.4.

1.7 SOCIAL AND ECONOMIC CONDITIONS

1.7.1 Existing Development

Land use in the project study area is a mixture of residential, commercial, industrial, military, silvicultural, and agricultural development. US 70 is the only principal arterial that passes through the City of Havelock. As with many other roadways in populated areas and with limited- or no access control, US 70 is flanked predominantly by commercial development (retail, restaurants, and other businesses) that provide services to area residents, Cherry Point MCAS, and the traveling public. The City of Havelock is bordered to the northeast by the Cherry Point MCAS, which covers more than 29,000 acres from Havelock to the Neuse River. Much of the region southwest of Havelock is part of the Croatan National Forest (CNF). Currently, the CNF contains approximately 160,000 acres. Most of this acreage is located to the south and west of Havelock.

1.7.2 Future Development

Future land use mapping shows the proposed bypass and identifies future land uses adjacent to the proposed bypass. Much of this area is planned to remain consistent with current land uses, with the exception of additional single-family residential development occurring at the western end of SR 1747 (Sunset Drive), additional high-density residential development extending westward from Havelock along SR 1756 (Lake Road) and a commercial area in the eastern quadrants of the SR 1756 (Lake Road) interchange. Future land use is discussed further in Chapter 3.1.3.

1.7.3 Regional and Military Plans

Future development in the Havelock area is also shaped by regional plans such as the Craven County *Coastal Area Management Act (CAMA) Core Land Use Plan* (Holland Planning Consultants, 2009), the North Carolina Eastern Region Military Growth Task Force's *Regional Growth Management Plan* (Marstel-Day, 2009) and East Carolina Joint Land Use Study (East Carolina Council, 2002).

1.8. TRANSPORTATION PLANNING

Truck volumes, military use, and beach travel all contribute to high regional traffic volumes that require assessment and planning on a statewide and regional level. As such, in addition to local transportation plans, the proposed project is also included in a number of state and regional transportation plans. Exhibit 1.8.1 shows local and regional transportation projects described in this chapter.

1.8.1 Strategic Highway Corridors Program

In September 2004, NCDOT, NC Department of Commerce, and NC Department of Environment and Natural Resources (NCDENR) adopted the Strategic Highway Corridor (SHC) planning program, the goals of which were to enhance mobility and connectivity of critical highway facilities while utilizing existing facilities to the maximum extent possible, and fostering economic prosperity by moving goods quickly and efficiently throughout the state. SHC routes were chosen based on traffic volumes and relative importance to the state and/or region, whether they provide a connection between major activity centers or between existing and/or planned interstates, and if they serve as reliever routes to an existing interstate facility. Although NCDOT is currently developing a new policy (discussed in Chapter 1.8.2), this section summarizes previous planning efforts under the SHC program.

US 70 was included as a SHC corridor (identified in 2004 as Corridor 46) because it provides regional connectivity with the Port of Morehead City, Global TransPark, industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and it functions as a primary route for seasonal beach traffic.

In 2013, the Port of Morehead City served 121 ships and 446 barges, accommodating 1,749,600 metric tons of total imports and exports. Top imports include sulfur products and metal products; top exports include phosphate and woodchips. These commodities support North Carolina industries such as retail stores, agriculture, apparel, fertilizer manufacturing, textile mills, wood product manufacturing, and construction. From June 2013 to May 2014, the Port of Morehead City contributed $1.1 billion to the state's economy and supported 76,700 jobs across the state. The activity at the Port of Morehead City resulted in over $38.6 million in state and local tax collection (ITRE, 2014).

There are three military installations in eastern North Carolina: Camp Lejeune Marine Base, Cherry Point Marine Corps Air Station, and the Seymour Johnson Air Force Base; two of these are located along the US 70 corridor in eastern North Carolina. The Port of Morehead City is one of 15 designated Strategic Seaports nationwide; the Port of Wilmington is one as well (ITRE, 2014).

Because it provides such a high degree of regional connectivity, the SHC goal to enhance the mobility and connectivity of critical highway facilities was particularly relevant to the proposed project. From a regional vantage point, the SHC Program acknowledges existing and future regional traffic demands and therefore identifies US 70 as a controlled-access, median-divided freeway with a functional purpose of providing high mobility and low access (i.e., direct access to US 70 only via interchanges).

The SHC Program was to create a consistent vision for each corridor, the SHC Program acknowledges that facility types for a single corridor may change due to project-specific elements. As such, supplemental planning and design studies were subsequently conducted to determine the appropriateness of the SHC recommendations. Studies, including the *US 70 Access Management Study* (Kimley-Horn, 2007) and *Havelock Bypass DEIS*, were developed to assess mobility and connectivity needs in the Havelock area to determine if the SHC Program recommendation would be appropriate for the Havelock area. Based on these project-specific analyses, NCDOT determined that traffic volumes justify a controlled-access freeway. Because improving the existing route is not a viable or reasonable way to address project needs, as discussed in Chapters 2.5 and 2.6, only new location alternatives for a controlled-access facility were carried forward for detailed study. Improve existing options were examined, but ultimately deemed unreasonable.

1.8.2 Strategic Transportation Corridors Plan

In mid-2013, NCDOT began to update its Strategic Highways Corridors program, which ten years earlier had identified 55 SHCs across the state deemed to be of high priority in achieving state development goals. NCDOT also needed to update the planning tools used to evaluate transportation corridors. The result of this update was the North Carolina Transportation Network (NCTN), which builds on the NC Multimodal Network developed in 2004. The NCTN was used to generate proposed Strategic Transportation Corridors (STCs).

STCs are a critical network of multimodal transportation corridors considered the backbone of the state's transportation system. These 25 STCs move most of our freight and people, link critical centers of economic activity to international air and sea ports, and support interstate/intrastate commerce. They must operate well to help North Carolina attract new businesses, retain existing businesses, grow jobs and catalyze economic development.

The goals of the STCs include:

- *System connectivity*: Provide essential links as part of defined Interstate highway, defense, and freight networks for movement of people and goods.
- *Mobility*: Facilitate significant movements of people and goods across the state.
- *Economic prosperity*: invest NC's transportation resources to maximize economic opportunity.

STC designation will be used as a planning tool to support multiple NCDOT activities including: comprehensive Transportation Plans, by defining corridors with the highest levels of statewide interest; project development, by providing system-level input to Purpose & Need Statements; and, access management, by establishing corridors needing high levels of access control.

US 70 Commission Access Management Plan

TIP R-5516
Intersection Improvements
US 70 and Slocum Rd.

Study Area for US 70 Commission
Access Management Plan
Recommendations Include:
- Median closures
- New medians
- Signal removal
- Intersection, signal and signage improvements
- Service road extentions

Lewis Farm Rd.
Fontana Blvd.
Havelock
McCotter Blvd.
Sermons Blvd.
Slocum Rd.
North Carolina RR
Old Landfill
Waste Facility
Power Transmission Line
Headwaters of Tucker Creek
Miller Blvd.
Greenfield Heights
Blvd.
Sunset Dr.
Gray Rd.
Lake Rd.
Camp Lejeune RR
East Prong Slocum Creek
Southwest Prong
Slocum Creek

US 70 Corridor Project Status Map

GOLDSBORO BYPASS (20.6 mi)
TIP #: R-2554
Trust Fund Project/GARVEE
PLANNING: Complete
DESIGN: Underway
ROW: Underway
CONSTRUCTION: Underway (Section BA)
COST: $300 million
($179 million unfunded)

CLAYTON BYPASS (10.7 mi)
TIP #: R-2552
Trust Fund Project
CONSTRUCTION: Complete
COST: $197 million

KINSTON BYPASS (12.4 mi)
TIP #: R-2553
Trust Fund Project
PLANNING: Underway
DESIGN: Unfunded
ROW: FY 2015
CONSTRUCTION: Unfunded
COST: $129 million
($118 million unfunded)

NORTHERN CARTERET BYPASS (33.1 mi)
TIP #: R-4431
PLANNING: Unfunded
DESIGN: Unfunded
ROW: Unfunded
CONSTRUCTION: Unfunded
COST: $181 million (unfunded)

HAVELOCK BYPASS (9.0 mi)
TIP #: R-1015
Trust Fund Project/GARVEE
PLANNING: Complete
DESIGN: Complete
ROW: FY 2010
CONSTRUCTION: FY 2015 (Start)
COST: $157 million

GALLANTS CHANNEL BRIDGE/ BEAUFORT BYPASS (2.2 mi)
TIP #: R-3307
Trust Fund Project
PLANNING: Complete
DESIGN: Complete
ROW: Complete
CONSTRUCTION: FY 2015
COST: $105 million
($51 million unfunded)

Raleigh, Garner, Clayton, Wilson, Wilson's Mill, Smithfield, Pine Level, Princeton, Goldsboro, La Grange, Walnut Creek, Kinston, Dover, Cove City, New Bern, James City, Havelock, Newport, Morehead City, Atlantic Beach, Beaufort, Greenville

June 2010
0 2 4 8 12 16 Miles

US 70 Corridor Project Status Map

US 70 Strategy
- Existing Freeway
- Bypass
- Retrofit
- US 70 BUS

Roadways
- Interstate
- US Highway
- NC Route
- Railroads

Boundaries
- Municipalities
- NC Counties
- Member Counties

2007 HSIP Locations*
Improvement Status
- None
- Planned/Studied
- Completed

* The NCDOT Highway Safety Improvement Program (HSIP) biennially identifies potentially hazardous locations in the State Roadway System for study and potential safety improvements.

Croatan Regional Bike and Trails Plan (2006)

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Area Transportation Projects
Scale: 1" = 1 mile
Exhibit 1.8.1

This page intentionally left blank to facilitate double-sided printing.

NCDOT is currently working with a broad-based advisory group comprised of stakeholders, including local planning organizations, members of local and regional governments, and area business leaders to develop STC policy. NCDOT has conducted eight meetings across the state to present proposed STCs. NCDOT is currently seeking public comment on the proposed STC policy and map of the 25 corridors before the N.C. Board of Transportation considers the recommendations for adoption.

Absent of new information or circumstances, development of the new STC policy is not intended to alter ongoing or prior project development related to active SHC projects. Such project development includes but is not limited to, environmental studies, purpose and need determinations, screening of alternatives, travel corridor or mode definitions, or identification of environmental impacts and mitigation. It is not the intent of the STC policy to replace, modify, or negate any ongoing or prior project development that includes or references components of the SHC program. Federal law supports the development of systems-level corridor planning studies and their use as part of the overall project development process consistent with NEPA (23 CFR 450.212). Therefore, in the absence of new information or other circumstances, previous planning efforts under the SHC program remain valid and are incorporated into current project development.

For consistency and for the remainder of this FEIS, Strategic Highway Corridors shall be referred to as Strategic Transportation Corridors or "SHC (now STC)", as appropriate.

1.8.3 State Transportation Improvement Program

The proposed project has been included in the NCDOT State Transportation Improvement Program (STIP) since 1983 and is identified as Project No. R-1015. The proposed Havelock Bypass is one of five bypass projects included in the STIP to enhance statewide travel along the US 70 corridor between the State Capital in Raleigh and the second largest port in North Carolina at Morehead City. Two of these projects, the US 70 Clayton Bypass (Project No. R-2552) and US 70 Smithfield-Selma Bypass (Project No. R-84), have been constructed. The US 70 Goldsboro Bypass (Project No. R-2554) is partially completed with remaining sections currently under construction and the US 70 Kinston Bypass (Project No. R-2553) is currently in the planning and design stage, with construction scheduled after 2020. Planning and design efforts are in progress for the upgrade of US 70 to freeway standards from SR 1124 (Grantham Road) to the Neuse River Bridge in James City (Project No. U-5713). Another proposed US 70 improvement on US 70 is the Gallants Channel Bridge Improvements east of Morehead City which include a 2.2-mile multi-lane facility from the existing four-lane section at Radio Island east of Morehead City to north of Beaufort near SR 1429 (Olga Road) (Project No. R-3307). Construction of this project is underway.

The STIP includes improvements in the area of the US 70/Slocum Road intersection in Havelock (Project No. R-5516), shown in Exhibit 1.8.1. The project includes a flyover ramp from eastbound US 70 to Slocum Road, closure of the US 70 intersection with MacDonald Boulevard and rerouting of traffic along a new alignment to the Pine Grove Road/Hickman Hill Road intersection with US 70, and the extension of Sermons Boulevard to Pine Grove Road. This project is scheduled for construction in 2017.

In 2012, NCDOT completed an approximately 1.5-mile median and signal improvement project from Fontana Boulevard south to Forest Hill Drive to complete the roadway's conversion to a four-lane, median divided roadway (Project No. 5101). These projects are among several improvement projects recommended in the *US 70 Access Management Study* (Kimley-Horn, 2005) and in the *Draft US 70 Corridor Commission Access Management Plan* (US 70 Corridor Commission, 2012b). Most of the existing route is now a four-lane, median-divided roadway with service roads and consolidated signalized intersections. Additional projects include median closures, directional cross-overs, service road extensions, signal removal, and improvements to the US 70/NC 101 intersection.

The STIP also includes two bridge replacement projects in the area: Bridge No. 2 on SR 1715 over Fork Clubfoot Creek (STIP Project No. B-4487). This project is scheduled for right-of-way acquisition in 2017 and construction in 2018. No NEPA studies are currently underway for these projects.

NCDOT Strategic Prioritization

The 2010 Strategic Transportation Investments (STI) Law (House Bill 817) established the Strategic Mobility Formula, a new way of allocating available revenues based on data-driven scoring and local input. The Strategic Mobility Formula is a data-driven analysis of existing and future conditions, benefits the project is expected to provide, the project's multi-modal characteristics, and how the project fits in with local priorities. The outcome of this analysis serves as input for the Draft State Transportation Improvement Program (STIP). In December 2014, NCDOT released the 2016-2025 Draft STIP which includes projects proposed for full or partial funding. This FEIS reflects final results of the Strategic Mobility Formula analysis.

Feasibility Studies

Several Feasibility Studies have been prepared to investigate potential improvements along the US 70 corridor. Feasibility studies determine the scope and general cost of unfunded potential projects in case programming (funding) is considered in the future.

The STIP includes a feasibility study for access management improvements for US 70 from James City to the proposed Havelock Bypass (Project No. FS-0802B). In addition, a study

was completed (NCDOT, 2010) that analyzed the feasibility of modifying a section of US 70 to freeway standards, from the Trent River Bridge to just south of SR 1131 (Airport Road). The US 70 James City Pilot Project evaluated several alternatives and NCDOT held public workshops to gather input on the alternatives as well as discuss bypass options from New Bern to Havelock and compare retrofit and bypass options. This study resulted in the conceptual design of two ramp-over interchanges and numerous auxiliary improvements along the US 70 corridor in the James City area. The study also included a preliminary comparison of retrofit and bypass options. The recommendations in this study are also evaluated in the development of the Draft US 70 Corridor Commission Conceptual Freeway Plan (US 70 Corridor Commission, 2012). A separate feasibility study is also being prepared that will evaluate the potential for a new location bypass around New Bern and James City; it is anticipated that this study will be completed in 2014.

A feasibility study was prepared in 2009 for the approximately 33-mile Northern Carteret Bypass from Havelock to Beaufort (STIP Project No. R-4431). The project is included in the Carteret County Comprehensive Transportation Plan (NCDOT, 2014); however, the plan notes that the project was dropped from the 2012-2020 STIP due to its score in the NCDOT Strategic Prioritization process. Further, the Northern Carteret Bypass is not included in the Draft 2016-2025 Draft STIP, released December 24, 2014. Final scores for NCDOT Division 2 rank the Northern Carteret Bypass did not score high enough to be funded on statewide, regional, or Division level. The Down East Rural Planning Organization noted that it does not support the project and believes that it is too costly to fund at the regional level. As such, the project is unfunded and no additional studies are planned in the foreseeable future.

1.8.4 Regional and Local Transportation Plans

The proposed project was originally considered as a potential bypass around the southwestern side of the Havelock in the 1979 Thoroughfare Plan for the City of Havelock. More recently, the City of Havelock Thoroughfare Plan (City of Havelock, 1993) and the Havelock Comprehensive Transportation/Land Use Plan (City of Havelock, 2007) show the US 70 Havelock Bypass as a proposed freeway around the southwest side of the City with interchanges on each end and at SR 1756 (Lake Road). The plans describe the bypass as a four-lane divided, controlled-access freeway. The proposed bypass is also considered in the City of Havelock 2030 Comprehensive Plan (City of Havelock, 2009).

The Cherry Point MCAS Transportation Demand Management Plan (City of Havelock, 2011) identifies a number of measures to be developed and implemented over the next five years to reduce the number of single-occupancy vehicles entering the base. These measures include ride-sharing, a park & ride system in conjunction with an on-base shuttle service, flextime, compressed work weeks, and other strategies. The plan notes that implementation of these strategies is primarily dependent upon logistics related to maintaining security.

1.8.5 Bicycle, Pedestrian, and Greenway Plans

As indicated earlier, a limited number of designated bicycle facilities and sidewalks exist within Havelock. No designated bicycle routes are located in the project study area; however, the Draft Havelock Comprehensive Transportation/Land Use Plan (City of Havelock, 2007) proposes bicycle facilities on Hickman Hill Road, Sunset Drive, and Lake Road.

Section 157.06 of the City's unified development ordinance (2012) requires that most new development consider sidewalks for one or both sides of the roadway and in some cases consider sidewalks and/or pedestrian walkways to provide access to internal or adjoining recreational areas and facilities, community buildings, schools, commercial areas, and other pedestrian-oriented areas. This provision is consistent with the City's planning policy to construct sidewalks and greenways that optimize pedestrian movements between buildings in a non-residential development and connect to existing facilities where they currently exist (City of Havelock, 2009). The Draft Havelock Comprehensive Transportation/Land Use Plan (City of Havelock, 2007) does not include any sidewalks along existing roads within the area of the proposed bypass.

The Comprehensive Parks and Recreation Master Plan for Havelock (City of Havelock, 2007a) includes proposed greenway facilities within the Havelock planning area. These facilities include existing US 70 as a potential greenway location.

The Croatan Regional Bike + Trails Plan (NCDOT, 2006) identifies the existing route for the Mountain to Sea Trail as loosely paralleling US 70 west of Havelock through the Croatan National Forest. The trail turns east on SR 1746 (Gray Road), crossing US 70 and continuing eastward on NC 101. The proposed route would utilize an alternate alignment west of the existing route but still within the Croatan National Forest. The existing and proposed Mountain to Sea Trail routes are shown in Exhibit 1.8.1.

1.9 TRAFFIC OPERATIONS ANALYSES

1.9.1 Existing Roadway Characteristics

US 70 through the City of Havelock is relatively straight and flat with approximately 30 local or state intersecting roadways. Currently, 13 of these intersections are signalized. On the north end of US 70, service roads are provided along both sides of the four-lane divided section from Slocum Road to NC 101 (Miller Boulevard) to carry traffic from adjacent properties to the intersecting streets. From NC 101 east to Forest Hill Drive, the existing roadway was recently upgraded to a four-lane divided roadway with no control of access. South of Forest Hill Drive, US 70 remains a four-lane divided section without service roads.

As the commercial district along US 70 in Havelock has grown, more traffic signals became warranted to provide safe access to and across the route. Of the 13 traffic signals along US 70 through Havelock, five were added since 1990. Each new signal causes a delay to through traffic and deteriorates the level of traffic service along the route. Without improvements to accommodate the anticipated increases in traffic volume, the level of traffic service along US 70 will continue to deteriorate. As discussed in Chapter 1.8.3, median improvements along US 70 from NC 101 to Forest Hill Drive (Project No. W-5101) were completed in 2013. These median improvements were considered as existing conditions and were incorporated into the no-build analyses discussed in the following paragraphs. Although the median improvements address some of the access related issues along US 70 through Havelock, these improvements alone do not satisfy the project needs identified in Chapter 1.3.

1.9.2 Existing Traffic Conditions

The average daily traffic volumes (ADT) for the base year 2008 are shown in Exhibit 1.9.1. These ADT volumes along US 70 range from a low of 23,400 vehicles per day (vpd) between Nunn Street (a city street) and SR 1824 (McCotter Boulevard) on the south end of the project, to a high of 34,800 vpd between SR 1735 (Cunningham Boulevard) and Hollywood Boulevard (a city street) in the center of Havelock.

Levels-of-service A through C are the desired levels, although LOS D is considered acceptable for urban facilities. Traffic conditions worse than LOS D (E and F) are deemed undesirable. These undesirable LOS conditions represent substantial travel delay, increased accident potential, and inefficient motor vehicle operation.

1.9.3 2035 No-Build Traffic Projections

NCDOT Transportation Planning Branch prepares project-level traffic forecasts based on a variety of input, including land use plans, future growth rates, projected employment and employment centers – all of which happens in coordination with local government planners. The forecasted design year traffic volumes along the existing section of US 70 were used to determine if the existing route would accommodate future traffic at an acceptable LOS. The proposed project uses a design year of 2035, which aligns with the required minimum 20-year forecast period for long-range transportation planning (23 CFR 450.214). In addition, this time frame is compatible with the long-term planning horizons for other infrastructure needs (i.e., water, sewer, utilities) and land use plans. Generally speaking, evaluating a project over a longer length of time ensures that the capital investment is effective at meeting long-term needs.

The average ADT for the 2035 design year are shown in Exhibit 1.9.2. The design year ADT volumes range from a low of 39,900 vehicles per day (vpd) between NC 101 and SR 1737 (Roosevelt Boulevard) to a high of 59,600 vpd between SR 1735 (Cunningham Boulevard) and Hollywood Boulevard (a city street). Both of these locations occur south of NC 101, in the commercial area of Havelock.

1.10 ACCIDENT ANALYSIS

An accident study of US 70 in Havelock was conducted to determine the accident potential and relative safety of the existing roadway. A total of 527 reported accidents occurred along the studied portion of US 70 during the period between October 1, 2009 and September 30, 2012. Two crashes (1%) involved fatal injuries, 129 (24%) involved non-fatal injury crashes, and 396 (75%) resulted in property damage-only crashes. The 527 reported accidents resulted in an estimated $1,759,297 loss in property damage. Table 1.10.1 is a summary of the recorded accident types along the studied roadway during this period. Exhibit 1.10.1 shows the accident locations.

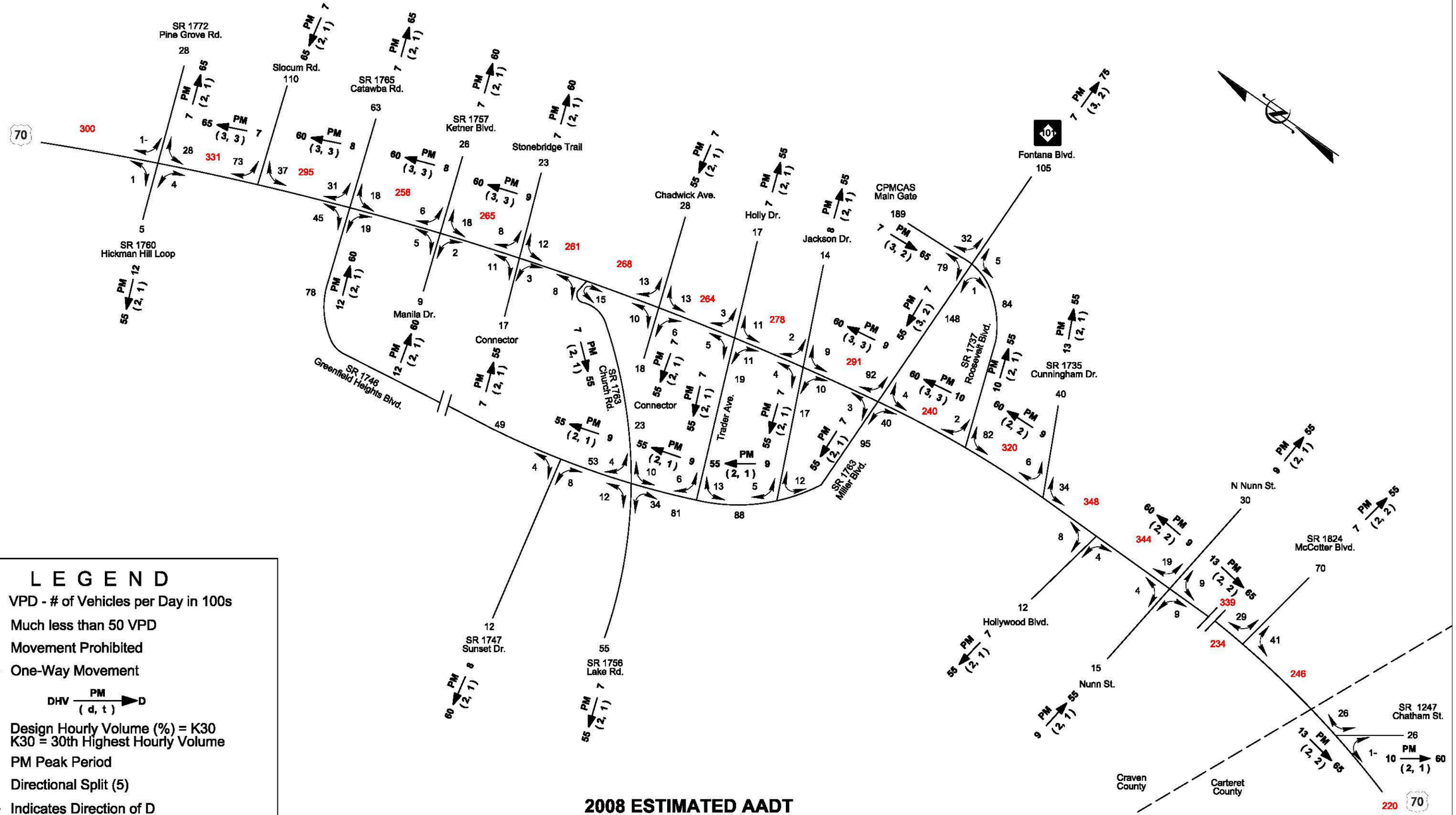
TABLE 1.10.1
ACCIDENT TYPES

ACCIDENT TYPE	NUMBER	PERCENT OF TOTAL
Rear-end	272	51.6%
Turning Movements	71	13.5%
Angle	44	8.3%
Sideswipe	59	11.2%
Ran Off Road	27	5.1%
Other	54	10.2%

A comparison of the accidents along the studied route shows the most frequent single type of accident involved a rear-end collision (51.6%). The large percentage of rear-end collisions indicates a congested roadway with numerous driveway access points and at-grade intersections. Given this information, it stands to reason that the addition of a median-divided, fully access-controlled facility with uninterrupted flow would serve as an attractive option for through traffic. A reduction in traffic volumes on the existing section of US 70 would reduce congestion and in turn would likely reduce the potential for rear-end collisions.

More than 52% (277) of the 527 total accidents occurred within 150 feet of signalized intersections. These locations are listed in Table 1.10.2 from south to north along the studied portion of US 70. The most accidents (40) occurred at the US 70 intersection with NC 101 and Miller Boulevard (SR 1763).

Accident rates are determined by the route length, average daily traffic, and number of reported accidents in a specific time frame. These rates are listed as accidents per 100 million vehicle miles (per 100MVM). From west of Havelock to NC 101 (Miller Boulevard), US 70 is a four-lane divided facility with partial control of access (at-grade intersections and service roads). From NC 101 eastward, the existing roadway has recently been upgraded to a four-lane divided roadway with no control of access. Further east near Forest Hill Drive, US 70 transitions to a four-lane divided section also with no control of access. The total accident rate for the stated time period along the studied portion of US 70 is 312.02 per 100MVM.



L E G E N D

###	VPD - # of Vehicles per Day in 100s
1-	Much less than 50 VPD
X	Movement Prohibited
→	One-Way Movement
DHV PM (d, t) D	
DHV	Design Hourly Volume (%) = K30 K30 = 30th Highest Hourly Volume
PM	PM Peak Period
D	Directional Split (5)
→	Indicates Direction of D Reverse Flow for AM Peak
(d, t)	Duals, TTSTs (5)

2008 ESTIMATED AADT

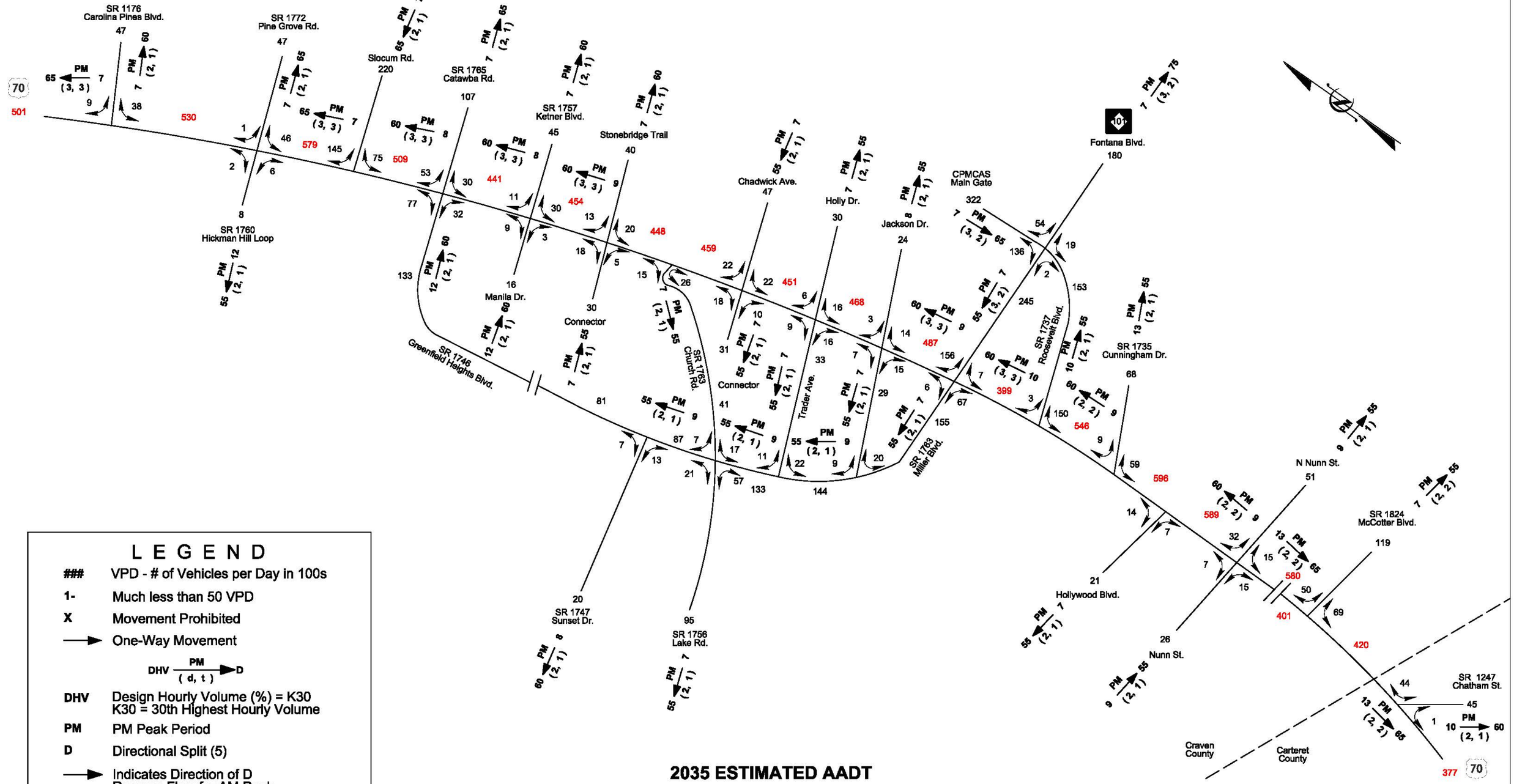
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

2008 Estimated Average
Annual Daily Traffic
Not to Scale
Exhibit 1.9.1

This page intentionally left blank to facilitate double-sided printing.



LEGEND

###	VPD - # of Vehicles per Day in 100s
1-	Much less than 50 VPD
X	Movement Prohibited
⟶	One-Way Movement
DHV PM (d, t) D	
DHV	Design Hourly Volume (%) = K30 K30 = 30th Highest Hourly Volume
PM	PM Peak Period
D	Directional Split (5)
⟶	Indicates Direction of D Reverse Flow for AM Peak
(d, t)	Duals, TTSTs (5)

2035 ESTIMATED AADT

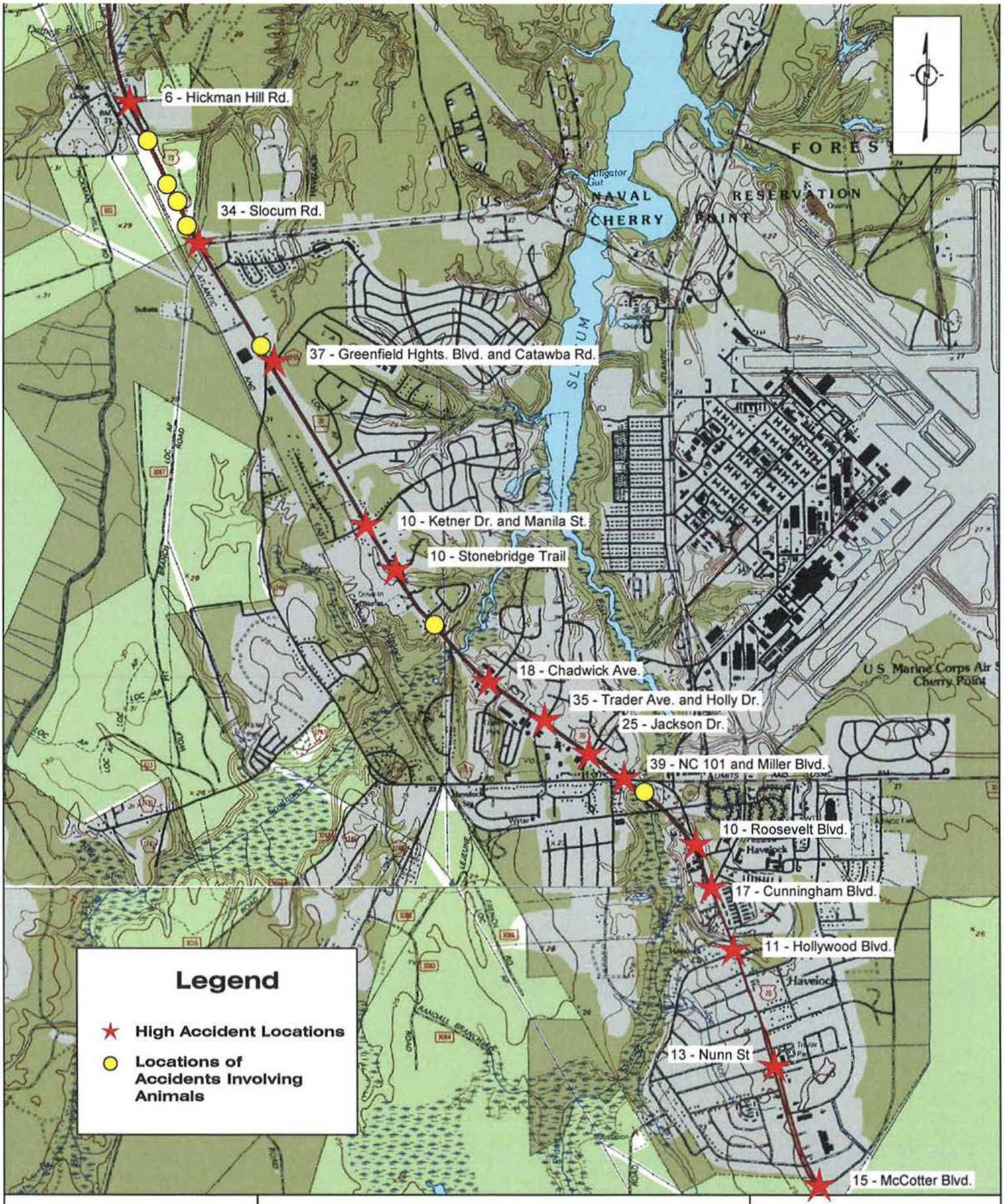
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

2035 Estimated Average
Annual Daily Traffic
Without Bypass
Not to Scale
Exhibit 1.9.2

This page intentionally left blank to facilitate double-sided printing.



US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

High Accident Locations
Not to Scale
Exhibit 1.10.1

This page intentionally left blank to facilitate double-sided printing.

TABLE 1.10.2
PRIMARY ACCIDENT LOCATIONS
(October 1, 2009 to September 30, 2012)

LOCATION	NUMBER OF ACCIDENTS
Hickman Hill Road (SR 1760)	11
Slocum Road	33
SR 1773 and Wal-Mart Driveway	18
Greenfield Heights Blvd (SR 1746) and Catawba Road (SR 1765)	28
Ketner Drive (SR 1757) and Manila Street (SR 1800)	6
Stonebridge Trail	13
Chadwick Avenue	12
Trader Avenue and Holly Drive	30
Jackson Drive	25
NC 101 and Miller Boulevard (SR 1763)	40
Roosevelt Boulevard (SR 1737)	13
Cunningham Boulevard (SR 1735)	15
Hollywood Boulevard	16
Nunn Street	10
McCotter Boulevard (SR 1824)	7

Average statewide accident rates are categorized according to the type of facility. For comparison to statewide accident rates, existing US 70 through Havelock is compared to urban US routes with four or more lanes. Table 1.10.3 shows a comparison of the accident rates for the studied portion of US 70 to the average North Carolina Statewide Accident rates. All statewide average accident rates are shown for urban US routes with four or more lanes divided with no control of access, partial control of access, and full control of access.

As Table 1.10.3 shows, the total accident rate along the studied portion of US 70 is higher than the North Carolina Statewide average rates for divided US routes with four or more lanes containing full, partial or no control of access. The total accident rate is almost three times higher than the statewide average for a 4+-lane freeway with full control of access. The fatal accident rate is also significantly higher than statewide averages for freeway sections. In addition, the total accident rate is above the corresponding critical crash rate. (Critical crash rates are threshold values that have been statistically adjusted and calculated for the specific study site, based on other roads with similar characteristics throughout the state (i.e. all urban 4-lane divided US highways with no control of access) to remove the elements of chance and randomness. Sites with critical crash rates that exceed the observed crash rate should be further investigated.) The non-fatal injury accident rate on US 70 in Havelock is lower than both the statewide average and the critical rate for urban freeways.

TABLE 1.10.3
ACCIDENT RATE COMPARISON

LOCATION	TOTAL ACCIDENTS per 100 MVM	FATAL ACCIDENTS per 100 MVM	NON-FATAL INJURY ACCIDENTS per 100 MVM
US 70, Havelock, NC	312.02	1.18	76.38
Critical Crash Rates	*297.05*	*2.41*	*105.31*
US Urban Routes with 4+ lanes divided with no control of access	275.74	0.91	92.82
US Urban Routes with 4+ lanes divided with partial control of access*	170.91	0.86	57.03
US Urban Routes with 4+ lanes divided with full control of access*	105.59	0.46	33.25

NOTES: Standard 2008-2010 Three Year Crash Rates, All United States Routes in North Carolina.

It is expected that the proposed bypass facility would perform similar to other urban median-divided facilities which typically experience much lower crash rates compared to other urban facility types. It is expected that the frequency of crashes would be lower than the no-build scenario because the proposed bypass is expected to divert a significant amount of traffic, lowering the exposure on existing US 70.

Collisions With Large Animals – During the three-year study period, seven collisions with animals occurred along US 70. As shown in Exhibit 1.10.1, six of these collisions occurred in areas where riparian corridors cross US 70. Four collisions occurred at the upper reaches of tributaries to Sandy Run just north of Slocum Road. One occurred where the Southwest Prong of Slocum Creek crosses US 70 and one occurred where the East Prong of Slocum Creek crosses US 70. The remaining collision occurred on US 70 in a developed area near Catawba Road.

2.0 DESCRIPTION OF ALTERNATIVES CONSIDERED

This chapter describes the preliminary alternatives as well as alternatives retained for detailed study. A number of preliminary alternatives were developed and evaluated during the early phases of the project development process, including the No-Build Alternative, Transportation System Management Alternatives, Transportation Demand Management Alternatives, Mass Transit Alternative, Improve Existing Alternatives, and Build Alternatives. This chapter provides a discussion of the preliminary alternatives considered for this action, the process of elimination that determined alternatives for detailed study, and selection of the preferred alternative.

Project Study Area

The proposed project is located in the southeastern portion of Craven County, North Carolina. Set in the eastern coastal plain region of the State, approximately 30 miles west of the Atlantic coast, the general topography of the study area is nearly level with slight relief along the stream terraces. The Neuse River provides the primary drainage for the study area. Goodwin Creek, Daniels Branch, Southwest Prong of Slocum Creek, East Prong of Slocum Creek, and Black Swamp all drain into Slocum Creek, a tributary of the Neuse River.

US 70 is the only principal arterial that passes through the City of Havelock. The project study area begins along US 70 approximately 3.5 miles northwest of the City and extends approximately 10.5 miles to the southeast of the City near the Craven/Carteret County line. Through the project study area, US 70 is a multilane arterial with fourteen signalized intersections concentrated along the route. It serves a majority of the commercial businesses in the City.

The City of Havelock is the home of the Cherry Point U.S. Marine Corps Air Station (MCAS) that covers more than 12,000 acres at its primary complex. The Cherry Point MCAS is located on the northeast side of the City of Havelock and is bounded on the north by the Neuse River and on the southwest by existing US 70. Much of the region southwest of Havelock is part of the Croatan National Forest (CNF). Currently, this National Forest contains approximately 160,000 acres. Most of this acreage is located to the south and west of Havelock.

The land use in the project study area is a mixture of residential, commercial, industrial, silvicultural (timber production), and agricultural development. While silviculture is an important use of the CNF, the protection of watershed, terrestrial and aquatic habitat, and recreation are other important uses of the CNF. The project location is shown in Exhibit 1.1.1.

2.1 NO-BUILD ALTERNATIVE

The No-Build Alternative assumes that within the Craven County transportation system, US 70 would remain as it currently exists. With the exception of the programmed improvements in the area of the US 70/Slocum Road intersection in Havelock and the recently-completed median project from NC 101 to Forest Hill Drive (discussed in Chapter 1.8), no other major improvements would be made to the current US 70 corridor and only routine maintenance would occur in future years. Although no relocations or public funds would be expended for right-of-way acquisition and construction, long-term operational, social, and environmental effects would result from increased congestion on the existing route.

If the No-Build Alternative had been selected as the Preferred Alternative in 1998, the Croatan Wetland Mitigation Bank (CWMB) would be a significantly smaller site. Originally, only a portion of the current site was identified for use as a mitigation bank. In the early planning stages for the Havelock Bypass, however, the CWMB's size was increased in anticipation of potential impacts from the Havelock Bypass and other nearby transportation projects. For a large portion of the site, existing conditions would likely still persist, which include the negative effects of extensive ditching and timber production. It is most likely that the site would have remained in use for silviculture and recreational hunting. The No-Build Alternative would not necessitate the acquisition of the entire site, still leaving portions of the CNF disconnected from other NFS lands.

As discussed in Chapter 1.9, intersections of connecting streets along existing US 70 are predicted to operate with failing levels of service. The No-Build Alternative would allow traffic congestion to increase, leading to a general breakdown of traffic service along this section of US 70.

As noted in Chapter 1.10, rear-end collisions comprise over half of the accidents along US 70 and are the predominant type of accident associated with congestion; this type of accident is likely to increase as traffic volumes rise. Based on 2008 traffic volumes, truck traffic ranges from 960 to 2,088 trucks per day; these volumes are projected to range between 1,596 and 3,576 trucks per day in 2035, an increase of 636 to 1,488 trucks per day. As traffic increases, highway noise will also increase, due in large part to more trucks on the highway. Most trucks rely on compression release engine brakes (i.e., "jake" brakes), which in congestion, would notably contribute to higher highway noise levels. Higher traffic volumes and increased delays on the existing route will also contribute to increased automobile emissions, which may have a localized negative effect on air quality.

Maintaining through-traffic on existing US 70 (Main Street) is not consistent with goals detailed in the City of Havelock's 2030 Comprehensive Plan, which intend to "set a new vision for the US 70 Corridor that will transform Main Street back into a community asset

once the proposed bypass is completed" and "revert to a more traditional Main Street that primarily serves local residents and businesses" (URG, 2009). Further, allowing through-traffic to remain on the existing route would reduce the viability of non-motorized travel. Removing through-traffic would allow the City to more-effectively develop bicycle and pedestrian facilities, which is more consistent with City plans and the USDOT's Policy Statement on Bicycle and Pedestrian Accommodation (i.e., Complete Streets policy).

The regional and statewide needs for the proposed project are not met by the No-Build Alternative. Increasing congestion on the existing through-route would contribute to fourteen potential intersection time delays that, collectively, would cause regional and statewide travel delays. As discussed in Chapter 1.8, the proposed Havelock Bypass is one of several bypass projects sharing a purpose to improve traffic operations for regional and statewide traffic along the US 70 corridor, which enhances the ability of US 70 to serve a regional transportation function.

Although the No-Build Alternative does not meet the purpose and need for this project, it does provide a baseline comparison for the Build Alternatives in accordance with NEPA (40 CFR 1502.14(d)) and with FHWA guidelines (FHWA, 1987).

2.2 TRANSPORTATION SYSTEM MANAGEMENT (TSM) ALTERNATIVES

Transportation System Management (TSM) alternatives are relatively low-cost improvements to an existing facility. TSM measures enhance the operations of a facility while minimizing capital outlay. TSM measures may include operational improvements such as traffic signal timing optimization, speed restrictions, access control, flexible work hours, and physical improvements such as turning lanes, high-occupancy vehicle (HOV) lanes, intersection realignments, or new traffic signals.

2.2.1 Operational Improvements

Examples of TSM operational improvements include traffic law enforcement, flexible work hours, turn prohibitions, access control, signal coordination, signal phasing/timing changes, and speed restrictions.

TSM operational measures usually can be implemented easily and require little capital investment. In this case, however, many of these measures are already in place along the existing route and will not be able to acceptably rectify operational deficiencies projected for 2035. Adequate traffic law enforcement is currently in place and most locations along the roadway have already been modified to include medians, channelized left-turns, consolidated signals, and service roads, but these measures do not eliminate the operational deficiencies caused by the large number of signalized intersections along this section.

Cherry Point MCAS is the sole concentrated employment center in the study area. As discussed in Chapter 1.8, modifications are programmed for the US 70/Slocum Road area that will improve traffic flow through the area; however, these improvements do not address through-traffic volumes. Signal coordination and optimizing signal timing would improve traffic flow; however, the benefits of this improvement would be limited due to the high volumes projected for the roadway. The operating speed is already restricted due to the number of traffic signals along the roadway.

TSM operational improvements would not substantially improve mobility for local, regional, and statewide traffic along the US 70 corridor. These improvements would not enhance the ability of US 70 to serve the regional transportation function in accordance with the Strategic Transportation Corridors Plan. TSM operational improvements do not meet the purpose and need, and therefore were eliminated from further consideration for this project.

2.2.2 Physical Improvements

Examples of TSM physical improvements include the addition of turn lanes, intersection realignment, warning, and information signs, new signals, and high-occupancy vehicle (HOV) lanes.

Physical improvements require greater capital investment than operational improvements; however, the benefits are more substantial. Existing US 70 through the project study area is a four-lane, divided roadway with turn lanes at most of the signalized intersections. Intersection realignment and HOV lanes are not feasible due to roadside development and limited right-of-way. Striping, warning devices, and improved signing may reduce accidents, but will not substantially improve traffic flow or the level of service.

As stated in Chapter 1.8.3, most of existing US 70 is now a four-lane, median-divided roadway with service roads and consolidated signalized intersections. In 2012, NCDOT completed an approximately 1.5-mile median and signal improvement project from Fontana Boulevard south to Forest Hill Drive to complete the roadway's conversion to a four-lane, median divided roadway (Project No. 5101). In addition to this project, improvements are also planned in the area of the US 70/Slocum Road intersection in Havelock (Project No. R-5516), as described in Chapter 1.8.3. These projects are among several improvement projects recommended in the *US 70 Access Management Study* (Kimley-Horn, 2005) and in the *Draft US 70 Corridor Commission Access Management Plan* (US 70 Corridor Commission, 2012b). Additional projects include median closures, directional cross-overs, service road extensions, signal removal, and improvements to the US 70/NC 101 intersection.

The construction of these TSM physical improvements has not reduced traffic congestion enough to improve the levels of service on US 70 to an acceptable level in the design year (2035). As stated in Chapter 2.8.2, the proposed bypass plus additional improvements to existing US 70 are needed to accommodate future traffic volumes. TSM improvements do not meet the project's purpose and need and were eliminated from further consideration for this project.

2.3 TRANSPORTATION DEMAND MANAGEMENT (TDM) ALTERNATIVES

For TDM alternatives to provide viable traffic service, certain characteristics and conditions must exist such as concentrated employment centers, direct routes to desired destinations, and low automobile to household ratios. The only concentrated employment center in the study area is the Cherry Point MCAS. Along existing US 70, there are no large shopping malls, office buildings, industrial plants, or other concentrated employment centers. Additionally, based on 2007-2011 US Census, American Community Survey (ACS) estimates, 76% of county commuters and 67% of Havelock commuters drive to work alone. This data indicates that 14% of county work trips and 20% of Havelock work trips involve carpooling. The higher percentage for Havelock is attributed to military personnel carpooling to Cherry Point MCAS; however, the feasibility of this means to work is limited.

As discussed in Chapter 1.8.4, the Cherry Point MCAS Transportation Demand Management Plan (Kimley-Horn, 2011) identifies a number of measures to reduce the number of single-occupancy vehicles entering the base. These measures include ride-sharing, a park & ride system in conjunction with an on-base shuttle service, flextime, compressed work weeks, and other strategies. The plan notes that implementation of these strategies is primarily dependent upon logistics related to maintaining security. There are also logistical issues associated with on-base mobility without a personal vehicle as the base covers approximately 29,000 acres and is not currently served by an on-base shuttle service.

2.3.1 Ridesharing

The Cherry Point MCAS Fleet Readiness Center (FRC) participates in the federal Transportation Incentive Program, which includes a vanpooling system that is estimated to serve approximately 800 people daily with 62 vans in use. Aside from this program, there are no other concentrated employment centers with notable ridesharing programs. A large percentage of the US 70 traffic is regional and/or statewide through traffic, particularly in the summer months as travelers seek coastal destinations. Ridesharing does not present a practicable solution to reduce the congestion currently experienced or expected with future through-traffic along US 70.

2.3.2 Flexible Work Schedule

With the exception of Cherry Point MCAS, there is not a concentrated employment center in the study area. This lack of civilian concentrated employment centers combined with

the large volume of regional through traffic precludes the use of flexible work hours to noticeably improve traffic service on existing US 70. Also, the military sets work schedules and the traditional notion of "flexible work schedule" does not apply.

2.3.3 Telecommuting

The Cherry Point MCAS Transportation Demand Management Plan (Kimley-Horn, 2011) notes that telecommuting would be challenging to implement due to security concerns, equipment requirements, or on-base responsibilities. It is identified as a potential measure but the plan notes that participation would be limited to those approved by tenant command.

In general, telecommuting works best in the development and transfer of technology, data bases, billing services, etc. There are no large technology centers in Havelock to make this a viable means of reducing the work trip demands on US 70.

2.3.4 Guaranteed Ride Home

With such diverse origins of work trips, the "guaranteed ride home" would need to be an identified public/private program such as a taxi service. In such a case, if the rider were responsible for the ride-home cost, the cost would be a further deterrent to ridesharing.

In summary, TDM alternatives will not substantially achieve the goals of the project by improving the level of service for local, regional, and statewide traffic along the US 70 corridor. These improvements would not enhance the ability of US 70 to serve the regional transportation function in accordance with the Strategic Transportation Corridors Plan. TDM alternatives do not meet the purpose and need for the project, and therefore were eliminated from further consideration in this document.

2.4 MASS TRANSIT ALTERNATIVES

Mass transit alternatives typically include bus, rail, and/or other transit alternatives that can meet project needs without requiring highway capacity improvements. The feasibility of mass transit alternatives is evaluated early in the federal project planning process to assess whether NEPA studies and project funding should follow Federal Transit Authority (FTA) or FHWA procedures.

2.4.1 Bus Alternatives

As discussed in Chapter 1.6, mass transit service in the Havelock area is limited to the CARTS service in New Bern and the Amtrak Thruway Motorcoach service that connects to the Amtrak Palmetto route in Wilson. Although CARTS provides transportation services to the general public, this demand/response service is provided on a limited basis with emphasis on the elderly and persons with disabilities.

Havelock is not currently served by local, fixed-route, fixed-schedule mass transit. This is due to the lack of demand, dispersed residential areas, diffused employment centers (with the exception of Cherry Point MCAS), and diversity of trip origins and destinations. The area has only one large employment center, the Cherry Point MCAS; however, mass transit onto the base presents security challenges that have hindered the implementation of a park and ride shuttle service or other mass transit options.

Although the City of Havelock has identified an interest in bolstering bus services as mentioned in the Draft Havelock Comprehensive Transportation/Land Use Plan (Kimley-Horn, 2007), the overall vision states transit should be available to serve the needs of the transit dependent population, while also offering a competitive alternative to the automobile for "choice" customers. Buses are not envisioned as a "stand alone" alternative to reduce congestion on US 70. Even if the local traffic could be reduced by the introduction of a bus system along existing US 70, this would not be an effective means of reducing congestion. Numerous stops and/or turns to and from existing US 70 would introduce new delays to the through traffic along the route. These new delays would result in increased emergency response times as well as increased traffic congestion. These results are not compatible with either of the primary purposes for the project. Therefore, bus alternatives were eliminated from further consideration in this document.

2.4.2 Rail Alternatives

Although bus service is available to access the Amtrak station in Wilson, no passenger service is available in the region. The Camp Lejeune Railroad, owned by the U.S. Government and operated by Norfolk Southern, provides military service between the Cherry Point MCAS and Camp Lejeune. Implementation of future rail is still uncertain with no defined programming. Due to the level of forecasted traffic volumes and mix of regional through traffic, passenger rail was not deemed to be a feasible alternative to a bypass.

The North Carolina Railroad, operated by Norfolk Southern, provides only freight service from New Bern to the Port at Morehead City. With regard to increasing rail usage to reduce capacity demands on US 70, the North Carolina Maritime Strategy Final Report (Strategy Report) (NCDOT, 2012) states, "For the most part, North Carolina's rail network offers sufficient capacity to accommodate additional rail trips that would be generated by the market opportunities identified by the Maritime Strategy" but notes that other rail and highway investments are needed to improve cost and operational efficiencies, including: a new intermodal terminal east of Charlotte; improvement of rail-related traffic impacts in Charlotte (being addressed through the NCDOT CRISP Program) and the subsequent expansion of the existing CSC Charlotte intermodal terminal; the development of inland rail ramps at certain industrial sites; and the Pembroke Connector (STIP Project No. P-4900).

The need to relocate the rail line through Morehead City is also identified in the Strategy Report. The rail line is located in the middle of the Arendell Street median and has 30 at-grade crossings along the 3.5-mile length west of the port. The at-grade crossings on Arendell Street could be blocked for upward of 12 minutes while trains are assembled and another 20 minutes while the train is moving through the area. The current speed through Morehead City is a maximum of 10 miles per hour, but it is likely lower due to the high number of at-grade crossings (North Carolina State Ports Authority, 2011). In addition to operational issues associated with assembling and moving trains through Morehead City, blocking up to 30 at-grade crossings for an extended amount of time has the potential to create adverse effects such as increasing emergency response times or increased noise during evening hours.

Due to these cost and operational inefficiencies, the current demand for rail service in NC is low. As stated in the Strategy Report, "Low historical rail freight volumes to both Wilmington and Morehead City have resulted in high per-unit rail costs, making rail transport less competitive as compared to truck transport within the state." Table 3 of the Maritime Strategy Final Report shows that over 90% of shipments within and originating from NC are made by truck. The report also states, "The dominance of truck freight for North Carolina is expected to persist through 2040."

A number of the rail improvement projects listed above are currently being studied or implemented, but they are not considered to be "reasonable alternatives" as part of this project. Given the state's overwhelming reliance on trucking, a large number of rail improvements would be needed to considerably reduce truck traffic on US 70 through Havelock. Rail improvements are planned for the state; however, there is no single or specific set of rail improvements or combination of multimodal improvements that would reduce truck traffic on US 70. As such, there is no reasonable alternative that includes rail improvements.

2.4.3 Express Lane Alternatives

The Express Lane Alternative typically favors through-traffic flow in an access-controlled environment. Limited opportunities for access control make this alternative unfeasible. Peak hour traffic demand on US 70 is dominated by left-turn demand at a number of the key intersections, e.g., Slocum Road, NC 101, and McCotter Boulevard. US 70 provides limited access control between Slocum Road and NC 101, but has closely spaced intersections allowing access to and from frontage roads. The high left-turn demand and the free-flow nature of express lanes are not a compatible combination from a traffic management point of view.

2.5 IMPROVE EXISTING ALTERNATIVES

Two preliminary build alternatives, an Expressway alternative and a Freeway alternative, were studied as improvements to existing US 70. The improve existing US 70 alternatives extended approximately six miles, from the signalized intersection at Slocum Road south to the signalized intersection at McCotter Boulevard (SR 1824). Both alternatives include an additional through-lane in each direction (for a total of six lanes) and would include a 22-foot median and parallel two-way service roads to access adjacent properties currently served by driveways. A right-of-way width of approximately 360 feet would be needed to contain these lanes, with additional right-of-way needed at signalized intersections or interchanges for turning lanes and ramps. A detailed discussion of the two existing US 70 alternatives is contained in Chapters 2.6.2 through 2.6.5.

Current and Projected Traffic Volumes on existing US 70

As discussed in Chapter 1.9 and shown in Exhibit 1.9.2, current (2008) average daily traffic volumes for US 70 range between 23,400 and 34,800 vehicles per day. NCDOT developed projections for design-year (2035) traffic volumes on existing US 70 without the proposed bypass: which range between 39,900 and 59,600 vehicles per day.

2.6 DEVELOPMENT AND ANALYSIS OF PRELIMINARY STUDY ALTERNATIVES

2.6.1 Logical Termini/Independent Utility

To ensure a comprehensive and fair evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, federal law requires that the proposed action establish meaningful start and end points - which are termed "logical termini." The project should also be of sufficient length to address environmental matters on a broad scope; have independent utility or independent significance (i.e., be usable and be a reasonable expenditure even if no additional transportation improvements are made in the area); and not restrict consideration of alternatives for other reasonably-foreseeable transportation improvements.

The improve existing alternatives and bypass alternatives share the same termini. The project's northern terminus is approximately one-mile north of the existing US 70/SR 1760 (Hickman Hill Loop Road); the southern terminus is just south of the US 70/SR 1824 (McCotter Boulevard) intersection at the south end of Havelock. These termini were established so that the project extends beyond the 14 signalized intersections through Havelock's commercial corridor. The southern terminus is located as close to the City limits as possible to avoid a large wetland area in the Croatan National Forest. The use of other termini (for example: Fontana Boulevard (NC 101) at the city's center) would not have met the project's purpose to remove through traffic from Havelock or provide substantial mobility improvements.

The proposed bypass project would reduce traffic on existing US 70 through Havelock, improve safety for regional and local travel alike, and would reduce regional travel times. As such, it would offer independent utility and be a reasonable expenditure even if no other transportation improvements are made in the area.

The alternatives developed for the proposed project do not restrict the development of alternatives for other transportation projects. Because it terminates back to existing US 70 at both ends, the bypass would not restrict the development of future projects on existing US 70, nor does it restrict the location of new location alternatives.

2.6.2 Improve Existing US 70

Planning and design studies included the examination of two improve-existing US 70 alternatives. Two alternatives were developed: a freeway alternative and an expressway alternative. Both alternatives extend a distance of approximately six miles from the signalized Slocum Road intersection northwest of the City through the signalized McCotter Boulevard (SR 1824) intersection southeast of the City. These alternatives both include six 12-foot travel lanes with 12-foot outside shoulders, divided by a 22-foot median and center concrete barrier. Each improve existing US 70 alternative would require a minimum 360-foot right-of-way (as compared to a 250-foot right-of-way for a new location alternative), with additional right-of-way needs at intersections and interchanges. DEIS Exhibit 2.1 shows the typical section for the improve existing US 70 alternatives.

As noted in Chapters 1.5.2 and 7.1.2, these alternatives were eliminated from detailed study after environmental studies and public involvement. Many attendees of the January 1995 Citizens Informational Workshop commented that the improve existing alternatives would be too damaging to existing development. In February 1996, the project steering committee eliminated the Improve Existing US 70 Alternatives from consideration. The following section summarizes the studies and decisions involving the two improve existing alternatives.

2.6.3 Improve Existing: Expressway Alternative

The Expressway Alternative consists of adding one through-travel lane in each direction to create a six-lane highway. Appropriate turn lanes would be added at major signalized intersections. Limited control of access would be provided by removing direct driveway access to US 70 along the entire project. Street connections to US 70 would remain at-grade. New parallel, two-way service roads would be added to allow access to the adjacent properties currently served by US 70. Existing parallel service roads would be relocated further from US 70 at signalized intersections to avoid degradation of intersection operations. For safety and because of the narrow median width, a concrete barrier would be constructed in the center of the median.

A 360-foot right-of-way width was determined to be necessary for these improvements. Additional right-of-way would also be needed to offset the parallel service roads at signalized intersections.

As noted in Chapter 2.1, passing state and regional traffic through Havelock on the existing route is not consistent with goals detailed in the City of Havelock's 2030 Comprehensive Plan, which intends to "set a new vision for the US 70 Corridor that will transform the busy highway back into a more traditional Main Street that primarily serves local community residents and businesses" (URG, 2009). Furthermore, removing regional through-traffic would allow the City to foster improved bicycle and pedestrian facilities, which is more consistent with the City's plans.

As shown in Exhibit 1.9.2, a number of locations show projected traffic volumes approaching and exceeding 55,300 vpd. NCDOT conducted a capacity analysis of the Expressway Alternative, which concludes that the 14 existing and closely-spaced signalized intersections will determine capacity. Adding a third travel lane in each direction will help where volumes are under 55,300 vehicles per day, but many locations would still operate below LOS D. The average speed along the route in the design year (2035) would be 22 to 25 miles per hour due to the expected delays at signalized intersections. This average speed is not desirable for the substantial volume of regional and statewide through traffic on US 70 in Havelock. As such, a six-lane, median-divided facility with these volumes would not operate at a consistent, acceptable LOS due to high traffic volumes.

As discussed in Chapters 1.4 and 1.8.2, highway improvements should be designed in a manner that is consistent with the long-range vision of the STC policy. NCDOT's STC policy supports the previous SHC designation of US 70 as a Freeway with full control of access. An Expressway facility does not fully meet that goal.

Due to a failure to meet the project's purpose and need with the undesirable LOS and slow average speeds for the regional and statewide through traffic, inconsistency with local planning efforts and the SHC (now STC) Plan, and substantial right-of-way damages required by this alternative, the Expressway Alternative was not retained for functional design-level study.

2.6.4 Improve Existing: Freeway Alternative

The Freeway Alternative considered removing existing traffic signals and widening to a total of three through-lanes in each direction. A total of six interchanges would be added at the following locations: Slocum Road, SR 1746 (Greenfield Heights Boulevard), NC 101 (Miller Boulevard), SR 1735 (Cunningham Boulevard), SR 1733 (Hollywood Boulevard) and SR 1824 (McCotter Boulevard). Grade separations by means of bridges would also be provided at Shepard Street and Nunn Street to connect SR 1797 (Stratford Road) to SR 1802 (Rose Street), SR 1800 (Manilla Street) to SR 1757 (Ketner Drive), SR 1763 (Church Road) to SR 1781 (Slocum Road), and Holly Drive to Trader Avenue. Access would be fully controlled by

closing all direct street and driveway connections to US 70 and providing access only at the six interchanges. Parallel two-way service roads would be added or upgraded along both sides of the existing route to allow access to the adjacent properties along US 70. Traffic on service roads would then access US 70 via connections at interchange locations. The remaining local roads would tie-in with the parallel service roads.

A 360-foot right-of-way width was determined to be necessary for these improvements, with additional right-of-way required for interchange footprints, grade separations, and the offset-intersections of service roads.

Capacity analysis for the Freeway Alternative indicated the facility would provide better than LOS B in 2035 with a prevailing speed of 49.5 miles per hour. Because these modifications would accommodate future traffic volumes and fulfill the vision of the SHC (now STC), the Freeway Alternative was retained for functional design-level study.

2.6.5 Impact Analysis of the Existing US 70 Alternatives

Both the Expressway and Freeway Alternatives require a minimum 360-foot right-of-way, with additional right-of-way needs at intersections and interchanges. The proposed right-of-ways for the Expressway and Freeway Alternatives would relocate 59 businesses and would alter access to remaining businesses, creating an overall negative effect on the local business community. As noted in Chapter 7.2.6, the improve existing US 70 alternatives were presented at the first Citizens Informational Workshop on January 17, 1995. Many attendees noted that existing route improvements would be too damaging to existing residential and business development along US 70.

DEIS Table 2.2
Comparison of Initial Detailed Study Alternatives (1998)

	EXISTING US 70	BYPASS Alternate 1 (Outside)	BYPASS Alternate 2 (Inside)
COSTS			
Construction	$77,500,000	$76,200,000	$74,300,000
Right of Way & Utility Relocation	$47,825,000	$4,390,500	$10,883,500
TOTAL (R/W + Construction)	$125,325,000	$80,590,500	$85,133,500
RELOCATIONS			
Residences	> 51	15	72
Churches [# *Affected Employees*]	0	0	1 [2]
Businesses [# *Affected Employees*]	> 59 [323]	1 [1]	2 [2]
TOTAL	110	16	75
PHYSICAL ENVIRONMENT			
Croatan National Forest (Acres)	22	237	304
Eligible National Register Properties	1	0	0
Public Parks and Recreation Areas	1	0	0
Air Quality One Hour CO Concentrations			
1997 (ppm)	5.0	2.2	2.2
2017 (ppm)	5.4	2.2	2.2
Noise Impacted Locations			
Residences	40	11	11
Businesses	4	0	0
Potentially Contaminated Sites	20	1	1
Major Stream Crossings	4	3	3
NATURAL RESOURCES (Acres)			
Prime Farmlands by Soils in R/W	13	93	115
Wetlands in R/W			
Privately Owned	1	37	25
Croatan National Forest	5	124	143
TOTAL	6	161	168

As noted above, the Freeway Alternative would fulfill the SHC (now STC) Plan and was retained for a comparative evaluation against the bypass corridors. Characteristics including construction and right-of-way costs, necessary business and residential relocations, affected Croatan National Forest acreage, historic sites, air quality, noise impacts, potentially contaminated sites and wetlands acreage were

considered. DEIS Table 2.2, shown on the preceding page, displays the factors considered and quantified for this comparison.

In addition to adverse effects on Havelock's business community, the Freeway Alternative would affect the Needham B. White House, a property eligible for listing on the National Register of Historic Places, and a city park located along US 70 north of Cunningham Boulevard. The 10-acre park includes mature wooded areas and open lawns with features that include playground equipment, two picnic shelters, restrooms, and a covered stage. Taking land from either of these properties would result in an impact under Section 4(f) of the U.S. Department of Transportation Act of 1966 (U.S. DOT Act). Section 4(f) is discussed in detail in Chapter 3.5. The intent of the Section 4(f) statute is to avoid the use of public parks, recreation areas, wildlife and waterfowl refuges, and historic sites, unless there is no feasible and prudent alternative to the use of such land. If there is a feasible and prudent alternative that avoids the use of a 4(f) resource, that alternative must be selected over ones that impact the 4(f) resource. Impacting the Needham B White house also invokes Section 106 of the National Historic Preservation Act of 1966, which requires Federal agencies to take into account the effects of their undertakings on historic properties.

As noted in Chapter 2.1, keeping state and regional traffic on the existing route is not consistent with goals detailed in the City of Havelock's 2030 Comprehensive Plan, which intends to "set a new vision for the US 70 Corridor that will transform the busy highway back into a more traditional Main Street that primarily serves local community residents and businesses" (URG, 2009). Furthermore, removing through-traffic would allow the City to foster improved bicycle and pedestrian facilities, which is more consistent with the City's plans.

The Freeway Alternative for existing US 70 would provide an adequate LOS for through traffic; however, it does not provide a design amenable to meeting local traffic or community needs. The Freeway Alternative would relocate over 59 businesses and create Section 4(f) uses by affecting the historic Needham B. White House (a Section 106 historic resource) and a city park. For these reasons, the Freeway Alternative for existing US 70 was removed from further consideration.

Summary of Impacts associated with the Improve Existing US 70 Alternatives

The Expressway Alternative would:

- Relocate 59 businesses
- Not operate at a consistent, acceptable LOS due to high traffic volumes in the design year
- Have average speeds of 22 to 25 miles per hour in the design year
- Not fulfill vision of the SHC (now STC) Plan
- Impact the Needham B. White House and a park, creating a Section 4(f) use and a Section 106 impact
- Not provide a design suitable for local traffic or community needs

The Freeway Alternative would:

- Relocate 59 businesses
- Impact the Needham B. White House and a park, creating a Section 4(f) use and a Section 106 impact
- Not provide a design suitable for local traffic or community needs

The interagency team comprised of federal and state regulatory and resource agencies eliminated both of the improve existing alternatives from further study on February 15, 1996.

2.6.6 Programmed Improvements to Existing US 70

The need for the proposed bypass is acknowledged in the *US 70 Access Management Study* (Kimley-Horn, 2005) and in the *Draft US 70 Corridor Commission Access Management Plan* (*US 70 Corridor Commission, 2012b*), which recommend the bypass in addition to access management improvements on existing US 70. Although the proposed bypass would reduce through traffic volumes on existing US 70, projected traffic volumes on the existing route in 2035 would still exceed system capacity. As such, improvements are still required along the existing route.

Most of the existing route is now a four-lane, median-divided roadway with service roads and consolidated signalized intersections. In 2012, NCDOT completed an approximately 1.5-mile median and signal improvement project from Fontana Boulevard south to Forest Hill Drive to complete the roadway's conversion to a four-lane, median divided roadway (Project No. 5101). In addition to this project, improvements are also planned in the area of the US 70/Slocum Road intersection in Havelock (Project No. R-5516), as described in Chapter 1.8.3. These projects are among several improvement projects recommended in the *US 70 Access Management Study* (Kimley-Horn, 2005) and in the *Draft US 70 Corridor Commission Access Management Plan* (*US 70 Corridor Commission, 2012b*). Additional projects include median closures, directional cross-overs, service road extensions, signal removal, and improvements to the US 70/NC 101 intersection.

2.6.7 Bypass Alternatives on New Location

A number of bypass alternatives were developed to satisfy the purpose of and need for the proposed project. Mapping showing constraints such as existing residential and commercial developments, community and cultural centers, wetlands, historic resources, and protected species habitat was used to develop preliminary study corridors. Other environmental aspects such as air quality and noise were also considered and minimized to the extent practicable. To avoid substantially impacting the Cherry Point MCAS and the City of Havelock, bypass alternatives were only developed to the west of existing US 70.

Alternatives were presented to environmental review agencies, local government officials, and area citizens for comments. From its inception, the proposed project was developed in coordination with an interagency team of state and federal regulatory and resource agencies, and then through the subsequently developed NEPA/404 Merger Process. This comprehensive process was used to ensure the location and design of the alternatives would satisfy the purpose of and need for the project while avoiding or minimizing impacts to the human and natural environments.

Because a large portion of the study area involves National Forest System lands in the Croatan National Forest (CNF), United States Forest Service (USFS) officials were involved early in the planning process. The USFS conducted analyses of potential project impacts to aquatic species, wildlife, plants, soils, streams, and wetlands, as well as the recreational and visual impacts of the build alternatives. These studies were initially completed in 1998 and updated periodically throughout the planning and design process, as detailed in Chapters 3.0 and 4.0. USFS officials continue to provide valuable assistance in the establishment of criteria to minimize project impacts to the wetlands, protected plant and animal species, and other natural systems in the entire project area.

Social and economic issues were also considered in the establishment of project design criteria. Impacts to homes, neighborhoods, businesses, schools, churches and other elements of community cohesion were considered and then minimized during alternative development. Local officials were included early in the planning process to determine the perspective and sentiment of the public regarding the project. Public opinion was also obtained directly through citizen workshops, small group meetings, the media, and project newsletters. Economic impacts such as road user costs and benefits - as well as the expenditure of public funds were also given consideration.

Refinement of Bypass Alternatives on New Location

Development of the preliminary bypass alternatives involved a two-phase process. First, land suitability mapping (LSM) was developed to show physical and natural resources and characteristics that would influence the location of the bypass alternatives. The project team then identified ten short corridors with minimal adverse impacts; these corridor segments were then connected to form the corridors for the bypass alternatives. Exhibit 2.6.1 shows the short segments and preliminary bypass alternatives.

A comparative evaluation of these preliminary bypass alternatives was conducted using impacts identified from the land suitability mapping. The ability of the alternatives to satisfy the purpose of and need for the project and the conformance of the alternatives with the long-range thoroughfare plan was evaluated. Since a substantial portion of these corridors are within the Croatan National Forest, the effects on habitat, aquatic resources, and the

Forest management plan were also considered. Based on the results of this evaluation, several of the preliminary new location corridors for the bypass were revised or eliminated from further consideration.

One of the short corridor segments (Corridor 2; see Exhibit 2.6.1) was developed to improve the access to the Cherry Point MCAS northeast of town. Land suitability mapping revealed this corridor would impact a large area of wetlands and a recently upgraded military housing community, would require the relocation of a large power substation, and would substantially impact a relatively new elementary school. In addition, the location of a railroad spur for the transport of military ordnances seriously limited the possibilities for providing an interchange at Slocum Road to serve the Cherry Point MCAS. For these reasons, the Preliminary Bypass Alternatives that included Corridor 2 (Alternatives B, D and F) were eliminated from further consideration.

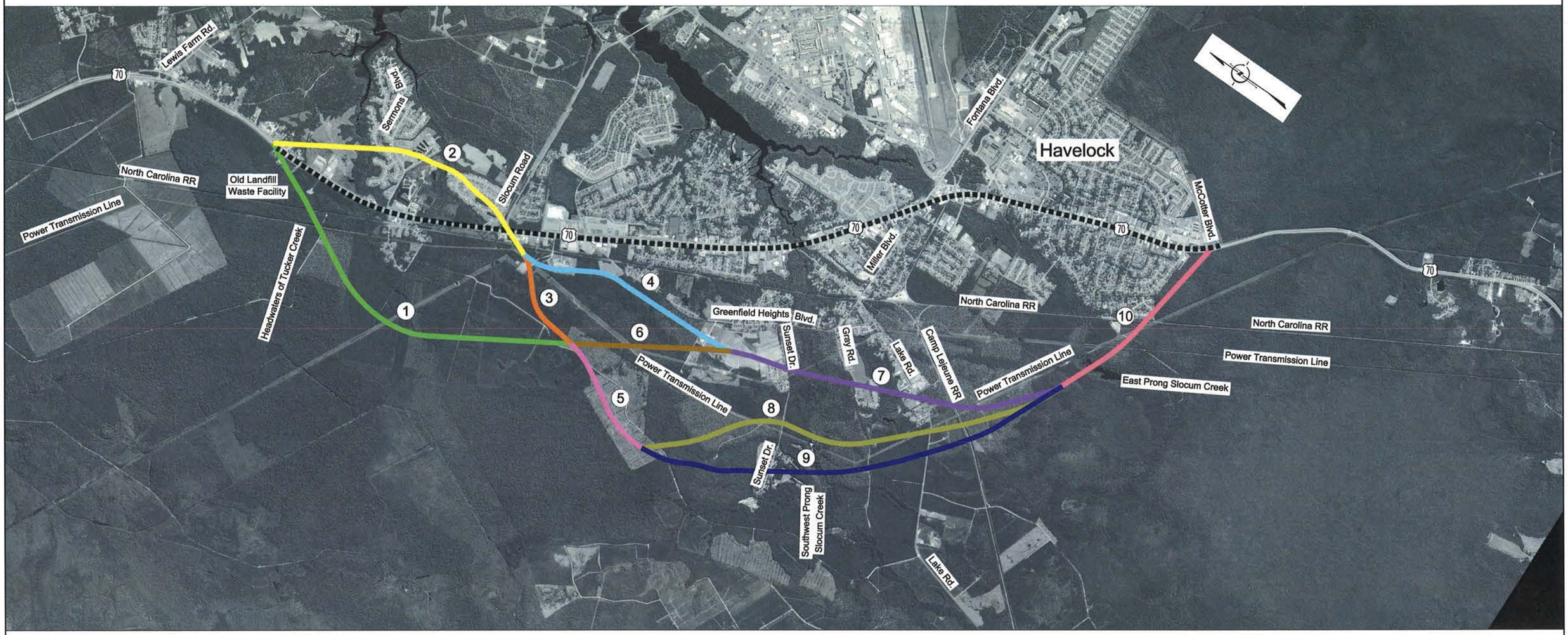
Preliminary Bypass Alternative E was also eliminated from further consideration because it would impact the highest amount of National Forest System (NFS) lands and the second highest amount of wetlands (see DEIS Appendix B, 10/19/95 Steering Committee Minutes).

Based on impact evaluations and comments provided by the Federal and State resource agencies as well as the public, the remaining preliminary bypass alternatives were adjusted to follow the existing power transmission line corridors as closely as practicable to avoid additional habitat fragmentation.

The westernmost Preliminary Bypass Alternative C was renamed Alternative 1. Preliminary Bypass Alternative A, which is closer to Havelock, was renamed as Alternative 2. The team noted that Alternative 1 minimizes impacts to existing development while Alternative 2 was developed to minimize impacts to the Croatan National Forest. Therefore, a new alternative (Alternative 3) was developed to balance the impacts of Alternatives 1 and 2. These three bypass alternatives were carried forward for detailed study and are discussed further in Chapter 2.7.1.

Avoidance and Minimization

During alternative development, it should be noted that proposed highway alignments were further refined within each study corridor to entirely avoid or minimize impact to important resources, such as wetlands, habitat, homes, etc. For example, wetland boundaries and known stream systems were overlaid on top of alternative corridors so that proposed highway alignments could be developed in a responsible and balanced manner that met highway operational and safety needs - yet minimized impact to resources. The detailed study alternative alignments reflect that effort.



Preliminary Alternatives	Segments
Improve Existing	▪▪▪▪▪▪▪▪▪▪
A	1-6-7-10
B	2-4-7-10
C	1-5-9-10
D	2-3-5-9-10
E	1-5-8-10
F	2-3-5-8-10

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Preliminary Alternatives
October, 1994
Scale: 1" = 1 mile
Exhibit 2.6.1

This page intentionally left blank to facilitate double-sided printing.

2.7 DETAILED STUDY ALTERNATIVES

As shown in Exhibit 2.7.1, Alternatives 1, 2 and 3 connect with existing US 70 via a new interchange that is located just west of SR 1760 (Hickman Hill Loop Road). This interchange location allows the northern terminus of the bypass to extend beyond the developed areas of Havelock with sufficient distance between the proposed interchange with existing US 70 and the North Carolina Railroad so the bypass can be elevated to cross over the railroad. In the central portion of the project study area, Alternative 2 roughly parallels US 70 and Havelock proper while Alternatives 1 and 3 turn in a southwesterly direction away from Havelock. Alternative 1 extends farther west than the other two alternatives, although all three alternatives converge to a common corridor just north of the new grade-separated crossing of the Camp Lejeune Railroad and continue along the same corridor to the common terminus at existing US 70 southeast of SR 1824 (McCotter Boulevard). The location of this terminus allows the bypass to extend beyond the developed areas of Havelock and to shadow an existing cleared power transmission line easement near existing US 70. It also avoids placing an interchange on a large natural wetland area.

All of the detailed study alternatives propose a four-lane highway divided by a 46-foot median, with full control of access that provides access to US 70 only at interchange locations. A detailed description of the Preferred Alternative is included in Chapter 2.10.

2.7.1 Highway Design Criteria

The detailed study alternatives were proposed as a new 46-foot median-divided, four-lane freeway with full control of access. Full interchanges would be provided on both ends of the project and at SR 1756 (Lake Road). The three railroad crossings and SR 1747 (Sunset Drive) would be grade-separated from the bypass by bridges. A right-of-way width averaging 250 feet was established, with additional right-of-way needed at the interchanges.

The highway design criteria used to develop the preliminary designs are based on the American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets (AASHTO, 2011) and the North Carolina Department of Transportation Design Manual (2002 edition), and are listed in Table 2.7.1.

2.7.2 Typical Sections

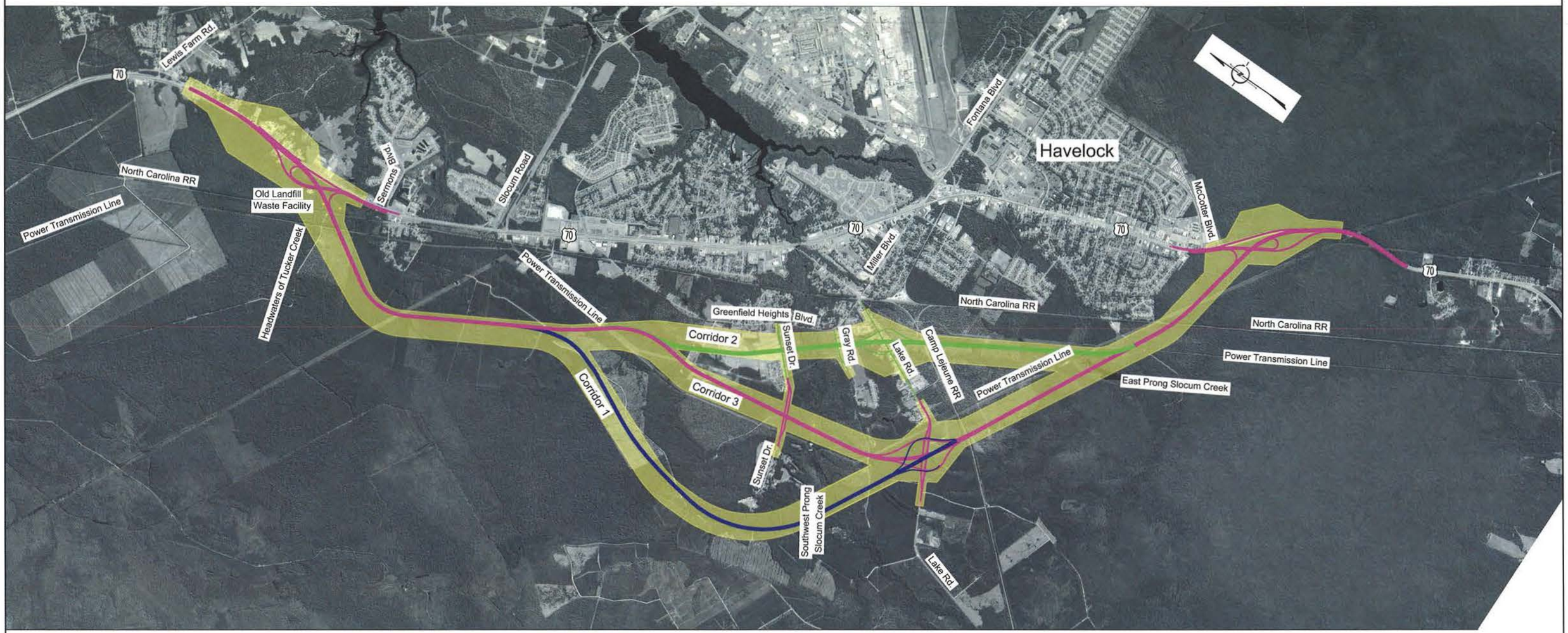
A typical section was developed using the highway design criteria in Table 2.7.1, as shown in Exhibit 2.7.2. The roadway typical section consists of four 12-foot travel lanes, placed on fill material. The highway has 12-foot outside shoulders (10-feet paved) and grass-lined ditches with slopes ranging from 6:1 to a 3:1 maximum. The inside shoulders are 4-foot paved, 6-foot shoulders which are then depressed downward to the center of the median at a 6:1 slope. The total depressed-median width (paved and grass) is 46 feet, which is deemed the minimum width that will provide adequate vehicle separation and median

drainage for the roadway subgrade. Full movement Interchanges are proposed at each end of the proposed bypass and at SR 1756 (Lake Road). A minimum of 23 feet of vertical clearance will be held over railroads and a minimum of 17 feet vertical clearance above intersecting roadways.

TABLE 2.7.1
HIGHWAY DESIGN CRITERIA

DESIGN SPEED	
Mainline	70 miles per hour (mph)
Ramps	50 mph (35 mph min.)
Loops	30 mph (25 mph min.)
Y-Lines	35 to 50 mph
MEDIAN WIDTH	
New Location Bypass	46 feet (Depressed)
LANE WIDTHS (min. four lanes, two in each direction)	
Mainline	12 feet
Ramps	14 to 16 feet
Loops	Per AASHTO 2011
Y-Lines	Based on projected traffic
SHOULDER WIDTHS (w/ 46-foot Depressed Median)	
Mainline	Outside/paved - 12 feet (10 feet paved shoulder) Median - 6 feet Median paved - 4 feet
Ramps	Outside - 14 feet desirable, 12 feet minimum Inside - 12 feet desirable, 10 feet minimum Paved - 4 feet
Loops	Left - 12 feet desirable, 10 feet minimum Right 2.5 feet curb & gutter
Y-Lines	Based on projected traffic
HORIZONTAL ALIGNMENT	
Mainline	1630-foot minimum radius curve with 0.10 superelevation
Ramps	758-foot minimum radius curve with 0.08 superelevation
Loops	214-foot minimum radius curve with 0.08 superelevation
Y-Lines	758-foot minimum radius curve with 0.08 superelevation
VERTICAL ALIGNMENT	
Mainline	3% maximum grade, K sag 181, K crest 274
Ramps	5% maximum grade (Des. Man. Part 1, 8-4)
Y-Lines	AASHTO 2011, based on design speed, terrain and facility type

The proposed bypass includes proposed grade separated crossings that support bicycle traffic at SR 1747 (Sunset Drive) and at the SR 1756 (Lake Road) interchange. The proposed roadway approaches for SR 1756 (Lake Road) include four-foot paved shoulders and the proposed bridge has six-foot offsets with bicycle safe bridge railings. The proposed roadway approaches for SR 1747 (Sunset Drive) include four-foot paved shoulders and the proposed bridge has four-foot offsets with bicycle safe bridge railings. Pedestrian movements on these facilities can also be accommodated with the proposed four-foot paved shoulders and the appropriate bridge offsets and bridge railing.



Legend

- Alternative 1
- Alternative 2
- Alternative 3

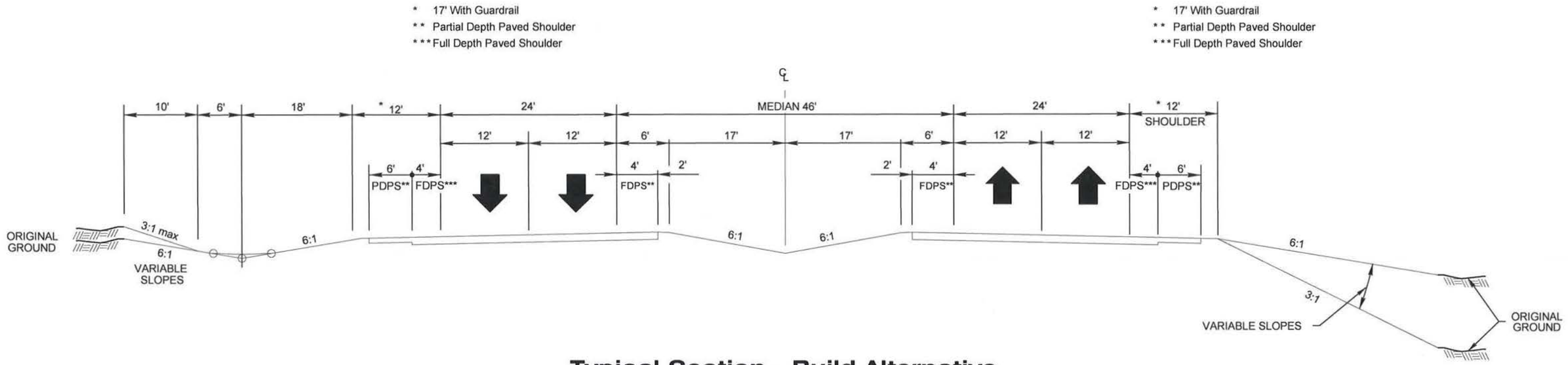
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Detailed Study Corridors and Study Alternatives
Scale: 1" = 1 mile
Exhibit 2.7.1

This page intentionally left blank to facilitate double-sided printing.



Typical Section - Build Alternative

	US 70, Havelock Bypass Craven County, North Carolina STIP No. R-1015	Typical Section Not to Scale Exhibit 2.7.2

This page intentionally left blank to facilitate double-sided printing.

2.7.3 Access Control

Full control of access is proposed. Control of access fencing will be used to prohibit new roadway or driveway connections and maintain full control of access along the entire length of the project – providing access to the US 70 Bypass only at interchange locations.

Special driveway access is needed for USFS forest management access and for major utility maintenance. These access drives will have special locked gates installed in the control of access fencing. The keys to the special access gates will be under the care and responsibility of the USFS and NCDOT Division Office.

2.7.4 Railroad Crossing Criteria

The project includes three grade separated rail crossings. NCDOT's policy for horizontal and vertical clearances at railroad-highway crossings is in concert with the Federal Highway Administration Standards as presented in 23 CFR 646, Appendix to Subpart B (Effective Date: October 24, 1988), excerpted as in the following bullets:

- For horizontal clearances, offset dimensions to the abutment slope of up to 20 feet from the centerline of tracks require no special justification for federal aid cost participation. Horizontal offsets in excess of 20 feet should be justified based on individual site conditions. An offset of 25 feet from the centerline of the track to the nearest bridge bent is used to justify elimination of crash walls on the bents.

- For vertical clearances, clearances up to 23 feet require no special justification for federal aid cost participation. Greater vertical clearances can be justified based upon special site conditions, state regulatory requirements, or needs to meet documented railroad electrification plans or other documented needs.

- Should a railroad desire additional clearances other than necessary to meet these crossing conditions, such additional costs are not eligible for federal-aid funding without proper justification and documentation.

Currently, no changes are proposed to the Camp Lejeune Railroad at the proposed crossings on National Forest System lands. NCDOT has met with USFS to review plans, and will maintain ongoing coordination with the USFS regarding the review of the preliminary design plans for this crossing.

2.8 TRAFFIC OPERATIONS ANALYSIS

To determine the facility necessary to adequately accommodate the forecasted 2035 design year traffic, a capacity analysis was conducted on the build alternatives utilizing the procedures outlined in the *Highway Capacity Manual 2000* (TRB, 2000) to estimate the future level-of-service (LOS). The traffic forecast and capacity analysis was updated in 2008 and again in 2014.

2.8.1 2035 Build Traffic Projections

The forecasted 2035 design year Average Annual Daily Traffic (AADT) volumes along the proposed bypass and the remaining volume along existing US 70 are shown in Exhibit 2.8.1. Due to their close proximity, all three new-location bypass alternatives share the same traffic forecast numbers. The 2035 AADT along the proposed bypass ranges from 18,800 vehicles-per-day (vpd) south of SR 1756 (Lake Road), to 22,900 vpd north of SR 1756.

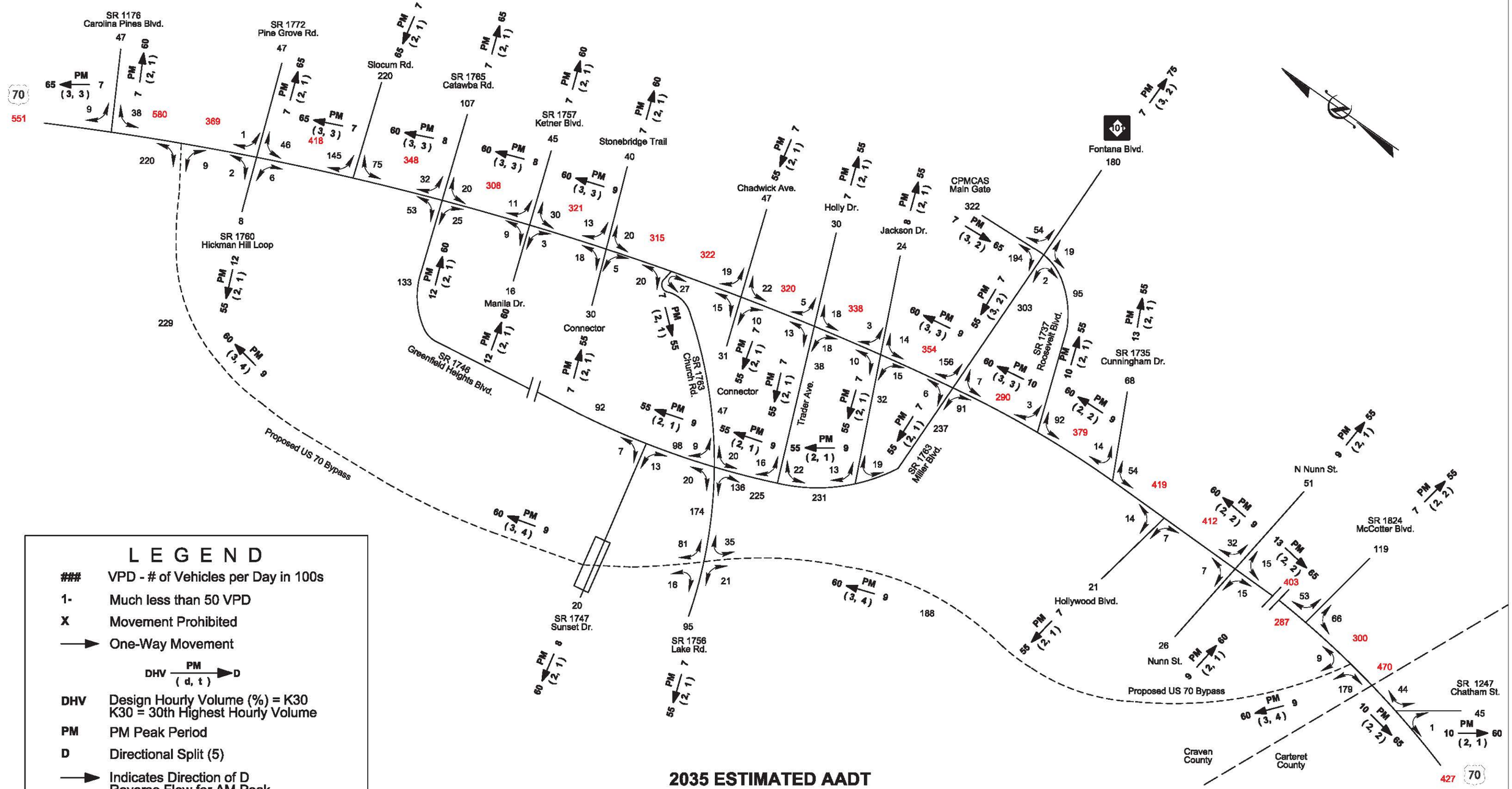
As shown on Exhibits 1.9.2 and 2.8.1, approximately 18,800 to 22,900 vehicles per day (vpd) (year 2035) will shift from existing US 70 through Havelock onto the proposed bypass. The proposed bypass is aligned parallel to existing US 70 and only has one proposed interchange; Lake Road. The traffic shift is based on the estimated percentage of through traffic used in the development of the traffic forecast, combined with local origination and local destination trips accessing the Lake Road area via its new interchange.

The traffic forecast identified future corridor diversion to the US 70 corridor from motorists presently utilizing the US 258/NC 24 corridor from Kinston and the US17/NC58 corridor from New Bern to access coastal communities in Carteret County. Traffic diversion to the US 70 corridor is a primary factor in an approximate 10-13 percent (5,000 vpd) increase in overall daily traffic volumes in design year 2035 entering and exiting the project study area as compared to the No Build scenario. Previously, the NC 24 corridor was upgraded in 2006 and resulted in initial daily traffic increases of up to 10 percent on the US 258/NC 24 corridor due to diversion from the US 70 corridor, as the US 258/NC 24 corridor provided a high degree of travel time consistency due a limited amount of traffic signals and a freeway facility around the City of Jacksonville. The Havelock Bypass, along with additional upgrades to US 70 will result in a similar diversion from the US 258/NC24 and US 17/NC 58 corridors to the US 70 corridor, as the US 70 will primarily be a fully access controlled, freeway facility from east of Kinston to Carteret County.

Additional trips are anticipated to be generated from origins inside and outside of the project area. For motorists traveling from inside the project study area, motorists are anticipated to access the bypass via the Lake Road interchange and also travel to commercial development projected to occur primarily along the Lake Road interchange. In addition, motorists traveling from outside the project area are also anticipated to access the interchange for destinations within the study area in addition to accessing commercial development along Lake Road on their way to destinations east and west of the project study area.

2.8.2 2035 Build Capacity Analysis

The adequacy of the proposed project was evaluated based on its capacity to handle projected design year (2035) traffic volumes. The accepted methodology for this evaluation



LEGEND

###	VPD - # of Vehicles per Day in 100s
1-	Much less than 50 VPD
X	Movement Prohibited
⟶	One-Way Movement
DHV PM (d, t) D	
DHV	Design Hourly Volume (%) = K30 K30 = 30th Highest Hourly Volume
PM	PM Peak Period
D	Directional Split (5)
⟶	Indicates Direction of D Reverse Flow for AM Peak
(d, t)	Duals, TTSTs (5)

2035 ESTIMATED AADT

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

2035 Estimated Average
Annual Daily Traffic
With Bypass Alternative 3
Not to Scale
Exhibit 2.8.1

This page intentionally left blank to facilitate double-sided printing.

is to compare projected traffic volumes with roadway capacity and compute the volume-to-capacity ratio (v/c). The v/c ratio, in addition to other indicators such as projected speed and intersection delay, was used to find and report the facility's level-of-service (LOS). The LOS may range from A to F. LOS A has a low v/c indicating smooth free-flowing traffic. LOS F has a high v/c and indicates the worst-case scenario with high congestion and a complete breakdown of traffic flow. Levels- of-service A through C are the desired levels, although LOS D is considered acceptable for urban facilities. Traffic conditions exceeding LOS D (E and F) are deemed unacceptable. These undesirable LOS conditions represent substantial travel delay, increased accident potential, and inefficient motor vehicle operation. Table 2.8.1 provides a more detailed description of LOS.

TABLE 2.8.1
DESCRIPTION OF LEVELS OF SERVICE

LEVEL OF SERVICE	ROAD SEGMENT/RAMPS
A	Free flow. Individuals are unaffected by other vehicles and operations are constrained only by roadway geometry and driver preferences. Maneuverability within traffic stream is good. Comfort level and convenience are excellent.
B	Free flow, but the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but there is a slight decline in freedom to maneuver and level of comfort.
C	Influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Multi-lane highways with a free flow speed (FFS) above 50 miles per hour (mph), the speeds reduce somewhat. Minor disruptions can cause serious local deteriorations and queues will form behind any significant traffic disruption.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operating conditions at or near the capacity level, usually unstable. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily. Most multilane highways with FFS between 45 and 60 mph vehicle mean speeds at capacity range from 42 to 55 mph, but are highly variable and unpredictable.
F	Breakdown flow. Traffic is over capacity at points. Queues form behind such locations, which are characterized by extremely unstable stop-and-go waves. Travel speed within queues are generally less than 30 mph.

Source: Transportation Research Board, 2000

Freeway LOS Analysis of a New-Location Bypass

Based on the forecasted 2035 design year AADT volumes, a freeway LOS was developed for the proposed bypass using HCS software. The bypass was analyzed in two segments; from US 70 to west of SR 1756 (Lake Road) (Segment 1) and from east of SR 1756 (Lake Road) to US 70 (Segment 2). Freeway analyses indicate that Segment 1 will operate at LOS B during peak hour. Segment 2 is predicted to operate at a LOS A in 2035.

2.8.3 Travel Time Analysis

In order to present a sensitivity analysis of forecasted travel times, three different growth scenarios were evaluated. Travel times were calculated by inputting the forecasted traffic volumes into a Synchro network and then running SimTraffic 9 for approximately 8.4 miles of the existing US 70 corridor from Chatham Street to Hickman Hill Road/Pine Grove Road. Simulation runs for the westbound and eastbound directions for both the AM and PM peak periods were run five times for each scenario and averaged.

The three growth scenarios are described below. Each of these scenarios is applied to the 2008 base year traffic volumes and carried to the design year 2035.

0.0% Annual Growth Rate

The first scenario assumes no growth and therefore uses a 0.0% growth factor applied to the 2008 traffic volumes. This scenario is not considered likely for planning purposes because state population projections show growth ranging from a minimum of 0.83% inside Havelock to higher ranges regionally and statewide. However, using 0.0% growth establishes a baseline or "floor" for the travel times.

0.83% Annual Growth Rate

The second scenario is a growth rate matching the population forecast used in the Water Quality ICI analysis was used. The Water Quality ICI population forecast (sourced from State of North Carolina population forecasts) is 0.83%. This growth rate applies to population growth within the Havelock study area. This rate represents local growth only and does not account for regional growth that could occur outside of the Havelock study area, and that would also be served by the bypass.

Traffic Forecast (~2.0%) Annual Growth Rate

The third scenario matches the 2035 project traffic forecast as presented in the FEIS. The project traffic forecast has an approximate 2% annual growth rate; accounting for local growth (within the study area) and regional through traffic with origins and destinations beyond the study area.

Floating Car Study – In order to provide context for the simulated 2035 travel time estimates, NCDOT conducted a floating car study to gage current (2015) actual travel times. The floating car study involved driving through the corridor while attempting to match speeds of the surrounding traffic (e.g. the floating vehicle passes the same number of vehicles by which it is passed). The study was conducted on Tuesday August 4th and Wednesday 5th, 2015.

The floating car study was not conducted in coordination with any traffic data collection. So it provides a point-in-time reference for current travel times, but cannot be directly compared with model runs. The traffic volumes are not presumed to be the same for the model runs and the floating car study (and are not known for the days the floating car studies were conducted). The floating car study provides another data point for use in presenting the range of potential travel times for the corridor.

Travel Time Comparison – The following table shows the anticipated travel times (in minutes) required to traverse the approximately 8.4 mile corridor. Times are presented for the above-described annual growth rate scenarios: 0.0% growth, 0.83% growth, and traffic forecast (~2.0% growth). The table also shows the times observed from the floating car study. These estimates provide an anticipated range of travel times along US 70 for a no-build scenario in comparison to the projected travel times along US 70 if the proposed bypass is constructed.

For the level of microsimulation analysis used, it is more appropriate to focus on the change/difference in travel times between the No Build and Build alternatives in each growth scenario rather than the specific travel times reported for each scenario. It is noted that the comparison of No-Build versus Build shows a travel time reduction for every growth scenario presented.

Table 2.8.2 shows that 2015 floating car study travel times are lower than those simulated for 2008. The floating car study provides context but is not a direct comparison to the SimTraffic runs. It is not a direct comparison because the floating car study was conducted for a point in time that does not coincide with the traffic volumes used in the model runs (traffic data was not collected during the floating car study).

Traffic may have been lower during the 2015 study than the average volumes included in the 2008 date due to an observed dip in traffic volumes in the study area since 2008. The 2008 volumes ranged from 22,000 to 34,800 per day after which staff reductions at Cherry Point Marine Corps Air Station have lowered traffic along the corridor. For 2014 (latest available NCDOT traffic maps) volumes range from 24,000 to 31,000 per day so the average current traffic may be slightly lower than 2008 estimates. (*Note: These are Average Daily Traffic Volumes as reported on NCDOT traffic maps for Craven County. Traffic counts were not collected as part of the floating car study.*).

The range of simulated travel times, combined with the floating car results, establishes parameters within which estimated travel durations should reasonably be expected. It should be noted that, regardless of the actual travel time experienced, construction of the bypass is expected to substantially reduce the time required to traverse the corridor. In the case of the 2035 (traffic forecast, 2% growth) comparison shown, the bypass would reduce travel time by 33% to 38%.

TABLE 2.8.2
TRAVEL TIME RESULTS
US 70 from SR (Chatham Street) to Hickman Hill/Pine Grover Road

	AM Peak Hour		PM Peak Hour	
	Westbound	Eastbound	Westbound	Eastbound
Floating Car Study				
August 2015 Travel Time Runs	12.1 min (42 mph)	11.0 min (47 mph)	10.9 min (47 mph)	11.6 min (44 mph)
0.0% (No Growth) Scenario				
No-Build, 2035 @ 0.0% (SimTraffic)	15.2 min (34 mph)	16.9 min (30 mph)	15.2 min (34 mph)	16.6 min (30 mph)
Build, 2035 @ 0.0% (SimTraffic)	14.1 (35 mph)	14.8 (34 mph)	14.1 (35 mph)	15.0 (34 mph)
Travel Time Reduction (%)	7%	12%	7%	10%
0.83% (Water Quality ICI) Growth Scenario				
No-Build, 2035 @ 0.83% (SimTraffic)	19.7 min (25 mph)	24.4 min (20 mph)	17.3 min (29 mph)	20.8 min (24 mph)
Build, 2035 @ 0.83% (SimTraffic)	15.1 min (34 mph)	15.8 min (32 mph)	15.1 min (34 mph)	16.1 min (31 mph)
Travel Time Reduction (%)	23%	35%	13%	23%
Project Traffic Forecast Scenario				
No-Build, 2035 @ ~2.0% (SimTraffic)	38.7 min (13 mph)	60.8 min (8 mph)	39.0 min (13 mph)	39.4 min (13 mph)
Build, 2035 @ ~2.0% (SimTraffic)	24.5 min (20 mph)	38.0 min (13 mph)	26.2 min (19 mph)	25.4 min (20 mph)
Travel Time Reduction (%)	37%	38%	33%	36%

Projected Travel Time on Proposed Bypass – The proposed US 70 Havelock Bypass is 10.3 miles long with a speed limit of 65 mph. The bypass ties into existing US 70 at Carolina Pines Road, approximately 2.1 miles west of Hickman Hill / Pine Grove Road where the signalized corridor analyzed in SimTraffic begins. The speed limit along this western unsignalized segment of existing US 70 is 55 mph. So an estimated 2.2 minutes of travel time on existing US 70 would be added to each scenario to reach the bypass terminus. The attached exhibit shows the segment used for the signalized corridor travel time study and the longer segment used for the bypass comparison.

With the inclusion of the 2.1 mile segment west of the signalized corridor, expected travel times for existing US 70 for all 2035 No-Build scenarios between the bypass termini range from 17.4 minutes to 63.0 minutes. The estimated travel time for the proposed freeway in the 2035 project traffic forecast at 2% growth (highest traffic volumes) is 9.5 minutes. So the estimated travel time on the bypass is lower than any of the simulated travel times on existing US 70 or those reported by the floating car study. Table 2.8.3 shows travel time savings anticipated for vehicles using the bypass versus existing US 70 for each of the growth scenarios. Note that the shortest time (peak hour, direction) was used for each growth scenario in this tabular comparison.

TABLE 2.8.3
THROUGH-TRAFFIC TIME SAVINGS PROVIDED BY BYPASS VS. EXISTING US 70,
Based on No-Build and Three Growth Scenarios)

Growth Scenario (%)	Existing US 70 (min.)	Havelock Bypass (min.)	Time Savings (min.)
0.0%	17.4	9.5	7.9
0.83%	19.5	9.5	10.0
~2.0% (Traffic Forecast)	40.9	9.5	31.4

2.8.4 Safety

The large percentage of rear-end collisions on existing US 70 indicates a congested roadway with numerous driveway access points and at-grade intersections. As stated in Chapter 1.10, more than 52% (277) of the 527 total accidents during the study period occurred within 150 feet of signalized intersections. It therefore stands to reason that the addition of a median-divided, fully access-controlled facility with uninterrupted flow would serve as an attractive option for through traffic. A reduction in traffic volumes on the existing section of US 70 would reduce congestion and in turn would likely reduce the potential for rear-end collisions.

As stated in Chapter 1.4, the proposed controlled-access bypass would provide travelers with a safer facility than the existing route. Median-divided, access-controlled roadways greatly reduce the typical conflict points found along undivided roadways with no access control. During the period between October 1, 2009 and September 30, 2012, the crash rate for the studied portion of US 70 was 312.02 crashes per 100 million vehicle miles of travel (100MVM). A rural US route, median-divided highway with four or more lanes and with full control of access has a crash rate of 74.19 accidents per 100 MVM. Therefore, it is expected that the proposed bypass facility would perform similar to other rural median-divided four-lane facilities which typically experience much lower crash rates compared to urban or other rural facility types.

2.8.5 Summary and Conclusions

As indicated in Chapter 1.9, the existing US 70 corridor will be heavily congested in 2035 if no additional improvements are made. A substantial portion of the intersections are expected to operate at LOS F. Additionally, even those intersections that are expected to operate at an acceptable LOS, one or more movements or approaches is expected to operate at LOS F.

The proposed bypass is expected to operate with minimal delay, with an estimated travel time that is substantially better than traveling through an unimproved US 70 corridor in 2035. The construction of the bypass will divert traffic from existing US 70 and provide improvements in overall operations through Havelock. In addition, the new bypass will provide increased safety for traveling motorists and will create an attractive route for seasonal (beach) and port-related traffic.

As stated previously, the bypass will operate at LOS A and LOS B in the design year. At LOS A, drivers experience free-flow travel where maneuverability is almost completely unimpeded. The effects of accidents or breakdowns are well-absorbed – standing queues would not form and traffic would resume its previous travel rate after passing the incident.

LOS B also provides free-flow conditions with only slight restrictions on maneuverability. The effects of incidents are still easily absorbed although localized deterioration in LOS would be more severe than for LOS A.

2.9 COSTS

Costs associated with selection of the detailed study alternatives are shown in Table 2.9.1.

TABLE 2.9.1
COST ESTIMATES FOR THE DETAILED STUDY ALTERNATIVES

	Alternative 1	Alternative 2	Alternative 3
Roadway Construction Cost (2008)	$156,400,000	$138,800,000	$149,600,000
Utility Relocation Cost (2007)	1,649,280	2,773,680	2,773,680
Right-of-Way Cost (2009)	9,800,000	28,975,000	10,625,000
TOTAL COSTS	**$167,849,280**	**$170,548,680**	**$162,998,680**

2.10 PREFERRED ALTERNATIVE

After evaluating the potential impacts associated with the detailed study alternatives, Alternative 3 was identified as the Preferred Alternative for the proposed project, as shown in Exhibit 2.10.1.

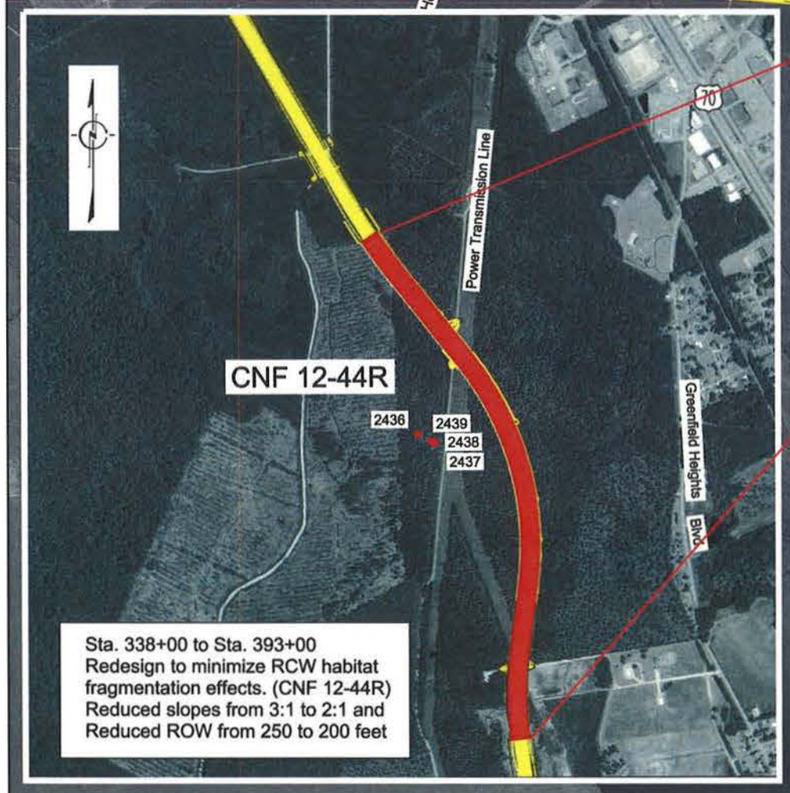
2.10.1 Description of the Preferred Alternative

The Preferred Alternative (Alternative 3), shown in Exhibit 2.10.1, originates at an interchange with existing US 70, just north of SR 1760 (Hickman Hill Loop Road) and extends to the southwest. The proposed bypass continues in a southwesterly direction and crosses the North Carolina Railroad and Tucker Creek. It then turns southeastward and crosses SR 1747 (Sunset Drive) and the Southwest Prong of Slocum Creek to an interchange at SR 1756 (Lake Road). From the proposed SR 1756 (Lake Road) interchange, the Preferred Alternative continues southeastward over a grade separation at the Camp Lejeune Railroad before crossing over the East Prong of Slocum Creek. The alignment continues in a southeasterly direction to terminate at an interchange with existing US 70 southeast of SR 1824 (McCotter Boulevard).

Structures over Water

The tributary to Tucker Creek will be crossed with a double 10-foot by 8-foot reinforced concrete box culvert that is 400 feet in length perpendicular to the proposed roadway. The existing triple RCBC on Tucker Creek near US 70 will be retained and extended approximately 25 upstream and 78 feet downstream. The recommended bridge lengths for

Lewis Farm Rd.
70
North Carolina RR
Power Transmission Line
Old Landfill
Waste Facility
Headwaters of Tucker Creek
Sermons Blvd.
Slocum Road
Power Transmission Line
Greenfield Heights Blvd.
Sunset Dr.
Gray Rd.
Miller Blvd.
Lake Rd.
Camp Lejeune RR
Fontana Blvd.
Havelock
McCotter Blvd.
North Carolina RR
Power Transmission Line
East Prong Slocum Creek
North Carolina RR
Power Transmission Line
Sunset Dr.
Southwest Prong Slocum Creek
Lake Rd.



US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Preferred Alternative
Scale: 1" = 1 mile
Exhibit 2.10.1

This page intentionally left blank to facilitate double-sided printing.

the Preferred Alternative include a 945-foot bridge at the Southwest Prong of Slocum Creek and 1,620-foot bridge at the East Prong of Slocum Creek. FEIS Chapter 4.14.2 contains additional discussion of the recommended bridge lengths as agreed upon by the NEPA/404 Merger Team.

2.10.2 Basis for Selection

As discussed in Chapters 1.5.2 and 7.1.2, studies for the proposed project began in the early 1990's. These efforts included detailed environmental studies, alternatives development and analysis, agency coordination, and public involvement. Project studies were documented in an Environmental Assessment (EA), approved in January 1998. The EA also included NCDOT's recommendation of Alternative 3 as the Preferred Alternative. Concurrence from resource agencies (DEIS Appendix A) resulted in the approval of Alternative 3 as the Least Environmentally Damaging Practicable Alternative (LEDPA). Alternative 3 was presented as the Preferred Alternative at a Corridor Public Hearing in May 1998. The NCDOT Corridor Selection Committee endorsed the selection of Alternative 3 as the Preferred Alternative on August 27, 1998. Preliminary designs for the Preferred Alternative were further refined and on January 18, 2001, the NEPA/404 Merger Team approved avoidance and minimization measures for the revised project design. Hydraulic designs were also reviewed in 2002. Final designs were then produced.

DEIS Table 2.8: Comparison of Bypass Alternatives (2011)
*** See FEIS Tables 2.10.1 through 2.10.5 for impact updates.*

	Alternate 1 (Outside)	Alternate 2 (Inside)	Alternate 3 (Combined)
Length (miles)	10.85	9.91	10.31
Costs (year dollars)			
Construction (08)	$156,400,000	$138,800,000	$149,600,000
Utility Relocation (07)	1,649,280	2,773,680	2,773,680
Right of Way (09)	9,800,000	28,975,000	10,625,000
TOTAL	$167,849,280	$170,548,680	$162,998,680
Relocations (2009)			
Residences (minorities)	13 (0)	133 (18)	16 (0)
Churches (members)	0	0	0
Businesses (employees)	1 (2)	3 (9)	1 (2)
Non-profit	1 (3)	1 (3)	1 (3)
TOTAL	13	137	18
Physical Environment			
Croatan National Forest (Acres)	189	225	240
Potentially-Contaminated Sites	1	1	1
Major Stream Crossings	3	3	3
Natural Resources (Acres)			
Prime Farmland by Soils in R/W	66	112	71
Jurisdictional Areas in R/W			
Wetlands (acres)	109	78	115
Streams (lin. ft.)	2,581	3,094	2,505
Neuse River Riparian Buffers (sq. ft.)	69,534	142,025	106,647
RCW (June 2008 Evaluation, JCA)			
Active clusters	0	0	0
Inactive clusters	1 N, 4 R*,	1 N, 3 R*	1 N, 4 R*
Future Recruitment clusters	1	1	1
Habitat management areas	3	3	3
	* N=Natural, R= Recruitment		

Ongoing discussions subsequent to preparation of the EA resulted in the decision that natural and human environmental impacts collectively rose to a level of significance. In December 2003, FHWA directed that an EIS be prepared for the project. Earlier decisions to eliminate improving the existing US 70 corridor from detailed study were reviewed by the team and remained valid. The three new location options originally developed and assessed in detail in the EA were revisited by the NEPA/404 Merger Team. No additional alternatives were brought forward by the team members. FHWA approved the DEIS on September 6, 2011, followed by a comment period and Public Hearing. After reviewing public and agency comments, the NEPA/404 Merger Team met on April 10, 2012 and re-affirmed Alternative 3 as the LEDPA. These decisions were fully coordinated with the State

and Federal review agencies who remain involved in the reviews of the updated information as summarized in this FEIS. The following paragraphs discuss the basis for selecting Alternative 3 as the Preferred Alternative.

As shown in Exhibit 2.7.1, Alternative 1 extends the farthest outward of any bypass alternative, and in doing so minimizes impact to the human environment but with the consequence of fragmenting the most habitat. Conversely, Alternative 2 runs closely parallel to the developed US 70 corridor and, in doing so, would cause significant disruption to the human environment while generally disrupting less of the natural environment. Alternative 3 was developed as a compromise between Alternative 1 and Alternative 2 impacts, with many impacts resulting in a "middle ground." As stated in Chapter 2.5, the improve existing alternatives are not considered reasonable alternatives. Constructing a facility of sufficient capacity through the center of Havelock would relocate 59 businesses and create impacts to a historic/Section 4(f) resource. DEIS Table 2.8, copied on the preceding page, contains a comparison of the bypass alternatives which was utilized during the Preferred Alternative selection process.

As potential impacts became known, mitigation opportunities and strategies were developed concurrent with alternative studies. For example, decision-makers were aware that the 4,035-acre Croatan Wetland Mitigation Bank was available for use in providing in-kind compensatory mitigation for unavoidable stream and wetland impacts for which no on-site, in-kind mitigation is available. Discussions also considered closing the bypass to conduct prescribed burns, which are vital to red-cockaded woodpecker (RCW) and rare plant habitat management.

With respect to wetland impacts, the existing Croatan Wetland Mitigation Bank (CWMB) provides over 3,800 wetland acres that are protected in perpetuity, and readily mitigate wetland impacts of this project as well as other NCDOT projects and private development projects. As shown in the figure on Page 2-36 (and in Exhibit 4.15.1), the CWMB (in green) is almost entirely bordered by NFS lands (in brown). The location of the CWMB augments its benefits to include connectivity to thousands of acres of black bear sanctuary and other natural areas within the CNF.

2.10.2.1 Early Avoidance, Minimization, and Mitigation Planning

Avoidance and minimization strategies were considered and adopted during preliminary and detailed alternative development. As alternatives were developed, the project team also understood that land management aspects could comprise a necessary component of the proposed project and could, in fact, influence alternative selection. For example: if an alternative is not conducive to prescribed burns for RCW management then that constraint affected alternative selection.

2.10.2.2 Preferred Alternative Selection

Alternative 3 was selected as the Preferred Alternative because it provides the best opportunity to collectively minimize impacts to both the human and natural environments. Alternative 3:

- ***Is the least cost alternative*** – primarily due to its shorter length (than Alternative 1) and because it would require fewer relocations than Alternative 2;
- ***Causes a minimal number of relocations (18)*** – as compared to 15 with Alternative 1 and 137 with Alternative 2;
- ***Minimizes habitat fragmentation effects*** – by following the power line corridor west of Havelock and by its shorter length. Alternative 1 would disconnect 1,412 acres of NFS lands from contiguous NFS lands. Alternative 2 would disconnect 240 acres; however, the positive aspect of lower habitat fragmentation effects are outweighed by the substantially higher relocations associated with Alternative 2. Alternative 3 would disconnect 699 acres of NFS lands from contiguous NFS lands. These quantities are based on the 1,000-foot corridors utilized during early planning and design studies and do not include disconnected areas that would be identical for all bypass alternatives. For Alternative 1, this also includes the isolated portion of the NFS parcel remaining west of the corridor.

  With respect to the creation of "edge habitat" (a potentially negative effect associated with forest fragmentation), Alternative 1 is 0.54-mile longer than Alternative 3 largely through NFS lands and areas of privately-owned forested land. Because periodic timber harvesting occurs in these areas, it is not possible to assess with certainty the amount of additional edge habitat that would be created by Alternative 1; however, it is reasonable to infer that Alternative 1's longer length would create more edge habitat within established forests.
- ***Most conducive to conducting prescribed burns*** – which provides essential habitat management for the endangered RCW and other forest species of concern;
- ***Causes the least amount of stream impact*** – 589 linear feet less than Alternative 1 and 76 linear feet less than Alternative 2;

- ***Causes a "middle ground" impact to prime farmlands*** – Alternative 3 affects five more farmland acres than Alternative 1 but 41 fewer farmland acres than Alternative 2;

- ***Causes a "middle ground" impact to riparian buffers***

- ***Is the best compromise between impacts to the CNF and the City of Havelock*** – Although Alternative 3 impacts the highest amount of wetlands (140 acres) and has the highest impacts to NFS lands (240 acres), these impacts must be considered alongside Alternative 3's lower impacts in other areas, in particular habitat fragmentation and relocations.

Alternative 1 was not selected as the Preferred Alternative because it caused a high degree of impacts to the natural environment when compared to either Alternative 2 or Alternative 3. Alternative 1:

- Is farthest from the City of Havelock and thus fragments the largest area (by far) of CNF habitat between the proposed bypass and the city.

- Alternative 1 presented substantial concerns about habitat fragmentation of the CNF, for all species. RCW habitat was also a primary consideration. Although Alternative 1 directly affects less NFS lands, it would isolate numerous NFS parcels and thus have a greater long-term effect on RCW populations. At the NEPA/404 Merger Team meeting on April 10, 2012 (CP3 Revisited), USFS staff indicated that Alternative 1 would have a greater effect on RCWs because it would make prescribed burning extremely difficult and that it would make it more difficult to manage RCW clusters and to access/manage lands.

- Alternative 1 causes the least number of relocations (15), the fewest direct conversion of NFS lands to highway use (189 acres), and impacts the second least amount of wetlands (109 acres). When these impacts are balanced against habitat fragmentation effects, however, the interagency NEPA/404 Merger Team decided not select Alternative 1 as the LEDPA.

Alternative 2 was not selected as the Preferred Alternative because it caused a high degree of impacts to the human environment when compared to either Alternative 1 or Alternative 3. Alternative 2:

- Causes 8-10 times more residential and business relocations (137) than other alternatives. The high number of relocations associated with Alternative 2 is primarily due to the relocation of a number of multi-family dwellings on Lake Road. The alignment and proposed interchange at Lake Road was developed to minimize fragmentation effects to NFS lands and avoid destroying a nearby RCW cluster (CNF

902). NCDOT studied alignment shifts and various interchange designs to avoid impacting the multi-family dwellings; however, the orientation of the RCW cluster and the multi-family dwellings did not allow the alignment to be shifted enough to avoid impacts to the residences.

- Alternative 2 has the highest total estimated cost of the bypass alternatives, largely due to its right-of-way costs associated with the relocations.

- It should be noted that Alternative 2 is closest to the City of Havelock, and thereby fragments the smallest area of CNF habitat, and a moderately lower acreage of CNF lands than the LEDPA. Alternative 2 also impacts the least amount of wetlands (78 acres). Due to the comparatively high impacts to the human environment, however, the interagency NEPA/404 Merger Team did not select Alternative 2 as the LEDPA.

As previously stated, decision-makers followed the protocol of avoidance, minimization, and then mitigation when developing alternatives and selecting the Preferred Alternative. This progression is not linear, however, because selection of an alternative also considers whether adequate mitigation is available. Thus, the project team proactively studied mitigation opportunities concurrent with alternative development.

In conclusion, Alternative 3 was selected as the LEDPA for a variety of reasons. It should be noted that, even though Alternative 3 had been identified as the alternative most conducive to a prescribed burning plan, the NEPA/404 Merger Team expressed concerns with NCDOT's ability to facilitate prescribed burns. These concerns were addressed by NCDOT agreeing to close the new bypass periodically and in consultation with the USFS to allow prescribed burns. The prescribed burn plan for the proposed project is discussed in Chapter 4.15.5.4 and included in Appendix A.

2.10.3 Refinement of the Preferred Alternative after LEDPA Selection

NCDOT's Preferred Alternative (Alternative 3) was first identified as the LEDPA in 1998 (see agency correspondence contained in DEIS Appendix A) then reaffirmed by the NEPA/404 Merger Team in 2012. The Preferred Alternative's alignment was designed to avoid and minimize impacts to the human and natural environments to the extent possible including the City of Havelock, MCAS Cherry Point, streams, wetlands, and RCW clusters on NFS lands. Exhibit 2.10.1 shows the Preferred Alternative.

The horizontal alignment of the current preliminary design has not changed since meeting with regulatory and resource agencies in 2001. Thus, the current LEDPA includes minimization measures already adopted, such as:

- Development of an alignment within the Alternative 3 Corridor, which sought to minimize impact to natural resources such as streams, wetlands, and habitat.
- Interagency selection of a LEDPA that best balances the impacts associated with Alternatives 1 and 2.
- Use of a 46-foot median (as opposed to 70-foot median).
- No new ditching in wetlands where the highway is on new location.
- Bridging over the Southwest Prong of Slocum Creek that also accommodates wildlife passage.
- Bridging over the East Prong of Slocum Creek that also accommodates wildlife passage.
- No deck drains will be used over surface waters or buffer zones and will be eliminated as much as possible over wetlands.

After the LEDPA selection and following the publication of the 2011 DEIS, NCDOT continued studies of many species and habitats. Specifically, the Department coordinated with USFWS and USFS on continued evaluation of RCW impacts associated with the LEDPA and in accordance with Section 7 of the Endangered Species Act. NCDOT also conducted field surveys to update stream and wetland delineations.

NCDOT has conducted further design studies to reduce project impacts. On-going design revisions since 2011 have resulted in further minimization of impacts. To date, the additional minimization of impacts due to the revised design includes impacts to wetlands (reduction of 9 acres), forested area (reduction of 5.5 acres), and the Southwest Prong Flatwoods Natural Heritage Area (reduction of 1.5 acres).

2.10.3.1 Prescribed Burn Plan

RCW studies highlighted the importance of continued RCW habitat management by the Croatan National Forest, which includes periodic burning to maintain proper RCW habitat. Because smoke impairs highway visibility and affects safety, a coordination meeting was held on March 17, 2011 where representatives from the USFS, USFWS, and NCDOT developed a plan to periodically close the proposed bypass to conduct prescribed burns. In correspondence dated January 9, 2012, the NCDOT State Highway Administrator agreed to allow periodic closures of the bypass in order for the USFS to conduct prescribed burns. This correspondence and the prescribed burn plan are contained in Appendix A. The plan provides general descriptions of logistical issues such as public notification and coordination of traffic signals on existing US 70 during bypass closure.

2.10.3.2 Reduced Highway Clearing Width

As preparation for Endangered Species Act coordination for the red-cockaded woodpecker and to meet USFS requirements for CNF and RCW management, the NCDOT Natural Environment Section conducted field investigations and habitat evaluation which resulted in technical reports described in this FEIS.

After coordinating with natural resource agencies, NCDOT determined that an attempt should be made to reduce the cleared width of the proposed project for a 1.1-mile section of highway that passes through RCW habitat. Design revisions reduced the proposed highway cross section from a 250-foot cleared width to a 200-foot cleared width, from Station 338+00 to Station 393+00 (Exhibit 2.10.1). The reduced width was accomplished by steepening the fill side-slopes, while maintaining the median and shoulder widths required by design criteria for this facility. This minimization effort reduced impacts to natural resources such as RCW habitat and wetlands.

In summary, NCDOT committed to two major measures listed below to minimize RCW impacts.

- Prescribed burning plan to manage habitat, including agreement top periodically close the highway
- Reduced highway width through RCW habitat

The combination of these commitments (as supported by studies) provided adequate justification for USFWS to issue a finding of "May Affect / Not Likely to Adversely Affect" for the RCW.

2.10.3.3 Updated Wetland Impact Calculations

Design minimization after LEDPA selection is a normal project occurrence; therefore impact recalculations are generally updated immediately after completion of design revisions. The following paragraphs describe impact quantity changes since the publication of the DEIS.

A systematic error in the calculation of wetland impacts was discovered subsequent to the publication of the DEIS. Therefore prior to reporting any updated impact calculations based on the revised design, it is imperative to report the "corrected" LEDPA impacts and then use those as a baseline by which to compare any updated impacts. The error resulted from conversion/scaling issues in transferring data between GIS and Microstation (highway design software). The miscalculation resulted in reporting the wetland impacts for each of the Preliminary Alternatives lower than actual measured areas. The conversion error only applied to wetland impacts. Table 2.10.2 shows the change for all three build alternatives.

Table 2.10.1 shows that the reported impacts for each of the alternatives increased by 25-31 acres based on the update. It should be noted that Alternative 3 showed the highest wetland impacts when originally selected as the LEDPA. This has not changed; however Alternative 3 now appears to have a lower differential of impact than previously reported as it exhibits the lowest total (and percentage) increase of any corrected acreages. At the time LEDPA was selected, Alternative 3 impacted 47% more wetlands than the Alternative 2 and 6% more wetlands than Alternative 1. Yet after the impact correction, Alternative 3

impacts 28% more wetlands than Alternative 2, and 4% more than Alternative 3. Therefore, the corrected wetland acreages (and their impact difference among alternatives) serve to further validate the selection of Alternative 3 as LEDPA. Stream and wetland impacts associated with the LEDPA are detailed in Chapter 4.14.1.

TABLE 2.10.1
WETLAND IMPACT UPDATES AFTER 2011 DEIS PUBLICATION

Wetland Impacts Reported in 2011 DEIS and 2012 CP3 Revisited Meeting (acres)			
	Alternative 1	Alternative 2	Alternative 3
Wetland Impacts	109	78	115
Corrected Wetland Impacts (acres) ***Prior to reducing clearing width for 1.1 mile***			
	Alternative 1	Alternative 2	Alternative 3
Corrected Wetland Impacts	135	109	140
Change in Reported Impacts due to Update (acres)			
	Alternative 1	Alternative 2	Alternative 3
Change in Wetland Impacts	+26 acres (a 24% increase)	+31 acres (a 31% increase)	+25 acres (a 22% increase)

Correcting for the conversion/scaling error resulted in 140 acres of wetland impact for the Preferred Alternative. Since 2011, NCDOT has further refined the preliminary design of the Preferred Alternative, identifying areas where the design could reduce impacts. In 2014, project impacts were updated to reflect delineation updates and the most recent preliminary designs. Wetland impacts based on the current design are shown in Table 2.10.2. The 1.1-mile refined design reduced wetland impacts by 1.7-acres. Combined with design changes since 2011, a total of nine acres of wetland impacts have been further avoided.

TABLE 2.10.2
WETLAND IMPACTS FOR THE PREFERRED ALTERNATIVE

	DEIS	**2013 UPDATE**	**CHANGE**
Total impact to wetlands (acres)	140	131	-9
Total impact to wetlands on NFS lands (acres)	102	93	-9

2.10.3.4 Updated Stream Impact Calculations

Since the publication of the DEIS in 2011, total stream impacts for the LEDPA increased by 443 feet as a result of stream and wetland delineations conducted in 2013. Areas adjacent to Stream 7 (S7) and Stream 9 (S9) were originally considered part of Wetlands 10 and 13, respectively; however, the stream lines were extended in 2013 to reclassify areas previously categorized as wetlands. These changes added 473 linear feet to S7 and 593 linear feet to S9. At the same time new stream and wetland delineations were being conducted, NCDOT was also working on the preliminary design of the Preferred Alternative, identifying areas where the design could reduce stream and wetland impacts. In 2014, stream and wetland impacts were updated to reflect delineation updates and the most recent preliminary

designs. The results are shown in Table 2.10.3. Although an additional 1,067 linear feet of stream impacts were added to the Preferred Alternative, minimization measures since 2011 reduced stream impacts such that the net change is limited to an additional 443 linear feet. With regard to NFS lands, stream impacts increased by 593 feet along S7; however, minimization measures reduced this to a net increase of 438 feet.

TABLE 2.10.3
STREAM IMPACT UPDATES FOR THE PREFERRED ALTERNATIVE

	DEIS	2013 UPDATE	CHANGE
Total impact to streams (linear feet)	2,505	2,948	+443
Total impact to streams on NFS lands (linear feet)	1,387	1,825	+438

NOTES: Because the Preferred Alternative was further refined after its selection as the LEDPA, similar avoidance and minimization measures were not developed for the other two build alternatives. As such, the updated stream impacts for the Preferred Alternative cannot be compared to quantities in the DEIS for Alternatives 1 and 2. It can be noted, however, that the additional 473 linear feet of impact associated with S7 would be an additional impact for Alternative 1. These updates would not affect the LEDPA decision, as stream impacts were secondary to other decision-making factors, particularly habitat fragmentation.

2.10.3.5 Updated Riparian Buffer Impacts

As stated above, total stream impacts for the LEDPA increased by 443 feet as a result of updated stream and wetland delineations. S9 did not affect buffer calculations; however, the extension of S7 added 21,094 square feet of impact (Zone 1: 12,748; Zone 2: 8,346) to the total buffer impacts. Although stream impacts increased (due to reclassification as discussed above), overall buffer impacts were reduced due to minimization measures that reduced the project footprint (area). Table 2.10.4 shows updated buffer impacts for the Preferred Alternative.

TABLE 2.10.4
BUFFER IMPACT UPDATES FOR THE PREFERRED ALTERNATIVE

		DEIS	2014 UPDATE	CHANGE
Total Impact to Buffers (square feet) in the DEIS timeframe	Zone 1	135,930	129,402	-6,528
	Zone 2	79,168	81,142	1,974
	Total	**215,098**	**210,544**	**-4,554**
Total Impact to buffers (square feet) adjusted to include S7 extension in DEIS quantities	*Zone 1*	*157,024**	*129,402*	*-27,622*
	Zone 2	*91,916**	*81,142*	*-10,774*
	Total	***248,939****	***210,544***	***-38,395***
Impact to Buffers on NFS lands only (square feet)	Zone 1	69,698	54,884	-14,814
	Zone 2	36,949	33,524	-3,425
	Total	**106,647**	**88,408**	**-18,239**

NOTES: Because S7 was extended in 2014 and is outside NFS lands, the impact reduction shown for NFS lands appear disproportionately larger than the total reduction.

2.10.3.6 Updated Impacts Based on the Refined LEDPA Design

The continued minimization of impacts and refined design reduced impacts to: wetlands (reduction of 9 acres); forested area (reduction of 22 acres), and the Southwest Prong Flatwoods Natural Heritage Area (reduction of 1.5 acres). Table 2.10.5 shows the updated impacts based on this design revision. Most notably, the refined design mitigates RCW habitat fragmentation effects on a 165-acre contiguous portion of the CNF between existing US 70 and the proposed bypass.

2.10.4 Summary

As explained in Chapter 2.10.2, Alternative 3 is the most practicable alternative for a number of reasons. Alternative 1 is not considered the least environmentally-damaging alternative because it fragments a large amount of CNF habitat, and because the USFS has stated that conducting prescribed burns would be extremely difficult, resulting in considerable long-term habitat fragmentation effects on RCW populations within the CNF. Alternative 2 is not considered the least environmentally-damaging alternative because it would create a very high number of business and residential relocations, including minority relocations, and is also not conducive to burning. The high number of relocations associated with the improve existing alternatives was also a primary factor in alternative elimination.

TABLE 2.10.5
COMPARISON OF BYPASS ALTERNATIVES

ENVIRONMENTAL FEATURES	REFINED ALT. 3 (PREFERRED) (2014)	ALT. 3 (2011)	ALT. 1 (2011)	ALT. 2 (2011)
Length (miles)	10.3	10.3	10.85	9.91
Relocations Residential	16	16	13	133
Business	1	1	1	3
Non-profit [1]	1	1	1	1
Minority/Low Income Populations - Disproportionate Impact	No	No	No	No
Historic Properties (adverse effect)	No	No	No	No
Community Facilities Impacted [1]	No	No	No	No
Section 4(f) Impacts	No	No	No	No
Noise Receptor Impacts	43 [2]	31	31	31
Prime Farmlands	71	71	66	112
NFS Lands – acres [3]	240	240	189	225
Forested Acres *(NFS lands)* [4]	332 (204)	354 (244)	343 (188)	258 (213)
CNF Habitat Fragmentation [5]	534	699	1,412	240
Wetland Acres *(NFS lands)* [6]	131 (93) [7]	140 (102)	135 (96)	109 (87)
Streams *(NFS lands)* – linear feet [8]	2,948 [9] (1,825)	2,505 (1,387)	2,581 (1,012)	3,094 (1,764)

TABLE 2.10.5 cont.
COMPARISON OF BYPASS ALTERNATIVES

ENVIRONMENTAL FEATURES	REFINED ALT. 3 (PREFERRED) (2014)	ALT. 3 (2011)	ALT. 1 (2011)	ALT. 2 (2011)
Riparian Buffer Impacts – sq feet *(NFS lands)* [6] **Zone 1**	129,402 (54,884)	135,930 (69,698)	124,823 (46,344)	172,705 (91,341)
Zone 2	81,142 (33,524)	79,168 (36,949)	75,232 (23,190)	108,019 (50,684)
Total Buffer Impacts	210,544 (88,408)	215,098 (106,647)	200,055 (69,534)	280,724 (142,025)
100 Year Floodplain and Floodway Impacts – acres	1.6	1.6	1.3	1.3
Federally Protected Species	May Affect Not Likely To Adversely Affect (1 species: RCW)	Unresolved: RCW May Affect, Not Likely To Adversely Affect: Bald Eagle		
Right of Way Cost	$11,425,000	$11,425,000	$9,800,000	$28,975,000
Utility Relocation Cost	$951,440	$951,440	$1,649,280	$2,773,680
Construction Cost	$160,000,000	$161,000,000	$156,400,000	$138,800,000
Total Cost [10]	$172,376,440	$173,376,440	$167,849,280	$170,548,680

NOTES:

1. The Craven County Waste Transfer Facility would be displaced by the Preferred Alternative. The county is aware of the impact and is currently evaluating alternative sites. Prior to right-of-way acquisition, NCDOT will prompt coordination with the City of Havelock to relocate the facility. In coordination with USFS, the City must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on this effort is ongoing and the results will be documented in the ROD.
2. The noise analysis presented in the DEIS was prepared in 2006, prior to the 2011 update of NCDOT's Traffic Noise and Abatement Manual. The updated manual requires a more sophisticated "validation model" and noise contours are no longer used to determine impacts. These more detailed models often pick up additional receptors as impacts as compared to the noise contour method. As such, noise impacts for the Refined Preferred Alternative increased due to the new methodology. It is noted that the new analysis indicates that the number of build-condition impacts is lower than the number of no-build condition impacts (49) because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.
3. Impacts to NFS lands are based on proposed right-of-way limits.
4. Impact quantities for the Refined Preferred Alternative are based on the proposed right-of-way. Impacts for the build alternatives at LEDPA selection are based on the construction limits of the Preferred Alternative plus an additional *35-foot* buffer. Direct impacts are projected to be less than those shown in the table. The NCDOT will pay the USFS, or their approved contractor, to measure to USFS specifications, the volume of timber on USFS land within the right-of-way limits. The USFS and NCDOT will determine the precise monetary value of the timber through appraisal at rates effective at the time of the timber sale contract.
5. The amount of NFS lands disconnected from contiguous NFS lands based on the detailed study alternative corridors. For Alternative 1, this total also includes the isolated portion of the NFS parcel remaining west of the corridor, just north of the SR 1756 (Lake Road) interchange. These acreages do not include areas that would be the same for all alternatives.
6. Impact quantities are based on the proposed construction limits plus an additional 25 feet, in accordance with current NCDOT impact analysis guidelines.
7. A systematic error in the calculation of wetland impacts was discovered subsequent to the publication of the DEIS. The error resulted from conversion/scaling issues in transferring data between GIS and Microstation. The miscalculation resulted in reporting the wetland impacts for each of the Preliminary Alternatives lower than actual measured areas. The conversion error only applied to wetland impacts.
8. Impact quantities are based on the proposed construction limits plus an additional 25 feet, in accordance with current NCDOT impact analysis guidelines.
9. Because the Preferred Alternative was further refined after its selection as the LEDPA, similar avoidance and minimization measures were not developed for Alternatives 1 and 2. It can be noted, however, that S7 would be an additional impact for Alternative 1. These updates would not affect the LEDPA decision, as stream impacts were secondary to other decision-making factors, particularly habitat fragmentation.

10. The difference between the construction cost estimates in the 2011 DEIS and the current construction cost estimate for the Refined Preferred Alternative is due to updated quantities and unit prices. In addition to unit price increases, outside shoulder widths increased from 10 feet to 12 feet with paved shoulders increasing from 4 feet to 10 feet.

3.0 AFFECTED ENVIRONMENT

Chapter 3.0 contains a comprehensive inventory of the human and natural environmental settings of the project study area. This chapter includes updated information as well as any new information resulting from additional studies conducted after the completion of the DEIS. This inventory serves as the basis for assessing the potential environmental impacts of the proposed project, as discussed in Chapter 4.0.

3.1 LAND USE AND TRANSPORTATION PLANNING

3.1.1 Existing Land Use

The proposed project is located in the coastal plain region of eastern North Carolina. Although generally rural, this area of coastal North Carolina is experiencing substantial growth. Situated near the Neuse River, between the Cherry Point U.S. Marine Corps Air Station (MCAS) and the Croatan National Forest (CNF), highway access into the Havelock area is limited to three routes including US 70, NC 101, and SR 1756 (Lake Road) (also known as Nine Mile Road). Existing US 70 is the only principal arterial that passes through the City of Havelock.

The largest land use within the project study area is the CNF followed by private forested lands with active silviculture (timber harvesting) operations. With no established central business district or downtown, Havelock's commercial and business centers are concentrated along existing US 70. The existing US 70 corridor is predominantly lined with commercial uses, interspersed with residential, institutional, office, and industrial uses and vacant parcels. Several strip malls, restaurants, hotels, gas stations, and other services typical of a commercial corridor are located along existing US 70. The City of Havelock currently has ten shopping centers in addition to a large military shopping complex within Cherry Point MCAS. Nine of these shopping centers are located along existing US 70 between Slocum Road and McCotter Boulevard. The tenth is located along NC 101 near the main gate to the Cherry Point MCAS. Other commercial development is scattered throughout the community. Commercial uses are also located along McCotter Boulevard. A new Wal-Mart superstore recently opened along US 70 north of Slocum Road. The US 70 corridor is flanked by dense residential development, most notably to the west and south of Cherry Point MCAS. Further west of existing US 70, residential development is generally dispersed along area roads outside the CNF, including SR 1760 (Hickman Hill Road), SR 1745 (Greenfield Heights Boulevard), SR 1747 (Sunset Drive), Gray Road, and SR 1756 (Lake Road).

Cherry Point MCAS

The Cherry Point MCAS is located within the City of Havelock and a preponderance of the residential areas and commercial services within the city serve the air station. Cherry Point is the home of the nation's largest U.S. Marine Corps Air Station and a large Naval Aviation Depot operated by the Marine Corps. Cherry Point was constructed in the early 1940's and

covers more than 29,000 acres at its primary complex to the north and east of existing US 70 through Havelock. A portion of the Cherry Point MCAS was annexed into the City of Havelock in December 1979.

Croatan National Forest

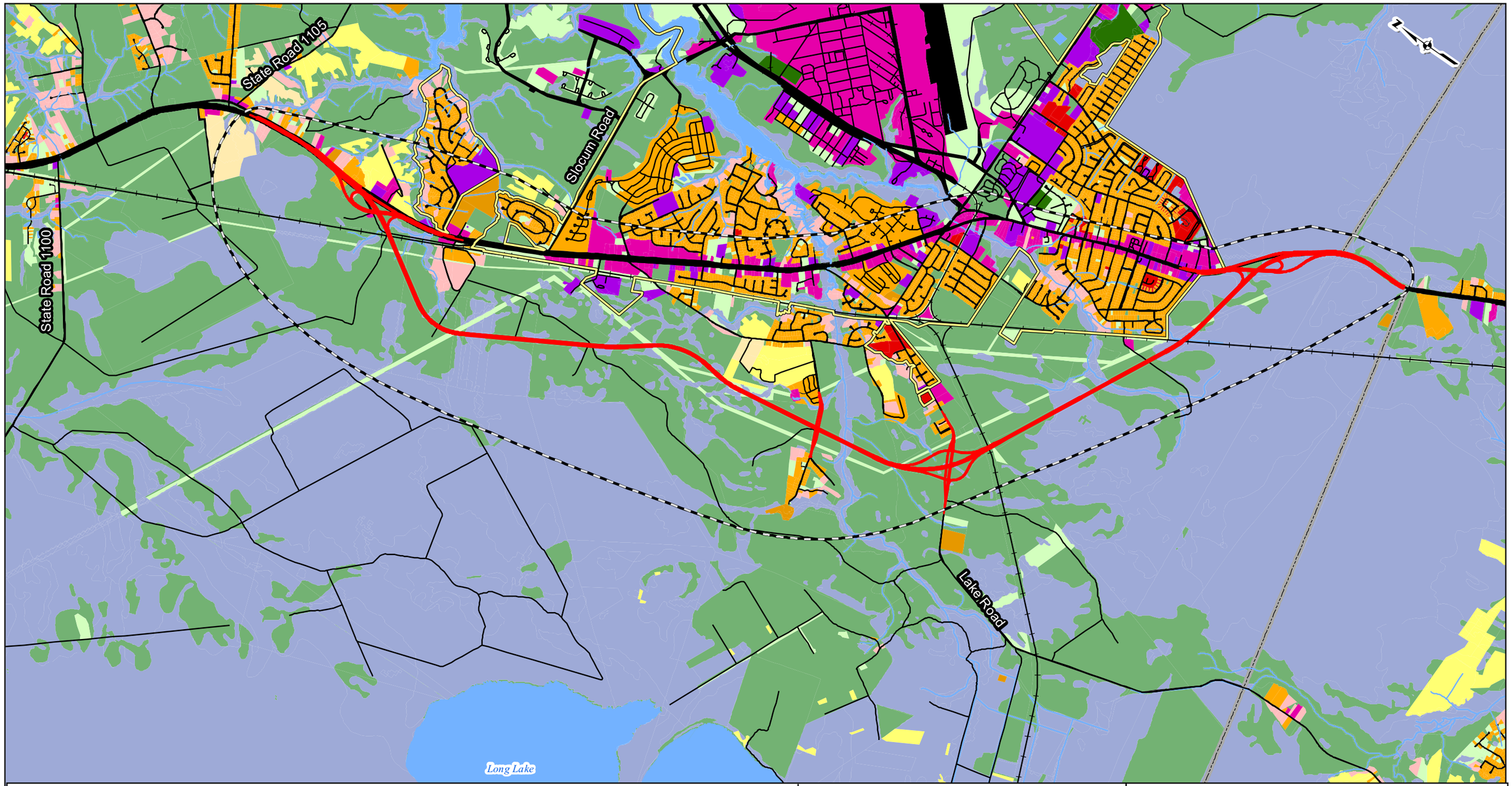
The Croatan National Forest (CNF) borders the City to the south and west of existing US 70. As shown in Exhibit 3.1.1, the proposed US 70 Bypass is located around the western side of the City through portions of the CNF. A portion of the project study area is located in undeveloped lands contained within the boundaries of the CNF. The CNF is one of four National Forests in North Carolina owned and managed by the U.S. Forest Service. The purchase of the Croatan Forest began in the early 1930's and by 1935 the forest included 77,000 acres. Currently, the CNF consists of approximately 160,000 acres in Craven, Carteret, and Jones Counties. There are approximately 40 miles of streams and 4,300 acres of lakes in the CNF. The CNF is generally bounded by the White Oak River to the west, the Neuse and Trent Rivers to the north and east, and Bogue Sound to the south.

Although much of the project study area is undeveloped, increasing residential development on private lands is limiting the ability of the USFS to properly manage land within the CNF. As shown, most uplands (non-wetlands) within the CNF are designated as "RCW habitat management areas (HMAs)." Management activities within RCW HMAs include prescribed burning, timber harvesting, planting, and other appropriate practices to maintain stand structure and provide for pine regeneration. Management activities for hardwood cypress wetlands include restoration planting of hardmast-producing hardwoods and bald cypress, very limited timber salvaging, and mowing existing wildlife openings and existing hiking trails (USFS, 2002).

3.1.2 Zoning Characteristics

Most of the lands within the western portion of the project study area are adjacent to the current Havelock extras-territorial jurisdiction (ETJ); however, the future planning jurisdiction assumed for the *2030 Comprehensive Plan* (URG, 2009) extends west just past the Preferred Alternative corridor.

Most of the lands within the detailed study corridors are undeveloped and currently outside of the City of Havelock's current zoning jurisdiction. Craven County has no countywide zoning ordinance. East of the project study area and the Cherry Point MCAS, there is a county zoning ordinance to address military aircraft impacts including noise; however, the principal purpose of this ordinance is not land use control. Regulations within this document focus on how the land is developed within the noise contours and general airport environment of Cherry Point MCAS. The focus is to minimize the amount and intensity of residential development within what is termed the Air Installation Compatibility Use Zone (AICUZ) and the Accident Potential Zones (APZ). Permitted uses are identified, and development requirements are specified.



Cropland
Pasture
Open
Forest
Water
Wetland
Turf
Disturbed
Low-density Residential
Medium-density Residential
Multi-Family Residential
Office/Institutional/Light Industrial
Commercial/Heavy Industrial
Paved Road with Right of Way
Alternative 3 - Preferred Alternative
EIS Study Area
DOT Primary Roads
Railroads
Havelock City Limits
County Boundary
Stream

US 70, Havelock Bypass

Craven County, North Carolina
STIP No.R-1015

Exhibit 3.1.1 Existing Land Use

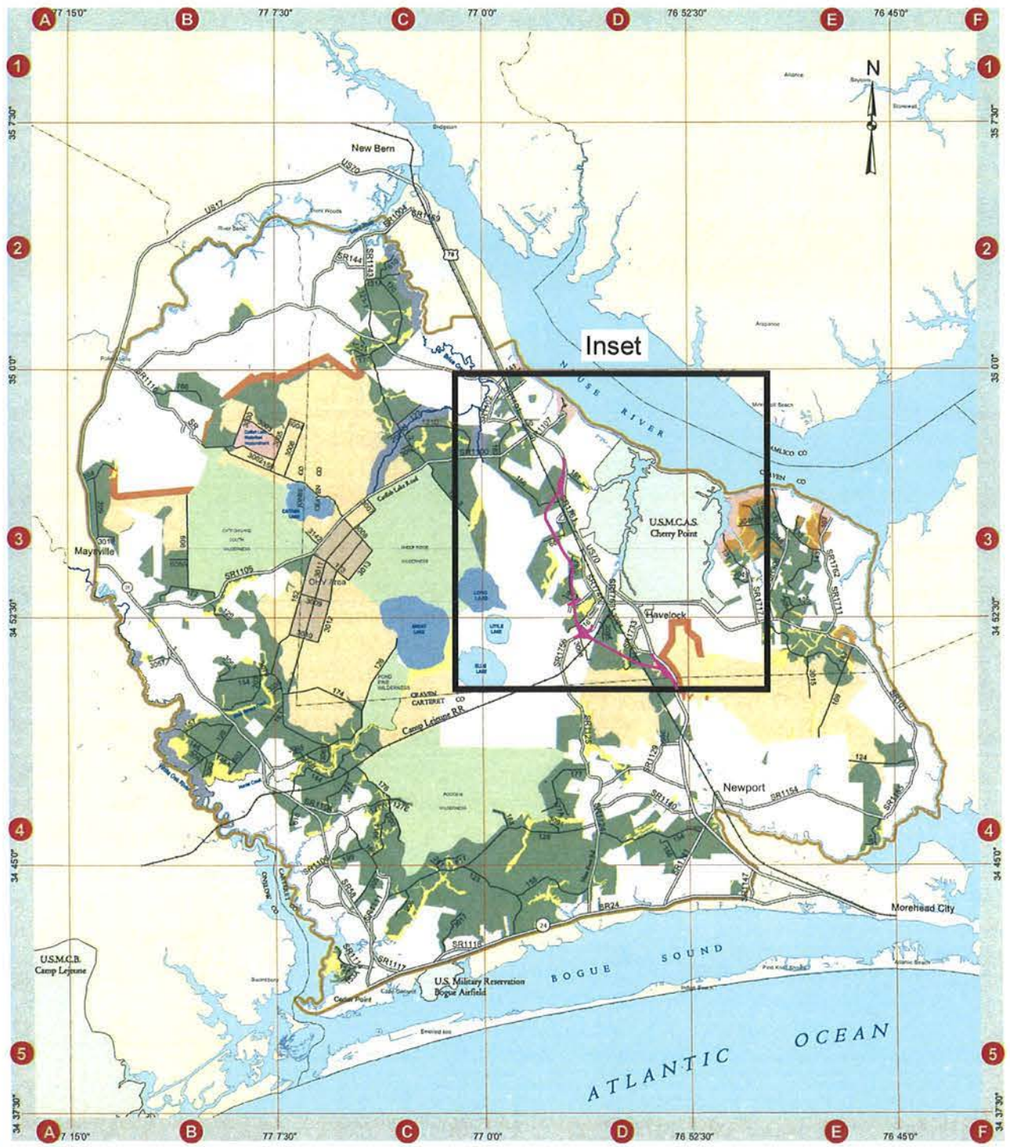
0 0.25 0.5 1 1.5 2 Miles

This page intentionally left blank to facilitate double-sided printing.

Croatan National Forest

Land & Resource Management Plan 2002

Management Prescriptions and Locations



Legend

- Proclaimed Boundary
- Major Roads
- Roads
- Municipalities
- Military Reservations

Primary Management Prescription

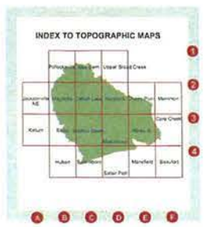
- Pocosin Lakes Management
- Wilderness Management
- River Corridors Eligible for W&S River Status
- Hardwood Cypress Wetland Management
- RCW Habitat Management
- Wildland/Urban Interface Corridors
- Upland Hardwood Management
- Black Bear Habitat Management
- Developed Area Mgmt, inc Water-based Rec.
- OHV

Disclaimer: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accuracy only at certain scales, based on modeling or interpretation, incomplete while being revised, etc. Using GIS products for purpose other than intended may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification.

1:126,720

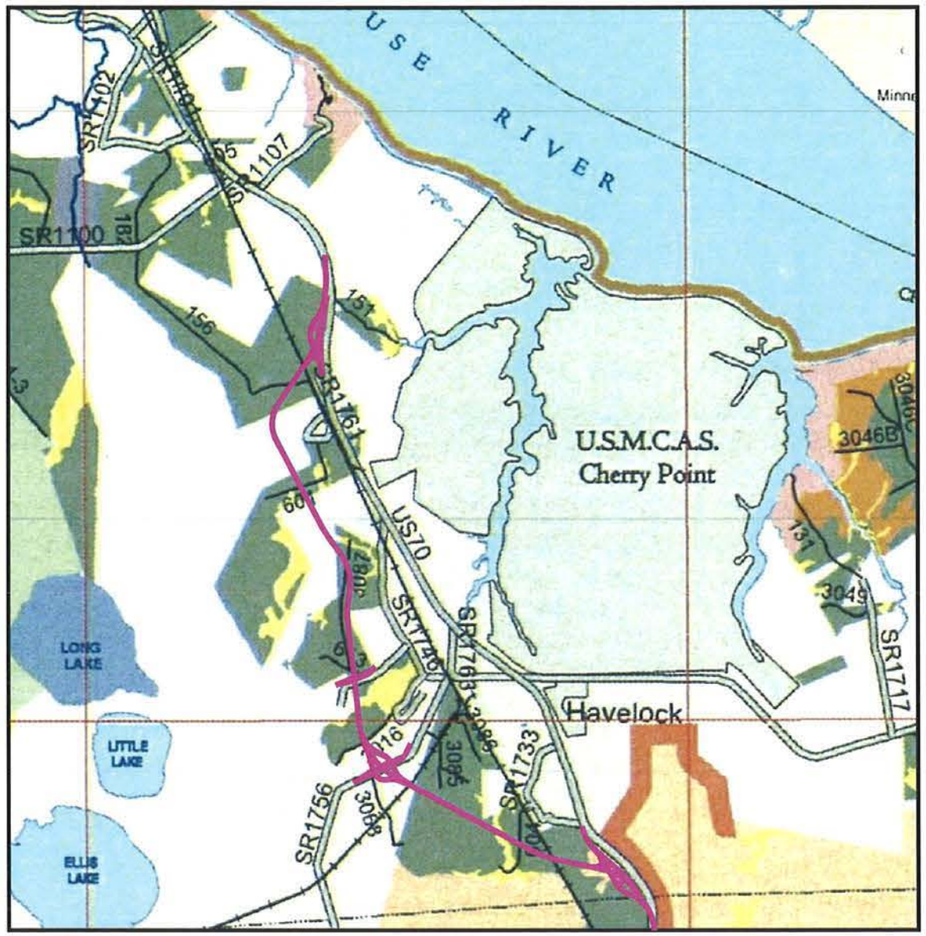
0 0.5 1 2 3 4 5 Miles

1 inch equals 2 miles



VICINITY MAP

National Forests in North Carolina



Inset

Preferred Alternative

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Croatan National Forest
Land and Resource
Management Plan
Not to Scale
Exhibit 3.1.2

This page intentionally left blank to facilitate double-sided printing.

Zones include:

- A = Clear Zones (CZ); greatest potential for accidents and highest noise exposure; no residential development
- B3 = Accident Potential Zone 1 (APZ 1) & Noise Zone 3 (75 ldn or higher); significant potential for accidents and area of significant noise impact; no residential development
- 3 = Noise Zone 3 (75 ldn or higher); area of significant noise impact; no residential development
- B1 = Accident Potential Zone 1 (APZ 1) & Noise Zone 1 (below 65 ldn); significant potential for accidents and area of some noise impact; maximum density is one unit per five acres.
- B2 = Accident Potential Zone 1 (APZ 1) & Noise Zone 2 (65 to 74 ldn); significant potential for accidents and area of moderate noise impact; maximum density is one dwelling unit per five acres.
- C1 = Accident Potential Zone 2 (APZ 2) & Noise Zone 2 (65 to 74 ldn); measurable potential for accidents and area of moderate noise impact; maximum density not to exceed two dwelling units per acre.
- C2 = Accident Potential Zone 2 (APZ 2) & Noise Zone 1 (below 65 ldn); measurable potential for accidents and area of some noise impact; maximum density not to exceed two dwelling units per acre.
- 2 = Noise Zone 2 (65 to 74 ldn); area of moderate noise impact; maximum density not to exceed two dwelling units per acre.
- 1 = Noise Zone 1 (below 65 ldn); area of some noise impact.

The only existing zoning districts within the project study area are under the jurisdiction of the City of Havelock. The City of Havelock determines and regulates zoning districts for the lands within the Havelock City Limits and ETJ. Approximately 10,395 acres within the city limits of Havelock are zoned for various uses. Over 70 percent of this acreage is for the Cherry Point MCAS. However, the Cherry Point MCAS, total area of more than 29,000 acres, is not under the City of Havelock's zoning authority. The predominant zoning for the areas outside the MCAS are single- family residential or highway commercial. An additional 7,912 acres are zoned in the City's ETJ. The Croatan National Forest occupies most of the approximately 2,453 acres of the ETJ that are zoned as government services. Most of the western side of the project study area is outside of the Havelock City Limits, but some is within the City's current ETJ.

The City of Havelock zoning districts currently include:

- Military Reservation
- R-10 (Minimum Lot Size 10,000 sq. ft.)
- Highway Commercial
- Government Services

- R-12 (Minimum Lot Size 12,000 sq. ft.)
- R-M (Multi-family residential)
- R-20 (Minimum Lot Size 20,000 sq. ft.)
- R-7 (Minimum Lot Size 7,000 sq. ft.)
- Light Industrial
- R-13 (Minimum Lot Size 13,000 sq. ft.)
- R-MH (Mobile Home Minimum Lot Size 5,000 sq. ft.)
- R-20A (Minimum Lot Size 20,000 sq. ft.)
- Office and Institutional

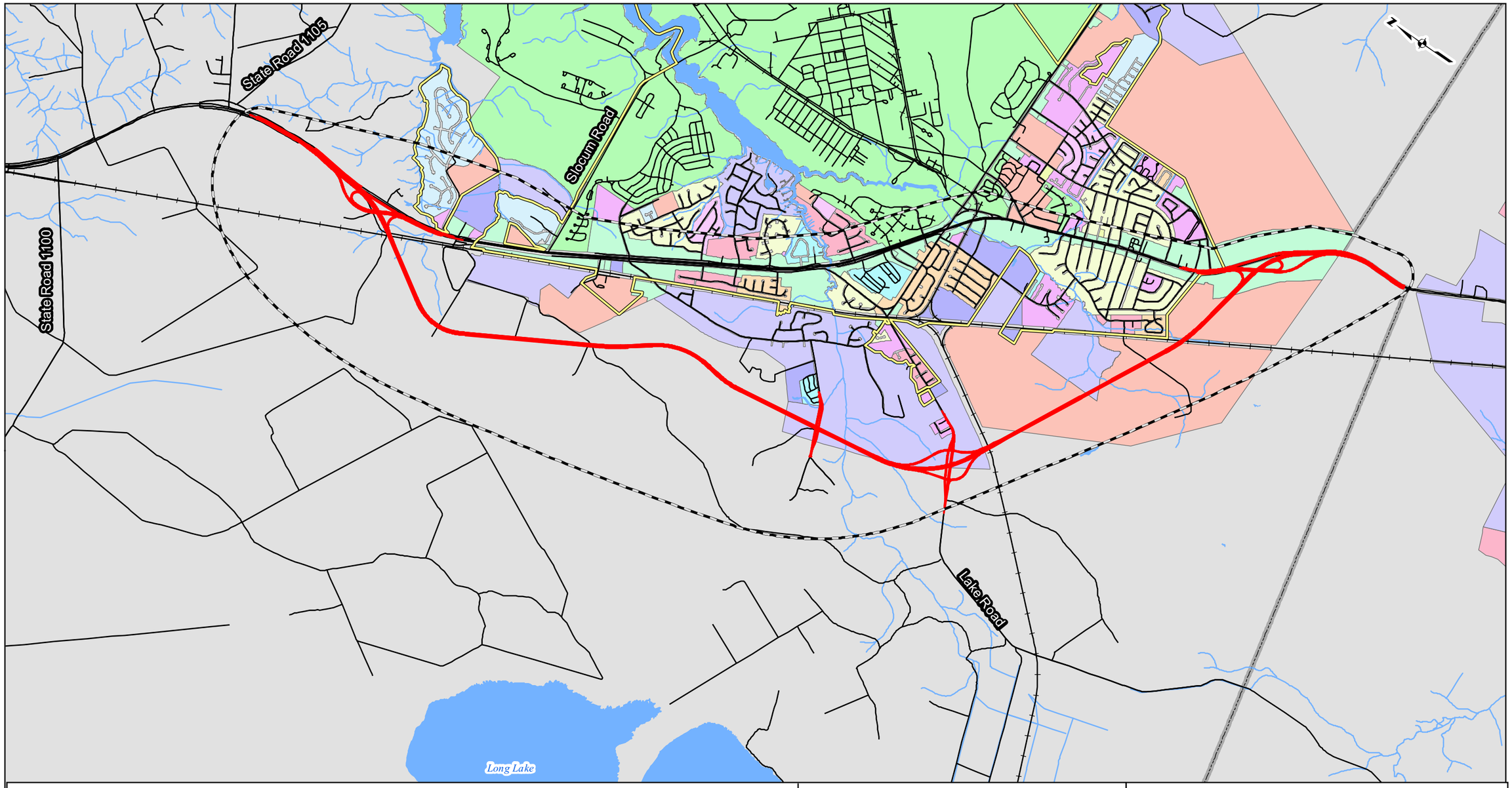
The City of Havelock's Zoning Ordinance stated purpose is to promote the "health, safety, morals, and the general welfare of the community." The ordinance outlines the permitted uses within each zoning designation, as well as the site development regulations within these designations. The regulations set forth in the ordinance affect the construction, modification, and use of all land and buildings.

The entire area along existing US 70 is zoned highway commercial. In the bypass study corridors, the zoning is principally single-family residential in the privately owned areas along SR 1756 (Lake Road), SR 1746 (Gray Road), and SR 1747 (Sunset Drive). However, there are also several existing mobile home parks zoned as multi-family residential in these areas. The only properties in the ETJ zoned industrial are a parcel along the southeastern side of SR 1756 (Lake Road) that is occupied by an auto salvage yard and a vacant parcel along SR 1747 (Sunset Drive). There is no existing highway commercial zoning in the bypass study corridors except at the termini along existing US 70. Zoning is shown in Exhibit 3.1.3.

3.1.3 Future Land Use

Craven County is one of the twenty North Carolina coastal region counties regulated by the Coastal Area Management Act (CAMA). As such, land use planning in the project study area must comply with coastal management requirements. The City of Havelock *2030 Comprehensive Plan* (URG, 2009) and the Craven County CAMA Core Land Use Plan (Holland Planning Consultants, 2009) were prepared in accordance with CAMA regulations. Both of these CRC-certified plans recognize and support the US 70 Havelock Bypass.

Future land use planning for most of the project study area is outlined in Havelock's *2030 Comprehensive Plan* (URG, 2009). This plan serves as the official adopted statement of the Havelock Board of Commissioners and was adopted by the North Carolina Coastal Resources Commission to be in compliance with the Coastal Area Management Act (CAMA) in 2009. Most of the lands within the western portion of the project study area are adjacent to the current Havelock ETJ; however, the future planning jurisdiction assumed for the plan extends west just past the Preferred Alternative corridor.



Alternative 3 - Preferred Alternative
EIS Study Area
DOT Primary Roads
Railroads
Havelock City Limits
County Boundary
Waterbody
Stream
No Zoning
GS
HC
LI
MR
O&I
R-10
R-12
R-13
R-20
R-20A
R-7
RM
RMH

US 70, Havelock Bypass
Craven County, North Carolina
STIP No.R-1015

Exhibit 3.1.3 Havelock Zoning Map

0 0.25 0.5 1 1.5 2 Miles

This page intentionally left blank to facilitate double-sided printing.

Future land use mapping, shown in Exhibit 3.1.4, identifies the Preferred Alternative (Alternative 3) corridor and future land uses adjacent to the proposed bypass. Much of this area is planned to remain consistent with current land uses, with the exception of additional single-family residential development occurring at the western end of SR 1747 (Sunset Drive), additional high-density residential development extending westward from Havelock along SR 1756 (Lake Road) and a commercial area in the eastern quadrants of the SR 1756 (Lake Road) interchange.

The Craven County *CAMA Core Land Use Plan* (Holland Planning Consultants, 2009) was adopted by the Craven County Board of Commissioners and by the North Carolina Coastal Resources Commission in 2009. The plan documents existing conditions within the county with respect to demographics and the economy. It also projects land development patterns and identifies future infrastructure and land use issues, as well as creates a policy and vision statement for resource protection, economic and community development, and public participation. The plan states that the largest concentration of commercial/mixed development is anticipated to occur along the US 70 corridor between New Bern and Havelock and along US 17 south of New Bern.

Additional development ordinances that guide land use development include the Craven County Flood Damage Prevention Ordinance and the Cherry Point MCAS Zoning Ordinance. Future development is also shaped by regional plans such as the North Carolina Eastern Region Military Growth Task Force's *Regional Growth Management Plan* (Marstel-Day, 2009) and East Carolina Joint Land Use Study (East Carolina Council, 2002).

Croatan National Forest

Although the City of Havelock provides land use planning for most of the project study area, the USFS provides land use planning and resource management for the CNF. The *Croatan National Forest Land and Resource and Management Plan* (USFS, 2002), guides natural resource management activities and establishes management standards within the CNF. It describes the care and protection of the land, resource management practices, and the availability of lands for varied purposes for the next 10 to 15 years. The plan was prepared in accordance with the National Forest Management Act of 1976 (Public Law 94-588) and the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 USC 1600). The goals of the CNF Management Plan are to provide a forest environment for public enjoyment, to provide goods and services to satisfy short-term public demand, to provide quality habitat for fish and wildlife, to protect unique natural pocosin environments, to maintain plant and animal diversity, and to protect threatened, endangered, and sensitive plant and animal species among others. The plan provides a description and history of the Croatan National Forest, and addresses issues related to:

biological diversity, recreation opportunities, special land allocations, forest health and products, fire management, access, and coordination with local communities.

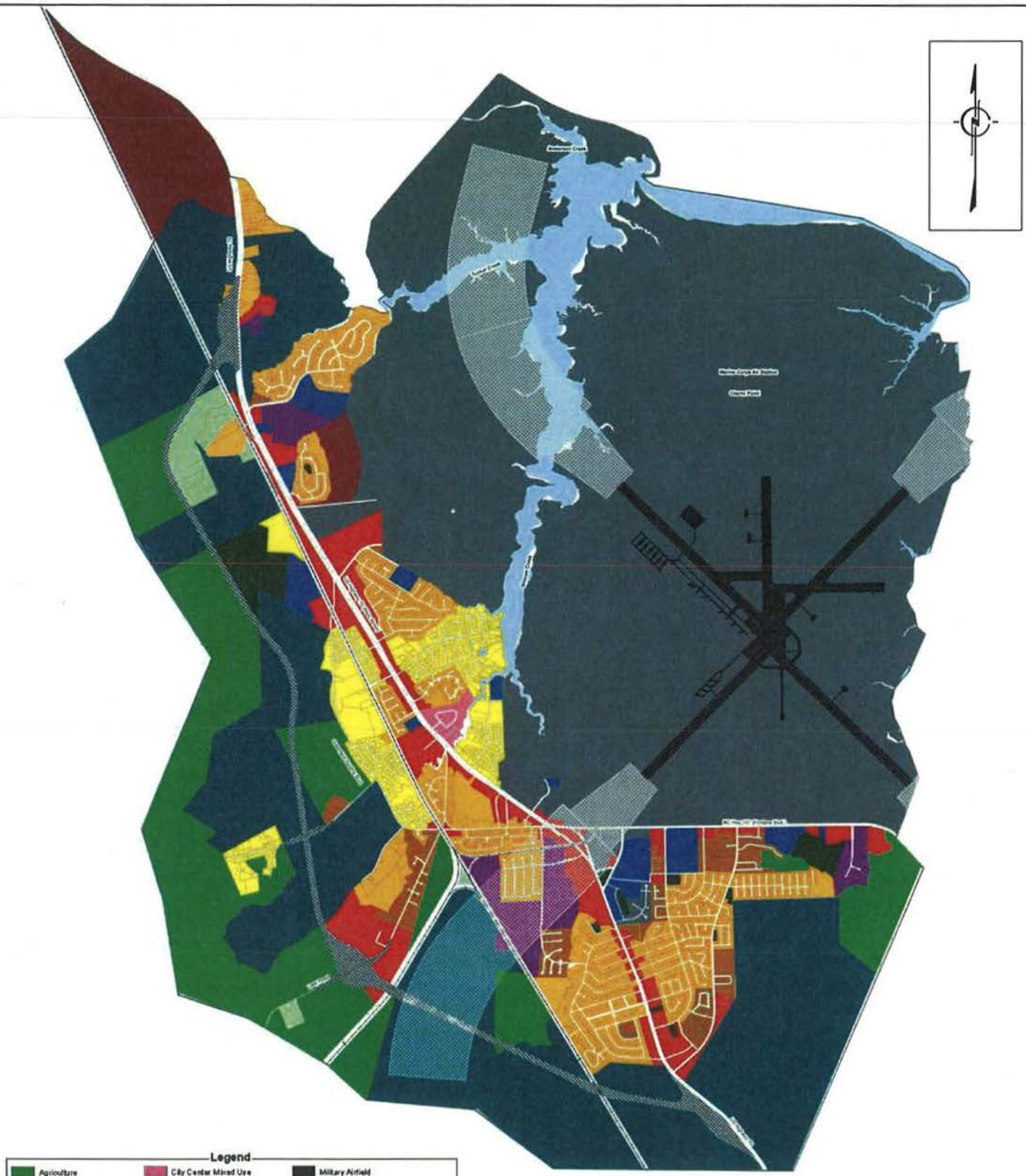
3.1.4 Transportation Planning

In November 1983, the proposed project was included in the NCDOT STIP as Project R-1015.

The NC Strategic Highway Corridors (SHC) Program identifies highway corridors that play a critical role in regional or statewide mobility and seeks to protect and improve these routes in an effort to enhance transportation, economic development, and environmental stewardship. The SHC are chosen based on traffic volumes and relative importance to the state and/or region, whether they provide a connection between major activity centers or between existing and/or planned interstates, and if they serve as reliever routes to an existing interstate facility.

US 70 was identified as a SHC corridor because it provides regional connectivity with the Port of Morehead City, Global TransPark, industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and it functions as a primary route for seasonal beach traffic. Because this facility provides such a high degree of regional connectivity, the SHC goal to protect the mobility and connectivity of a critical highway facility is particularly relevant to the proposed project. From a regional vantage point, the SHC Program acknowledges existing and future regional traffic demands and as such envisions US 70 as a controlled-access, median-divided freeway. Although one of the goals of the SHC Program is to create a consistent vision for each corridor, the SHC (now STC) program acknowledges that facility types for a single corridor may change due to project-specific elements. As such, planning and design studies are conducted to determine the appropriateness of the SHC recommendations. Studies for the proposed project include the US 70 Access Management Study, the Havelock Bypass DEIS, and this FEIS, which were subsequently developed to assess mobility and connectivity needs in the Havelock area to determine if the SHC Program recommendation would be appropriate for this section of US 70.

The City of Havelock *2030 Comprehensive Plan* (URG, 2009) was developed with the assumption that the proposed project will be a bypass around the southwestern side of the City and will provide the opportunity to establish land use controls for protecting investment in the proposed bypass and to transform Main Street (the existing US 70 corridor) back into a community asset once the proposed bypass is completed. This plan recognizes the direct connections to the bypass will be limited to proposed interchanges and suggests Havelock should consider developing a small area plan for the proposed interchange at Lake Road.



Source: City of Havelock Comprehensive Plan (URG 2009)

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Project Land Use
Not to Scale
Exhibit 3.1.4

This page intentionally left blank to facilitate double-sided printing.

The plan also suggests that land use preservation and access management restrictions should be in place before interchanges are constructed. The plan states "The City of Havelock strongly supports construction of the US 70 Bypass to relieve congestion along existing US 70" (Policy 4.1.2). This plan follows previous land use plans in continuing to stress the importance of constructing a US 70 Havelock Bypass in order to relieve congestion along existing US 70.

The *Draft Havelock Comprehensive Transportation/Land Use Plan* (Kimley-Horn, 2007) includes a proposed US 70 Bypass southwest of the City. According to the plan, "wide-spread community support exists for preserving the integrity of established neighborhoods. This momentum allows city officials opportunities to promote Havelock as a vibrant urban landscape with an identifiable city center, establish land use controls for protecting investment in the proposed bypass, and set a new vision for the US 70 Corridor that will transform Main Street back into a community asset once the proposed bypass is completed."

The *Draft Havelock Comprehensive Transportation/Land Use Plan* (Kimley Horn, 2007) shows a US 70 Havelock Bypass around the southwest side of the City, through the Croatan National Forest, with an interchange at Lake Road. The plan's highway map shows the bypass beginning to the north of Hickman Hill Road at an interchange with US 70 and ending south of McCotter Boulevard, again tying to US 70 with an interchange. The plan identifies the US 70 bypass as a freeway, which is by definition an access-controlled highway facility. The only intermediate public access to the bypass would be via the proposed interchange at Lake Road.

The Craven County *CAMA Core Land Use Plan* (Holland Planning Consultants, 2009) notes the County's support for projects which will improve hurricane evacuation routes and improve access to the Cherry Point MCAS. County policy supports the implementation of the STIP and the county land use plan lists the US 70 Havelock Bypass as one of several transportation improvements in the County.

Bicycle/Pedestrian Plans

Discussions with the NCDOT Bicycle and Pedestrian Division indicate that currently there are no designated bicycle routes in the project study area. However, the Draft Havelock Comprehensive Transportation/Land Use Plan includes local elements for bicyclists and pedestrians. The Down East Rural Planning Organization (RPO) Bicycle Routes Map (2005) identifies the following potential bike routes in the Havelock area:

US 70 from New Bern to NC 101 - Proposed Regional Bike Route
NC 101 from US 70 to Ferry Road - Proposed Regional Bike Route

NC 101 from Ferry Road to east - Existing State Bike Route
Ferry Road from US 70 north to Neuse River - Existing State Bike Route
Lake Road from US 70 to beyond County Line - Proposed Regional Bike Route
Old Winberry from NC 101 to south - Proposed Regional Bike Route

The Croatan Regional Bike + Trails Plan (NCDOT, 2006) identifies the existing route for the Mountain to Sea Trail as loosely paralleling US 70 west of Havelock through the Croatan National Forest. The trail turns east on SR 1746 (Gray Road), crossing US 70 and continuing eastward on NC 101. The proposed route would utilize an alternate alignment west of the existing route but still within the Croatan National Forest. The existing and proposed Mountain to Sea Trail routes are shown in Exhibit 1.8.1.

To bring the proposed bicycle routes to fruition, demand and priorities must be established and funding provided for signing and improvements such as adequate bicycle lanes to separate bicycle traffic from motor vehicle traffic.

3.1.5 Travel Patterns and Accessibility

US 70 provides connectivity with the Port of Morehead City, Global TransPark, industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and functions as a primary route for seasonal beach traffic. It is also the primary route for local traffic, providing access to Cherry Point MCAS and various commercial destinations along the corridor. Other local routes include Miller Boulevard/NC 101 and SR 1746 (Greenfield Heights Boulevard), a north-south route that parallels US 70 for roughly two miles on the west side of Havelock. Given the limited number of north-south routes in the area, regional and local travel patterns rely on the existing US 70 route through Havelock. The USFS utilizes a number of local and USFS roads to access lands within the CNF. These roads include Pine Grove Road, Hickman Hill Road, Scott Road, SR 1745 (Greenfield Heights Boulevard), Gray Road, J.C. Road, and French Road.

Due to historically high traffic volumes, a number of access management measures are currently in place along existing US 70. These measures include medians and lateral service roads that utilize consolidated, signalized access points; the most recent additions were completed in 2012, as discussed in Chapter 1.8.3. The majority of commercial areas along the corridor are accessed from service roads that parallel US 70.

The *2030 Comprehensive Plan* (URG, 2009) states that although opportunities exist to walk or bicycle, these trips are primarily recreational in nature rather than a means of transportation. The plan notes that many advanced cyclists utilize local rural roads with

low to moderate traffic while others utilize the City's limited sidewalk network and emerging greenway network.

3.2 SOCIOECONOMIC CHARACTERISTICS

The following sections were updated to reflect the most current demographic and economic data contained in the *Community Impact Assessment* (HNTB, 2008), which is incorporated herein by reference (40 CFR 1500.4(j)).

In order to evaluate direct impacts on the surrounding community, a Direct Community Impact Area (DCIA) was developed, which includes the planning project study area shown in Exhibit 1.1.1. The DCIA includes the existing US 70 corridor and the three detailed study alternatives and is generally bounded by the Croatan National Forest to the west, Carolina Pines Boulevard to the north, the East Prong of Slocum Creek and NC 101 to the east, and the Craven/Carteret County line to the south.

To analyze demographic data of the DCIA, a Demographic Study Area (DSA) was developed based on Census boundaries. The DSA encompasses the DCIA and is comprised of 2010 U.S. Census Tracts 9611, 9612.01, 9612.02, 9613.01, and 9613.02 (2000 U.S. Census Tracts and Block Groups: Tract 9611, Block Groups 1, 2, and 3; Tract 9612, Block Groups 1 and 2; and Tract 9613, Block Groups 1 and 2). The DSA is generally bounded to the north by Catfish Lake Road, US 70, and the Neuse River; to the east by Hancock Creek and NC 101; to the south by the Craven/Carteret County line and the Craven/Jones County line; and to the west by the Craven/Jones County line.

Census data was also gathered to determine the socioeconomic characteristics of the City of Havelock, Craven County and North Carolina as a whole. Census data for 2000 and 2010 was compared to determine the changes in the socioeconomic characteristics that occurred in this ten-year period.

3.2.1 Population Characteristics

As noted in the DEIS, the City of Havelock's population grew by 10.7% (2,174 people) between 1990 and 2000. As shown in Table 3.2.1, Havelock's population decreased by 7.6% (1,707 people) between 2000 and 2010. Part of this decrease is attributed to changes in how "temporary assigned duty" (TAD) military personnel and dependents are counted in the 2010 census. In past years, individuals on TAD were counted as part of the population at their base; in 2010, TAD personnel were counted in their home state rather than their base at Cherry Point. This change in reporting methods explains how Havelock could appear to have such a large population decrease despite Cherry Point MCAS adding approximately 3,231 active military and dependents between 2006 and 2009 (Marstel-Day, 2009). In addition, the NC Office of State Budget and Management (OSBM) State

Demographics Branch estimates that Havelock experienced a 1.4% growth (287 people) between April 2010 and July 2011 (OSBM, 2012).

TABLE 3.2.1
POPULATION GROWTH

AREA	POPULATION		GROWTH 2000-2010	
	2000	2010	Difference	% Change
Demographic Study Area	26,504	26,135	-369	-1.39%
Havelock	22,442	20,735	-1,707	-7.61%
Craven County	91,436	103,505	12,069	13.20%
North Carolina	8,049,313	9,535,483	1,486,170	18.46%

SOURCE: US Bureau of the Census, 2010.

Craven County is currently the 27th fastest growing county (out of 100) (NCOSBM, 2011). From 2000 to 2010, Craven County grew by 13.2% (12,069 people), with more than half of this growth (7%, 6,413 people) occurring in New Bern.

Racial Characteristics

The racial composition of the population in Craven County did not change dramatically from 1960 through 1990. During the decade from 1990 to 2000, more significant shifts in the racial composition of the area have taken place. In Havelock, the white population has decreased from 75.3 percent to 70.4 percent. The black population has remained almost constant at 18.5 percent. The other population component has increased from 6.7 percent to 11.0 percent. In Craven County, the trend is also lower percentage white population, lower percentage black population, and higher percentages of other ethnic populations when compared to 1990 Census data. Table 3.2.2 shows the 2010 racial composition of the Demographic Area, the City of Havelock, Craven County, and the State.

With the exception of a few minor differences, race distribution of the DSA was generally similar to that of the City of Havelock, Craven County, and statewide averages, as shown in Table 3.2.2. The percentages of African Americans in the DSA and Havelock are slightly lower than in Craven County and the statewide average. The percentages of White Hispanics in the DSA and Havelock are roughly twice that of Craven County and the statewide average. The higher percentage of White Hispanics may be related to the presence of the Cherry Point MCAS.

Population Characteristics by Gender

Table 3.2.3 shows the male-female ratio in the DSA, City of Havelock, Craven County, and North Carolina. Statewide, the number of females slightly outnumbers males. However, in the DSA and the City of Havelock, the reverse is true with roughly 54% males to 45.5% females.

Although it is more usual to find the number of females slightly outnumbering males, the reverse in the Havelock area is likely the result of the presence of the Cherry Point MCAS.

TABLE 3.2.2
RACIAL AND ETHNIC CHARACTERISTICS (2010)

RACE	DEMOGRAPHIC STUDY AREA		CITY OF HAVELOCK		CRAVEN COUNTY		NORTH CAROLINA	
	Pop.	%	Pop.	%	Race	Pop.	%	Pop.
White	18,927	72.4%	14,513	70.0%	72,441	70.0%	6,528,950	68.5%
White Hispanic	1,434	5.5%	1,233	6.0%	3,016	2.9%	304,955	3.2%
Black or African American	4,198	16.1%	3,611	17.4%	23,193	22.4%	2,048,628	21.5%
Black Hispanic	149	0.6%	136	0.7%	325	0.3%	28,774	0.3%
American Indian/ Alaska Native	186	0.7%	155	0.85%	504	0.5%	122,110	1.3%
American Indian/ Alaska Native Hispanic	29	0.1%	25	0.1%	84	0.1%	13,281	0.1%
Asian	728	2.8%	599	2.9%	2,099	2.0%	208,962	2.2%
Asian Hispanic	23	0.1%	19	0.1%	41	0.1%	2,383	0.02%
Native Hawaiian/Pacific Islander	76	0.3%	68	0.3%	135	0.1%	6,604	0.1%
Native Hawaiian/Pacific Islander Hispanic	9	0.03%	8	0.04%	29	0.03%	1,345	0.01%
Other Race	892	3.4%	824	4.0%	2,361	2.3%	414,030	4.3%
Other Race Hispanic	837	3.2%	778	3.8%	2,236	2.2%	398,942	4.2%
Two or More Races	1,128	4.3%	965	4.7%	2,772	2.7%	206,199	2.2%
Two or More Races Hispanic	233	0.9%	214	1.0%	541	0.5%	50,440	0.5%
Total	***26,135***	***100.0%***	***20,735***	***100.0%***	***103,505***	***100.0%***	***9,535,483***	***100.0%***
Total Hispanic	2,714	10.4%	2,413	11.6%	6,272	6.1%	800,120	8.4%

SOURCE: US Bureau of the Census, 2010.

TABLE 3.2.3
POPULATION CHARACTERISTICS BY GENDER (2010)

	DEMOGRAPHIC STUDY AREA		CITY OF HAVELOCK		CRAVEN COUNTY		NORTH CAROLINA	
	Total	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**
Male	14,040	53.7%	11,371	54.8%	51,492	49.8%	4,645,492	48.7%
Female	12,095	46.3%	9,364	45.2%	52,013	50.3%	4,889,991	51.3%
Total	**26,135**	100.0%	**20,735**	100.0%	**103,505**	100.0%	**9,535,483**	100.0%

SOURCE: US Bureau of the Census, 2010.

Population by Age Group

Table 3.2.4 summarizes the population by age group for the DSA, City of Havelock, Craven County and North Carolina. As indicated in the table, the 15-24 age range comprises the largest percent of residents in the DSA and Havelock and is higher than county and statewide averages. The second largest population is the 25-44 age group, although these percentages are more consistent with county and statewide averages. The number of residents 0-4 is higher than for the DSA and Havelock, while the percent of residents 65+ is considerably lower than county and statewide averages. The distribution of age data, particularly the high percentages in the 0-4 and 15-24 age groups is likely due to the presence of young military personnel and dependents.

TABLE 3.2.4
POPULATION BY AGE GROUP (2010)

AGE	DEMOGRAPHIC STUDY AREA		HAVELOCK		CRAVEN COUNTY		NORTH CAROLINA	
	Number	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
0-4	2,752	10.5%	2,363	11.4%	7,681	7.4%	632,040	6.7%
5-14	3,278	12.5%	2,591	12.5%	12,747	12.3%	1,267,049	13.3%
15-24	7,301	27.9%	6,660	32.1%	16,282	15.7%	1,321,164	13.9%
25-44	6,789	26.0%	5,438	26.2%	25,044	24.2%	2,573,744	27.0%
45-64	4,355	16.7%	2,812	13.6%	25,941	25.1%	2,507,407	26.3%
65+	1660	6.4%	871	4.2%	15,810	15.3%	1,234,079	12.9%
TOTAL	**26,135**	**100.0%**	**20,735**	**100.0%**	**103,505**	**100.0%**	**9,535,483**	**100.0%**

SOURCE: US Bureau of the Census, 2010.

Educational Attainment

As shown in Table 3.2.5, educational attainment for residents within the DSA and Havelock is generally comparable to Craven County and statewide averages, although percentages for those with less than a high school education is considerably lower than the county and

statewide averages. The percentages of those with some college and associates degrees are higher for the DSA and Havelock, while those with bachelors degrees are slightly lower for the DSA and Havelock.

TABLE 3.2.5
EDUCATIONAL STATUS (2011)

EDUCATIONAL ATTAINMENT FOR AGES 25+	DEMOGRAPHIC STUDY AREA	HAVELOCK	CRAVEN COUNTY	NORTH CAROLINA
	% of Population	% of Population	% of Population	% of Population
< High School	6.6%	5.9%	12.5%	15.9%
High School	29.3%	28.4%	28.1%	27.7%
Some College	36.5%	40.9%	28.1%	21.4%
Associates Degree	11.8%	11.7%	10.3%	8.5%
Bachelors Degree	11.2%	10.2%	14.4%	17.7%
Graduate/Professional Degree	4.6%	2.9%	6.7%	8.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

SOURCE: US Bureau of the Census, 2007-2011 American Community Survey (ACS) 5-Year Estimates.

Housing Characteristics

The US Bureau of the Census (USBOC) defines a household as a single house, apartment, or other housing unit that is intended for occupancy (i.e., mobile home). As shown in Table 3.2.6, between 2000 and 2010, the number of households in the DSA grew by 6.6% (518 households) and the number of households in Havelock decreased by 0.03% (2 households). The percent growth for the DSA is consistent with growth from 1990 to 2000 (6.9%), as shown in the DEIS; however, the decrease in households within Havelock differs from the previous decade's growth (13.2%) between 1990 and 2000. As previously mentioned, this decrease is attributed to changes in how "temporary assigned duty" (TAD) military personnel were counted in the 2010 census. In past years, individuals on TAD were counted as part of the population at their base; in 2010, TAD personnel were counted in their home state rather than their base.

Census data on vacant housing units indicates that the number of vacant houses in Havelock increased by 29 houses between 2000 and 2010. Although an increase, the percent of vacant houses remained relatively stable during the same period, increasing only 0.4% from 5.5% to 5.9%. If the City had genuinely experienced a 1,707-person net decrease in population, it is reasonable to assume that the number of vacant houses would have increased proportionately. In addition, Havelock vacancy rates are consistently lower than county and state percentages. Craven County's current vacancy rate is 10.5%; the statewide vacancy rate is 13.5%.

TABLE 3.2.6
HOUSEHOLD GROWTH (2000-2010)

AREA	HOUSEHOLDS			GROWTH, 2000-2010	
	1990	2000	2010	Difference	% Change
Demographic Area	7,498	8,019	8,537	518	6.56%
Havelock	5,661	6,411	6,409	-2	-0.03%
Craven County	29,542	34,582	40,299	5,717	16.53%
North Carolina	2,517,026	3,132,013	3,745,155	613,142	19.58%

NOTES: The decrease in the number of households in Havelock is attributed to changes in how "temporary assigned duty" (TAD) military personnel were counted in the 2010 census. In past years, individuals on TAD were counted as part of the population at their base; in 2010, TAD personnel were counted in their home state rather than their base.

As shown in Table 3.2.7, homeownership rates in the DSA and Havelock slightly increased between 2000 and 2010. Conversely, total homeownership in Craven County decreased, which is more consistent with the statewide average and more reflective of nationwide trends in recent years.

TABLE 3.2.7
HOMEOWNERSHIP RATE (2000-2010)

AREA	RATE (%)			CHANGE, 2000-2010	
	1990	2000	2010	% Difference	% Change
Demographic Study Area	39.60	45.53	47.73	2.20	4.83
Havelock	29.80	37.90	40.34	2.44	6.44
Craven County	63.30	66.70	58.50	-8.20	-12.29
North Carolina	68.00	69.40	57.72	-11.68	-16.83

SOURCE: US Bureau of the Census, 2010.

In 2010, the median home value for the DSA is notably higher than those for Havelock, Craven County, and statewide. This is a departure from the 2000 DSA median values which are more comparable to Havelock and county median values and lower than the statewide median. Median home values and structure ages are shown in Table 3.2.8.

TABLE 3.2.8
MEDIAN HOME VALUE AND YEAR STRUCTURE BUILT

AREA	2000 MEDIAN VALUES		2010 MEDIAN VALUES	
	Value	Year Built	Value	Year Built
Demographic Area	$84,886	1976	$198,333	1980
Havelock	$81,700	1974	$140,000	1984
Craven County	$86,100	1979	$154,700	1984
North Carolina	$95,800	1978	$152,700	1984

SOURCE: US Bureau of the Census, 2010.

3.2.2 Employment and Economic Characteristics

Table 3.2.9 shows the employment growth by industry sector for Craven County between 1990 and 2006. With the exception of Retail Trade, Management, Healthcare/Social Assistance, and Arts/Entertainment/Recreation, employment numbers decreased in each category between 2006 and 2011, although many categories appear to be stabilizing or adding jobs in more recent years. Between 2006 and 2010, 1,717 jobs in manufacturing were lost county wide; however, 29 manufacturing jobs were created between 2010 and 2011 and employment data for the first quarter of 2012 indicates that 139 manufacturing jobs were added in Craven County (NCDC, 2012). Similar conditions were observed for Transportation/Warehousing, which added 226 jobs between 2010 and 2011 and 267 during the first quarter of 2012 (NCDC, 2012). Other employment sectors, in particular public administration and construction, are not experiencing any leveling or increases.

Public administration jobs were reduced by 165 between 2010 and 2011 and 172 more jobs were lost in the first quarter of 2012 (NCDC, 2012). In the construction sector, 66 jobs were lost from 2010 to 2011 and 31 jobs lost in the first quarter of 2012 (NCDC, 2012). Based on the first quarter of 2012, the number of total jobs in Craven County is increasing. Although 3,305 jobs were lost between 2010 and 2011, 1,069 jobs were added in the first three quarters of 2012.

The Department of Defense is the top employer in Craven County (over 10,000 employees), followed by Craven County Schools, and Craven Regional Medical Center, which employ 1,000+ employees each. Cherry Point MCCS Trade, Walmart, Bosch Home Appliances Corporation, Craven County Public Administration, and Moen Incorporated all employ 500+ employees each (NCDC, 2011).

Unemployment

According to the Employment Security Commission of North Carolina, the unemployment rate in 2008 for Craven County (6.1%) was comparable to the State of North Carolina (6.3%) as a whole. In 2006, before the recent economic downturn, the unemployment rate in Craven County (4.4%) was also comparable to the State of North Carolina (4.7%) as a whole. There was a decrease in the unemployment rate from 1990 to 2006 for Craven County. The largest closing, at Jasper Textiles, Inc. in Havelock, involved the loss of approximately 170 jobs. Employment at the Naval Aviation Depot in Havelock also decreased by 24 employees during this time period.

Since 2006, Craven County's unemployment rate has been within 0.5% of statewide averages; in December 2012 Craven County's unemployment rate was 10%, 0.5% higher than the 9.5% statewide average. Similar to the statewide trend, Craven County also experienced a decrease in unemployment in 2012, although not as large a decrease as the statewide average. Table 3.2.10 shows county and statewide annual unemployment rates.

TABLE 3.2.9
EMPLOYMENT BY SECTOR FOR CRAVEN COUNTY

SECTOR	HISTORICAL DATA					2010	2011	CHANGE 2006-11 #	%
	1990	2000	2001	2002	2006				
Agriculture, Forestry, Fishing & Hunting	355	505	465	484	414	285	268	-146	-35.27%
Mining	68	*	*	*	57	49	53	-4	-7.02%
Utilities	97	78	77	74	105	109	108	3	2.86%
Construction	1,564	1,907	1,891	1,709	1,774	1,338	1,272	-502	-28.30%
Manufacturing	3,608	4,622	4,612	4,405	4,837	3,120	3,149	-1688	-34.90%
Wholesale Trade	907	957	862	886	898	859	791	-107	-11.92%
Retail Trade	4,481	5,012	4,803	4,614	4,706	4,951	5,117	411	8.73%
Transportation and Warehousing	675	1,136	1,287	1,321	1,420	940	1,127	-293	-20.63%
Information	690	728	766	748	613	473	453	-160	-26.10%
Finance and Insurance	683	682	677	706	699	716	627	-72	-10.30%
Real Estate and Rental and Leasing	224	479	319	322	371	322	314	-57	-15.36%
Professional and Technical Services	1,095	1,524	1,530	1,590	1,743	1,831	1,673	-70	-4.02%
Management	*	70	72	75	105	138	134	29	27.62%
Administrative and Waste Services	691	1,915	1,654	1,753	2,237	1,750	1,671	-566	-25.30%
Educational Services	*	2,692	2,766	2,725	2,767	2,798	2,727	-40	-1.45%
Health Care and Social Assistance	3,033	5,194	5,130	5,228	6,260	6,517	6,328	68	1.09%
Arts, Entertainment, and Recreation	809	522	530	522	545	577	591	46	8.44%
Accommodation and Food Services	1,999	2,892	2,911	3,052	3,497	3,500	3,469	-28	-0.80%
Other Services, Excl. Public Administration	833	1,089	1,059	1,044	1,119	901	875	-244	-21.81%
Public Administration	6,354	7,603	7,631	7,479	7,083	6,904	6,739	-344	-4.86%
Unclassified	11,026	*	*	*	150	17	*	N/A	N/A
Total**	**39,192**	**39,607**	**39,042**	**38,737**	**41,400**	**38,095**	**37,486**	**-3914**	**-9.45%**

Source: North Carolina Employment Security Commission (NCESC).
* - Indicates disclosure suppression; N/A – Not Applicable; ** - 1990 & 2006 total does not include data for * sectors

TABLE 3.2.10
ANNUAL UNEMPLOYMENT RATES
(Not Seasonally Adjusted)

YEAR	CRAVEN COUNTY ANNUAL UNEMPLOYMENT RATES	STATEWIDE ANNUAL UNEMPLOYMENT RATES
2002	6.0	6.6
2003	5.7	6.5
2004	4.8	5.5
2005	4.7	5.3
2006	4.4	4.8
2007	4.3	4.8
2008	6.1	6.3
2009	10.3	10.5
2010	11.0	10.9
2011	11.0	10.5
2012	9.9*	8.4*

SOURCE: US Department of Labor, Bureau of Labor Statistics, 2013.
NOTES: 2012 unemployment rate is average of not seasonally adjusted rates for January 2012 through November 2012.

Income and Poverty

As shown in Table 3.2.11, over the last two decades, the median household income for the DSA has growth at a higher rate than the City of Havelock, Craven County or the statewide median. Although median incomes for Havelock and Craven County have grown from being below to within close range of the statewide median, the DSA median exceeds other median values, which have grown at slower rates.

TABLE 3.2.11
MEDIAN HOUSEHOLD INCOME

AREA	HOUSEHOLD INCOME			GROWTH, 1999-2011	
	1989	1999	2011	DIFFERENCE	% CHANGE
Demographic Study Area	$25,783	$36,406	$51,970	$15,564	42.75%
Havelock	$24,553	$35,351	$46,681	$11,330	32.05%
Craven County	$25,619	$35,966	$46,251	$10,285	28.60%
North Carolina	$26,647	$39,184	$46,291	$7,107	18.14%

SOURCE: US Bureau of the Census, 2007-2011 American Community Survey (ACS) 5-Year Estimates.

The U.S. Census Bureau employs a set of income thresholds that vary by the size and composition of a family to determine poverty status. These thresholds are not based on geographic boundaries and are adjusted for inflation. The thresholds are also based on income before taxes, and do not include any capital gains or non-cash benefits such as public assistance. In addition, those people living in military barracks or institutional group homes are not included in the poverty statistics.

As shown in Table 3.2.12, the percentage of the DSA population that lived below the poverty level was 10.0% percent in 1989, the lowest of any of the other areas studied. In 1999, the poverty rate for the DSA decreased to 8.7%. The percentages of impoverished persons living in the DSA and Havelock between 1989 and 1999 experienced greater decreases than either the County or the State; conversely, these groups experienced overall increases between 1999 and 2011 while county and statewide poverty rates decreased.

TABLE 3.2.12
POVERTY LEVELS

AREA	% BELOW POVERTY LEVEL			CHANGE, 1999-2011	
	1989	1999	2011	DIFFERENCE	% CHANGE
Demographic Study Area	10.00%	8.70%	12.60%	3.90%	44.83%
Havelock	10.50%	8.60%	13.20%	4.60%	53.49%
Craven County	13.60%	13.10%	12.00%	-1.10%	-8.40%
North Carolina	13.00%	12.30%	11.80%	-0.50%	-4.07%

SOURCE: US Bureau of the Census, 2007-2011 American Community Survey (ACS) 5-Year Estimates.

Table 3.2.13 summarizes the socioeconomic data analyzed for the City of Havelock, Craven County and the state. A review of the Census data shows that as population grew, the total number of housing units in Craven County and Havelock increased. During this same period, the civilian labor force increased from 37,733 to 44,018 in Craven County and from 6,801 to 7,275 in the City of Havelock. This increase can be attributed to rebounding business opportunities in the area.

The percentage of employees commuting out of the county has remained relatively consistent over the last two decades.

3.2.3 Neighborhoods and Community Cohesion

The presence of the Cherry Point MCAS has created both on and off-base military neighborhoods throughout the Havelock area. A large concentration of the off-base military housing is adjacent to the east side of existing US 70. The military neighborhoods in Havelock are a mix of single and multi-family housing units in relatively well defined locations. Other neighborhoods within the area are comprised of one and two-story single family houses not related to the MCAS. These neighborhoods are located off US 70 near Hollywood Boulevard, Carolina Pines Drive, Webb Boulevard, and on Hickman Hill Loop Road. Some of the infill development in these neighborhood areas includes apartments, manufactured housing, or multi-family townhouses.

TABLE 3.2.13
SOCIOECONOMIC DATA SUMMARY

Category	City of Havelock			Craven County			North Carolina		
	1990	2000	2010	1990	2000	2010	1990	2000	2010
Total Population	20,268	22,442	20,735	81,613	91,436	103,505	6,628,637	8,049,313	9,535,483
Total Housing Units	6,096	6,783	6,810	32,293	38,150	45,002	2,818,193	3,523,944	4,327,528
Median Household Income	$24,553	$35,351	$46,681	$25,619	$35,966	$46,251	$26,647	$39,184	$46,291
Per Capita Income	$9,204	$15,586	$21,313	$11,619	$18,423	$25,067	$12,885	$20,307	$25,256
Labor Force									
Armed Forces	6,352	6,335	4,533	7,383	7,097	5,856	118,432	90,847	87,592
Civilian	4,435	6,801	7,275	31,305	37,733	44,018	3,401,495	4,039,732	4,697,392
TOTAL	*10,787*	*13,136*	*11,808*	*38,688*	*44,830*	*49,874*	*3,519,927*	*4,130,579*	*4,784,984*
Unemployed	617	405	771	2,143	2,008	4,739	163,081	214,991	455,742
Percent of Civilian Unemployed	12.20%	6.00%	5.00%	6.40%	5.30%	5.90%	4.80%	5.30%	6.10%
Workers Working Outside of County	--	--	--	4,036	5,879	6,343	--	--	--
Percent Working Outside County	--	--	--	12.90%	13.10%	12.71%	--	--	--

Source: U.S. Census Bureau
NOTES: The decrease in the number of households in Havelock is attributed to changes in how "temporary assigned duty" (TAD) military personnel were counted in the 2010 census. In past years, individuals on TAD were counted as part of the population at their base; in 2010, TAD personnel were counted in their home state rather than their base.

Areas of community cohesion are not widespread throughout the western portion of the project study area. Neighborhoods within the western portion of the project study area are limited to the Norris Mobile Home Village on Gray Road, Greenfield Mobile Estates on SR 1747 (Sunset Drive), and several neighborhoods connecting to SR 1756 (Lake Road) east of the proposed interchange.

Residential uses in this portion of the project study area are typically a mix of single-family houses and manufactured homes lining rural routes through the area. These areas border the CNF and are set adjacent to forests and fields typical of rural areas.

The majority of houses within the city and its extraterritorial area are more than 30 years old. However, the military is remodeling some of its older housing adjacent to US 70. Many new houses are being constructed as developers are trying to keep up with the demand for housing. Newer subdivisions are Wolfcreek, Stonebridge, Foxcroft, Hunters Landing, and Tucker Creek. None of these subdivisions are in the immediate vicinity of the project.

3.2.4 Title VI of the 1964 Civil Rights Act and Environmental Justice

Title VI of the Civil Rights Act of 1964 (42 USC 2000(d)-2000(d)(1) Section 601 to 603) and related statutes, require there be no discrimination in Federally-assisted programs on the basis of race, color, national origin, age, sex, or disability. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (Federal Register Vol. 59, No. 32, February 16, 1994), provides that "each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its program, policies, and activities on minority populations and low-income populations." It also directs agencies to ensure that representatives of an affected community have every opportunity to provide input regarding the impact of the proposed project.

Environmental justice refers to the equitable treatment of people of all races, cultures, and incomes with respect to development, implementation and enforcement of environmental laws, regulations and policies. In addition, the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment (ICOGP) has identified vulnerable elements of the population to include the elderly, children, the disabled, and members of low-income and minority groups. These special populations based on the ICOGP definitions, and those set forth in Title VI of the Civil Rights Act of 1964 and Executive Order 12898, have been identified to ensure that the project is not disproportionately impacting or disproportionately denying benefits of the project.

The Council on Environmental Quality (CEQ) has oversight of the Federal government's compliance with Executive Order 12898. CEQ has developed guidance to further assist agencies with their procedures so that environmental justice concerns are effectively identified and addressed. Based on the CEQ guidance, minority populations should be identified where either: (a) the minority population of the affected area exceeds 50% or (b) the minority population percentage of the affected area is meaningfully greater than the minority population in the general population or other appropriate unit of geographic analysis. The North Carolina Department of Transportation (NCDOT) defines "meaningfully greater" as being ten percentage points higher than the county average. Low-income populations, based on CEQ guidance, should be identified with the annual statistical poverty thresholds from the United States Census Bureau's Current Population Reports (Series P-60 on Income and Poverty) (US Census Bureau, 2005).

According to the 2010 Census for the DSA, City of Havelock, and Craven County, minority percentages are 27.6%, 30%, and 30%, respectively. These total minority percentages are slightly lower than the state average of 31.5%.

According to school information from the National Center for Education Statistics (NCES, 2012), minority and low-income populations are found in areas schools, as evidenced by race data and the percent of students eligible for free or reduced-price lunches. Minority and lunch-eligibility percentages are as follows: Roger R. Bell Elementary School (64.8% minority, 65.7% free or reduced-price lunch eligible), Havelock Elementary (65.9% minority, 59.8% free or reduced-price lunch eligible), Havelock Middle School (57.5% minority, 60.9% free or reduced-price lunch eligible), and Havelock High School (47.6% minority, 9.9% free-lunch eligible).

As noted in Chapter 3.2.1, the percentages of African Americans in the DSA and Havelock are lower than county and statewide averages. The percentages of Hispanics in the DSA and Havelock (10.4% and 11.6% respectively) are higher than county (6.1%) and statewide (8.4%) averages. The percentage of Asians in the DSA and Havelock is less than 3% but nearly twice that of Craven County and the state. The broader stratification of ethnicity is most likely related to the military portion of the population.

Upon examination of the 2010 Census data at the block level, a few trends concerning race were noted. Census tracts with the highest levels of minority population are primarily located in the more developed areas of the City of Havelock and surrounding Cherry Point MCAS (MCAS). The area surrounding Hickman Hill Road is predominantly African-American. The DSA has higher percentages of Hispanics than Craven County populations.

Block Groups within the DCIA have higher percentages of Hispanic persons than Craven County. Census Tract 9613, Block Group 4 (10.4 percent Hispanic) and Census Tract 9612, Block Group 1 (11.1 percent Hispanic) each have Hispanic populations more than double the County average. Both of these Block Groups border the existing US 70 corridor and are in close proximity to Cherry Point MCAS.

Local officials indicated one home for the elderly exists within the area (Britthaven of Havelock along McCotter Boulevard) and a Havelock Senior Citizens Center has been proposed for the former post office building along Trader Avenue. There is also a large youth population (15 to 24 years old) in Havelock. This is likely resulting from the presence of the Cherry Point MCAS.

Although the proposed project is principally in undeveloped areas west of Havelock, residential communities are present along SR 1756 (Lake Road), SR 1746 (Gray Road), and SR 1747 (Sunset Drive). Site investigations and discussions with local officials did not reveal any notable presence of populations subject to environmental justice considerations in these communities. Site investigations have identified the previously mentioned African-American neighborhood at Hickman Hill Road, which is located adjacent to existing US 70 near the northwestern terminus of the proposed project. None of the properties within this neighborhood are affected by the bypass study corridor.

Two Block Groups, east of existing US 70 and close to the center of the City, were determined to have a lower median income than the remainder of the DCIA. One of these had 20.5% of residents living below the poverty level. Three low-income areas exist within the DCIA including the Lynnwayne Circle area (east of existing US 70), the Belltown Apartments (along Belltown Road west of US 70), and Manteo Circle (a public housing facility run by the Eastern Carolina Regional Housing Authority located at the intersection of Manteo Circle and High School Drive, east of existing US 70).

This assessment reveals the presence of population groups subject to environmental justice considerations in the DSA; however, this assessment also indicates these populations are located in the developed areas of Havelock near the Cherry Point MCAS, along and east of existing US 70. No population groups subject to environmental justice considerations were noted within close proximity to the proposed project.

Two Citizens Informational Workshops and a Corridor Public Hearing have been conducted to present the proposed project to the public and obtain both written and spoken information and comments from all attending. Comment sheets were provided at all three of these public meetings, for those attending and for attendees to distribute to any concerned citizens who could not attend. Copies of the meeting handouts with project

information and comment sheets were also made available through mailings and at local facilities.

3.2.5 Access to Services for Persons with Limited English Proficiency (LEP)

Executive Order 13166 "Improving Access to Services for Persons with Limited English Proficiency" requires all recipients of federal funds to provide meaningful access to persons who are limited in their English proficiency (LEP). The US Department of Justice defines LEP individuals as those "who do not speak English as their primary language and who have a limited ability to read, write, speak, or understand English" (67 FR 41459). Data about LEP populations was gathered in the Census Bureau's 2007-2011 American Community Survey (ACS). Due to the higher average percent of Hispanics in the DSA and in Havelock, a Limited English Proficiency (LEP) assessment was conducted of the population in the Demographic Area. Table 3.2.14 illustrates the LEP population of the total adult population 18 years of age or older.

TABLE 3.2.14
LIMITED ENGLISH PROFICIENCY (LEP) POPULATION

Block Group	Total Adult Pop.	Primary Language Group of Persons Who Speak English Less than Very Well								Total LEP	
		Spanish		Other Indo-Euro		Asian/Pacific		Other			
		#	%	#	%	#	%	#	%	#	%
CT 9611, BG 1	1,877	9	0.5%	0	0%	5	0.3%	0	0%	14	0.7%
CT 9611, BG 2	1,491	38	2.5%	0	0%	19	1.3%	0	0%	57	3.8%
CT 9611, BG 3	1,336	35	2.6%	0	0%	29	2.2%	0	0%	64	4.8%
CT 9612, BG 1	7,918	127	1.6%	16	0.2%	68	0.9%	20	0.3%	231	2.9%
CT 9613, BG 1	627	0	0%	0	0%	23	3.7%	0	0%	23	3.7%
CT 9613, BG 2	1,066	6	0.6%	8	0.8%	14	1.3%	0	0%	28	2.6%
CT 9613, BG 3	1,192	0	0%	0	0%	13	1.1%	0	0%	13	1.1%
CT 9613, BG 4	1,246	0	0%	0	0%	20	1.6%	0	0%	20	1.6%
CT 9613, BG 5	2,555	30	1.2%	0	0%	39	1.5%	0	0%	69	2.7%
DA Aggregate	**19,308**	**245**	**1.3%**	**24**	**0.1%**	**230**	**1.2%**	**20**	**0.1%**	**519**	**2.7%**
Craven County	27,818	905	3.3%	61	0.2%	384	1.4%	43	0.2%	1,393	5%

There are no language groups within the DA in which more than five percent of the population or 1,000 persons speak English less than "Very Well." Within the DSA, 694 people, approximately three percent of the DSA population speak English less than very well. Therefore, demographic assessment does not indicate the presence of LEP language groups that exceed the Department of Justice's Safe Harbor threshold. However, NCDOT will include notice of Right of Language Access for future meetings for this project. Thus, the requirements of Executive Order 13166 appear to be satisfied.

3.3 COMMUNITY FACILITIES

3.3.1 Community Facilities and Services

Havelock has no established or traditional downtown area. Much of the government and public services are located in the vicinity of existing US 70 (Main Street) and SR 1735 (Cunningham Boulevard). The Havelock City Hall is located east of existing US 70 off of Cunningham Boulevard. The Havelock Post Office and the Havelock Tourist & Event Center are both located along existing US 70. The Craven County Public Library and Craven County Community College are located along Cunningham Boulevard east of existing US 70. These facilities are shown in Exhibit 3.3.1.

3.3.2 Parks & Recreation Facilities

The City of Havelock's Parks and Recreation Department manages two facilities available to the residents of the Havelock area. These are City Park and the Recreation Center (at the intersection of US 70 and Cunningham Boulevard) and adjoining Walter B. Jones Park, 50-acre athletic complex, off NC 101 beside the Roger Bell Elementary School, shown in Exhibit 3.3.1.

The Croatan National Forest (CNF) offers recreational opportunities but has no designated recreational areas in the immediate study area, although it is open for a wide range of dispersed recreations activities such as wildlife watching and fishing. The nearest designated recreational area is Fishers Landing along the Neuse River, just north of Havelock. According to the *Croatan National Forest Final Environmental Impact Statement* (USDA, 2002), "much of the recreation opportunities within the CNF occur on significant bodies of water within a few miles of the Atlantic Ocean; and most of these waters have a tidal influence. These tidal waters are among the most important aspects of recreation on the CNF."

A recreational analysis of the proposed project on the CNF was conducted by the U. S. Forest Service. This analysis noted visitors to the CNF within the project study area are predominantly engaged in dispersed recreational activities such as hunting, hiking, fishing, and wildlife and bird watching. Although primitive camping is allowed in this part of the CNF, the area affected by the proposed bypass is not currently designated as a public recreation area. Analysis of the detailed study alternatives indicates no designated wildernesses, wild or scenic rivers, or other specially designated recreational areas within the CNF that might be impacted by the proposed project.

The Carolina Pines County Club and the Cherry Point Marine Corps Air Station both operate 18-hole golf courses in the Havelock vicinity.

The nearby Neuse River and the Atlantic Ocean afford many water-related recreational opportunities to area residents. A public boat launch is located along the northern branch of Slocum Creek just west of existing US 70.

3.3.3 Schools

There are eight public schools in the City of Havelock, including five elementary schools (grades K-5), two middle schools (grades 6-8) and one high school (grades 9-12), as shown in Exhibit 3.3.1. All of these schools except one, the Gurganus Elementary School, are located on the northeastern side of existing US 70. The Gurganus Elementary School is located approximately 0.2 miles west of the US 70 and SR 1746 (Greenfield Heights Boulevard) intersection. The Tucker Creek Middle School is located north of the City of Havelock. Although this facility is not located in the project study area, it has access to existing US 70 at the SR 1760 (Hickman Hill Loop Road) intersection at the northern end of the study area. In addition to the eight public schools, two parochial schools serve the Havelock Community - Annunciation Catholic School (K-8) and Liberty Christian (K-12). To serve the local schools in 2008, there were 40 school bus routes that used existing US 70 in the project study area twice daily.

3.3.4 Churches

The City of Havelock has approximately thirty-five churches serving many denominations. Although most of these churches are located closer to the center of the City, one church, the Lake Road Baptist Church (formerly Crystal Pines Baptist Church) is located along Lake Road in the project study area, as shown in Exhibit 3.3.1.

3.3.5 Civic and Fraternal Organizations

There are no civic or fraternal organizations located in the Havelock Bypass study area.

3.3.6 Emergency Response Services (Police, Fire & Emergency Services)

The Havelock Police Department and four emergency response facilities are located along the US 70 corridor, as shown in Exhibit 3.3.1. The service areas for these facilities encompass 220 square miles within Havelock and surrounding areas. The Havelock Fire Department consists of 18 employees and 40 volunteers. The MCAS fire station and the Havelock police, fire, and EMS services are mutually supporting.

3.3.7 Hospitals, Nursing Homes, Daycares

Carolina East Health Systems in New Bern and Carteret General Hospital in Morehead City are area's two primary medical centers. With the exception of services provided for military at Cherry Point MCAS, there is no hospital in Havelock. Beachcare Urgent Care Center is located along existing US 70 south of the NC 101 intersection. The Britthaven Nursing Home is located on the east side of the US 70 corridor, south of NC 101 and Cherry Point MCAS.

3.4 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act (36 CFR 800) requires federal agencies to consider the effects of their undertakings on historic properties and to allow the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the proposed action. Historic properties protected under Section 106 include prehistoric [archeological] or historic districts, sites, buildings, structures, or objects included in or eligible for inclusion in the National Register of Historic Places.

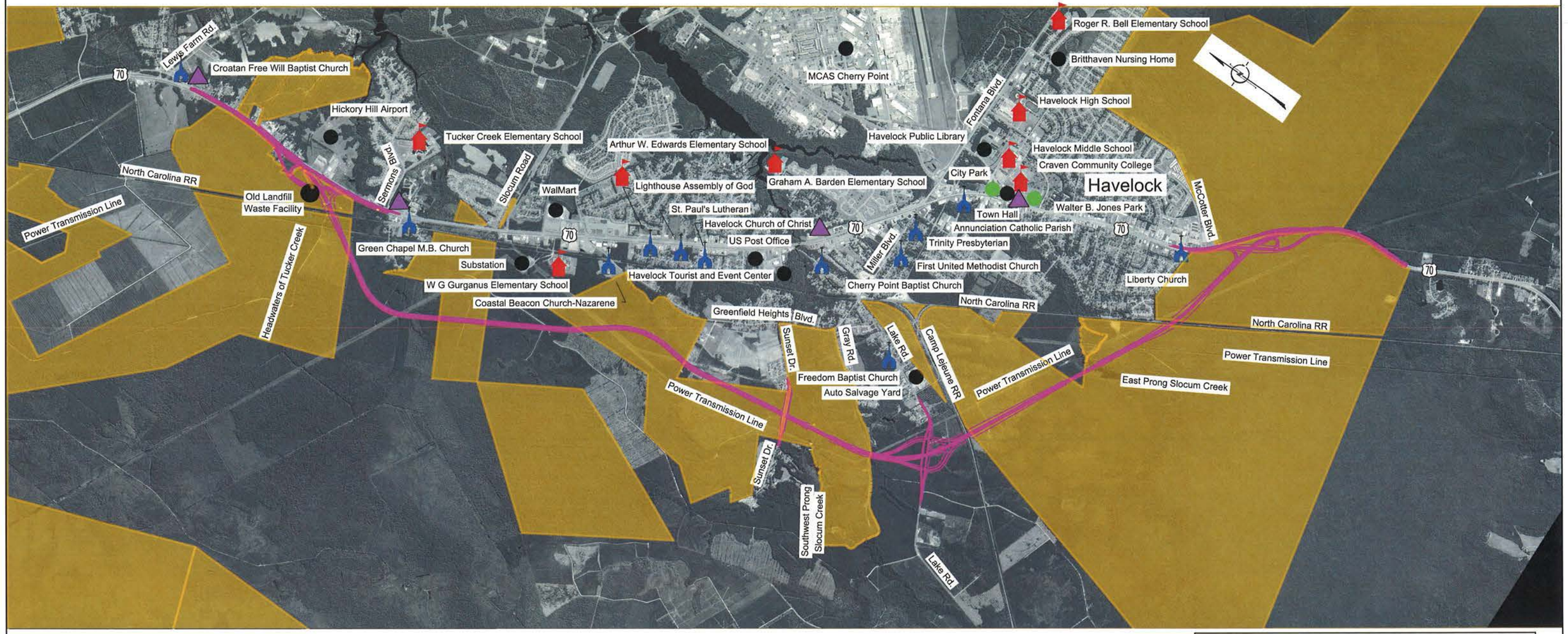
Section 4(f) of the US Department of Transportation Act requires consideration of historic sites that are eligible for listing or listed on the National Register of Historic Places. Additional Section 4(f) resources within the project study area are discussed in Chapter 3.5.

To address Section 106 requirements, cultural resources investigations were undertaken to identify important historic architectural and archaeological resources within the project study area. Several reports were prepared during the course of the project, including *An Architectural Resources Survey and Evaluations for the US 70, Proposed Havelock Bypass* (NCDOT, 1993), *Archaeological Background Report, US 70 Havelock Bypass* (Smith, 1997), and *An Intensive Archaeological Survey of the Preferred Corridor for the US 70 Havelock Bypass* (NCDOT, 2000) are available for review at the North Carolina Department of Transportation in Raleigh, North Carolina. In the project vicinity, one historic architectural property was identified, seven previously recorded archaeological sites were located, and fifteen previously unrecorded archaeological sites were discovered.

3.4.1 Historic Architectural Resources

A historic architectural resources survey was conducted in accordance with Section 106 of the National Historic Preservation Act of 1966 and guidelines set forth by the NCDOT and the North Carolina State Historic Preservation Office (SHPO). The survey was conducted in two phases. In September 1992, a reconnaissance survey was conducted, and in August 1993, a determination of the Area of Potential Effect (APE) was made and identified properties in the APE were evaluated. One property within the APE was identified as potentially-eligible for the National Register of Historic Places.

Property:	The Needham B. White House
Location:	Southwest side of existing US 70, at junction with SR 1737 (Roosevelt Boulevard)
Date:	ca. 1840
Style:	Vernacular Federal
Description:	A story-and-a-half, three-bay-wide frame dwelling with a side-gable roof, stepped single-shoulder, gable-end chimneys of five-to-one common bond brick, and symmetrically-arranged doors and windows.



Legend

- Church
- School
- Community Facility/Service
- Parks
- Fire/Rescue
- National Forest System Land on the Croatan National Forest

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Community Facilities
Scale: 1" = 1 mile
Exhibit 3.3.1

This page intentionally left blank to facilitate double-sided printing.

On December 5, 2006, the NCDOT, FHWA, and the SHPO met for a consultation to discuss impacts associated with the proposed project. Furthermore, there are no properties within the APE which are considered to have achieved historic significance within the past 50 years.

3.4.2 Archaeological Resources

A staged archaeological background study and field reconnaissance of the study alternatives, entitled *Archaeological Background Report US 70 Havelock Bypass* (Greg C. Smith, 1997) was conducted for the US 70 Havelock Bypass. The purpose of the background work was to provide a framework and general understanding of the types of archaeological resources in the project vicinity. Maps, historical documents, and information about local history in the Croatan National Forest Ranger station, State Archives, Duke University's Special Collections, the Southern Historical Collection, the University of North Carolina's North Carolina Collection, North Carolina State University, New Bern Public Library, and the New Bern Historical Society were consulted.

The background study revealed no sites listed in or eligible for listing in the National Register of Historic Places (Smith, 1997). The study noted twenty previously-recorded archaeological sites within the project study area. Seven of these previously-recorded archaeological sites (31CV62, 31CV163**, 31CV164**, 31CV166**, 31CV168, 31CV169**, and 31CV170**) are located within the proposed corridors. Of these, only two sites (31CV164** and 31CV170** both located on National Forest System lands) were recommended for further testing to determine if they are eligible for listing. Most of the previously-recorded sites in the project vicinity are small, often nondiagnostic prehistoric and late 19th/early 20th century sites. The majority (55 percent) of the sites are earthen tar kilns located in poorly-drained areas, while 15 percent of the sites represent small Woodland Period sites situated in well-drained areas near a permanent water source. This study was provided to both the North Carolina Deputy State Historic Preservation Officer and the U.S. Forest Service, National Forests in North Carolina's Heritage Resources Staff Director (See the North Carolina Deputy State Historic Preservation Officer letter dated May 15, 1997 and the U.S. Forest Service, National Forests in North Carolina's Heritage Resources Staff Director letter dated June 11, 1997 in DEIS Appendix A.1 and A.2).

Based upon previous archaeological work in Craven County and results of the background study and project status at the time, an intensive terrestrial archaeological survey of the high probability soil within the Alternative 3 (the Preferred Alternative) Area of Potential Effect (APE = 327 acres) was conducted in 1999 (Smith et al. 2000). The NCDOT and FHWA coordinated with the SHPO and USFS to develop a mutually satisfactory Scope of Work for this terrestrial survey. As a result, 15 previously unrecorded archaeological sites were discovered. Subsurface testing demonstrated that 14 of the sites do not exhibit

characteristics that would make them eligible for listing in the National Register of Historic Places (NRHP). However, one site, 31CV302, located on National Forest System lands was found to contain intact subsurface deposits that have the potential to contribute new information regarding regional prehistory; therefore, Site 31CV302 is recommended as eligible for the NRHP per Criterion D. Two previously recorded archaeological sites (31CV164** and 31CV170**) were found and evaluated during the course of the intensive survey. Site 31CV164** was investigated and recommended as not eligible for the NRHP.

Site 31CV170** was not fully assessed because its location was considered outside the project limits; however, it was recommended as eligible for the NRHP per Criterion A according to its archaeological site form on file at the Office of State Archaeology. In a letter dated December 22, 2004, the SHPO concurred with these findings (see DEIS Appendix A.2).

Two cemeteries (Rowe Family Cemetery [Site 31CV300**] and Wynne Family Cemetery [31CV301**] neither located on National Forest System lands) have been recorded within the project vicinity. Based on current design plans, neither cemetery is located within the Area of Potential Effect. If design plans change prior to construction and avoidance is no longer possible, then relocation in accordance with existing State statutes is appropriate.

3.5 SECTION 4(F) AND SECTION 6(F) RESOURCES

Section 4(f) of the US Department of Transportation Act (the Act) provides protection for publicly owned parks, recreation areas, and wildlife and waterfowl refuges as well as significant historic sites. Historic sites protected by this regulation include sites that are eligible for listing or listed on the National Register of Historic Places. No sites affected by the proposed bypass are currently designated as public recreation areas subject to Section 4(f) regulations. Impacts to the CNF under Section 4(f) criteria are discussed in Chapter 4.5. There are no refuges, historic sites, or public parks within the project study area.

Section 6(f) of the Land and Water Conservation Fund Act (LWCF) of 1965 (16 USC 4601-4) requires federal agencies to analyze potential impacts to lands acquired or developed with LWCF grants. Section 6(f) prohibits the conversion of these properties to non-recreational use without replacement of land of equivalent value, usefulness, location, and approval of the National Park Service. There are no lands that were acquired or developed with LWCF grants within the project study area; therefore, Section 6(f) of the Land and Water Conservation Act is not applicable to this action.

3.6 UTILITIES

3.6.1 Electric Power Transmission Service

Carteret-Craven Electric Cooperative, Duke Energy and the City of New Bern provide electric power to the City of Havelock and surrounding areas. The Carteret-Craven Electric Cooperative provides electric service east of SR 1746 (Greenfield Heights Boulevard) and north of SR 1745 and SR 1763 (Miller Boulevard). Northwest of Greenfield Heights Boulevard, along existing US 70, Progress Energy and the City of New Bern both provide service to local customers.

In addition to the local service, several Duke Energy high-voltage electric transmission lines are located along the easements west of the North Carolina Railroad (NCRR), as shown in Exhibit 3.3.1. These lines converge at a large substation located along SR 1826 near the Gurganus Elementary School. A 115 KV line traverses the Croatan National Forest (CNF) connecting Havelock to New Bern, Morehead City, and Beaufort. This line is crossed by all three bypass alternatives on National Forest Service (NFS) lands at the northwestern end of the project, and again near the East Prong Slocum Creek crossing at the southeastern end of the project. Another 230 KV line, generally located further west of the 115 KV line, connects Havelock with New Bern, Jacksonville and Morehead City. This 230 KV line is crossed by the Preferred Alternative approximately 4500 feet south of the substation on NFS lands, and again by all three bypass alternatives at the southeastern end of the project east of the NCRR. If relocations or upgrading of these facilities is required as a result of this project, coordination with the U.S. Forest Service and Progress Energy will be required.

3.6.2 Water and Sewer Service

The City of Havelock, Craven County, and the Cherry Point MCAS maintain separate water and sewer systems. Within the Havelock City Limits, these services are provided by the City and Cherry Point systems. It was noted in discussions with local planners and developers that the presence of the railroad tracks is an impediment to the extension of water and sewer lines into developable lands across the tracks. Outside of the City limits, residents and businesses are not served by these systems. Craven County does not provide these services to any parts of the project study area not serviced by the City. Other than in the Carolina Pines development, located off of existing US 70 northeast of the project study area, private wells and septic tanks provide water and sewer for county residents. Water and sewer lines are shown in Exhibits 3.6.1a-b.

Water Service

The City's water supply is taken from wells that draw from the Castle Hayne aquifer. The City has two treatment facilities, both of which are north of existing US 70. The City provides water to approximately 5,500 residential customers and 250 business customers. This system has approximately 50 miles of water lines and is presently pumping an average of 1.2 million gallons per day (MGD). This system has a pumping capacity of 2.4 MGD.

The potable water supply at the Cherry Point MCAS is also pumped from wells and treated at a central base facility. This water treatment system has an average use of 4 MGD and a capacity of 6 MGD.

Sewer Service

The City of Havelock provides a complete sewer collection system for residents and businesses within the City limits. The sewage is treated at the City's wastewater treatment plant located on Jackson Drive, north of existing US 70. The treated effluent is discharged into the East Prong Slocum Creek. The sewage treatment facility treats 1.33 to 1.5 MGD and has a 1.9 MGD permitted capacity.

The Cherry Point MCAS also operates an independent sewage disposal system that has an average use of 2.3 MGD and a permitted capacity of 3.5 MGD. The treated wastewater effluent is discharged into the Neuse River.

Carolina Pines Utility, located north of the project study area has a permitted discharge of 0.5 MGD directly into the Neuse River.

3.6.3 Solid Waste Disposal

A private hauler under County contract provides solid waste collection in the City of Havelock. The City picks up yard trimmings, used furniture, and used appliances. The yard trimmings are taken to a composting site in New Bern and the used appliances and furniture are taken to the County's waste transfer station. The Craven County waste transfer station also accepts household waste from County residents. All waste accepted at this station is transferred to other waste disposal facilities outside of the project area. This transfer station is located approximately 0.5 miles northwest of the existing US 70 and SR 1760 (Hickman Hill Loop Road) intersection on NFS lands. Chapter 3.9 contains a discussion of the hazardous material investigation conducted at the site.

3.6.4 Natural Gas Service

Piedmont Natural Gas currently provides natural gas service via a line running from New Bern to Morehead City that runs along US 70 and along McCotter Boulevard. Local gas distributors provide gas for private storage tanks in the area.

3.6.5 Communications

CenturyLink provides local telephone services within the project study area and vicinity. Fiber optic and copper cables are buried along both shoulders of existing US 70. Copper cable is also buried along SR 1791 (Sunset Drive) and SR 1756 (Lake Road). Aerial wires are also present along SR 1791 (Sunset Drive).

State Road 1105

Slocum Road

State Road 1100

Lake Road

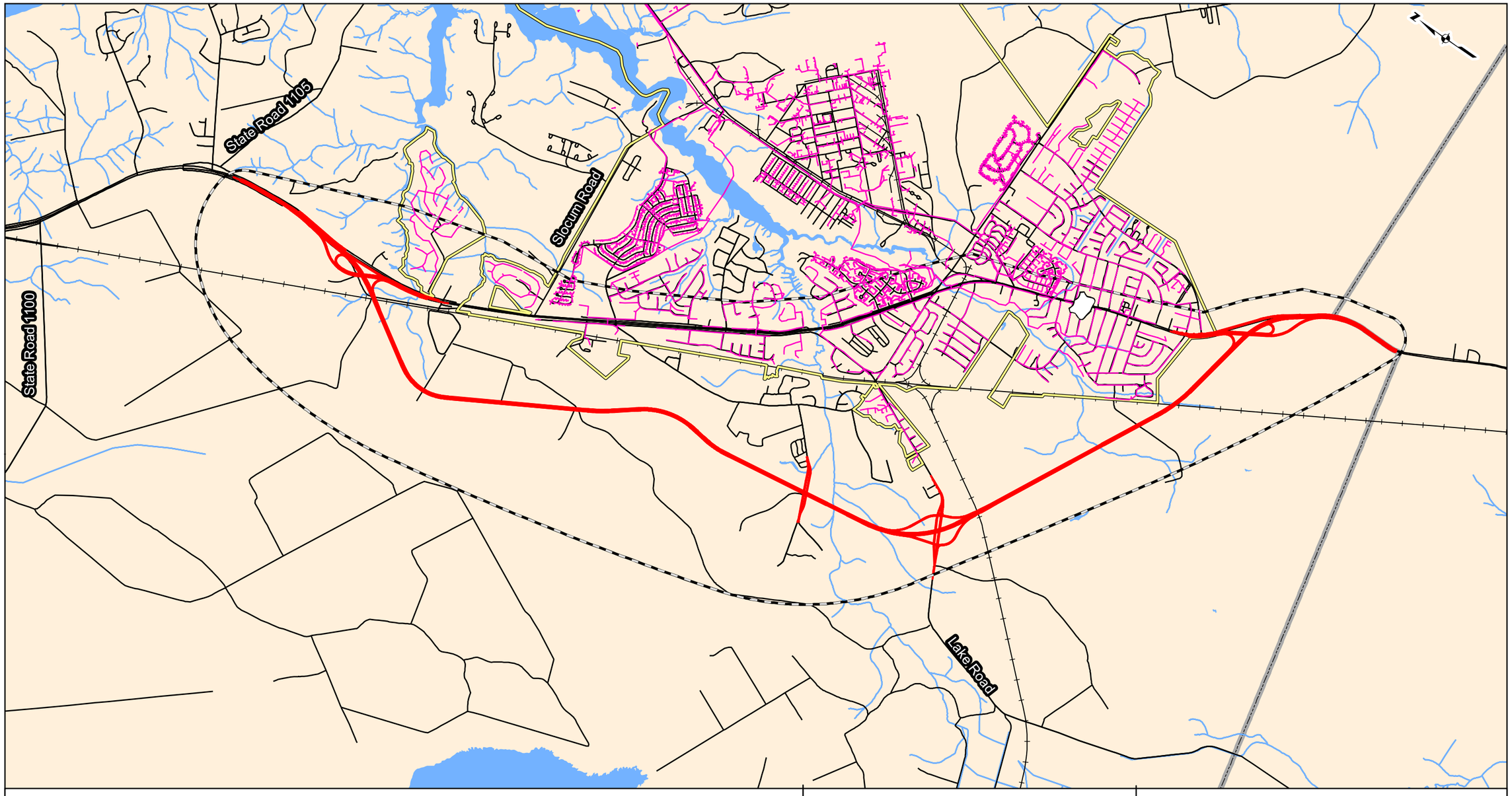
Water Line
Alternative 3 - Preferred Alternative
EIS Study Area
DOT Primary Roads
Railroads
Havelock City Limits
County Boundary
Stream
Waterbody

US 70, Havelock Bypass
Craven County, North Carolina
STIP No.R-1015

Exhibit 3.6.1a Municipal Water

0 0.25 0.5 1 1.5 2 Miles

This page intentionally left blank to facilitate double-sided printing.



Havelock Sewer Line
Alternative 3 - Preferred Alternative
EIS Study Area
DOT Primary Roads
Railroads
Havelock City Limits
County Boundary
Stream
Waterbody

US 70, Havelock Bypass
Craven County, North Carolina
STIP No.R-1015

Exhibit 3.6.1b Havelock Municipal Sewer

0 0.25 0.5 1 1.5 2 Miles

This page intentionally left blank to facilitate double-sided printing.

3.7 AIR QUALITY

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most prevalent sources. The impact resulting from highway construction ranges from intensifying existing air pollution problems to improving the ambient air quality. Changing traffic patterns are a primary concern when determining the impact of a new highway facility or the improvement of an existing highway facility.

The Federal Clean Air Act of 1970 established the National Ambient Air Quality Standards (NAAQS). These standards were established to protect the public from known or anticipated effects of air pollutants. The most recent amendments to the NAAQS contain criteria for sulfur dioxide (SO_2), particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb).

The primary pollutants from motor vehicles are unburned hydrocarbons, nitrous oxides, carbon monoxide, and particulates. Hydrocarbons and nitrogen oxides can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and NO_2. Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources.

A project-level qualitative air quality analysis was prepared for this project. A copy of the unabridged version of the full technical report entitled *Revised Air Quality Analysis*, dated March 11, 2013, can be viewed at the Project Development & Environmental Analysis Unit, Century Center Building A, 1010 Birch Ridge Drive, Raleigh.

Attainment Status

This project is located in Craven County, which has been determined to comply with the National Ambient Air Quality Standards. The proposed project is located in an attainment area; therefore, 40 CFR Parts 51 and 93 are not applicable. This project is not anticipated to create any adverse effects on the air quality of this attainment area.

Mobile Source Air Toxics

Background – Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/). In addition, EPA identified seven compounds with significant contributions from mobile sources

that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in the graph on the following page.

Motor Vehicle Emissions Simulator (MOVES) – According to EPA, MOVES improves upon the previous MOBILE model in several key aspects: MOVES is based on a vast amount of in-use vehicle data collected and analyzed since the latest release of MOBILE, including millions of emissions measurements from light-duty vehicles. Analysis of this data enhanced EPA's understanding of how mobile sources contribute to emissions inventories and the relative effectiveness of various control strategies. In addition, MOVES accounts for the significant effects that vehicle speed and temperature have on PM emissions estimates, whereas MOBILE did not. MOVES2010b includes all air toxic pollutants in NATA that are emitted by mobile sources. EPA has incorporated more recent data into MOVES2010b to update and enhance the quality of MSAT emission estimates. These data reflect advanced emission control technology and modern fuels, plus additional data for older technology vehicles.

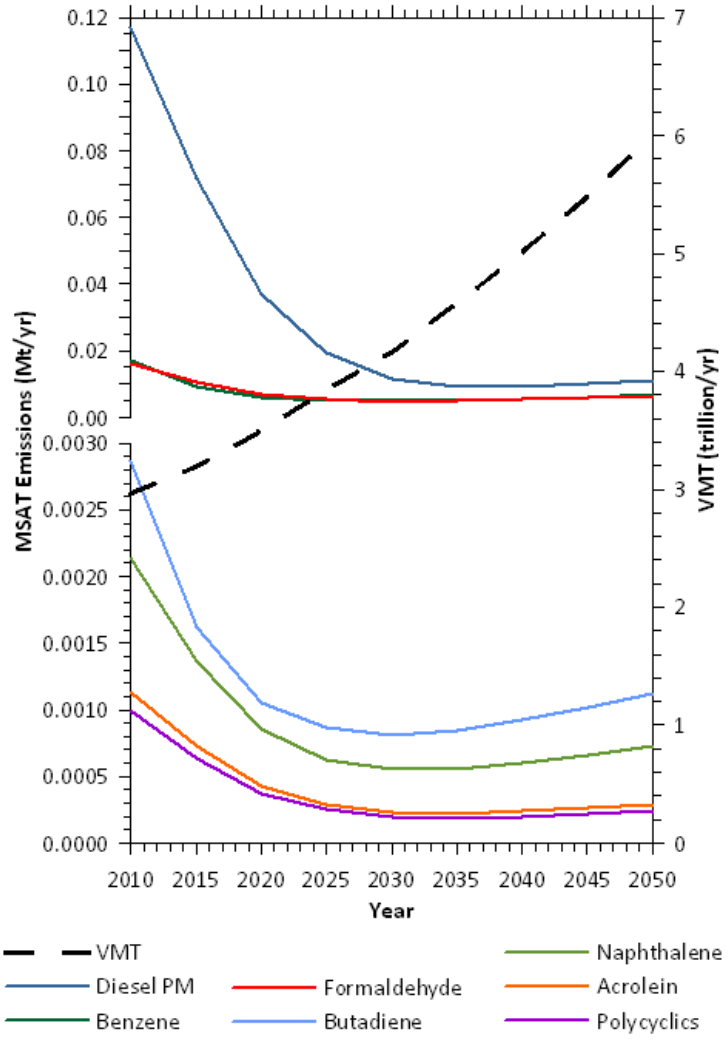
Based on an FHWA analysis using EPA's MOVES2010b model, as shown in the graph on the following page, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

The implications of MOVES on MSAT emissions estimates compared to MOBILE are: lower estimates of total MSAT emissions; significantly lower benzene emissions; significantly higher diesel PM emissions, especially for lower speeds. Consequently, diesel PM is projected to be the dominant component of the emissions total.

MSAT Research – Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, the public expects agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

National MSAT Emission Trends 1999 – 2050
For Vehicles Operating On Roadways Using EPA's MOVES2010b Model



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors
Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA.

NEPA Context

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals. NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. NEPA requires and FHWA is committed to the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

Analysis of MSAT in NEPA Documents – The FHWA developed a tiered approach for analyzing MSAT in NEPA documents, depending on specific project circumstances. The FHWA has identified three levels of analysis:

1. No analysis for projects with no potential for meaningful MSAT effects;
2. Qualitative analysis for projects with low potential MSAT effects; or
3. Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

(1) Exempt Projects or Projects with No Meaningful Potential MSAT Effects

This category includes projects that are qualified as categorical exclusion under 23 CFR 771.117(c), projects that are exempt under the Clean Air Act conformity rule under 40 CFR 93.126 and projects with no meaningful impacts on traffic volumes or vehicle mix. No analysis or discussion of MSATs is necessary for these projects and documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. The project record should document the basis for the determination of "no meaningful potential impacts" with a brief description of the factors considered.

(2) Projects with Low Potential MSAT Effects

These projects include those that improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions. This category covers a broad range of projects, including minor widening projects and new interchanges, such as those that replace a signalized intersection or where design year traffic is not projected to meet the 140,000 to 150,000 AADT criterion. For these projects, a qualitative assessment of emissions projections should be conducted. Most highway projects are included in this category.

(3) Projects with Higher Potential MSAT Effects

This category includes highway projects that have the potential for meaningful differences among project alternatives through 1) the addition of significant capacity where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year or 2) the significant alteration to a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, and 3) their being located close to populated areas or concentrations of vulnerable populations (i.e., schools, nursing homes, hospitals). These projects require a quantitative analysis, and only a limited number of projects will fall into this category. Mitigation options should be identified and considered in the analysis when meaningful differences in levels of MSAT emissions are identified. All projects warranting a Quantitative MSAT Analysis should include the seven priority MSAT pollutants.

Incomplete Or Unavailable Information – When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

a. If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
b. If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:
    1. a statement that such information is incomplete or unavailable;
    2. a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
    3. a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and
    4. the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts that have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

c. The amended regulation will be applicable to all environmental impact statements for which a Notice to Intent (40 CFR 1508.22) is published in the Federal Register on or after May 27, 1986. For environmental impact statements in progress, agencies may choose to comply with the requirements of either the original or amended regulation.

In FHWA's view, information is incomplete or unavailable to credibly predict health impacts at a project-specific level due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting public health and welfare from any known or anticipated effect of an air pollutant. It is the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. It maintains the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives.

These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI.[1] As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA[2] and the HEI[3] have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable.

1 http://pubs.healtheffects.org/view.php?id=282
2 http://www.epa.gov/risk/basicinformation.htm#g
3 http://pubs.healtheffects.org/getfile.php?u=395

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

MSAT Conclusion

This project is not anticipated to create any adverse effects on the air quality of this attainment area.

Knowledge about mobile source air toxics is still evolving. As the science progresses FHWA will continue to revise and update this guidance. The MOVES model and the issuance of the PM 2.5 Hot Spot Modeling Guidance will result in a number of significant improvements in model forecasting and air pollution analysis.

Summary – Vehicles are a major contributor to decreased air quality because they emit a variety of pollutants into the air. Changing traffic patterns are a primary concern when determining the impact of a new highway facility or the improvement of an existing highway facility. New highways or the widening of existing highways increase localized levels of vehicle emissions, but these increases could be offset due to increases in speeds from reductions in congestion and because vehicle emissions will decrease in areas where traffic shifts to the new roadway. Significant progress has been made in reducing criteria pollutant emissions from motor vehicles and improving air quality, even as vehicle travel has increased rapidly.

3.8 NOISE

3.8.1 Noise Characteristics

Traffic noise impacts and temporary construction noise impacts can be a consequence of transportation projects, especially for noise-sensitive land uses in close proximity to high-volume and/or high-speed existing steady-state traffic noise sources. When discussing existing noise levels in the Havelock vicinity, it is important to note the City of Havelock is home to the Cherry Point Marine Corps Air Station (MCAS).

Noise is basically defined as unwanted sound. It is emitted from many natural and man-made sources. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, which is usually twenty micro-Pascals (20μPa). Since the range of sound pressure ratios varies greatly – over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes is between the threshold of hearing at 0 decibels and the threshold of pain at 140 decibels.

Sound frequencies are represented in units of Hertz (Hz), which correspond to the number of vibrations per second of a given tone. A cumulative 'sound level' is equivalent to ten times the base-10 logarithm of the ratio of the sum of the sound pressures of all frequencies to the reference sound pressure. To simplify the mathematical process of determining sound levels, sound frequencies are grouped into ranges, or 'bands.' Sound levels are then calculated by adding the cumulative sound pressure levels within each band – which are typically defined as one 'octave' or '1/3 octave' of the sound frequency spectrum.

The commonly accepted limitation of human hearing to detect sound frequencies is between 20 Hz and 20,000 Hz, and human hearing is most sensitive to the frequencies between 1,000 Hz – 6,000 Hz. Although people are generally not as sensitive to lower-frequency sounds as they are to higher frequencies, most people lose the ability to hear high-frequency sounds as they age. To accommodate varying receptor sensitivities, frequency sound levels are commonly adjusted, or 'filtered', before being logarithmically added and reported as a single 'sound level' magnitude of that filtering scale. The 'A-weighted' decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive, and to minimize the frequencies to which human hearing is not as sensitive (refer to Table 3.8.1).

Several examples of noise levels expressed in dB(A) are listed in Table 3.8.2. As shown in Table 3.8.2, most individuals are exposed to fairly high noise levels from many sources on a regular basis. In order to perceive sounds of greatly varying pressure levels, human hearing has a non-linear sensitivity to sound pressure exposure. For example, doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels (3 dB(A)) or less are commonly considered "barely perceptible" to normal human hearing. A five decibel (5 dB(A)) change is more readily noticeable. By definition, a ten-fold increase in the sound pressure level correlates to a 10 decibel (10 dB(A)) noise level increase; however, it is judged by most people as only a doubling of the loudness – sounding "twice as loud".

TABLE 3.8.1
COMPARISON OF FLAT VS. A-WEIGHTED FREQUENCY SCALING

OCTAVE-BAND CENTER FREQUENCY (HZ)	A-WEIGHTED ADJUSTMENT[1]	SAMPLE FREQUENCY SOUND LEVELS (FLAT)	SAMPLE FREQUENCY SOUND LEVELS (A-WEIGHTED)
31	-39.53	90.00	50.47
63	-26.22	80.00	53.78
125	-16.19	70.00	53.81
250	-8.68	65.00	56.32
500	-3.25	60.00	56.75
1,000	0.00	60.00	60.00
2,000	+1.20	60.00	61.20
4,000	+0.96	55.00	55.96
8,000	-1.14	50.00	48.86
16,000	-6.7	45.00	38.30
	Overall Sound Levels:	**90.48 dB[2]**	**66.32 dB(A)[2]**

1. Based on the ISO 226:2003 standard for normal equal-loudness contours, the A-weighted decibel network filtering scale is defined for a frequency, f, by the equation: $20 \times \log_{10} (A(f) / A (1000))$, where $A(f) = [12{,}200^2 \times f^4] / [(f^2 + 20.6^2) \times (f^2 + 12{,}200^2) \times (f^2 + 107.7^2)^{0.5} \times (f^2 + 737.9^2)^{0.5}]$.
2. Although the energy in the flat sound source would create an *actual* sound level = 90.48 dB, it would be *perceived* as a sound level of 66.32 dB(A) by human hearing due to the decreased sensitivity of human hearing to lower sound frequencies.

The degree of disturbance or annoyance from exposure to unwanted sound – noise – depends upon three factors:

1. The amount, nature, and duration of the intruding noise

2. The relationship between the intruding noise and the existing (ambient) sound environment; and

3. The situation in which the disturbing noise is heard

In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than other people. The time patterns and durations of noise(s) also affect perception as to whether or not it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than one blowing in the afternoon when background noise levels are

typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

TABLE 3.8.2
COMMON INDOOR AND OUTDOOR NOISE LEVELS

Common Outdoor Noise Levels	Noise Level (dB(A))	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1,000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
	0	Threshold of Hearing

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

The third factor – situational noise – is related to the interference of noise with activities of individuals. In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces, and has been theorized to pose health risks. Appropriately, regulations exist for noise control or mitigation from many particularly offensive sources, including airplanes, factories, railroads, and highways. For all "Type I" federal, state, or federal-aid highway projects in the State of North Carolina, traffic and construction noise impact analysis and mitigation assessment is dictated by the applicable North Carolina Department of Transportation Traffic Noise Abatement Policy.

3.8.2 Noise Abatement Criteria

The Federal Highway Administration (FHWA) has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of 23 CFR, Part 772 is:

> …to provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to Title 23 United States Code (U.S.C.).

The abatement criteria and procedures are set forth in Title 23 CFR Part 772, which also states:

> …in determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.

A summary of the NAC for various land uses is presented in Table 3.8.3. The L_{eq}, or equivalent sound level, is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as a time-varying sound level during the same period. With regard to traffic noise, fluctuating sound levels of traffic noise are represented in terms of L_{eq}, the steady, or 'equivalent', noise level with the same energy.

NCDOT Noise Abatement Policy

The North Carolina Department of Transportation Traffic Noise Abatement Policy effective July 13, 2011 establishes official policy on highway noise. This policy describes the NCDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the NCDOT approach to implementation.

TABLE 3.8.3
NOISE ABATEMENT CRITERIA
Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

Activity Category	Activity Criteria[1] $L_{eq(h)}$[2]	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B [3]	67	Exterior	Residential
C [3]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E [3]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	Undeveloped lands that are not permitted

[1] The $L_{eq(h)}$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of L_{eq}.

[3] Includes undeveloped lands permitted for this activity category.

Noise Abatement Criteria

The two categories of traffic noise impacts are defined as 1) those that "approach" or exceed the FHWA Noise Abatement Criteria (NAC), as shown in Table 3.8.3; and 2) those that represent a "substantial increase" over existing noise levels as defined by NCDOT. An impact that represents a "substantial increase" is based on a comparison of the existing noise level [$L_{eq(h)}$] with the predicted increase with respect to a change to noise levels in the design year of between 10 and 15 dB(A) or more, as shown in Table 3.8.4.

TABLE 3.8.4
NCDOT "SUBSTANTIAL INCREASE" NOISE IMPACT CRITERIA
Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

EXISTING NOISE LEVEL[1] ($L_{eq(h)}$)	PREDICTED DESIGN YEAR NOISE LEVEL INCREASE[2] ($L_{eq(h)}$)
50 or less	15 or more
51	14 or more
52	13 or more
53	12 or more
54	11 or more
55 or more	10 or more

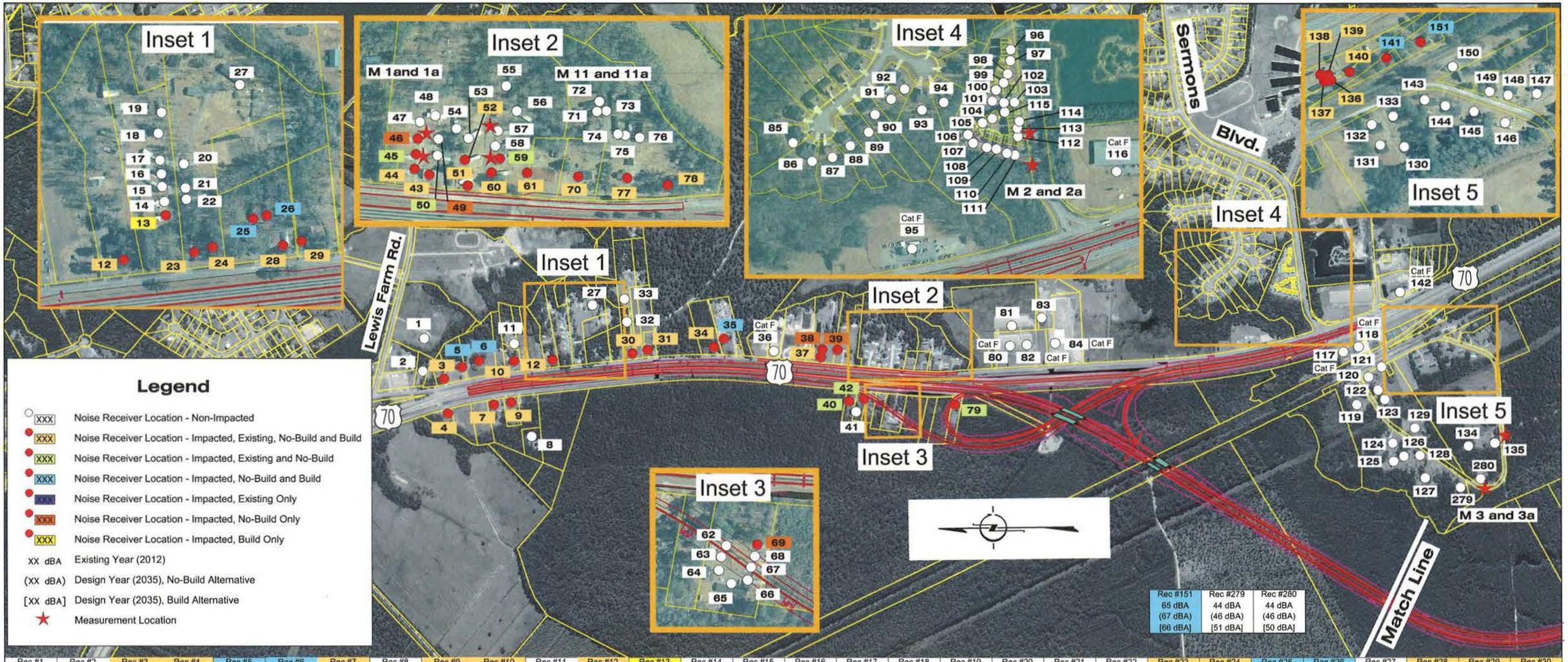
[1] Loudest hourly equivalent noise level from the combination of natural and mechanical sources and human activity usually present in a particular area.
[2] Predicted hourly equivalent Design Year traffic noise level minus existing noise level.

3.8.3 Noise Ambient Levels

Ambient noise is the noise around us caused by natural and manmade events such as wind, rain, thunder, birds chirping, insects, household appliances, commercial operations, lawn mowers, airplanes, and automobiles. It is all noise that is present in a particular area. When discussing existing noise levels in the Havelock vicinity, it is important to note the effect of the Cherry Point Marine Corps Air Station (MCAS) on ambient baseline noise. Ambient noise measurement locations are shown in Exhibit 3.8.1a-d. Results of the noise monitoring for each location are shown in Table 3.8.5.

TABLE 3.8.5
AMBIENT HOURLY-EQUIVALENT SOUND LEVELS, $L_{EQ(H)}$[1]

Setup	Receptor	Land Use	Roadway Noise Source(s)[2]	Start / Stop Time	$L_{eq(h)}$ (dB(A))
1	M1	Residential	US 70	10:00/10:20	58
	M1a	Residential			55
2	M2	Residential	US 70 and Sermons Blvd.	10:35/10:54	59
	M2a	Residential			59
3	M3	Residential	US 70	11:15/11:34	47
	M3a	Residential			45
4	M4	Farm	Greenfield Heights Rd.	1:38/1:57	43
	M4a	Residential			45
5	M5	Residential	Sunset Dr.	3:26/3:45	48
	M5a	Residential			51
6	M6	Residential	Sunset Dr.	2:25/2:44	50
	M6a	Residential			52
7	M7	Residential	Lake Road	4:08/4:27	55
	M7a	Residential			46



Rec #1	Rec #2	Rec #3	Rec #4	Rec #5	Rec #6	Rec #7	Rec #8	Rec #9	Rec #10	Rec #11	Rec #12	Rec #13	Rec #14	Rec #15	Rec #16	Rec #17	Rec #18	Rec #19	Rec #20	Rec #21	Rec #22	Rec #23	Rec #24	Rec #25	Rec #26	Rec #27	Rec #28	Rec #29	Rec #30
56 dBA	60 dBA	68 dBA	69 dBA	65 dBA	64 dBA	69 dBA	58 dBA	69 dBA	67 dBA	60 dBA	68 dBA	64 dBA	62 dBA	61 dBA	60 dBA	59 dBA	58 dBA	57 dBA	59 dBA	61 dBA	62 dBA	69 dBA	68 dBA	65 dBA	65 dBA	56 dBA	70 dBA	69 dBA	69 dBA
(58 dBA)	(62 dBA)	(70 dBA)	(71 dBA)	(67 dBA)	(66 dBA)	(71 dBA)	(60 dBA)	(71 dBA)	(69 dBA)	(62 dBA)	(70 dBA)	(65 dBA)	(64 dBA)	(63 dBA)	(62 dBA)	(61 dBA)	(60 dBA)	(59 dBA)	(61 dBA)	(63 dBA)	(64 dBA)	(71 dBA)	(70 dBA)	(67 dBA)	(67 dBA)	(58 dBA)	(71 dBA)	(71 dBA)	(71 dBA)
[59 dBA]	[63 dBA]	[71 dBA]	[72 dBA]	[68 dBA]	[67 dBA]	[71 dBA]	[61 dBA]	[71 dBA]	[69 dBA]	[64 dBA]	[71 dBA]	[67 dBA]	[65 dBA]	[64 dBA]	[63 dBA]	[62 dBA]	[61 dBA]	[60 dBA]	[63 dBA]	[64 dBA]	[65 dBA]	[72 dBA]	[71 dBA]	[68 dBA]	[68 dBA]	[59 dBA]	[72 dBA]	[72 dBA]	[71 dBA]
Rec #31	Rec #32	Rec #33	Rec #34	Rec #35	Rec #36-Cat F	Rec #37	Rec #38	Rec #39	Rec #40	Rec #41	Rec #42	Rec #43	Rec #44	Rec #45	Rec #46	Rec #47	Rec #48	Rec #49	Rec #50	Rec #51	Rec #52	Rec #53	Rec #54	Rec #55	Rec #56	Rec #57	Rec #58	Rec #59	Rec #60
68 dBA	59 dBA	55 dBA	68 dBA	65 dBA	68 dBA	68 dBA	64 dBA	64 dBA	66 dBA	62 dBA	67 dBA	70 dBA	69 dBA	66 dBA	64 dBA	61 dBA	61 dBA	64 dBA	66 dBA	70 dBA	67 dBA	62 dBA	61 dBA	57 dBA	60 dBA	62 dBA	63 dBA	66 dBA	68 dBA
(70 dBA)	(61 dBA)	(57 dBA)	(70 dBA)	(67 dBA)	(70 dBA)	(70 dBA)	(66 dBA)	(66 dBA)	(68 dBA)	(64 dBA)	(69 dBA)	(72 dBA)	(71 dBA)	(68 dBA)	(66 dBA)	(63 dBA)	(62 dBA)	(66 dBA)	(68 dBA)	(71 dBA)	(69 dBA)	(64 dBA)	(63 dBA)	(59 dBA)	(62 dBA)	(64 dBA)	(65 dBA)	(68 dBA)	(70 dBA)
[70 dBA]	[62 dBA]	[58 dBA]	[69 dBA]	[66 dBA]	[69 dBA]	[66 dBA]	[64 dBA]	[64 dBA]	[TAKE]	[TAKE]	[TAKE]	[67 dBA]	[65 dBA]	[64 dBA]	[63 dBA]	[61 dBA]	[61 dBA]	[63 dBA]	[65 dBA]	[68 dBA]	[66 dBA]	[62 dBA]	[62 dBA]	[58 dBA]	[60 dBA]	[62 dBA]	[64 dBA]	[63 dBA]	[65 dBA]	[66 dBA]
Rec #61	Rec #62	Rec #63	Rec #64	Rec #65	Rec #66	Rec #67	Rec #68	Rec #69	Rec #70	Rec #71	Rec #72	Rec #73	Rec #74	Rec #75	Rec #76	Rec #77	Rec #78	Rec #79	Rec #80	Rec #81	Rec #82	Rec #83	Rec #84	Rec #85	Rec #86	Rec #87	Rec #88	Rec #89	Rec #90
68 dBA	63 dBA	62 dBA	61 dBA	60 dBA	61 dBA	62 dBA	63 dBA	64 dBA	68 dBA	59 dBA	59 dBA	59 dBA	61 dBA	61 dBA	62 dBA	68 dBA	68 dBA	67 dBA	62 dBA	58 dBA	62 dBA	60 dBA	62 dBA	56 dBA	57 dBA	57 dBA	56 dBA	56 dBA	55 dBA
(73 dBA)	(68 dBA)	(64 dBA)	(63 dBA)	(62 dBA)	(63 dBA)	(64 dBA)	(65 dBA)	(66 dBA)	(70 dBA)	(61 dBA)	(61 dBA)	(61 dBA)	(63 dBA)	(63 dBA)	(64 dBA)	(70 dBA)	(71 dBA)	(69 dBA)	(64 dBA)	(63 dBA)	(64 dBA)	(62 dBA)	(64 dBA)	(58 dBA)	(59 dBA)	(59 dBA)	(58 dBA)	(58 dBA)	(57 dBA)
[67 dBA]	[TAKE]	[TAKE]	[TAKE]	[TAKE]	[TAKE]	[TAKE]	[TAKE]	[TAKE]	[67 dBA]	[59 dBA]	[58 dBA]	[59 dBA]	[60 dBA]	[60 dBA]	[60 dBA]	[67 dBA]	[66 dBA]	[TAKE]	[59 dBA]	[56 dBA]	[59 dBA]	[55 dBA]	[59 dBA]	[55 dBA]	[57 dBA]	[57 dBA]	[56 dBA]	[56 dBA]	[56 dBA]	[55 dBA]
Rec #91	Rec #92	Rec #93	Rec #94	Rec #95-Cat F	Rec #96	Rec #97	Rec #98	Rec #99	Rec #100	Rec #101	Rec #102	Rec #103	Rec #104	Rec #105	Rec #106	Rec #107	Rec #108	Rec #109	Rec #110	Rec #111	Rec #112	Rec #113	Rec #114	Rec #115	Rec #116	Rec #117-Cat F	Rec #118-Cat F	Rec #119	Rec #120
54 dBA	54 dBA	55 dBA	55 dBA	67 dBA	52 dBA	53 dBA	54 dBA	54 dBA	54 dBA	55 dBA	54 dBA	55 dBA	55 dBA	54 dBA	56 dBA	57 dBA	58 dBA	58 dBA	58 dBA	59 dBA	57 dBA	57 dBA	57 dBA	55 dBA	62 dBA	69 dBA	69 dBA	55 dBA	59 dBA
(56 dBA)	(56 dBA)	(57 dBA)	(57 dBA)	(69 dBA)	(54 dBA)	(55 dBA)	(56 dBA)	(56 dBA)	(56 dBA)	(57 dBA)	(56 dBA)	(57 dBA)	(57 dBA)	(56 dBA)	(58 dBA)	(59 dBA)	(60 dBA)	(60 dBA)	(60 dBA)	(61 dBA)	(59 dBA)	(59 dBA)	(59 dBA)	(57 dBA)	(64 dBA)	(71 dBA)	(71 dBA)	(57 dBA)	(61 dBA)
[55 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[67 dBA]	[53 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[56 dBA]	[55 dBA]	[56 dBA]	[56 dBA]	[55 dBA]	[56 dBA]	[57 dBA]	[58 dBA]	[58 dBA]	[59 dBA]	[59 dBA]	[57 dBA]	[57 dBA]	[57 dBA]	[55 dBA]	[63 dBA]	[69 dBA]	[69 dBA]	[56 dBA]	[59 dBA]
Rec #121	Rec #122	Rec #123	Rec #124	Rec #125	Rec #126	Rec #127	Rec #128	Rec #129	Rec #130	Rec #131	Rec #132	Rec #133	Rec #134	Rec #135	Rec #136	Rec #137	Rec #138	Rec #139	Rec #140	Rec #141	Rec #142-Cat F	Rec #143	Rec #144	Rec #145	Rec #146	Rec #147	Rec #148	Rec #149	Rec #150
59 dBA	56 dBA	54 dBA	49 dBA	48 dBA	48 dBA	46 dBA	47 dBA	50 dBA	56 dBA	57 dBA	59 dBA	59 dBA	46 dBA	46 dBA	66 dBA	67 dBA	69 dBA	68 dBA	66 dBA	65 dBA	69 dBA	59 dBA	58 dBA	57 dBA	55 dBA	56 dBA	57 dBA	57 dBA	61 dBA
(61 dBA)	(58 dBA)	(56 dBA)	(51 dBA)	(49 dBA)	(50 dBA)	(48 dBA)	(49 dBA)	(51 dBA)	(58 dBA)	(59 dBA)	(61 dBA)	(61 dBA)	(48 dBA)	(48 dBA)	(68 dBA)	(69 dBA)	(71 dBA)	(70 dBA)	(68 dBA)	(67 dBA)	(70 dBA)	(61 dBA)	(60 dBA)	(59 dBA)	(58 dBA)	(57 dBA)	(59 dBA)	(59 dBA)	(63 dBA)
[60 dBA]	[56 dBA]	[55 dBA]	[52 dBA]	[52 dBA]	[52 dBA]	[51 dBA]	[51 dBA]	[52 dBA]	[57 dBA]	[58 dBA]	[60 dBA]	[60 dBA]	[50 dBA]	[49 dBA]	[67 dBA]	[67 dBA]	[69 dBA]	[68 dBA]	[67 dBA]	[66 dBA]	[69 dBA]	[60 dBA]	[59 dBA]	[58 dBA]	[56 dBA]	[57 dBA]	[58 dBA]	[58 dBA]	[62 dBA]

US 70, Havelock Bypass

Craven County, North Carolina

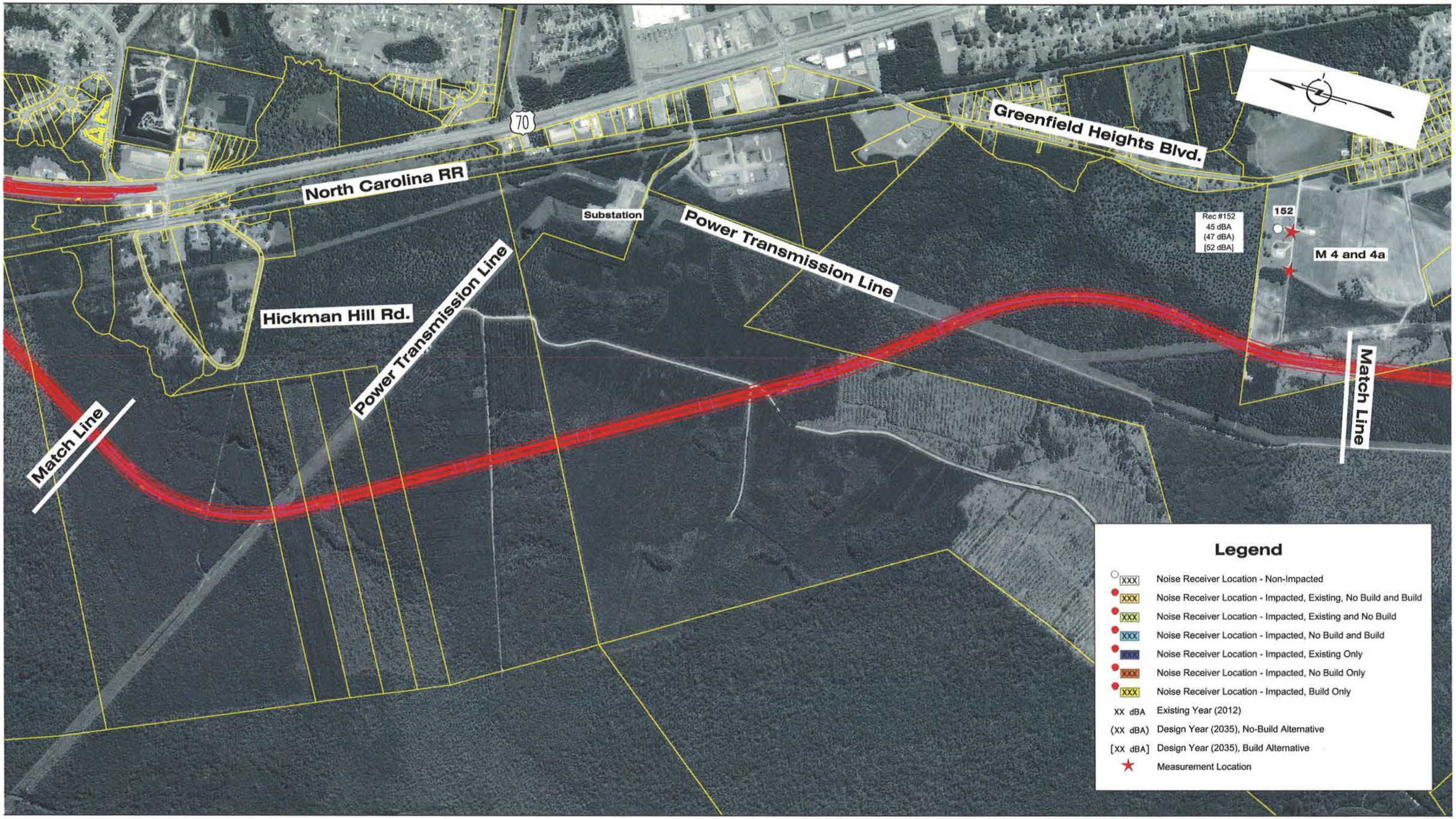
STIP No. R-1015

Noise Measurement Locations and TNM Results

Scale: 1" = 1000'

Exhibit 3.8.1a

This page intentionally left blank to facilitate double-sided printing.



US 70, Havelock Bypass

Craven County, North Carolina

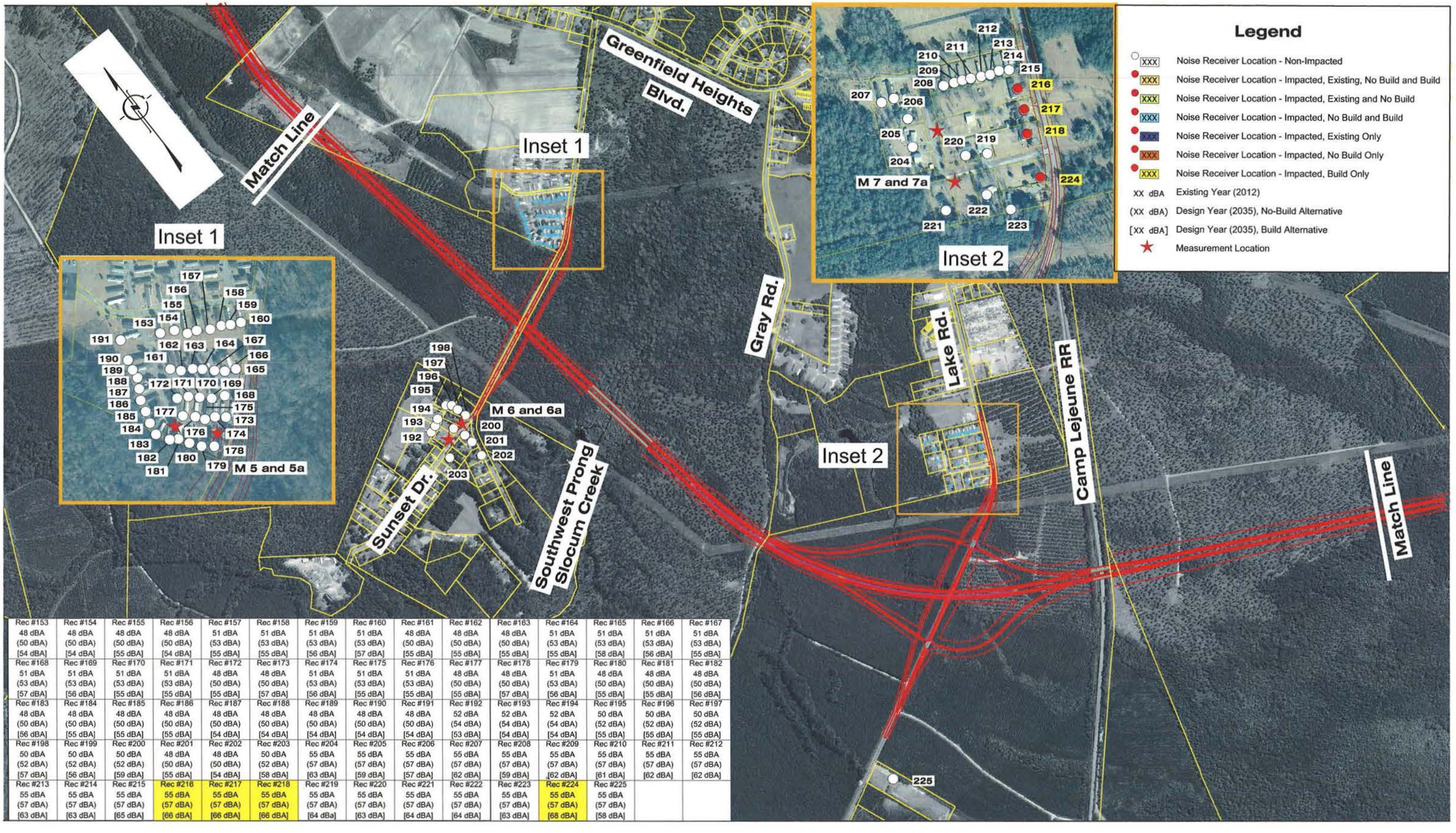
STIP No. R-1015

Noise Measurement Locations and TNM Results

Scale: 1" = 1000'

Exhibit 3.8.1b

This page intentionally left blank to facilitate double-sided printing.



Rec #153	Rec #154	Rec #155	Rec #156	Rec #157	Rec #158	Rec #159	Rec #160	Rec #161	Rec #162	Rec #163	Rec #164	Rec #165	Rec #166	Rec #167
48 dBA	48 dBA	48 dBA	48 dBA	51 dBA	51 dBA	51 dBA	51 dBA	48 dBA	48 dBA	48 dBA	51 dBA	51 dBA	51 dBA	51 dBA
(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)
[54 dBA]	[54 dBA]	[55 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[56 dBA]	[57 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[58 dBA]	[56 dBA]	[55 dBA]
Rec #168	Rec #169	Rec #170	Rec #171	Rec #172	Rec #173	Rec #174	Rec #175	Rec #176	Rec #177	Rec #178	Rec #179	Rec #180	Rec #181	Rec #182
51 dBA	51 dBA	51 dBA	51 dBA	48 dBA	48 dBA	51 dBA	51 dBA	51 dBA	48 dBA	48 dBA	51 dBA	48 dBA	48 dBA	48 dBA
(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(50 dBA)	(50 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(50 dBA)	(50 dBA)	(53 dBA)	(50 dBA)	(50 dBA)	(50 dBA)
[57 dBA]	[56 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[57 dBA]	[56 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[57 dBA]	[56 dBA]	[55 dBA]	[55 dBA]	[56 dBA]
Rec #183	Rec #184	Rec #185	Rec #186	Rec #187	Rec #188	Rec #189	Rec #190	Rec #191	Rec #192	Rec #193	Rec #194	Rec #195	Rec #196	Rec #197
48 dBA	48 dBA	48 dBA	48 dBA	48 dBA	48 dBA	48 dBA	48 dBA	48 dBA	52 dBA	52 dBA	52 dBA	50 dBA	50 dBA	50 dBA
(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(50 dBA)	(54 dBA)	(54 dBA)	(54 dBA)	(52 dBA)	(52 dBA)	(52 dBA)
[56 dBA]	[55 dBA]	[55 dBA]	[55 dBA]	[54 dBA]	[54 dBA]	[54 dBA]	[54 dBA]	[54 dBA]	[53 dBA]	[54 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[55 dBA]
Rec #198	Rec #199	Rec #200	Rec #201	Rec #202	Rec #203	Rec #204	Rec #205	Rec #206	Rec #207	Rec #208	Rec #209	Rec #210	Rec #211	Rec #212
50 dBA	50 dBA	50 dBA	48 dBA	48 dBA	50 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA
(52 dBA)	(52 dBA)	(52 dBA)	(50 dBA)	(50 dBA)	(52 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)
[57 dBA]	[56 dBA]	[59 dBA]	[55 dBA]	[54 dBA]	[58 dBA]	[63 dBA]	[59 dBA]	[57 dBA]	[62 dBA]	[59 dBA]	[62 dBA]	[61 dBA]	[62 dBA]	[62 dBA]
Rec #213	Rec #214	Rec #215	Rec #216	Rec #217	Rec #218	Rec #219	Rec #220	Rec #221	Rec #222	Rec #223	Rec #224	Rec #225		
55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA	55 dBA		
(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)	(57 dBA)		
[63 dBA]	[63 dBA]	[65 dBA]	[66 dBA]	[66 dBA]	[66 dBA]	[64 dBa]	[63 dBA]	[64 dBA]	[64 dBA]	[63 dBA]	[68 dBA]	[58 dBA]		

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Noise Measurement Locations and TNM Results

Scale: 1" = 1000'

Exhibit 3.8.1c

This page intentionally left blank to facilitate double-sided printing.

Rec #226	Rec #227	Rec #228	Rec #229	Rec #230	Rec #231	Rec #232	Rec #233	Rec #234	Rec #235	Rec #236
50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA
(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)
[52 dBA]	[53 dBA]	[54 dBA]	[54 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[56 dBA]	[56 dBA]	[57 dBA]	[58 dBA]
Rec #237	Rec #238	Rec #239	Rec #240	Rec #241	Rec #242	Rec #243	Rec #244	Rec #245	Rec #246	Rec #247
51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA	51 dBA
(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)	(53 dBA)
[58 dBA]	[58 dBA]	[58 dBA]	[57 dBA]	[56 dBA]	[55 dBA]	[55 dBA]	[53 dBA]	[53 dBA]	[53 dBA]	[53 dBA]
Rec #248	Rec #249	Rec #250	Rec #251	Rec #252	Rec #253	Rec #254	Rec #255	Rec #256	Rec #257	Rec #258
50 dBA	52 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA	50 dBA
(52 dBA)	(54 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)	(52 dBA)
[52 dBA]	[53 dBA]	[53 dBA]	[54 dBA]	[54 dBA]	[55 dBA]	[55 dBA]	[53 dBA]	[53 dBA]	[54 dBA]	[55 dBA]
Rec #259	Rec #260	Rec #261	Rec #262	Rec #263	Rec #264	Rec #265	Rec #266	Rec #267-Cat F	Rec #268-Cat E	Rec #269-Cat F
50 dBA	55 dBA	56 dBA	54 dBA	55 dBA	55 dBA	60 dBA	69 dBA	70 dBA	67 dBA	67 dBA
(52 dBA)	(57 dBA)	(58 dBA)	(56 dBA)	(57 dBA)	(59 dBA)	(62 dBA)	(70 dBA)	(72 dBA)	(68 dBA)	(69 dBA)
[55 dBA]	[55 dBA]	[57 dBA]	[54 dBA]	[55 dBA]	[57 dBA]	[61 dBA]	[68 dBA]	[69 dBA]	[67 dBA]	[67 dBA]
Rec #270-Cat E	Rec #271-Cat E	Rec #272-Cat E	Rec #273	Rec #274-Cat E	Rec #275-Cat E	Rec #276	Rec #277	Rec #278		
63 dBA	69 dBA	68 dBA	66 dBA	67 dBA	67 dBA	59 dBA	58 dBA	56 dBA		
(65 dBA)	(71 dBA)	(70 dBA)	(68 dBA)	(69 dBA)	(69 dBA)	(61 dBA)	(60 dBA)	(58 dBA)		
[64 dBA]	[69 dBA]	[68 dBA]	[66 dBA]	[68 dBA]	[69 dBA]	[60 dBA]	[58 dBA]	[56 dBA]		

Havelock

70

M 10 and 10a

M 9 and 9a

Inset 1

North Carolina Railroad

Match Line

Inset 1

M 8 and 8a

Legend

- XXX — Noise Receiver Location - Non-Impacted
- XXX — Noise Receiver Location - Impacted, Existing, No Build and Build
- XXX — Noise Receiver Location - Impacted, Existing and No Build
- XXX — Noise Receiver Location - Impacted, No Build and Build
- XXX — Noise Receiver Location - Impacted, Existing Only
- XXX — Noise Receiver Location - Impacted, No Build Only
- XXX — Noise Receiver Location - Impacted, Build Only
- XX dBA — Existing Year (2012)
- (XX dBA) — Design Year (2035), No-Build Alternative
- [XX dBA] — Design Year (2035), Build Alternative
- ★ — Measurement Location

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Noise Measurement Locations and TNM Results

Scale: 1" = 1000'

Exhibit 3.8.1d

This page intentionally left blank to facilitate double-sided printing.

TABLE 3.8.5
AMBIENT HOURLY-EQUIVALENT SOUND LEVELS, $L_{EQ(H)}$[1]

Setup	Receptor	Land Use	Roadway Noise Source(s)[2]	Start / Stop Time	$L_{eq(h)}$ (dB(A))
8	M8	Residential	Forest Road	9:47/10:06	51
	M8a	Residential			50
9	M9	Church	US 70	10:52/11:11	61
	M9a	Residential			57
10	M10	Commercial	US 70	11:42/12:01	67
	M10a	Commercial			61
11	M11	Residential	US 70	12:32/12:51	63
	M11a	Residential			59

1. In accordance with FHWA guidance and accepted industry standards, hourly equivalent sound levels, $L_{eq(h)}$, were extrapolated from short-term data collection monitoring sessions, and are expressed in units of A-weighted decibels (dB(A)) rounded to the nearest whole number. Data was obtained on October 18 and 19, 2012.
2. For each Setup, noise meters were located at logical locations for the assessment of existing highway traffic noise or for the prediction of noise level increase(s) due to future highway traffic noise. (See Exhibits 3.8.1a-3.8.1d)

Ambient noise monitoring data was collected at 11 locations with two meters, each taking readings for 20 minutes in one minute increments. Loudest-hour existing noise levels can be assessed using the TNM-predicted noise levels based on existing loudest-hour traffic estimates or the ambient noise levels obtained at representative locations in the field.[4]

For this traffic noise analysis, since much of the project is on new location, ambient noise levels measured in the field were used for existing and no build conditions where there are no existing traffic noise sources within the vicinity of these receptors or lack of adequate traffic data (Receptors 152 – 259).

3.9 HAZARDOUS MATERIALS

A survey to identify known and potential hazardous material sites as well as hazardous waste generators was conducted in the vicinity of Havelock. A search of records at the N.C. Department of Environment and Natural Resources (DENR), Division of Solid Waste Management, identified a closed solid waste landfill site located in the CNF behind the current Craven County Waste Transfer Facility near Hickman Hill Loop, on the southwest side of existing US 70 near the northern project terminus. The County operated the landfill in the 1960's with the objective of filling a marl pit on the property. The Craven County Waste Transfer Facility accepts used appliances, furniture and household waste from County residents and businesses. The Transfer Station is located on NFS lands. Both sites are shown in Exhibit 3.3.1.

4 Per 23 CFR 772.5, existing noise levels are defined as "the worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area." If the TNM-predicted existing loudest-hour *traffic* noise levels are lower than the hourly-equivalent noise levels obtained in the field, then existing noise levels are assessed as the latter.

A review of records from DENR, Division of Water Resources, Groundwater Section in concert with field investigations resulted in the identification of numerous underground storage tanks (UST) located along existing US 70 in Havelock. However, no UST sites were identified in the western portion of the project study area.

One potential site for contaminated soils or groundwater, Foss Auto Salvage, is located within the project study area at 901 Lake Road. The soils or groundwater at this site could be contaminated by gasoline, oil, battery acid, or other such contaminants found in motor vehicles.

Craven County Waste Transfer Facility

The USFS has indicated a potential contamination issue at the Craven County Waste Transfer Facility on National Forest System lands. A preliminary site assessment was prepared for the Craven County Waste Transfer Facility, within the proposed right-of-way of the Preferred Alternative (Alternative 3) (GEL Engineering of NC, Inc., 2013). Soil samples from five boring sites were analyzed for volatile organic compounds (VOCs), semi-organic compounds (SVOCs), and metals. A groundwater sample was analyzed for VOCs, SVOCs, and RCRA metals.

The only constituent exceeding NCDENR Health-Based PSRGs was arsenic, which was detected in four soil samples. The arsenic levels detected in four of the five soil samples are similar to background arsenic concentrations documented for coastal soils, and are considered to be indicative of naturally occurring conditions and do not indicate that soil impact has occurred at the waste transfer facility. None of the detected levels exceed NCDENR's Protection of Groundwater PSRG for arsenic. No additional environmental investigation of the site soil is recommended at this time.

One SVOC, bis(2-ehtylhexl)phthalate, was the only constituent detected in the groundwater sample. The detected concentration, 7.85 ug/L, exceeds the NC 2L groundwater standard of 3 ug/L. The detection of bis(2-ehtylhexl)phthalate in the groundwater sample is considered an anomaly resulting from contamination from PVC sampling materials used in the field during the investigation. No additional environmental investigation of groundwater at the site is recommended at this time.

Based on the data generated from the investigation, there is no evidence that a release of constituents of concern has occurred within the investigated area. Further, no trash or buried refuse associated with the adjacent, closed Craven County Landfill was encountered in any of the boring conducted within the investigated area.

3.10 GEOLOGY, TOPOGRAPHY AND SOILS

The project study area is located in the Coastal Plain physiographic province of North Carolina and is underlain by the Dublin Formation. This geologic formation is characterized

by shelly, medium-to-coarse-grained sands, sandy marls, and limestones which are generally bluish-gray in color.

The topography of the study area is characterized by nearly-level stream terraces dissected by drainageways, with the land gently sloping toward the Neuse River to the east. Slopes are nearly flat with only a few areas having slopes greater than 12 percent. Elevations range between approximately 30 feet above mean sea level (msl) in uplands to approximately five feet above msl in marshes and streambeds. Dominant topographic features occurring in the study area include uplands, floodplains along streams, and stream terraces.

There are seven hydric soil mapping units within the project study corridors: Bayboro mucky loam; Croatan muck; Leaf silt loam; Masontown mucky fine sandy loam and Muckalee sandy loam; Pantego fine sandy loam; Rains fine sandy loam, and Torhunta fine sandy loam (USDA 1991). The project study corridors also contain two non-hydric soil mapping units that may contain hydric inclusions: Lenoir silt loam and Lynchburg fine sandy loam (USDA 1991). Six other non-hydric soil mapping units occur within the project study area. All soil mapping units within the project study area are listed in Table 3.10.1.

TABLE 3.10.1
SOILS IN THE PROJECT STUDY AREA

SOIL NAME	MAP SYMBOL	DRAINAGE CLASS	HYDRIC STATUS
Bayboro	Ba	Very Poorly Drained	Hydric
Craven	CrB	Moderately Well Drained	Non-hydric
Croatan	CT	Very Poorly Drained	Hydric
Goldsboro	GoA	Moderately Well Drained	Non-hydric
Leaf	La	Poorly Drained	Hydric
Lenoir	Le	Somewhat Poorly Drained	Hydric*
Lynchburg	Ly	Somewhat Poorly Drained	Hydric*
Masontown	MM	Very Poorly Drained	Hydric
Muckalee	MM	Poorly Drained	Hydric
Norfolk	NoB	Well Drained	Non-hydric
Onslow	On	Moderately Well Drained	Non-hydric
Pantego	Pa	Very Poorly Drained	Hydric
Rains	Ra	Poorly Drained	Hydric
Suffolk	SuD	Well Drained	Non-hydric
Torhunta	To	Very Poorly Drained	Hydric
Udorthents	Ud	NA	Non-hydric

* Soil mapping unit primarily non-hydric but which have hydric inclusions

3.11 PRIME, IMPORTANT, AND UNIQUE FARMLANDS

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops.

Prime, unique, statewide, and locally-important farmlands are classified by soil type. Those areas where soil types result in such a farmland designation may or may not be used for agricultural purposes. Urban or built-up land 10 acres or more in size, public land, and water areas cannot be considered prime farmland. In the study area, the Croatan National Forest contains large areas of prime and state-important farmland soil types. However, it is stated in the USDA Natural Resources Conservation Service *Soil Survey for Craven County* that public land cannot be considered prime farmland. Public land is land not available for farming in national forests, national parks, military reservations, and state parks (USDA, 1989). Craven County developed a Voluntary Agricultural District (VAD) program in 2009; however, there are no VADs within the project study area.

As defined in the U.S. Department of Agriculture, *Important Farmlands in North Carolina* (USDA, 1998), nearly 15 percent of Craven County is designated as prime farmland. This farmland occurs throughout the County on uplands and stream terraces mainly in areas near major drainage ways. The four prime farmland (P1) soils identified in the project area are as follows: Craven silt loam (CrB), Goldsboro loamy fine sand (GoA), Norfolk loamy fine sand (NoB) and Onslow loamy sand (On). Five (P2) soils that are prime farmlands if drained are also identified in the project area as follows: Lynchburg fine sandy loam (Ly), Masontown mucky fine sandy loam (MM), Pantego fine sandy loam (Pa), Rains fine sandy loam (Ra) and Torhunta - Urban land complex (To). Two (S2) soils, Lenoir silt loam (Le) and Bayboro mucky loam (Ba) are farmlands of statewide importance if drained.

As required by the Farmland Protection Act, this project was coordinated with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). According to the NRCS, the project will involve the use of some lands with the prime farmland designation. A discussion of farmland impacts for the detailed study alternatives is contained in DEIS Chapters 3.3.3 and 4.1.6.3. The completed Farmland Conversion Impact Rating form (Form AD-1006) is included in DEIS Appendix A1.

3.12 MINERAL RESOURCES

A June 1997 study of the files in the N.C. Department of Environment and Natural Resources, Division of Land Resources, Land Quality Section revealed there were thirty-five proposed or existing mines including twenty-six (26) that were active and two (2) seeking permits in Craven County since they began permitting mines in 1971. Of the thirty-five (35) mines, twenty-eight (28) were listed as sand and gravel mines. There are eight (8) sand and gravel mines including one (1) inactive, one (1) proposed and six (6) active mines listed in the immediate vicinity of Havelock. Of these, only one (1) inactive mine is located in the project study area. The inactive mine was used as a landfill in the 1960's, as discussed in Chapter 3.9. This former mine site is located on NFS lands adjacent to the Craven County Waste Transfer Facility. No other potential mineral resource sites within the project study area are known.

3.13 BIOTIC RESOURCES

The discussions of natural environment characteristics found in this chapter are taken from the *Natural Resources Technical Report for the US 70 Havelock Bypass* (Environmental Services, Inc., 2007). Jurisdictional streams and wetlands are discussed in Chapter 3.15.1.

Materials and research data in support of this investigation have been derived from a number of sources. The United States Geological Survey (USGS) 7.5-minute [Havelock, NC (1994), Masontown, NC (1994)] topographic quadrangle maps depicting the project study corridors were consulted to determine physiographic relief and to assess landscape characteristics. The National Wetlands Inventory (NWI) maps (USFWS 1988) of these same quadrangles were reviewed prior to the initiation of field studies. Additional information on soils, topography, and physiography was obtained from the county soil survey available through the Natural Resource Conservation Service (NRCS) for Craven (USDA 1989) and Carteret (USDA 1987) Counties.

Aerial photographs provided an overview of baseline features in the project study area. These photographs served as the basis for mapping the vegetative communities and jurisdictional areas. Vegetative community distributions were approximated from available mapping sources and verified in the field. Dominant components of these communities were examined and the species composition of each was recorded. Vegetative community designations are generally based on the classification system developed by Schafale and Weakley (1990). When appropriate, community designations have been modified to better reflect field observations. Vascular plant names generally follow nomenclature found in Kartesz (1999); plant names used on data forms generally follow Radford et al. (1968) based on the widespread usage of this source for wetlands regulatory purposes.

Wildlife distribution and habitat use were determined through field observation, evaluation of habitat type distributions, and a review of supporting literature (Martof et al. 1980, Potter et al. 1980, Webster et al. 1985, Menhinick 1991, and Rohde et al. 1994). Techniques used to document terrestrial fauna included visual observation, identification of bird and frog calls and songs, and identification of tracks and scat.

3.13.1 Terrestrial Communities and Wildlife

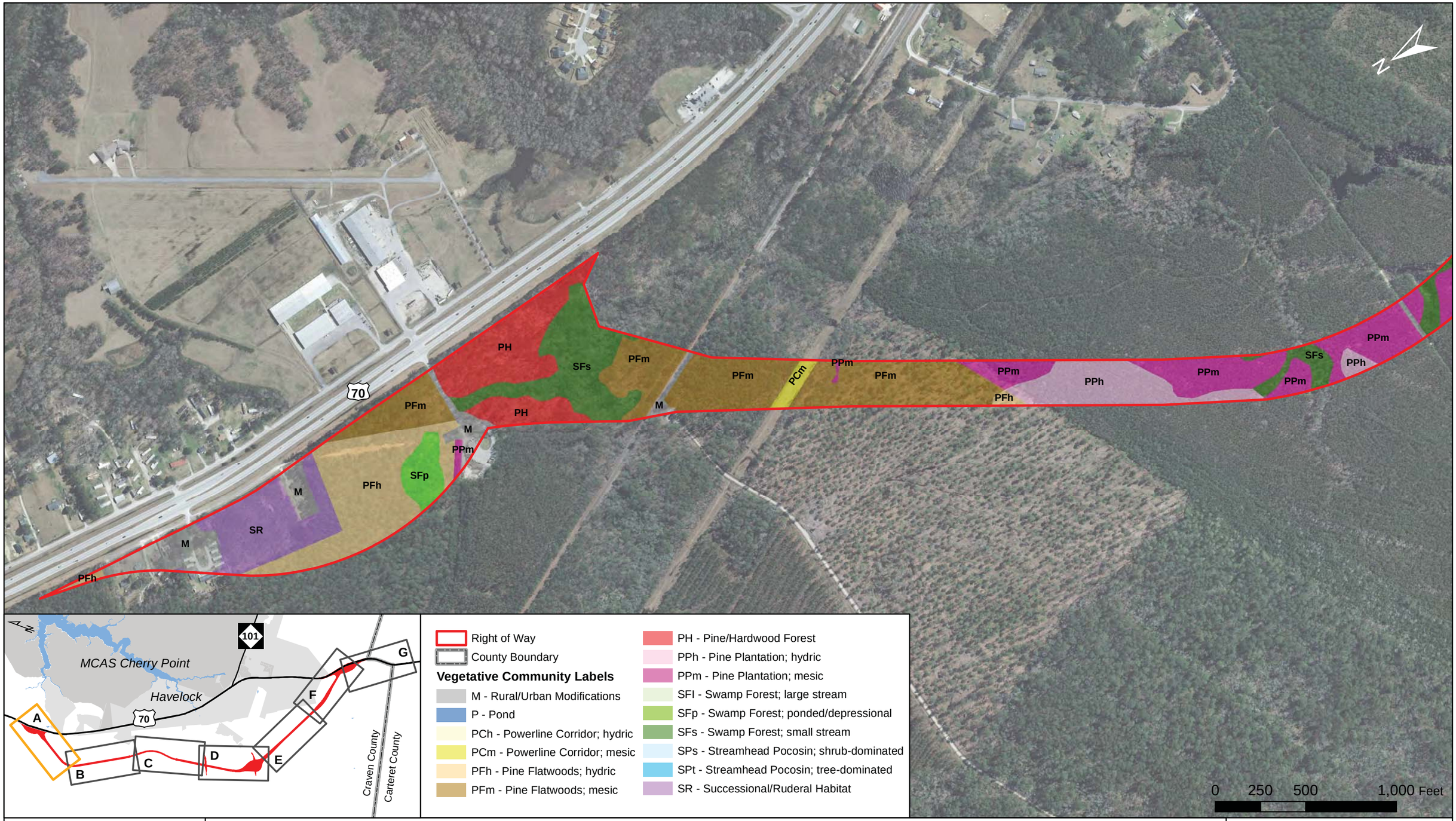
Distribution and composition of vegetative communities throughout the project study area reflect landscape-level variations in topography, soils, hydrology, and past or present land use practices. Development and other disturbances have resulted in the present vegetative patterns. Nine major vegetative community types were identified in the project study area. Examples of these communities identified on private lands typically include a greater component of invasive and successional species that are excluded from National Forest System (NFS) lands through fire and other management regimes. Five vegetative community types are further divided by characteristics of hydrology or vegetation. One vegetative community type, rural/urban modifications, is used to include all obvious

human-maintained landscape modifications such as roads, residential areas, and businesses. Communities sustaining recent or regular disturbance are included under the successional/ruderal habitat community type. Vegetative community mapping is depicted in Exhibits 3.13.1a-f. The vegetative community names have been adopted and modified from the N.C. Natural Heritage Program classification system units (Schafale and Weakley, 1990) and the descriptions written to reflect local variations within the project study corridors. Each vegetative community is described in detail below.

Pine Flatwoods (Mesic PFm, Hydric PFh)

This community type is synonymous with the mesic and wet pine flatwoods communities described in Schafale and Weakley. Pine flatwoods is the most abundant community type within the project study corridors. Mesic, or moist and hydric, or wet, variations have been mapped. Pine flatwoods develop naturally when landscapes in this region are exposed to regular fire. In many of the private lands, fire has been suppressed, whereas in Croatan National Forest the burning cycle is more systematically and evenly applied. Under completely natural conditions fires would be more random and the effects would be more discontinuous. Doubtless, more severe fires would result under natural conditions, and the resulting seres would be considerably different than those that currently exist in the project study area. Naturally, the landscape would support more of a heterogeneous mosaic of forest seres. Not only frequency, but also severity of fires governs the density of vegetation through pine flatwoods. The difference between mesic and hydric pine flatwoods variations is the greater tendency for the hydric form to hold moisture for longer periods of time during and following precipitation. Hydric flatwoods are not permanently wet, but may be wet in those winter seasons experiencing normal or above normal rainfall.

Pine flatwoods are dominated by two, or sometimes three, strata or vegetation layers. The upper-most layer or canopy is composed primarily of pine. Longleaf pine (*Pinus palustris*) is prevalent in dryer areas or mesic sites while loblolly pine (*Pinus taeda*) and/or pond pine (*Pinus serotina*) are most abundant in wetter or hydric areas (scientific and common names of vascular plants covered in this section generally follow Kartesz 1999). Under a regime of intermittent fire, a single layer of two to five foot high shrubby vegetation composed of tree and shrub species is common in the mesic and hydric variations of this type. Occasional young trees may extend above the shrub stratum. Within the communities examined, pine stems are usually within the 14 to 20 inch classes, but stands of younger trees can be found, particularly paralleling utility corridors. The pine canopies are not usually dense, due to thinning, and provide only a characteristic 20 to 25 percent cover over the forest floor. Shrub covers are much higher and approach 100 percent in some thick areas, but most usually do not exceed 60 to 70 percent cover. Herbaceous species generally provide scattered, sparse cover except in a few areas where high light levels reach the forest floor.



US 70, Havelock Bypass

Craven County, North Carolina

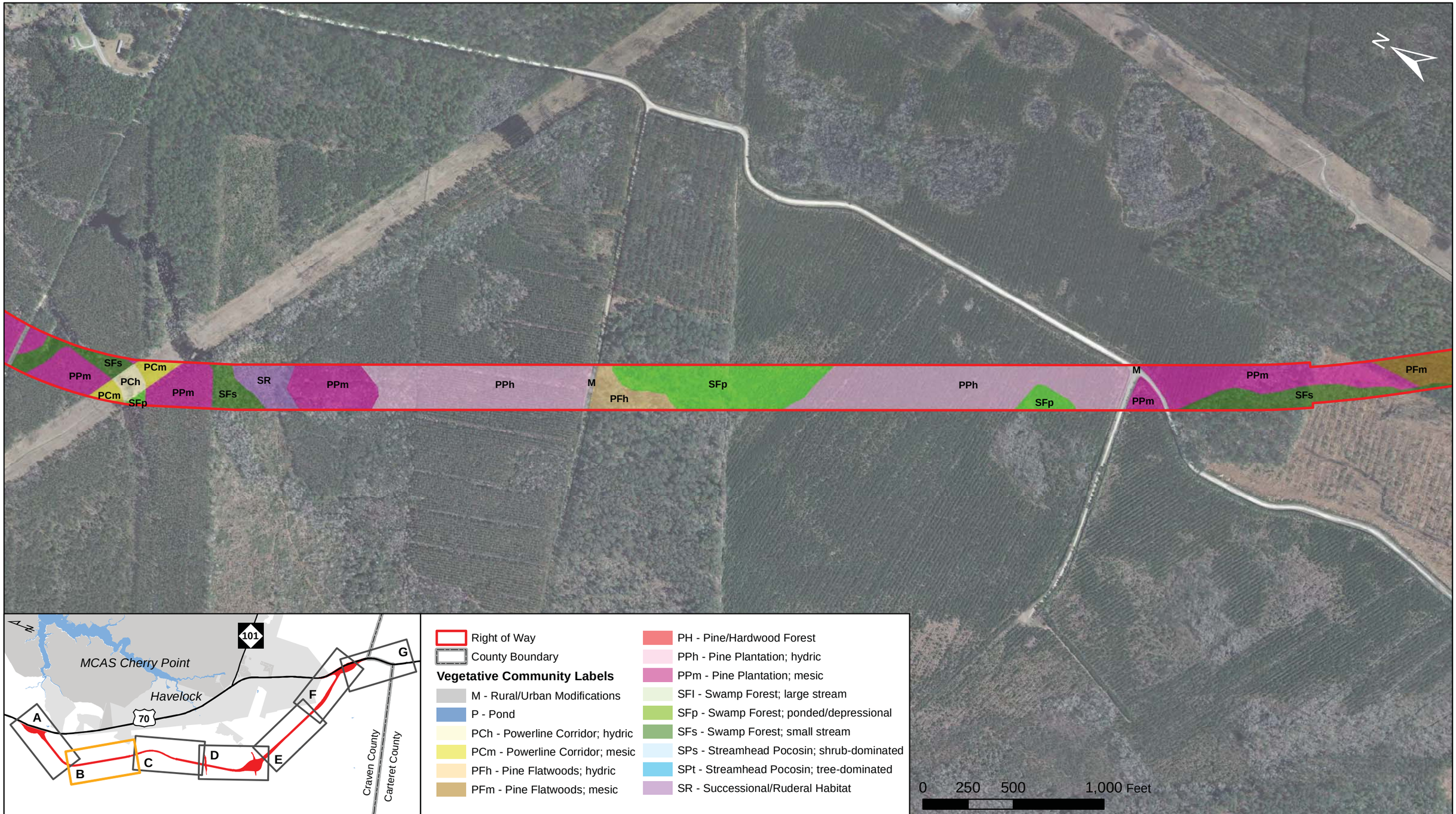
STIP No. R-1015

Vegetative Communities

Scale: 1" = 500'

Exhibit 3.13.1a

This page intentionally left blank to facilitate double-sided printing.



US 70, Havelock Bypass

Craven County, North Carolina

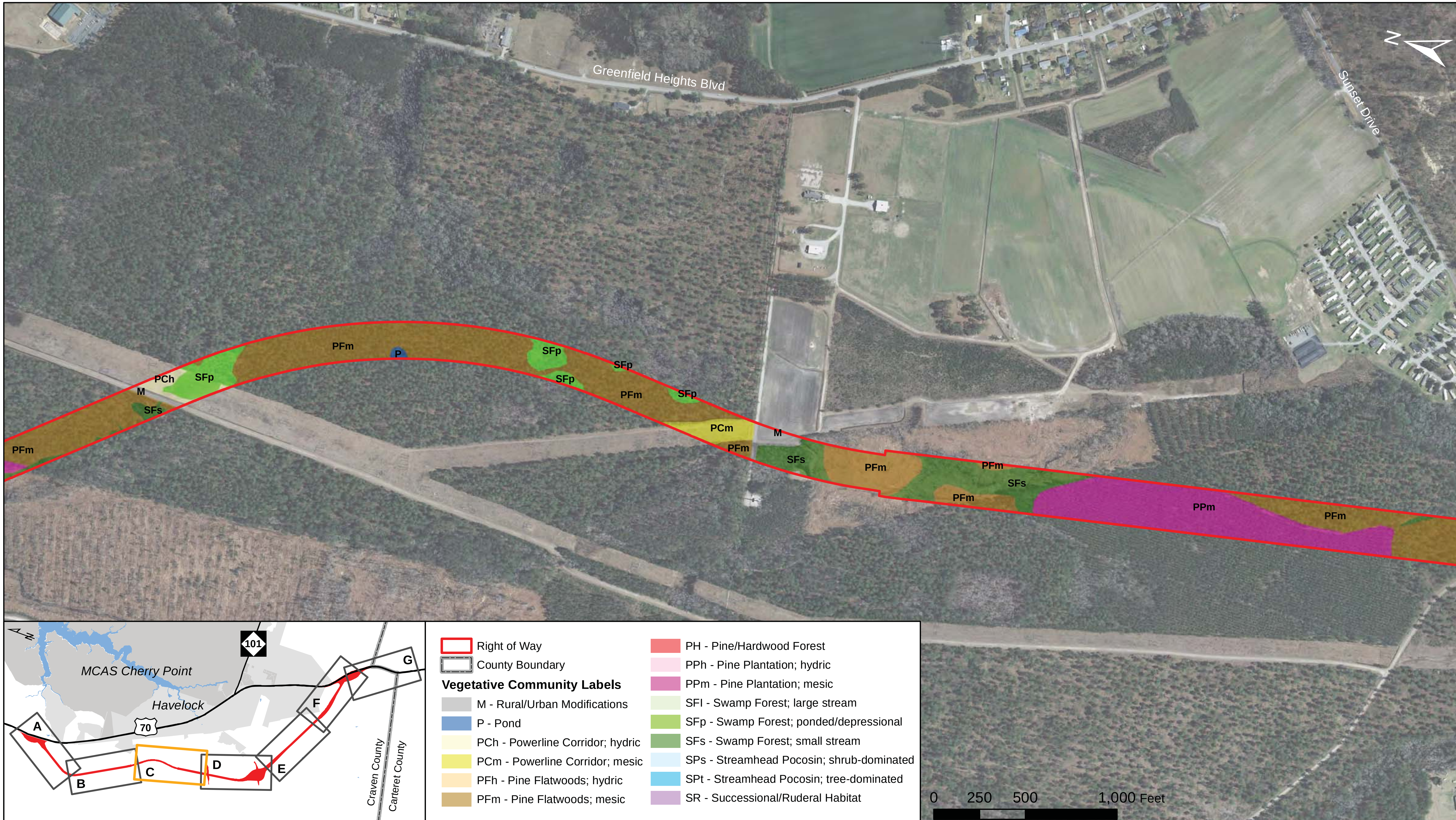
STIP No. R-1015

Vegetative Communities

Scale: 1" = 500'

Exhibit 3.13.1b

This page intentionally left blank to facilitate double-sided printing.


Greenfield Heights Blvd
Sunset Drive
PFm
P
SFp
PCh
M
SFs
PCm
PPm
MCAS Cherry Point
Havelock
101
70
A
B
C
D
E
F
G
Craven County
Carteret County
Right of Way
County Boundary
Vegetative Community Labels
M - Rural/Urban Modifications
P - Pond
PCh - Powerline Corridor; hydric
PCm - Powerline Corridor; mesic
PFh - Pine Flatwoods; hydric
PFm - Pine Flatwoods; mesic
PH - Pine/Hardwood Forest
PPh - Pine Plantation; hydric
PPm - Pine Plantation; mesic
SFl - Swamp Forest; large stream
SFp - Swamp Forest; ponded/depressional
SFs - Swamp Forest; small stream
SPs - Streamhead Pocosin; shrub-dominated
SPt - Streamhead Pocosin; tree-dominated
SR - Successional/Ruderal Habitat
0 250 500 1,000 Feet

US 70, Havelock Bypass
Craven County, North Carolina
STIP No. R-1015

Vegetative Communities
Scale: 1" = 500'
Exhibit 3.13.1c

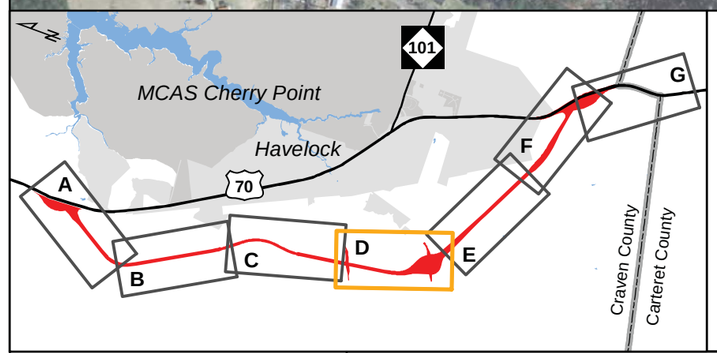
This page intentionally left blank to facilitate double-sided printing.

Gray Rd

Sunset Dr

Lake Rd

M
SFs
SFl
PPm
PFm
PCh
PCm
PFh
SR
PPh



- Right of Way
- County Boundary

Vegetative Community Labels

- M - Rural/Urban Modifications
- P - Pond
- PCh - Powerline Corridor; hydric
- PCm - Powerline Corridor; mesic
- PFh - Pine Flatwoods; hydric
- PFm - Pine Flatwoods; mesic
- PH - Pine/Hardwood Forest
- PPh - Pine Plantation; hydric
- PPm - Pine Plantation; mesic
- SFl - Swamp Forest; large stream
- SFp - Swamp Forest; ponded/depressional
- SFs - Swamp Forest; small stream
- SPs - Streamhead Pocosin; shrub-dominated
- SPt - Streamhead Pocosin; tree-dominated
- SR - Successional/Ruderal Habitat

0 250 500 1,000 Feet

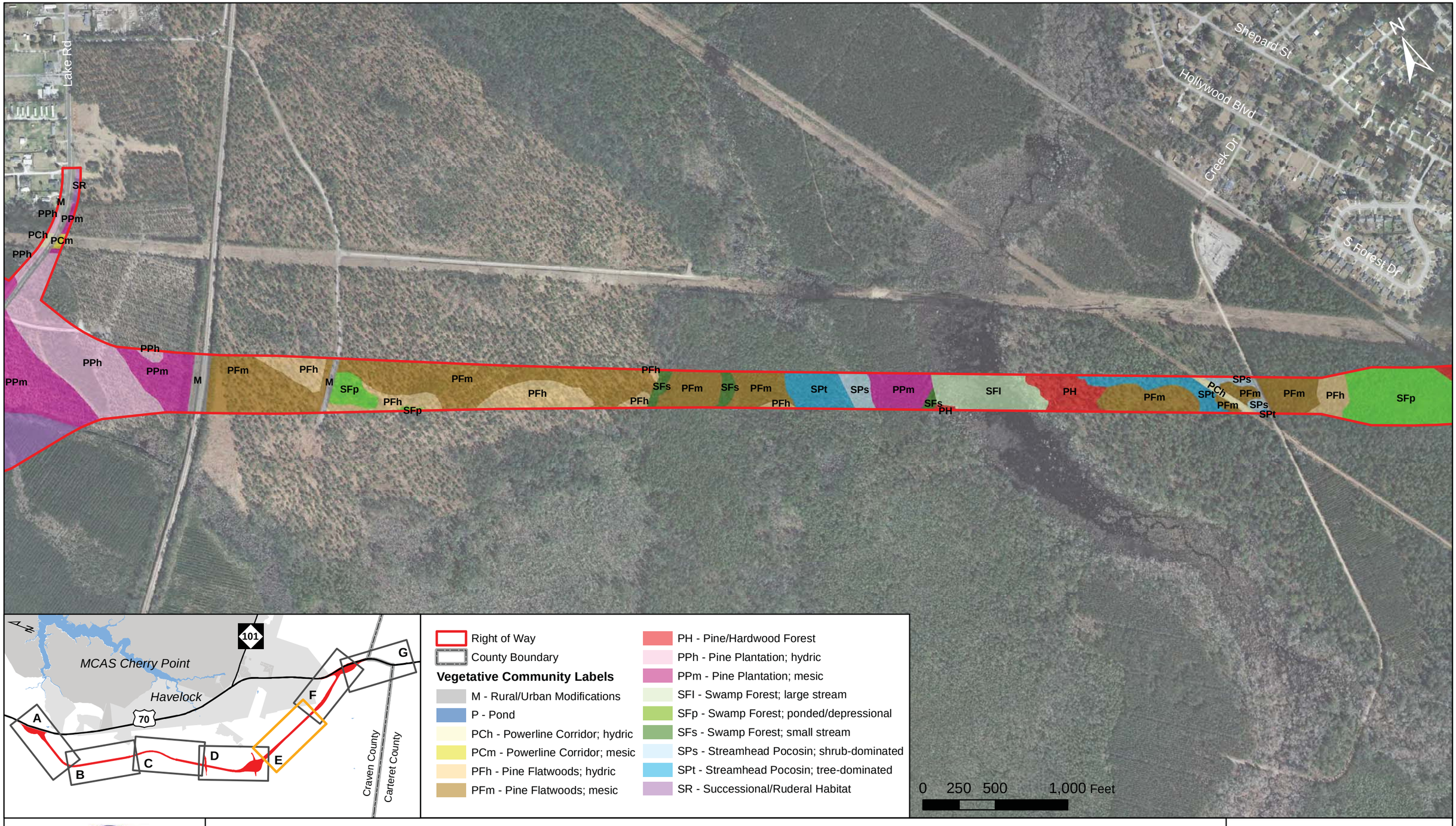
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Vegetative Communities
Scale: 1" = 500'
Exhibit 3.13.1d

This page intentionally left blank to facilitate double-sided printing.



Right of Way
County Boundary

Vegetative Community Labels

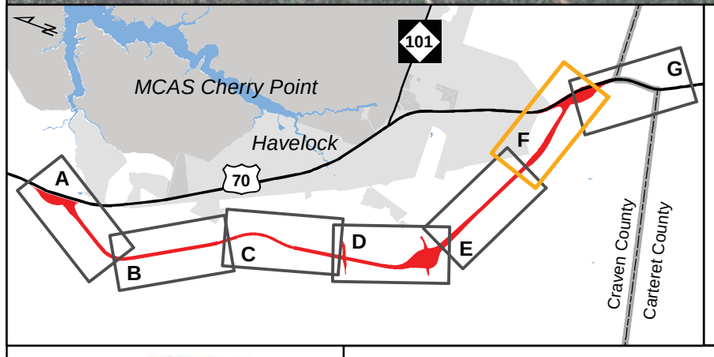
- M - Rural/Urban Modifications
- P - Pond
- PCh - Powerline Corridor; hydric
- PCm - Powerline Corridor; mesic
- PFh - Pine Flatwoods; hydric
- PFm - Pine Flatwoods; mesic
- PH - Pine/Hardwood Forest
- PPh - Pine Plantation; hydric
- PPm - Pine Plantation; mesic
- SFl - Swamp Forest; large stream
- SFp - Swamp Forest; ponded/depressional
- SFs - Swamp Forest; small stream
- SPs - Streamhead Pocosin; shrub-dominated
- SPt - Streamhead Pocosin; tree-dominated
- SR - Successional/Ruderal Habitat

US 70, Havelock Bypass

Craven County, North Carolina
STIP No. R-1015

Vegetative Communities
Scale: 1" = 500'
Exhibit 3.13.1e

This page intentionally left blank to facilitate double-sided printing.



- Right of Way
- County Boundary

Vegetative Community Labels

- M - Rural/Urban Modifications
- P - Pond
- PCh - Powerline Corridor; hydric
- PCm - Powerline Corridor; mesic
- PFh - Pine Flatwoods; hydric
- PFm - Pine Flatwoods; mesic
- PH - Pine/Hardwood Forest
- PPh - Pine Plantation; hydric
- PPm - Pine Plantation; mesic
- SFl - Swamp Forest; large stream
- SFp - Swamp Forest; ponded/depressional
- SFs - Swamp Forest; small stream
- SPs - Streamhead Pocosin; shrub-dominated
- SPt - Streamhead Pocosin; tree-dominated
- SR - Successional/Ruderal Habitat

0 250 500 1,000 Feet

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Vegetative Communities
Scale: 1" = 500'
Exhibit 3.13.1f

This page intentionally left blank to facilitate double-sided printing.

Craven County

Carteret County

SPt

PFm

M

SPt

PFh

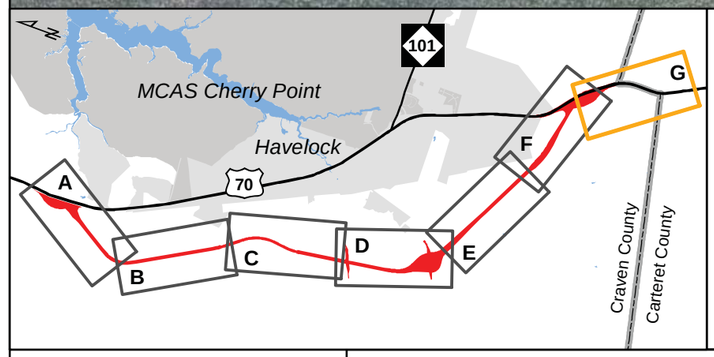
PFm

N

70

Lakeside Dr

Ridge Rd



- Right of Way
- County Boundary

Vegetative Community Labels

- M - Rural/Urban Modifications
- P - Pond
- PCh - Powerline Corridor; hydric
- PCm - Powerline Corridor; mesic
- PFh - Pine Flatwoods; hydric
- PFm - Pine Flatwoods; mesic
- PH - Pine/Hardwood Forest
- PPh - Pine Plantation; hydric
- PPm - Pine Plantation; mesic
- SFl - Swamp Forest; large stream
- SFp - Swamp Forest; ponded/depressional
- SFs - Swamp Forest; small stream
- SPs - Streamhead Pocosin; shrub-dominated
- SPt - Streamhead Pocosin; tree-dominated
- SR - Successional/Ruderal Habitat

0 250 500 1,000 Feet

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Vegetative Communities
Scale: 1" = 500'
Exhibit 3.13.1g

This page intentionally left blank to facilitate double-sided printing.

The single most abundant shrub species in mesic areas is blue huckleberry (*Gaylussacia frondosa*). Sweetgum (*Liquidambar styraciflua*) is the most abundant tree species present below the pine canopy, but this species may be represented by only shrub or sapling-sized individuals. Other woody species frequently present in mesic areas include horsesugar (*Symplocos tinctoria*), southern bayberry (*Morella cerifera*), swamp bay (*Persea palustris*), and small black blueberry (*Vaccinium tenellum*). Yellow jessamine (*Gelsemium sempervirens*) is a frequent woody vine that grows by twining through young trees and scrambling across the ground.

Openings in shrubs make sunlight more available and provide habitat for a variety of herbaceous species. In addition, this is prime habitat for a species of particular interest, spring-flowering goldenrod (*Solidago verna*), which is quite abundant throughout this habitat type, and even occurs in the more hydric variations of this habitat. Northern bracken fern (*Pteridium aquilinum* var. *pseudocaudatum*) and wire-grass (*Aristida stricta*) are abundant and provide thick cover in some areas. Additional, but rarely dominant species represented are round-leaf thoroughwort (*Eupatorium rotundifolium*), spiked hoary-pea (*Tephrosia spicata*), and narrow-leaf silk-grass (*Pityopsis graminifolia* var. *tenuifolia*).

Hydric variations of pine flatwoods are characterized by an intermittent to nearly continuous shrub stratum frequently dominated by giant cane (*Arundinaria*. *tecta*). While sweetgum is frequent in these habitats, red maple (*Acer rubrum*) is somewhat more abundant. Wetter versions of this habitat are similar to streamhead pocosins and may have some of the same species in common. Southern blueberry (*Vaccinium formosum*), evergreen bayberry (*Morella caroliniensis*), black blueberry (*Vaccinium fuscatum*), swamp bay, southern bayberry, horsesugar, and shinyleaf (*Lyonia lucida*) are often present. Herbaceous species include cinnamon fern (*Osmundastrum cinnamomeum*) and Virginia chain-fern (*Woodwardia virginica*) that are favored by scattered openings in the thick shrub cover.

Narrow seepage shelves along slopes above swamp forests at the edges of mesic pine flatwoods habitats are characterized by the clonal stands of coastal doghobble (*Leucothoe axillaris*). Stands of this species may remain visible for years following modification of the conditions that allowed them to establish. Loblolly pine is a regular canopy associate. Other species that can be found are cinnamon fern, American holly (*Ilex opaca*), and yellow poplar.

Bryophyte species are sparse through the mesic portions of this habitat. Wetter stages with fallen logs and hardwood tree bases may support mixed species dominated by the leafy liverwort *Odontoschisma prostratum* (scientific names of liverworts follow Hicks 1992) and the moss *Leucobryum albidum* (Scientific names of mosses follow Crum and Anderson 1981). Depressions holding water for extended periods of time may support small mounds of sphagnum (usually *Sphagnum palustre* or *S. affine* but also possibly *S. perichetiale*). These

are never extensive or abundant and are widely scattered unless associated with plowed firebreaks where moisture is perched over subsoil clays. Bryophyte cover in mesic habitats is sparse to non-existent especially under heavy leaf litter. Cover by bryophytes in some hydric stands can approach an estimated one percent.

Natural modifications in pine flatwoods habitats accompany topographic variation. Topographic variation is found along slopes of natural drainage lines, for example, Southwest Prong Slocum Creek. Changes accompanying topographic breaks are marked by an increase in occurrence of broadleaf deciduous tree species in the forest canopy or subcanopy. As the slope breaks from mesic flatwoods, longleaf pine may be partially replaced in the canopy by loblolly pine, white oak (*Quercus alba*), southern red oak (*Quercus falcata*), hickory (*Carya* spp.), and water oak (*Quercus nigra*). Sourwood (*Oxydendrum arboreum*) and flowering dogwood (*Cornus florida*) are regular constituents of a subcanopy along well-drained sandy slopes. Red maple and sweetgum often become more abundant on moist slopes, as well. Lower, along the slope, soils may become moister from seepage or sandier as fine particulates are leached from the soil and moved further down the slope. Yellow poplar (*Liriodendron tulipifera*) and swamp chestnut oak (*Quercus michauxii*) are often important in the canopy while American holly becomes a characteristic subcanopy species. Near the base of the slope, swamp forest species increase in importance as soil moisture increases and as textures become more loamy or mucky.

Pine/Hardwood Forest (PH)

As indicated above, pine/hardwood forests may develop along stream slopes. This forest type is also one of the intermediate results of fire exclusion from otherwise natural forest systems. In mature pine forests protected from fire, particularly mature loblolly pine forests, hardwood forest species tend to invade as soils become coarser and as light levels are reduced at the forest floor. Reduced light levels offer a competitive advantage to broadleaf deciduous or hardwood species. At intermediate seral stages, hardwoods may grow into a subcanopy stratum. Eventually, as pines mature, senesce, and die, hardwoods replace them in the canopy. This process of natural successions is often truncated in natural systems where fire is experienced. Pine forests may be the temporary result. Additional disturbances can further confuse successional stages and promote further diversity in forest variation. Mesic and hydric variations in pine/hardwood forests were not recognized during mapping due in part to the subtle successional and hydrologic factors present in these communities that are difficult to discern from aerial photography.

Additionally, pine/hardwood forest variations were not recognized because aerial photographic resources were inadequate without intensive ground truth. As a result many variations of this type along slopes have been included with pine flatwoods. In some areas, somewhat more extensive pine canopy covers are broken by hardwood occurrences. Examination of these areas in the field indicates that while pines appear to be functioning

as a canopy, high hardwoods, though not quite as tall as the pines, were functioning in the lower canopy as well. In such situations, photographic signatures returned only pine in the canopy. From a strictly aerial photographic view, pine-hardwood canopy mixing was not readily visible unless pines were more widely spaced.

Pine/hardwood forests are present in a wide range of landscape conditions. Successional trends across these habitats are not always clear, as indicated by the wetland example in the last paragraph. In one area there was a visible trend toward pine standing stock with greater diameters where hardwoods were present in the canopy. Combined cover by the canopy species (hardwood and pine) exceeded 50 percent in some areas. The successional sere was older. As in pine flatwoods, shrub strata were relatively dense with covers up to 60 percent. Covers were low for herbaceous plants. Bryophytic species were largely corticolous because of the presence of hardwood bark substrates. However, bryophytes were also favored on rotten wood and soil with the naturally increased moisture under multiple canopy layers. Fire, still a management factor in such habitats, was responsible for thinner litter layers and additional stand diversity.

In the above area, post-mature loblolly pine was the dominant tall canopy species, while a well-developed lower canopy of hardwood consists primarily of water oak, sweet-gum, red maple, and large swamp bay. Horsesugar makes up the bulk of the subcanopy stratum along with younger individuals of canopy species. Swamp titi (*Cyrilla racemiflora*) and large gallberry (*Ilex coriacea*) constitute a high shrub layer along with younger individuals of canopy and subcanopy species.

Bluff areas along Southwest Prong Slocum Creek within the detailed study corridors are marked by the occurrence of a greater percentage of hardwood species in the canopy and replacement of longleaf pine by loblolly pine. The slopes above the creek near the intersection of Greenfield Heights Boulevard and Gray Road have a similar canopy composition that grades to more loblolly pine to the south. One outstanding parcel along the south side of the creek at the eastern boundary of the Alternative 3 corridor has been partially separated from the mainland by stream dissection. The top of the resulting knoll rises 10 to 15 feet above the elevation of the surrounding swamp to about the height of the adjacent upland flatwoods landscape. With minimal connection to the main portion of the upland landscape, seepage characteristics have been lost.

A mix of hardwood species joins loblolly pine in the canopies of the above pine/hardwood parcels. Yellow poplar, hickory, white oak, southern red oak, an occasional northern red oak (*Quercus rubra*), water oak, and sweetgum are included among the canopy dominants. Longleaf pine is absent from these parcels, but present in the nearby adjacent landscapes. A subcanopy is composed of younger individuals of the canopy species as well as flowering dogwood and sourwood. In other more mesic areas such as the bluff along the north side of Southwest Prong Slocum Creek, American beech (*Fagus grandifolia*) grows

on the low slopes and ridges just above the wet floodplain along with a typical subcanopy species American hornbeam (*Carpinus caroliniana*). Shrub species included small-flower pawpaw (*Asimina parviflora*), silky-camellia (*Stewartia malacodendron*), swamp bay, and several species of woody vines including muscadine (*Vitis rotundifolia*) and Virginia creeper (*Parthenocissus quinquefolia*). Partridge-berry (*Mitchella repens*) and variable rosette grass (*Dichanthelium commutatum*) were the most abundant herbaceous species, though these were only scattered.

Additional areas of pine/hardwood forest were found. Two areas were found along a ridge paralleling the east and west sides of East Prong Slocum Creek. Several areas were found along the upland slopes of Tucker Creek west and south of the Craven County Transfer Facility.

Streamhead Pocosin (SPt - Tree Dominated, SPs - Shrub Dominated)

Significant streamhead pocosin habitats occur largely in the southern portion of the project study corridors. These are located near the western and eastern sides of East Prong Slocum Creek and in the proposed southern interchange with the existing US 70. Scattered pocosin habitat also occurred along the west side of Creek Road just south of Havelock and west of East Prong Slocum Creek. These habitats consist of high, dense-shrub strata under a scattered canopy of pond pine, occasionally loblolly pine, and loblolly bay (*Gordonia lasianthus*). Areas with a relatively continuous canopy are identified as tree-dominated (SPt). Shrubs dominate pocosin containing only widely-scattered trees in the canopy (SPs). Most of the pocosin habitat seen in the project study area exists at the heads of streams or in upper stream divides where runoff is slow. That is, they occur in areas above discernable stream dissection.

Pond pine is the dominant canopy species of most pocosin habitat. Occasional loblolly and longleaf pine may be present depending to some extent on variance in soil characteristics. A thick stratum of shrubs is typical of most areas. The shrub layers contain varying mixtures of several species of shrubs including shinyleaf, swamp titi, Carolina-laurel (*Kalmia carolina*), swamp doghobble (*Leucothoe racemosa*), southern blueberry, honeycup (*Zenobia pulverulenta*), inkberry (*Ilex glabra*), horsesugar, and large gallberry. Red maple, loblolly bay, and swamp bay occur as trees or younger individuals. Swamp tupelo (*Nyssa biflora*) and pond cypress (*Taxodium ascendens)* may be found in somewhat lower areas that experience nearly permanent standing water. Laurel-leaf greenbrier (*Smilax laurifolia*) is an abundant woody vine that adds significantly to the thickness of these habitats.

Shrub cover in most pocosin habitats approaches or exceeds 80 percent, while the canopy may have only 20 to 30 percent cover. Controlled burning may be responsible for reducing shrub cover in scattered areas, but that management practice has not been used to create any significant wet savannas. Pines dominating the canopy may exceed 18 inches

in diameter, but most are within the 12- to 16-inch classes. In a few areas, canopy trees are considerably smaller. Some areas are more open where the shrub stratum is intermittently broken such as the habitats west of Creek Road. These open areas support a wider variety of herbaceous species than do the more shaded systems. Two species commonly found throughout these habitats are cinnamon fern and Virginia chain fern. Many other species are regular constituents of more open phases of pocosins. Bryophytes are most visible in open habitats and include several species of *Sphagnum* as well as *Aulacomnium palustre*. In more shaded areas, a variety of both mosses and leafy liverwort species can be found on decaying wood and tree bases.

Swamp Forest (SFl -along large streams, SFs - along small streams, SFp - in ponds)
This community type is synonymous with the coastal plain small stream swamp community described in Schafale and Weakley. Swamp forest is typically subject to saturated soils and/or standing water for most of the year. These forests have been grouped under three distinct regimes with respect to hydrologic conditions. Swamp forests occur along large streams (SFl) such as East Prong Slocum Creek and Southwest Prong Slocum Creek. Larger streams often have been impounded by beaver (*Castor canadensis*) activity. Swamp forests occur along small streams (SFs) that are generally free-flowing and possibly intermittent tributaries of a larger stream. They occur, as well, in depressions or ponds (SFp) scattered through head water areas of small or large streams. During dry weather these depressions may be isolated from tributary streams and in some cases may be permanently isolated.

Canopy cover in swamp forest was highly variable. Generally, canopy coverage across more open large stream swamp forests was intermittent, primarily because of landscape drowning due to beaver activity. Small streams and inner edges of large stream swamp forests were usually quite well shaded with up to 60 or 70 percent cover by largely deciduous trees with a small percent contributed by pine. Cover by shrubs and herbs was usually low in small stream floodplains and ponded areas, but high along large streams particularly in areas flooded by beaver activity. Standing large trees nearest the main channels of large stream swamp forest were generally represented by dead stems. Away from the deeper portions of the swamp, larger trees could be found that were in the 20 to 24-inch diameter classes. Along small stream channels, tree stems usually matched in size those of adjacent upland areas. Stems in ponded swamp forest were quite variable and ranged from 8 to 16 inches in diameter.

Tree species commonly represented in large stream swamp forest are green ash (*Fraxinus pennsylvanica*), southern bald cypress (*Taxodium distichum*), sweetgum, red maple, swamp tupelo, and willow oak (*Quercus phellos*). The subcanopy contained younger individuals of the canopy species. Linear beaver dams add a dynamic elevation continuum from below ambient water levels to well above. Fallen dead trees provide additional habitat diversity for a time and ultimately assist in the accumulation of sediment and detritus in areas

impounded by beaver activity. Living plant stems provide additional flow reduction and diversion as the floodplain builds and spreads laterally.

Shrub and herb strata along large streams within the corridor have a species diversity that is accentuated and controlled largely by the course of beaver activity. A wide variety of species occur over the three-dimensional mosaic of beaver-influenced swamp forest in large streams, including swamp-loosestrife (*Decodon verticillatus*), eastern poison-ivy (*Toxicodendron radicans*), woodvamp (*Decumaria barbara*), horsebrier (*Smilax rotundifolia*), giant plume grass (*Saccharum giganteum*), swamp bay, lizard's-tail (*Saururus cernuus*), Virginia blueflag (*Iris virginica*), Virginia sweetspire (*Itea virginica*), swamp doghobble, and swamp rose (*Rosa palustris*).

Included in large stream swamp forest habitat are those areas that are adjacent and slightly above regular water flow, but still within the floodplain. These areas may be flooded during periods of heavy precipitation but otherwise remain saturated to within several inches of the surface of the soil. An example of such an area occurs along the western edges of Southwest Prong Slocum Creek within the Preferred Alternative corridor. This forest contains loblolly pine along with red maple, southern bald-cypress, and other canopy species of the more open swamp forest. Along with many of the shrub and herb species characteristic of more open areas, cinnamon fern, Virginia chain fern, royal fern (*Osmunda regalis* var. *spectabilis*), netted chain-fern (*Woodwardia areolata*), which often mark the zone of transition between wetland and upland habitats, small-spike false nettle (*Boehmeria cylindrica*), and southern wood fern (*Dryopteris ludoviciana*) may occur.

Small stream swamp forests are narrow linear features that support at least an intermittent flow and are well- shaded by a combination of pine and deciduous tree species. In some areas they differ little from hydric pine flatwoods except for a larger proportion of hardwood species in the canopies. The most well-developed examples were found in upper branches of Tucker Creek, including Daniels Branch, and along an unnamed tributary of Southwest Prong Slocum Creek between the creek and Gray Road. Other habitats of this type are scattered in mesic flatwoods forest north of Lake Road and south of Sunset Drive. Some are scarcely more than 20 feet in width, while others are over 100 feet wide. Customary canopy constituents are loblolly pine, red maple, swamp tupelo, and sweetgum. Pond pine is occasionally present. Shrub species present are influenced by the nature of the surrounding habitat and usually consist of varying combinations of southern bayberry, giant cane, swamp bay, southern blueberry, shiny leaf, large gallberry, inkberry, and horsesugar. Netted-chain fern and cinnamon fern are among the most abundant herbs.

Ponded swamp forest habitat occurs in depressions that can be perennially isolated or those that contribute to outflow during precipitation events. Those areas that are perennially isolated have a limited habitat diversity, and support a single, mixed-species stand typically consisting of swamp tupelo, pond cypress, and red maple. Swamp bay and

sweet-bay (*Magnolia virginiana*) may also be present. Shrub and herb constituents are usually limited to the peripheries of these ponds.

Another type of ponded swamp forest is subject to through-flow and is found in hydric pine flatwoods or streamhead pocosin habitats. These are shallow depressions that fill during precipitation events. Upon filling, there may be a partial flow reversal either above or below the soil surface so that there is a slow redistribution of moisture away from the location of the hydrologic head. A forest canopy and/or a thick shrub stratum usually shade these basin-like depressions. In some habitats, they are more open to direct light as a result of a partial thinning of the forest canopy. The largest such habitats seen are in the proposed southern interchange portion west of the existing US 70.

Vegetation adjacent to the second example of ponded swamp forest is intermediate between hydric pine flatwoods and streamhead pocosin. The habitat is broken by an irregularly-interconnected system of pools up to two feet deep and short channels bordered by narrow ridges supporting trees and shrubs. Largely loblolly pine with or without pond pine forms the highest canopy with deciduous species including red maple, swamp tupelo, sweetgum, and scattered pond cypress below. Swamp bay and sweet-bay are characteristic subcanopy trees. Southern bayberry and shiny leaf grow on ridges and in clumps often over hanging water. Younger individuals of subcanopy species are generously present. Other species present depend on the character of the surrounding vegetation and whether it is more similar to hydric flatwoods or streamhead pocosin. Cinnamon fern and Virginia chain fern are typically present.

Cover by bryophyte species was variable between different types of swamp forest. In ponded swamp forest, corticolous bryophytes occupied the surfaces of tree bases and fallen logs. These include, among others, *Odontoschisma prostratum*, *Pallavicinia lyellii*, *Leucobryum albidum*, *Leucolejeunea clypeata*, and *Sematophyllum adnatum*. In small stream swamp forest and more shaded edges of swamp forests along large streams, corticolous species were also very abundant with a greater number of leafy liverworts and large mosses in soil at the upper edges of floodplains such as *Mnium cuspidatum* and *Climacium americanum*. In addition to the above corticolous species in swamp forest ponds, others were seen on exposed roots and tree bases in swamp forest along major streams. These included *Metzgeria furcata*, *Entodon macropodus*, *Schwetschkeopsis fabronia*, and *Steercleus serrulatus*. In more perennial streams, aquatic species were also present. West of Gray Road, the stream contained *Fontinalis sullivantii*. The genus *Fissidens* was also represented. Swamp forests are rich habitats for bryophytes. Bryophytes were not regularly noted in the main channels of large stream swamp forests, but were abundant well away from areas exposed to frequent flooding in the flood plains, particularly along all portions of Southwest Prong of Slocum Creek.

Small Pond (P)

This community type includes vernal pools and other ephemeral depressions that have formed under natural conditions as well as isolated depressions that have formed through soil compaction by past off-road vehicle usage that have since naturalized with permanent vegetation. Small ponds are habitat features that are isolated by mesic flatwoods or other communities from any natural drainage system. Two areas containing concentrations of such ponds identified during the course of the fieldwork are described here. One area was in the mesic pine flatwoods within the Preferred Alterative corridor. The flatwoods ponds were essentially without canopy species except for the presence of a stem of swamp tupelo in one and a stem of loblolly pine in the other in the deepest parts of the depressions. Both were only ephemerally wet and only one supported wetland vegetation. Soils in one pond were marginally-hydric but fully-hydric in the other. Inkberry, giant cane, wand panic grass (*Panicum virgatum*), and cypress rosette grass (*Dichanthelium dichotomum*) were additional species present.

A second group of five ponds is located off Forest Road 3016 within a pine plantation along the north side of the road. The group consists of about five ponds, one of which extends outside the boundary to the west of the Alternative 1 study corridor. The depressions contained little water at the time of the field work in April of 2004, but water had been present earlier during the year as evidenced by the presence of dried sheets of *Sphagnum cuspidatum*. Young red maple, sweet gum, loblolly pine and black gum were present with a low understory of swamp titi. The presence of southern bayberry, inkberry, American holly, and broom-sedge indicated that the ponds were not usually flooded for prolonged periods.

Powerline Corridor (Mesic PCm, Hydric PCh)

Substantial sections of the Alternative 3 study corridor follow a maintained powerline corridor north of Sunset Drive, along FR 638 and across the end of Pine Grove Road (FR 156). A small fragment of power line corridor occurs in the project area east of Creek Road (FR 604) nearest the railroad. Portions of powerline corridor habitats designated as mesic (PCm) do not normally support standing water for significant periods of time. Powerline corridor habitats designated as hydric (PCh) are subject to prolonged periods of standing water normally during winter, spring, and sometimes early summer. Vegetation along these corridors is mowed at intervals of two to five years.

Plant species of mesic areas include inkberry, giant cane, loblolly pine, small black blueberry, narrow-leaf silk-grass, wire-grass, broom-sedge (*Andropogon virginicus*), spring-flowering goldenrod, and hair-awn muhly (*Muhlenbergia capillaris* var. *trichopodes*). Plants in hydric powerline corridors are, among many others, slender goldentop (*Euthamia caroliniana*), giant cane, inkberry, broom rosette grass (*Dichanthelium scoparium*), woolly rosette grass (*Dichanthelium scabriusculum*), rushes (*Juncus* spp.), sedges (*Carex* spp.), beak rushes (*Rhynchospora* spp.), blue-flower butterwort (*Pinguicula caerulea*), yellow pitcherplant (*Sarracenia flava*), purple pitcherplant (*Sarracenia purpurea*), and little

floating bladderwort (*Utricularia radiata*). The most common bryophytes are several species of *Sphagnum* as well as *Aulacomnium palustre*. Where powerline corridors are crossed by ponds or small streams, they may be submerged for a substantial portion of the year.

Pine Plantation (Mesic PPm, Hydric PPh)

Substantial pine plantations occur within the proposed bypass corridors. These pine plantation habitats are located (1) along Creek Road at the southern edge of the project corridor, (2) west of Sunset Drive along FR 638, (3) along the northern side of Hickman Hill Road (FR 601), (4) near the end of Pine Grove Road (FR 156) at the old landfill site west of Craven County Transfer Facility along the existing US 70, (5) along FR 3016, the extension of Gray Road, and (6) along a Weyerhaeuser access road. Soils within these habitats have been heavily disturbed either by bedding for pine plantation or by the importation of soil material, as in the case of the old landfill.

The bedding process in plantation areas turns furrow slices of soil material, usually the A-Horizon and part of the E-Horizon, to something of an upside-down position over an adjacent linear strip of undisturbed soil. This process changes the character of the soil and surface drainage, but creates a ridge that better supports pine seedlings, particularly in areas that tend to be wet. Otherwise, soils are similar to those found in the area in general. Soils at the landfill plantation are visibly mixed fill material with no natural horizons present.

The most upland plantation parcel was planted over the old landfill where pine was planted in loamy soil material brought in from some other site to cap the landfill. The dominant plant is young loblolly pine planted in rows. A scattered subcanopy of sweetgum has begun to grow between the rows and southern bayberry is scattered. Meadow rye grass (*Lolium pratense*), Chinese bush-clover (*Lespedeza cuneata*), and slender wood-oats (*Chasmanthium laxum*) have either volunteered or were spread at the time of capping.

A very small segment of hydric pine plantation at the side of Creek Road consists of very-closely-planted young loblolly pine planted on bedded rows. Saw-tooth blackberry (*Rubus argutus*) is residual from early growth following site preparation.

Loblolly and longleaf pine occur at the large pine plantation along FR 638 west of Sunset Drive. The plantation is largely mesic, though unmapped sections of it in the western half are somewhat wetter, and possibly hydric, than the eastern half. Saplings and small tree-sized sweetgum is the major tree species present. Horsesugar, huckleberry, southern bayberry, and swamp bay are the customary shrubs. Herbaceous species commonly represented are northern bracken fern, spring-flowering goldenrod, broom-sedge, and Virginia chain fern.

Loblolly pine has been planted at the western edge of the project corridor along the end of Pine Grove Road (FR 156). The major significant understory species in this mesic plantation is

southern bayberry. An additional loblolly pine plantation in the Alternative 3 study corridor was planted along Hickman Hill Road (FR 601). This stand is hydric. Sweetgum and southern bayberry are the most-significant understory species.

Successional/Ruderal Habitat (SR)

Natural communities in which natural soil/vegetation relationships have been modified for human use and then abandoned are considered successional. Abandoned agricultural fields, borrow pits, sand mines, and unmanaged clear-cut areas are examples. Ruderal habitats may exist where soil material is maintained in a constant state of disturbance.

An area along Sunset Drive is an example of habitat containing both successional and ruderal habitats. A combination of mesic pine flatwoods and hardwood slope forest along the north side of the swamp forest paralleling the Southwest Prong Slocum Creek was removed to create a borrow area for one or more nearby projects requiring fill material. Overburden was removed and piled to the sides to allow access to the required material. Natural soil material well into the C-horizon was transported from the site leaving exposed parent material for regeneration of vegetation.

The ruderal character of the site has been accentuated by recent use by all-terrain-vehicles (ATV). Packed clay soils and incised ATV tracks increase the water-perching capacity of some portions of the site, while breaches in the discarded overburden allow for drainage of others into the adjacent stream. More-frequently-used portions of the site are without significant vegetation. Soil profiles investigated in this area show continuous C-horizon or mixed horizon materials persisting. Areas used by ATV's have a surface that is mixed with surface C-horizon material, organic litter and fragments of previous horizons. Regeneration of vegetation in the low-nutrient soils has led to stunted growth of most trees and shrubs.

Poorly-developed vegetation consisting of spindly loblolly pine forest with a low, scattered hardwood understory dominates much of the site. A scattered understory of sweetgum, water oak, and red maple predominates along slightly lower drainage ways incised into the soil. Poor site quality has limited the coverage and rate of growth of most of the current vegetation. Other elements of the successional vegetation are characteristic of those found in pine plantation. Successional/ruderal habitat inter-fingers with a narrow band of hardwood slope forest just above the swamp forest along Southwest Prong Slocum Creek.

Rural/Urban Modifications (M)

Rural/Urban Modifications (M) habitats include all those landscape features in the project corridors that are currently functioning features within the human infrastructure. Examples are transportation corridors, ditches, transportation corridor shoulders, residential areas, and a recycling and transfer facility. These features are a part of the overall habitat complex of the project corridors, albeit a part with minimal non-human functional importance. These areas provide habitat for a wide assortment of weedy, non-native plant species as well as native flora and also provide corridors for their movement and redistribution. No attempt will be made to itemize plant species that can occur or are likely to be found in these

habitats. All species thus far mentioned, as well as many others, are candidates. Non-native invasive plant species in these areas include: Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), serica lespedeza (*Lespedeza cuneata*), and bicolor lespedeza (*Lespedeza bicolor*).

Wildlife (Terrestrial Fauna)

Most of the project study area is forested in nature, but there are disturbed areas that include clearcuts, residential and commercial areas, agricultural fields, and roads. Clearing and conversion of tracts of land for agricultural, residential, and commercial uses has eliminated cover and protection for many species of wildlife while increasing habitat for other species able to utilize these anthropogenic habitats. The project study area provides habitat for forest-interior species, but in disturbed areas, woodland strips bordering jurisdictional areas often serve as travel corridors for these species between different habitat types. Developed areas provide food for disturbance-adapted wildlife, and create edge habitat favored by certain species.

Most of the mammals documented within the project study area are the conspicuous larger and medium-sized species that have wide habitat tolerances and commonly occur in anthropogenic landscapes. Mammal species observed include gray squirrel (*Sciurus carolinensis*), white-tailed deer (*Odocoileus virginianus*), and gray fox (*Urocyon cinereoargenteus*), as well as evidence of Virginia opossum (*Didelphis virginiana*), beaver, raccoon (*Procyon lotor*), and black bear (*Ursus americanus*) activity.

No quantitative surveys were conducted to document the small mammal populations within the project study area. The forested communities within the project study area are expected to provide habitat for small animals including insectivores such as southeastern shrew (*Sorex longirostris*) and southern short-tailed shrew (*Blarina carolinensis*), and rodents such as cotton mouse (*Peromyscus gossypinus*) and golden mouse (*Ochrotomys nuttalli*). Early successional habitats and weedy disturbed areas are expected to provide habitat for insectivores such as least shrew (*Cryptotis parva*) and eastern mole (*Scalopus aquaticus*), and rodents such as the hispid cotton rat (*Sigmodon hispidus*).

Bird species documented in the project study area are typical of forested communities and maintained and disturbed areas of North Carolina. Bird sightings within the project study corridors include a combination of permanent residents, summer breeders or visitors, winter visitors, and migratory transients. Some species are habitat specific, being limited by narrow ecological requirements, while others have more general habitat requirements.

Common resident bird species observed year-round throughout the project study corridors include species commonly occurring in both natural and anthropogenic habitats in eastern North Carolina. Commonly encountered bird species of this type included mourning dove (*Zenaida macroura*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thryothorus ludovicianus*),

American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos*), brown thrasher (*Toxostoma rufum*), eastern towhee (*Pipilo erythrophthalmus*), northern cardinal (*Cardinalis cardinalis*), common grackle (*Quiscalus quiscula*), and brown-headed cowbird (*Molothrus ater*). Exotic species found primarily in residential areas included rock dove (*Columba livia*) and European starling (*Sturnus vulgaris*).

The extensive forested areas provide suitable habitat for many Neotropical migrants as well as residents that are area-sensitive species requiring mature forests for breeding. Many of these species are typically associated with specific forest types. Neotropical migratory birds documented in the swamp forests and adjacent slopes included red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia),* white-breasted nuthatch (*Sitta carolinensis*), Acadian flycatcher (*Empidonax virescens*), northern parula (*Parula americana*), yellow-throated warbler (*Dendroica dominica*), black-and-white warbler (*Mniotilta varia*), prothonotary warbler (*Protonotaria citrea*), worm-eating warbler (*Helmitheros vermivorus*), Swainson's warbler (*Limnothlypis swainsonii*), and hooded warbler (*Wilsonia citrina*). Birds documented in the pine flatwoods that are restricted to, or more prevalent within, this habitat included red-cockaded woodpecker (*Picoides borealis*), brown-headed nuthatch (*Sitta pusilla*), and pine warbler (*Dendroica pinus*).

Other species documented that occur in a wider range of forested habitats included wild turkey (*Meleagris gallopavo*), chuck-will's-widow (*Caprimulgus carolinensis*), whip-poor-will (*Caprimulgus vociferous*), red-headed woodpecker (*Melanerpes erythrocephalus*), red-bellied woodpecker (*Melanerpes carolinus*), hairy woodpecker (*Picoides villosus*), pileated woodpecker (*Dryocopus pileatus*), eastern wood-pewee (*Contopus virens*), red-eyed vireo (*Vireo olivaceus*), blue-headed vireo (*Vireo solitarius*), ruby-crowned kinglet (*Regulus calendula*), blue-gray gnatcatcher (*Polioptila caerulea*), wood thrush (*Hylocichla mustelina*), gray catbird (*Dumetella carolinensis*), yellow-rumped warbler (*Dendroica coronata*), prairie warbler (*Dendroica discolor*), ovenbird (*Seiurus aurocapillus*), and summer tanager (*Piranga rubra*).

Other birds documented that are typically found along forest edges or in shrubby habitats included northern bobwhite (*Colinus virginianus)*, eastern kingbird (*Tyrannus tyrannus*), white eyed vireo (*Vireo griseus*), common yellowthroat (*Geothlypis trichas*), yellow-breasted chat (*Icteria virens*), and swamp sparrow (*Melospiza georgiana*).

Bird species documented in association with aquatic habitats within the project study corridors, particularly the open, beaver-impounded areas, included wood duck (*Aix sponsa)*, hooded merganser (*Lophodytes cucullatus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), spotted sandpiper (*Actitis macularia*), osprey (*Pandion haliaetus*), belted kingfisher (*Ceryle alcyon*), and tree swallow (*Tachycineta bicolor*).

Terrestrial reptile species observed in the project study area included black racer (*Coluber constrictor*), southern copperhead (*Agkistrodon contortrix*), eastern worm snake (*Carphophis amoenus*), pine woods snake (*Rhadinaea flavilata*), scarlet kingsnake (*Lampropeltis triangulum elapsoides*), cornsnake (*Elaphe guttata*), rough green snake (*Opheodrys aestivus*), southern ringneck snake (*Diadophis punctatus*), ground skink (*Scincella lateralis*), southeastern five-lined skink (*Eumeces inexpectatus*), broadhead skink (*Eumeces laticeps*), green anole (*Anolis carolinensis*), and eastern box turtle (*Terrapene carolina*).

Terrestrial amphibians observed within the project study area were several species of toads, treefrogs, and chorus frogs, including Fowler's toad (*Bufo woodhousei fowleri*), oak toad (*Bufo quercicus*), southern toad (*Bufo terrestris*), squirrel treefrog (*Hyla squirella*), green treefrog (*Hyla cinerea*), pine woods treefrog (*Hyla femoralis*), gray treefrog (*Hyla versicolor*), and little grass frog (*Pseudacris ocularis*). These species require ephemeral pools for breeding, which were present in several locations throughout the project study corridors. Terrestrial salamanders documented included slimy salamander (*Plethodon glutinosus* complex) and Chamberlain's dwarf salamander (*Eurycea chamberlaini*).

3.13.2 Aquatic Communities and Wildlife

Aquatic habitats within the project study area range from ephemeral waters present in intermittent, channelized first-order streams to perennial stream channels and flooded palustrine habitat.

Wildlife (Aquatic Fauna)

The diversity of streams in the project study area provides habitat for a variety of aquatic species. Large streams with good water quality and a diversity of aquatic habitats, such as East Prong Slocum Creek, are expected to support a more-diverse assemblage of fish and other aquatic organisms than smaller tributaries. The variety of flow characteristics and microhabitat within these streams has the potential to support an array of species.

None of the project study area streams are considered Significant Aquatic Endangered Species Habitat (NCGIA, 2002). *BasinPro Significant Aquatic Endangered Species Habitat* identifies the extent of Endangered or Threatened species populations and the tributaries and headwaters of their habitats (NCGIA, 2002). A portion of Southwest Prong Slocum Creek extending into the western portion of the study area is identified as anadromous fish spawning area; this area is not depicted as extending into the Preferred Alternative alignment. Culverts under existing US 70, the railroad, and other roads are expected to limit the potential for anadromous fish to utilize stream segments within the project study corridors. The North Carolina Wildlife Resources Commission (NCWRC) has requested an in-water work moratorium for February 15 to June 15 for East Prong and Southwest Prong Slocum Creek throughout the project study area. Goodwin Creek and Tucker Creek upstream of the US 70 structure will not require a moratorium; however, if the current

structures are replaced or extended downstream, a February 15 to June 15 moratorium will apply.

NCDOT biologists sampled Southwest Prong Slocum Creek and East Prong Slocum Creek in April 2005 as part of the USFS rare species evaluation and documented the following species: bowfin (*Amia calva*), American eel (*Anguilla rostrata*), eastern mosquitofish (*Gambusia holbrooki*), creek chub sucker (*Erimyzon sucetta*), redfin pickerel (*Esox americanus*), pirate perch (*Aphredoderus sayanus*), bluespotted sunfish (*Enneacanthus gloriosus*), pumpkinseed (*Lepomis gibbosus*), flier (*Centrarchus macropterus*), warmouth (*Lepomis gulosus*), bluegill (*Lepomis macrochirus*), and mud sunfish (*Acantharchus pomotis*).

The stream channels and flooded wetlands within the project study area provide riparian and benthic habitat for amphibians and aquatic reptiles. Aquatic or semi-aquatic reptiles documented included cottonmouth (*Agkistrodon piscivorus*) and spotted turtle (*Clemmys guttata*). Other reptiles such as the Florida cooter (*Pseudemys floridana*), yellowbelly slider (*Trachemys scripta*), and northern water snake (*Nerodia sipedon*) are expected to occur in the project study corridors. Amphibians observed in or near stream channels and flooded wetlands include: green frog (*Rana clamitans*), southern leopard frog (*Rana utricularia*), carpenter frog (*Rana virgatipes*), and bullfrog (*Rana catesbeiana*).

3.13.3 Protected Lands

Wild and Scenic Rivers

There are no water bodies within the project study area deserving special attention as denoted under the Federal Wild and Scenic Rivers Act of 1968 (Pub. L. No. 90-542, 82 Stat. 906; codified and amended at 16 U.S.C. 1217-1287 (1982)) or under the N.C. Natural and Scenic Rivers Act of 1971 (G.S. 133A-30).

State/National Forests

The Croatan National Forest's ±160,000 acres lie partly within the project study area. The Croatan National Forest is generally bounded by US 17, US 58, NC 24, Newport River, and Neuse River. As discussed throughout this document, the forest contains numerous natural features including pocosin habitat, pine flatwoods, and pine savannas. It is near the northern range limit of the American alligator and also provides habitat for the red-cockaded woodpecker (RCW). Much of the forest can be characterized as a coastal plain forest that includes densely vegetated pocosins that support a wide range of wildlife, ridges that support longleaf pines, hardwood wetlands with sluggish, meandering streams with cypress trees that provide habitat for songbirds and other unique biological and topographical features. Additionally, habitat is provided on the CNF for two federally endangered species; the red cockaded woodpecker (RCW) and rough-leaf loosestrife.

Highlights of the Croatan National Forest are the Cedar Point Tideland Trail near Cape Carteret, the Island Creek Forest Walk, and the Neusiok Trail beginning at a Neuse River

estuary and ending at Oyster Point. Wilderness areas include the Pocosin Wilderness, Pond Pine Wilderness, Catfish Lake South Wilderness, and Sheep Ridge Wilderness.

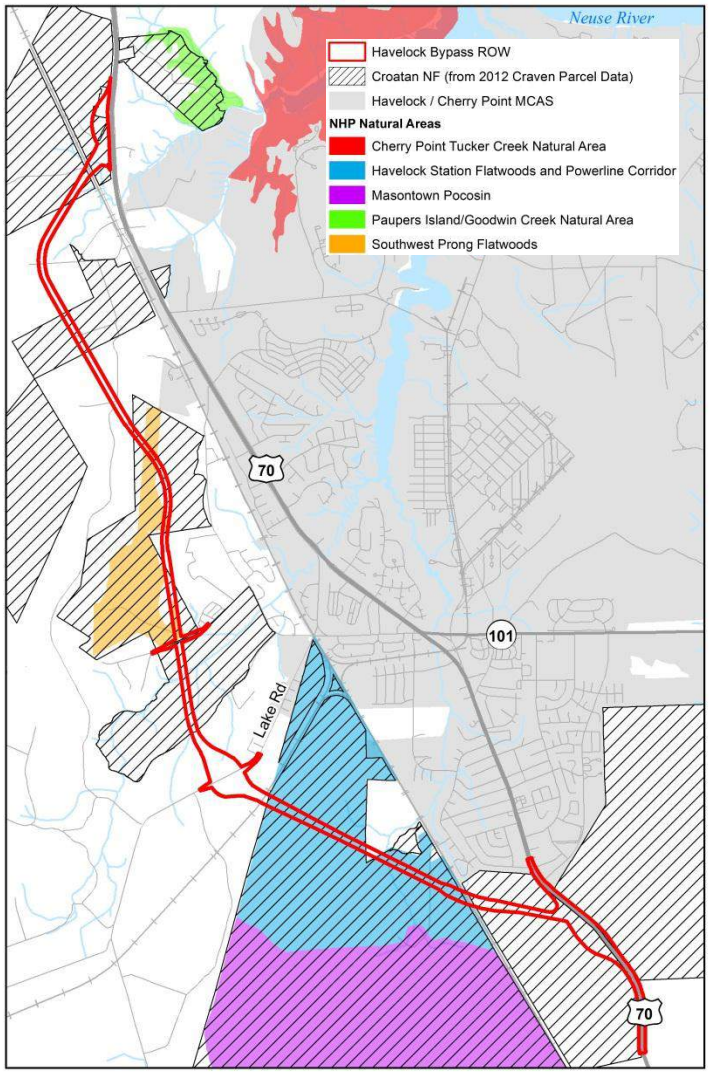
There are no other State or National Forests in the project area.

Gamelands

Although created to acquire lands needed for timber production as well as protecting flow of navigable streams, the Croatan National Forest is a gameland identified by the NC Wildlife Resources Commission and managed by the USFS. The land is open to anglers and hunters with the proper licenses and permits. Primary species hunted on CNF gamelands include deer, turkey, fox, rabbit, raccoon, squirrel, quail, dove, and waterfowl. The portions of the CNF within the project study area are designated Black Bear Sanctuary (NCWRC, 2003) where bear hunting is prohibited.

Preservation Areas

The N.C. Natural Heritage Program (NCNHP) was contacted to identify preservation areas in the vicinity of the project. Several sites were identified including the Southwest Prong Flatwoods Natural Heritage Natural Area (NHNA), Havelock Station Flatwoods and Powerline Corridor Natural Area, Masontown Pocosin NHNA, the Cherry Point Tucker Creek Natural Area, and the Paupers Island/Goodwin Creek Natural Area. These areas have been identified because they include large, steady-state, contiguous communities, unique ecotonal fringes, and important wetland corridors which may serve as critical habitat for wildlife.



The Southwest Prong Flatwoods Priority Area is located north of SR 1747 (Sunset Drive), encompasses a mesic pine savanna community and numerous transitions into wet pine flatwood variants. This area includes a red-cockaded woodpecker (RCW) cluster, extensive RCW habitat, and USFS rare species populations within the power line easement that bisects this savanna community. This natural area occupies a large portion of the NFS

lands north of SR 1746 (Sunset Drive), extending northward along a powerline corridor towards US 70. The NC Natural Heritage Program identifies this site as one of the best examples of Mesic Pine Savanna (Coastal Plain Subtype) in the state (NCNHP, 2011). The Longleaf Pine communities at this site occur on various soil types, including ones that today only rarely support longleaf, mainly because they have elsewhere been converted to agriculture or silviculture. The Southwest Prong Flatwoods SNHA also supports significant populations of spring-flowering goldenrod (*Solidago verna*), a Federal Species of Concern, and state-endangered mudbank crown grass (*Paspalum dissectum*).

The Havelock Station Flatwoods and Powerline Corridor Natural Area consist of mesic pine savanna dominated by longleaf pine, with two powerline corridors featured prominently through the area. The powerline corridors maintain savanna-like conditions thyat support a number of rare plant species. The savannah and flatwoods support 18 rare species including five butterflies, three birds, two reptiles, and eight plants. This natural area occupies a large area of NFS lands east of SR 1756 (Lake Road) and south of the railroad.

Masontown Pocosin Natural Area is located approximately 1,000 feet southwest of the southern terminus of the Preferred Alternative. Masontown Pocosin Natural Area denotes a large pocosin preserve within the Croatan National Forest Megasite. The difficulty in gaining access to the interior of Masontown Pocosin and the lack of recent disturbance to the site warrants protection of this area as a bioreserve.

The Cherry Point Tucker Creek Natural Area and the Paupers Island/Goodwin Creek Natural Area are located approximately 1,000 feet east of the northern terminus of the proposed project.

Croatan Wetland Mitigation Bank (CWMB)

The NCDOT purchased the CWMB, an approximate 4,035-acre tract of land approximately 3.6 miles northwest of Havelock in Craven County, in 1998 in coordination with USFS personnel who recommended the site for the purpose of restoring, enhancing, and preserving riverine and nonriverine wetland systems to compensate for unavoidable stream and wetland impacts associated with the proposed US 70 Havelock Bypass and other projects in the region separately authorized under Section 404 of the Clean Water Act.

The 2002 Memorandum of Agreement between NCDOT, US Army Corps of Engineers (USACE) and USFS states that the CWMB will be transferred to USFS and incorporated into the comprehensive management plan for the Croatan National Forest, including active management of RCW habitat. NCDOT is currently coordinating with the USACE and USFS to develop an updated MOU that will address the feasibility of managing the CWMB for RCW habitat.

As shown in the figure below (and in Exhibit 4.15), the CWMB (in green) is almost entirely bordered by NFS lands (in brown). The property fills in a substantial gap in NFS lands. Chapter 4.14.2 contains additional details on the future management of the CWMB. When added to existing NFS lands, the CWMB will increase the total size of the Croatan National Forest by 2.5 percent.

The CWMB was developed in two phases to allow for progressive watershed control and hydrologic management beginning in the upper reaches and proceeding downslope. Phase I construction was completed in 2001 and Phase II construction was completed in 2002. Five years of hydrologic and vegetative monitoring for Phase I were completed in 2006 for Phase I and in 2007 for Phase II.

Water Resources – Silviculture activities (road construction, ditching, and logging) have severely impacted hydrological functions of the site. The East Prong of Brices Creek and Tucker Creek are classified by the NCDWR as Class C waters with the supplemental classifications of nutrient sensitive waters (NSW) and swamp waters (Sw).

Topography and Soils – The topography of the CWMB is essentially flat with minimal slope to the north that is more prominent at the northern end of the site. A few very low ridges generally parallel the main access road maintained through the site. Soils on the CWMB can be divided into two basic classes, loamy soils with substantial amounts of clay in their lower horizons and organic soils with profiles formed in accumulations of decayed plant material. Soil series mapped for the CWMB include: Bayboro, Croatan, Dare, Dorovan, Goldsboro, Leaf, Leon, Lynchburg, Masontown, Muckalee, Murville, Pantego, and Rains.

Terrestrial Communities – Although most vegetative communities in the CWMB were altered by silviculture and ditching, many areas retain the characteristics of the natural conditions found at the site. In addition to areas of successional, opportunistic growth (since replanted with target communities as discussed in Chapter 4.14.2), natural communities present within the CWMB, as described by Schafale and Wealkey (1990), include: Swamp Forest (small stream), Pine Flatwoods (hydric, mesic, transitional), Successional/Ruderal Habitat (grass-sedge, shrub-scrub), Powerline Corridor (hydric), Non-riverine Wet Hardwood Forest, Non-riverine Swamp/Bay Forest, Lake Ridge Pine Forest, Pond, Hydric Pine Plantation, Hydric Pine Savanna, Upland Hardwood Forest, Pine/Hardwood Forest, Rural/Urban Modifications.

Wildlife – The CWMB Plan (NCDOT, 2000) notes that a number of area-sensitive species were documented within the CWMB site, including black bear (*Ursus americanus*) and wild turkey (*Meleagris gallopavo*), which require large tracts for foraging. The Plan also notes the presence of area-sensitive Neotropical migratory bird species in the remaining intact forested areas. Species noted include the Acadian flycatcher (*Empidonax virescens*), black-and-white warbler (*Mniotilta varia*), prothonotary warbler (*Prothonotaria citrea*), northern parula (*Parula Americana*), black-throated green warbler (*Dendroica virens*), ovenbird (*Seiurus aurocapillus*), Kentucky warbler (*Oporonis formosus*), and hooded warbler (*Wilsonia citrina*).

In addition to providing the opportunity to expand the Croatan National Forest, the CWMB provides potential habitat for all USFS Management Indicator Species (MIS), most notably wild turkey and black bear. Substantial habitat for both of these species exists at CWMB in the form of pocosin, oak gum cypress forest, pond pine woodland, and mature pine/hardwood forest. The CWMB could also potentially help meet the USFS goal to provide core habitat for interior neotropical migratory birds, travel corridors for black bear, turkey, and other terrestrial species, provide filter strips for adjacent stormwater run-off, and provide wood duck and waterfowl foraging habitat.

3.14 WATER RESOURCES

The discussions of natural environment characteristics found in this chapter are taken from the *Natural Resources Technical Report for the US 70 Havelock Bypass* (Environmental Services, Inc., 2007).

3.14.1 Surface Waters

The Neuse River is the main water body in the region. Rivers, streams, and tributaries within the project study area are part of the lower Neuse River Basin, and drainage generally runs from west to east towards the Neuse River. The named watercourses in the project study area include Goodwin Creek, Daniels Branch, Tucker Creek, Black Swamp, Southwest Prong of Slocum Creek and East Prong of Slocum Creek, shown in Exhibit 3.14.1. The project study area also contains unnamed tributaries to these streams. Although the main stems of Goodwin Creek occur north of the project study area, an additional tributary of this named stream occurs within the detailed project study corridors. As the terrain is very flat, all of these creeks have a low-velocity flow. Connecting ditches and/or smaller unnamed tributaries have been channelized or dredged to promote more efficient drainage.

At the headwater of its northwestern-most branch, Goodwin Creek, a tributary of Tucker Creek, is situated at the northernmost terminus of the project area. Daniels Branch, also a tributary to Tucker Creek, is immediately south, also at the northernmost terminus of the project area.

Source:
FEMA Flood Insurance Rate Maps
North Carolina
Map Numbers
3720642000J
3720641300J
3720640000J

Lewis Farm Rd.
70
Inset 1
North Carolina RR
Power Transmission Line
Headwaters of Tucker Creek
Sermons Blvd.
Slocum Road
Power Transmission Line
Greenfield Heights
Blvd.
Sunset Dr.
Gray Rd.
Lake Rd.
Camp Lejeune RR
Inset 2
Southwest Prong Slocum Creek
Sunset Dr.
Fontana Blvd.
Havelock
Miller Blvd.
McCotter Blvd.
North Carolina RR
Inset 3
East Prong Slocum Creek

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

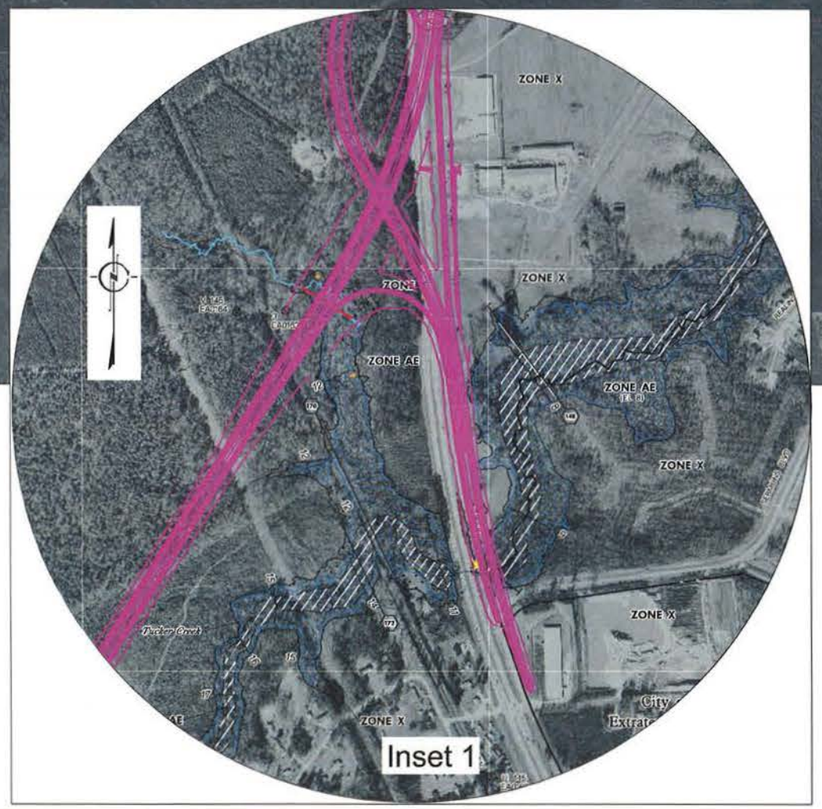
OTHERWISE PROTECTED AREAS (OPAs)

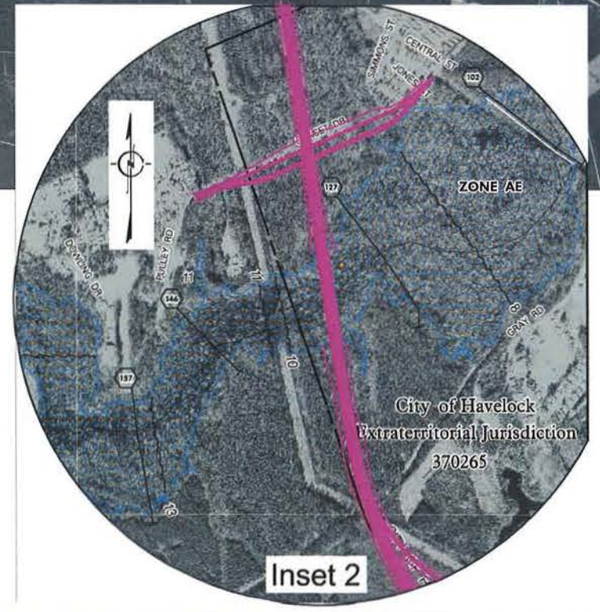
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas

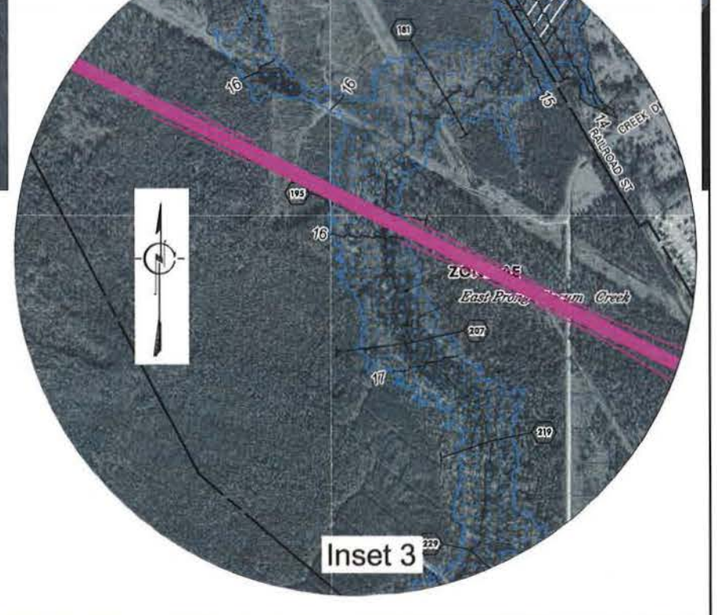
- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL. 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- 87°07'30"W, 32°22'30"N — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4278000mN — 2000-meter Universal Transverse Mercator grid ticks, zone 18
- 1000 FEET — 5000-foot grid values: North Carolina State Plane coordinate system (SPCS) ZONE 3200, State Plane (NAD 83 feet)
- BM5510 — North Carolina Geodetic Survey bench mark (see explanation in the Datum Information section of this FIRM panel)
- BM5510 — National Geodetic Survey bench mark (see explanation in the Datum Information section of this FIRM panel)
- M1.6 — River Mile







US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Floodplains
Scale: 1" = 1 mile
Exhibit 3.14.1

This page intentionally left blank to facilitate double-sided printing.

Ponds within the project study area consist of small, isolated vernal pools and other ephemeral depressions that have formed under natural conditions as well as isolated depressions that have formed through soil compaction by past off-road vehicle usage that have since naturalized with permanent vegetation. These features are characterized as wetlands rather than surface water features and are described in detail under the Small Pond terrestrial community type in Chapter 3.13.2.

Water Quality Characteristics

The water quality of the major watercourses in the Neuse River Basin is classified and protected by the N.C. Department of Environment and Natural Resources (DENR), Division of Water Resources (DWR). These classifications are assigned based upon the existing or contemplated best usage.

The project is located within sub-basin 030410 of the Neuse River Drainage Basin (DWQ 2006a) and is part of USGS hydrologic unit 03020204 (USGS, 1974). Drainages within the northern part of the project study corridors are part of the Tucker Creek watershed and drainages in the southern and central part of the project study corridors are part of the Slocum Creek watershed.

The stream index numbers for watercourses in the Tucker Creek and Slocum Creek watersheds are referenced in the *Classifications and Water Quality Standards Assigned to Waters of the Neuse River Basin* (DEM, 2000). The following is a list of these stream index numbers.

Goodwin Creek	27-112-6-2
Daniels Branch	27-112-6-1
Tucker Creek	27-112-6
Black Swamp	27-112-1-3
Slocum Creek	27-112
Southwest Prong of Slocum Creek	27-112-1
East Prong of Slocum Creek	27-112-2

Best Usage Classifications (BUC) and stream index numbers (SIN) follow classifications and water quality standards – published for each river basin (DEM 2000), as updated through September, 26 2006. Generally, unnamed streams carry the same BUC as its receiving water unless they are specifically denoted as having a separate BUC. However, unnamed freshwater tributaries to tidal saltwaters are considered to have a BUC of "C." Streams assigned a BUC within each sub-basin are often given a support rating as a method of interpreting water quality data and assessing water quality.

Goodwin Creek (27-112-6-2) has been assigned a BUC of SC; Sw, NSW from its source to Tucker Creek. Tucker Creek (27-112-6) has been assigned a BUC of SC; Sw, NSW from its source to Slocum Creek. Black Swamp (27-112-1-3) has been assigned a BUC of C; Sw, NSW from its source to Southwest Prong Slocum Creek. Southwest Prong Slocum Creek (27-112-1) has been assigned a BUC of C; Sw, NSW from its source to Slocum Creek. East Prong Slocum Creek (27-112-2) has been assigned a BUC of C; Sw, NSW from its source to Slocum Creek.

The N.C. Division of Water Resources (DWR) has compiled a comprehensive list of impaired waterbodies according to the Clean Water Act Section 303(d) and 40 CFR 130.7 [Section 303(d) list]. A waterbody that does not meet its water quality standards for its designated uses is considered to be impaired. The stream segments within the project study corridor have not been listed as impaired waters according to the 303(d) list; however, the Neuse River from a line across the Neuse River from Johnson Point to McCotter Point to a line across the Neuse River from Wilkinson Point to Cherry Point along with Slocum Creek from its source to the Neuse River are listed as impaired according to the 303(d) list (DWR 2012). Slocum Creek is located approximately 0.4-mile downstream of the project while the impaired segment of the Neuse River is approximately 3.6 miles downstream. The impaired segment of the Neuse River includes the confluence of Slocum Creek.

There are no Outstanding Resource Waters (ORW), High Quality Waters (HQW), WS-I waters, or WS-II waters within 3.0 miles upstream or downstream of the project study corridors (DEM, 2000) (DWQ, 2006b) or within the project study area. No stream that flows through the project study corridors is designated as a National Wild and Scenic River or a State Natural and Scenic River.

There are no benthic macroinvertebrate monitoring stations within the project study corridor; however, one benthic macroinvertebrate monitoring station is located on Southwest Prong Slocum Creek at Greenfield Heights Boulevard. This monitoring station was given a Moderate bioclassification between 2000 and 2005 (DWQ 2006a). No benthic macroinvertebrate sampling has been documented for other project study corridor streams. There are no fish sampling stations within the project study corridors as part of the DWQ Basinwide Fish Community Assessment (DWQ 2006a, DWQ 2006d).

3.14.2 Existing Major Drainage Structures

Tucker Creek is located south of Goodwin Creek near the northern end of the proposed project. The total drainage area of Tucker Creek is approximately 9.1 square miles. The upper reach of Tucker Creek near existing US 70, is sometimes referred to as Coleman Branch or Daniels Branch, which is a tributary of Tucker Creek. This stream crosses beneath existing US 70 in a triple barrel 9-foot by 7-foot reinforced concrete box culvert

approximately 1500 feet west of SR 1760 (Hickman Hill Loop Road). The drainage area at existing US 70 is approximately 4.5 square miles.

The Southwest Prong Slocum Creek, a tributary of Slocum Creek, is situated southwest of Tucker Creek. The total drainage area of Southwest Prong Slocum Creek is approximately 22 square miles. Existing US 70 crosses the Southwest Prong Slocum Creek on two bridges. Craven County Bridge Number 91 carries eastbound US 70 over this creek on a six-span, 226-foot long crossing that was built in 1956. Craven County Bridge Number 92 carries westbound US 70 on a four-span, 140-foot long crossing that was built in 1944. Immediately upstream, Craven County Bridge Number 176 carries SR 1763 (Church Road) over this creek on a 3-span, 116-foot long, reinforced concrete thru-girder bridge built in 1925. Approximately 0.6 miles upstream, Craven County Bridge Number 7 carries SR 1746 (Greenfield Heights Boulevard) over the Southwest Prong Slocum Creek on a 2-span, 65-foot, cored-slab bridge that was constructed in 1995. All of these crossings have spill-through designs and none have a history of flooding problems. The project corridor crosses the Southwest Prong Slocum Creek upstream from the existing crossings.

Black Swamp, a tributary of Southwest Prong Slocum Creek, is situated northwest of Southwest Prong Slocum Creek. No state routes cross this swamp.

The East Prong Slocum Creek, also a tributary of Slocum Creek, is situated southeast of Black Swamp and Southwest Prong Slocum Creek. The total drainage area of East Prong Slocum Creek is approximately 5.8 square miles. Existing US 70 crosses East Prong Slocum Creek approximately 700 feet east of the NC 101 intersection on Craven County Bridge Number 93, a 3-span, 105-foot long structure built in 1960. This crossing also has a spill-through design and no history of flooding problems. The drainage area of East Prong Slocum Creek at existing US 70 is 10.5 square miles.

The Preferred Alternative crosses East Prong Slocum Creek and Southwest Prong Slocum Creek with bridges. A culvert is proposed at a tributary of Tucker Creek and a culvert extension on Tucker Creek itself where it crosses existing US 70.

3.14.3 Floodplains and Floodways

The Neuse River and adjacent wetlands, under normal weather conditions, experience primarily wind-generated tides. The dominant source of flooding in the area is storm surge from the Atlantic Ocean. The storm surge propagates into the Pamlico Sound and inland up the Neuse River and Slocum Creek. In the Havelock area, the overall storm surge elevations are greatest during hurricanes and relatively insignificant during northeasters. Riverine flooding from heavy rainfall also occurs along Tucker Creek, Southwest Prong of Slocum Creek, and East Prong of Slocum Creek.

A floodway and floodplain evaluation was conducted in accordance with Executive Order 11988 - Floodplain Management and 23 CFR 650, Subpart A. Both Craven County and the City of Havelock are participants in the regular program of the National Flood Insurance Program (NFIP). The NFIP defines a floodplain as any land area susceptible to being inundated by water. A regulatory floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water elevation more than a designated height.

In NFIP regular program communities, the Federal Emergency Management Agency (FEMA) has conducted detailed flood studies to determine designated floodways to safely remove floodwater during flooding events. These studies result in flood boundary and flood insurance mapping. These maps indicate the regulatory floodways and base (100-year) floodplains for the major watercourses. In the project study area, these watercourses include Tucker Creek, Southwest Prong of Slocum Creek, and East Prong of Slocum Creek. Floodplains are shown in Exhibit 3.14.1.

The project study area is located within the detailed flood study limits and regulatory floodway for Tucker Creek. The crossings of the Southwest Prong of Slocum Creek and the East Prong of Slocum Creek are also located within a limited detailed flood study, which has been extended upstream of the former limits. The northernmost terminus of the project study area crosses the headwaters of Goodwin Creek, a tributary of Tucker Creek.

The base (100-year) floodplains and detailed flood study limits in the project study area are described below.

Tucker Creek (including several headwater tributaries upstream of existing US 70) crosses the project study area. In the project study area, the 100-year floodplain of Tucker Creek varies from 50 to 500 feet in width. According to the detailed flood study for Tucker Creek, immediately downstream of the project study area, the designated floodway is 100 feet wide with a 100-year flood elevation of 19.8 feet. Existing US 70 will merge with the northern end of the Bypass in this area and as a result, the existing culvert crossing at Tucker Creek will be extended upstream and downstream.

The project study area crosses the Southwest Prong Slocum Creek upstream from the upper limit of the former detailed flood study. However, a recent limited detail study has extended the limit to include the project study area. Due to the relatively flat terrain in the vicinity, the floodplain width across the study area varies from 600 to 2000 feet. The former detailed flood study for Southwest Prong Slocum Creek ended upstream of the Greenfield Heights Boulevard crossing. According to the detailed flood study, the floodway width downstream

of this crossing is 233 feet. The 100-year flood elevation within the floodway at this location is 7.8 feet.

The floodplain of East Prong Slocum Creek is approximately 700 to 2,300 feet wide in the project study area. The former detailed flood study for East Prong Slocum Creek ended upstream of the existing development near the North Carolina Railroad (NCRR). However, a recent limited detail study has extended the limit to include the project study area. According to the detailed flood study, the 100-year flood elevation with a 391-foot wide floodway at the NCRR is 13.9 feet. The floodway width downstream of existing US 70 is 135 feet. The 100-year flood elevation at existing US 70 is 9.3 feet. This floodplain is undeveloped and consists of predominantly pine-dominated forest alongside a cleared electric power transmission line corridor. The Preferred Alternative does not cross any FEMA-owned buyout properties.

The floodplains for Tucker and Slocum Creeks and their tributaries, attenuate stormwater runoff, reducing the impacts of major riverine flooding events. The Preferred Alternative crosses Tucker Creek, the Southwest Prong of Slocum Creek, and the East Prong of Slocum Creek. The NCDOT Hydraulics Unit will coordinate with the N.C. Floodplain Mapping Program (FMP), to determine the status of the project with regard to applicability of NCDOT's Memorandum of Agreement, or approval of a Conditional Letter of Map Revision (CLOMR) and subsequent final Letter of Map Revision (LOMR).

3.14.4 Wastewater

There are two active permitted discharges within 3.0 miles downstream of the project corridor. The United States Marine Corps Air Station at Cherry Point (NC0003816) is permitted to discharge 3.5 million gallons per day (MGD) into Slocum Creek, approximately 2.4 miles downstream from the project corridor. The Havelock Wastewater Treatment Plant (NC0021253) is permitted to discharge 1.9 MGD into East Prong Slocum Creek, approximately 2.1 miles downstream from the project corridor (DEM, 1988) (DWQ, 2006e).

Nonpoint source (NPS) pollution is described as pollution contained in stormwater and snowmelt runoff from agricultural, urban, mined, and other lands. NPS pollution comes from diffuse sources in contrast to "point-source" pollution, which is discharged through a pipe or outlet. Surface water as well as leachate to groundwater can be impacted by NPS pollution (DWQ, 2006a). Evidence of NPS discharges observed within the project study corridors includes sedimentation from land disturbance activities, such as logging, and stormwater runoff due to impervious surfaces in commercial and residential areas as well as roadways.

3.14.5 Groundwater/Wells

The Castle-Hayne Aquia aquifer yields large volumes of water in North Carolina where it consists of limestone. The Castle-Hayne Aquia aquifer is the groundwater source in the project study area. The aquifer is accessed via municipal wells.

Information provided by the City of Havelock, indicates municipal water services extend westward to include Greenfield Heights Boulevard and down Lake Road ending at Gray Drive. Either private or community wells serve the remaining development in the project study area.

3.15 JURISDICTIONAL ISSUES

Surface waters within the project study area were visited and evaluated to ascertain physical characteristics. All stream channel segments within the project study area were classified using the Natural Stream Channel Classification System (Rosgen 1996) and the Cowardin classification system (Cowardin et al. 1979). Water quality information for streams and tributaries within the project study area were derived from available sources provided through the N.C. Department of Environment and Natural Resources (DENR) (DWQ 2006a). Quantitative sampling was not undertaken to evaluate the DENR data.

Jurisdictional wetlands were identified using the three-parameter approach (hydrophytic vegetation, hydric soils, and hydrology) outlined in the Corps of Engineers Wetlands Delineation Manual (DOA 1987). Jurisdictional areas within the Preferred Alternative preliminary design limits were originally delineated in 1997-1999 and updated in January 2005. The detailed study corridor for the Preferred Alternative was field verified by the USACE in 1999 and the reevaluation approved by the USACE in January 2005. The USACE field verified Stream S-9 on May 11, 2005 and issued a Notification of Jurisdictional Determination to NCDOT on May 10, 2006 (expiration date 10 May 2011). Additional areas at interchanges outside the original project corridor, but within the project alignments were delineated on August 28, 2006. An updated NRTR was prepared in 2011 which included updated stream and wetland delineations for all three build alternatives. Stream and wetlands for the Preferred Alternative were field-verified in 2013.

3.15.1 Streams and Wetlands

Section 404 of the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA), requires regulation of discharges into "Waters of the United States." Water bodies such as rivers and streams are subject to jurisdictional consideration under the Section 404 of the CWA.

Although the principal administrative agency of the CWA is the U.S. Environmental Protection Agency, the USACE has major responsibility for implementation, permitting, and

enforcement provisions of the Act. The USACE regulatory program is defined in Title 33 Code of Federal Regulations, Part 320-330.

3.15.1.1 Streams

Surface waters within the project study corridors were visited and evaluated to ascertain physical characteristics. All stream channel segments within the project study area were classified using the Cowardin classification system (Cowardin *et al.*, 1979) and the Natural Stream Channel Classification System (Rosgen, 1996).

All streams within the project study area are considered to be riverine systems. Riverine systems may be perennial or intermittent and are identified as those areas contained within a channel that are not dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and contain less than 0.5 parts per thousand (ppt) ocean-derived salts.

Prior to initiation of field efforts, available mapping of stream channel segments within the project study area was reviewed to estimate sinuosity. In the field, all stream channels were traversed to identify any significant changes in channel type. Estimations of channel width, bankfull depth, and flood-prone width were made at selected locations to verify channel type. These locations were selected because they were either representative of the stream as a whole or of a specific reach. Sinuosity was estimated in the field and compared to estimated sinuosity from the mapping. Slope was also estimated in the field.

To enable alternative analyses, the USACE designates streams as either important or unimportant. Streams that have perennial flow, associated wetlands, significant aquatic fauna, or associated threatened and endangered species are generally considered to be important, and impacts to these streams require mitigation. Intermittent streams may be considered important if the associated wetlands, significant aquatic fauna, or threatened and endangered species criteria are met. Streams designated as unimportant do not typically require mitigation. The USACE has determined that all stream channels within the project study area are important.

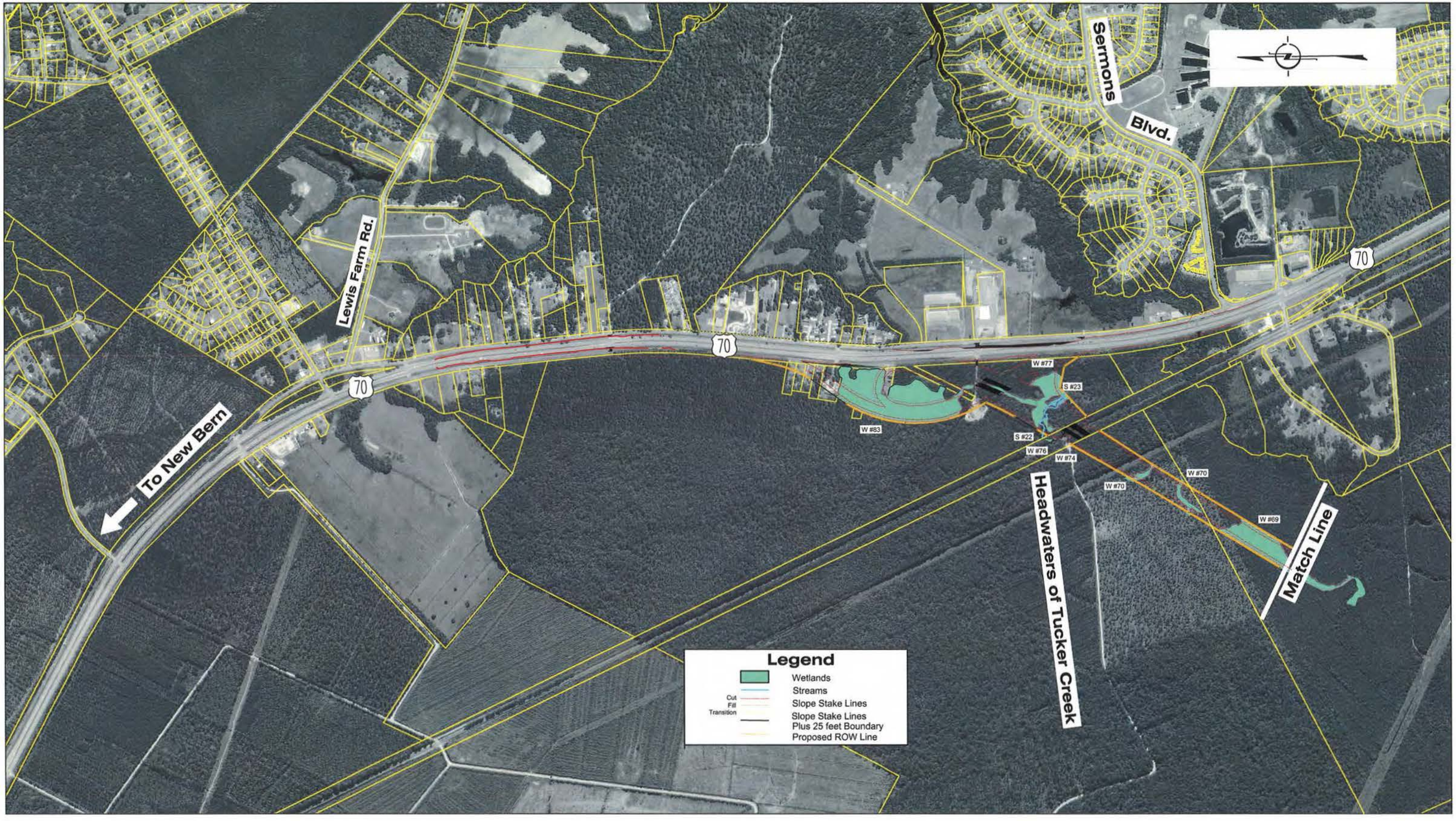
The following brief descriptions of the physical characteristics are provided for all twenty-five streams present within the project study area. A complete list of streams can be found in Table 3.15.1 with their substrate, average width and depth, Cowardin classification, Natural Stream Channel Classification, and jurisdictional flow classification of perennial or intermittent with their importance. Jurisdictional classifications have been field reviewed by USACE officials. Principal streams [defined as named rivers and creeks depicted on the USGS 7.5 minute (1:24,000) topographic quadrangles] within the project study area include East Prong Slocum Creek, Southwest Prong Slocum Creek, Black Swamp and Tucker Creek. Exhibits 3.15.1a-d depict the general locations of these streams.

All streams were delineated in the field. Each individual stream was designated alpha-numerically (S1 through S30); Southwest Prong Slocum Creek was labeled individually at each corridor crossing (S10, S12, and S17), widely-separated segments of Tucker Creek were labeled individually (S22 and S30), as were widely-separated segments of Black Swamp (S13 and S15). In Table 3.15.1 there is no S8 and some individual stream segments have a letter sub-designation. Stream segment sub-designations were typically used for stream channel reaches separated by culverts under existing roadways or railways, in areas where the stream channels lose their stream function for significant distances along the same drainage way, or the same stream channel is present in different portions of the project study area. General descriptions of streams within the project study area are presented below. Wetlands referenced in the descriptions below are designated alpha-numerically with a "W" prefix. Exhibits 3.15.1a-d depict general locations of wetlands within the project area. Further information concerning these streams is available in the *Natural Resources Technical Report* prepared for the proposed project (Environmental Services, Inc., 2007).

- **S1** (East Prong Slocum Creek) is located within the southern portion of the detailed study corridors for Alternatives 1, 2, and 3. The stream flows north from the southwestern boundary of the Alternative 3 study corridor to the northeastern boundary of the Alternative 2 study corridor. On the day of the field visit (9/14/04), the water had moderate turbidity with a substrate of sand and organic matter. This stream channel is approximately five feet wide and seven feet deep.

- **S2** enters the western boundary of the Alternative 2 study corridor and flows east to its confluence with East Prong Slocum Creek. On the day of the field visit (9/14/04), the water had moderate turbidity with a substrate of sand and organic matter. This stream channel is approximately three feet wide and two feet deep.

- **S3** originates in the area between the detailed study corridor for Alternative 2 and the shared portion of the detailed study corridor for Alternatives 1 and 3. S3 originates as a continuation of an excavated ditch that demonstrates stream function. S3 enters the western boundary of the Alternative 2 study corridor on the southeast side of a railroad bed and flows northeast to a culvert just outside the eastern boundary of the Alternative 2 study corridor (S3a). This stream channel is approximately three feet wide and four feet deep. The stream reenters the project study corridor at the culvert on the northwest side of the railroad bed and flows northwest to a culvert on the southeast side of Lake Road (S3b). This stream channel is approximately three feet wide and five feet deep. The stream emerges from the culvert and flows northwest to a culvert near the northeast side of an existing powerline corridor (S3c). This stream channel is approximately three feet wide and four feet deep. The stream emerges from this culvert and flows to its confluence with S16 in the powerline corridor (S3d). This stream channel is approximately three feet wide and two feet deep. On the day of the field visit (9/08/04), the water had low turbidity with a substrate consisting of sand.



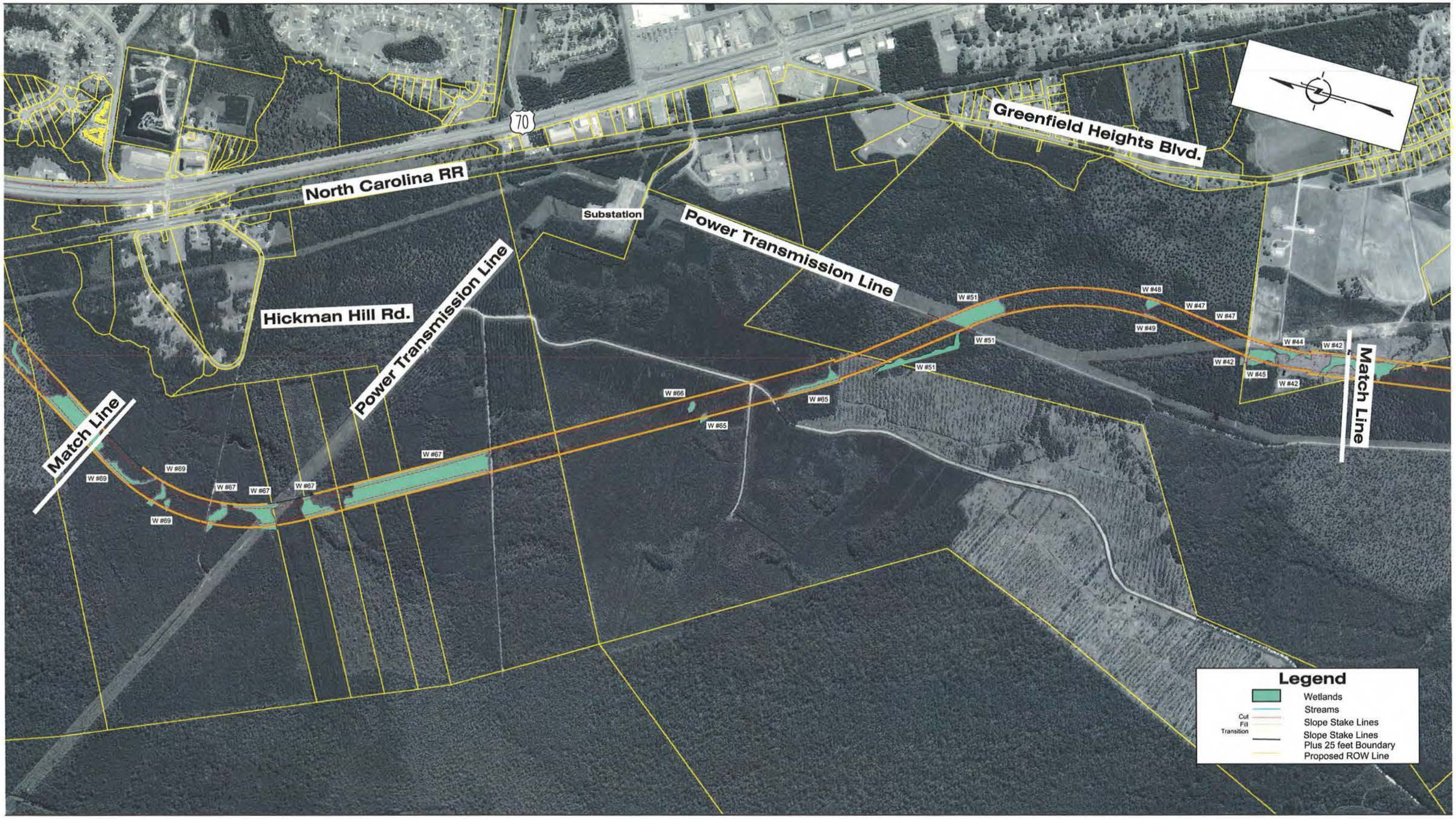
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

General Jurisdictional
Layout
Scale: 1" = 1000'
Exhibit 3.15.1a

This page intentionally left blank to facilitate double-sided printing.



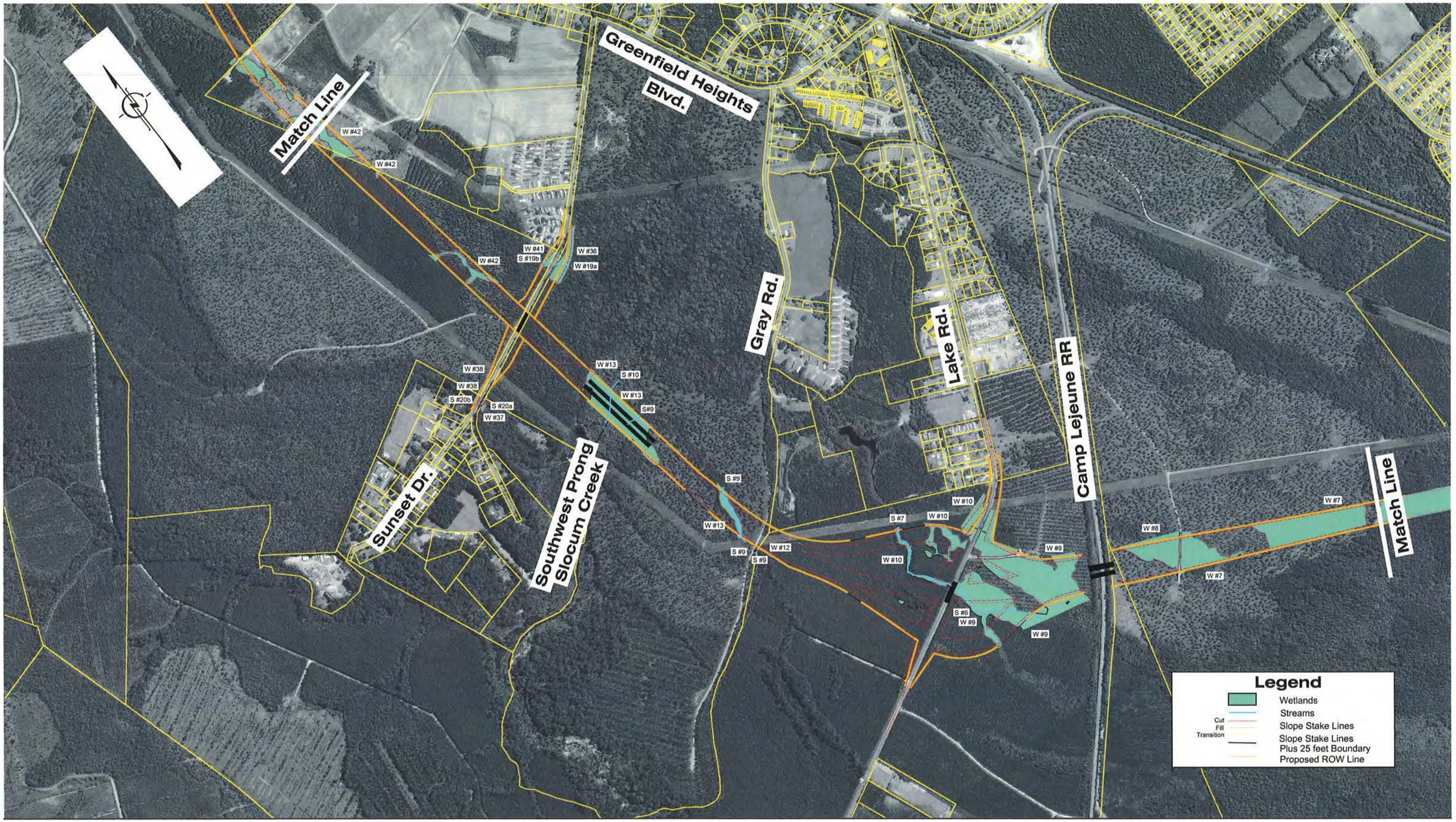
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

General Jurisdiction
Layout
Scale: 1" = 1000'
Exhibit 3.15.1b

This page intentionally left blank to facilitate double-sided printing.



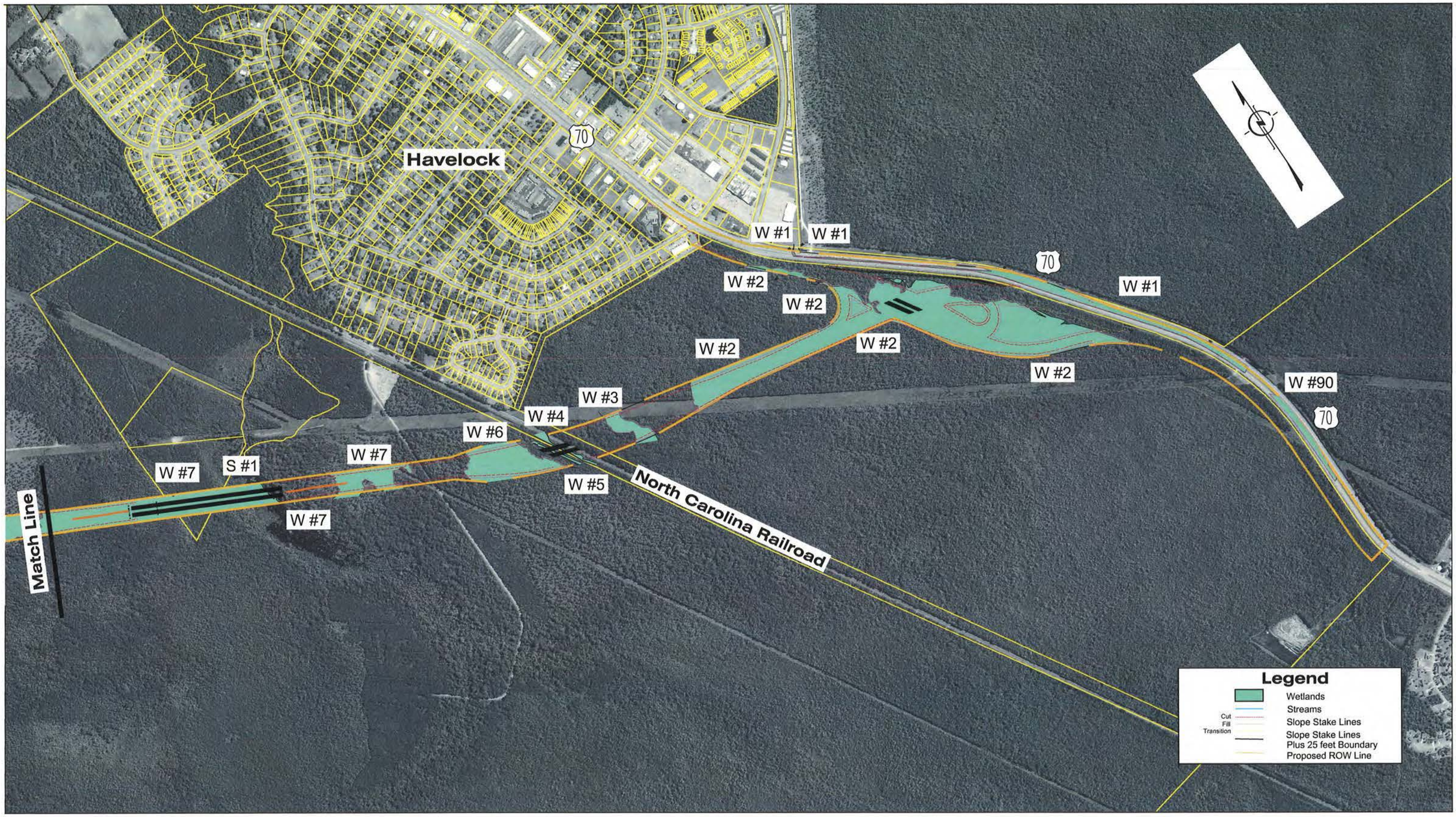
US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

General Jurisdictiona
Layout
Scale: 1" = 1000'
Exhibit 3.15.1c

This page intentionally left blank to facilitate double-sided printing.



US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

General Jurisdictional Layout

Scale: 1" = 1000'

Exhibit 3.15.1d

This page intentionally left blank to facilitate double-sided printing.

- **S4** originates northwest of Lake Road in the Alternative 2 study corridor behind a residential area, flows southwest into W27, and turns northwest. The stream channel loses its jurisdictional features before reaching the confluence with S16. On the day of the field visit (3/24/04), the water had moderate turbidity with a substrate consisting of sand and organic matter. This stream channel is approximately three feet wide and three feet deep.

- **S5** is a small stream segment that originates northwest of Lake Road in the Alternative 2 study corridor behind a residential area and flows northeast to its confluence with S4 in W27. On the day of the field visit (3/24/04), the water had moderate turbidity with a substrate consisting of sand and organic matter. This stream channel is approximately two feet wide and three feet deep.

- **S6** enters the southwestern boundary of the shared detailed study corridor for Alternatives 1 and 3, southeast of Lake Road in W9. The stream flows northwest, turns north, and ends at a culvert on the southeast side of Lake Road. On the day of the field visit (2/17/05), the water had low turbidity with a substrate consisting of sand. This stream channel is approximately 12 feet wide and 5 feet deep. S6 loses stream function downstream of the culvert.

- **S7** originates in a pine plantation northwest of Lake Road near the southern intersection of the study corridors for Alternatives 1 and 3. S7 represents resumption of stream function within the same wetland feature in which stream function is lost for S6. The stream flows northeast and ends near a powerline corridor southwest of the project study area boundary in W10. On the day of the field visit (1/04/05), the water had low turbidity and a substrate consisting of sand. This stream channel is approximately 10 feet wide and 5 feet deep.

- **S9** enters the Alternative 1 study corridor south of Gray Road and flows northeast to a culvert on the southeast side of Gray Road. Stream function is lost north of the culvert. On the day of the field visit (1/04/05), the water had moderate turbidity with a substrate consisting of sand. This stream channel is approximately three feet wide and two feet deep.

- **S11** is located south of Southwest Prong Slocum Creek. The channel originates near the northeastern boundary of the Alternative 1 study corridor, flows north, and turns west, where it loses its stream function before reaching Southwest Prong Slocum Creek. On the day of the field visit (4/06/04), the water had high turbidity with a substrate consisting of sand, silt, and organic matter. This stream channel is approximately three feet wide and one-foot deep.

TABLE 3.15.1
STREAMS WITHIN THE PROJECT STUDY AREA (MAY 2007)

Stream No.	Stream Name	Cowardin[a]	Rosgen[b]	P/I[c]	I/U[d]	Substrate[e]	Avg. Depth (ft)[f]	Avg. Width (ft)[f]
S1*	East Prong Slocum Creek	R3	D	P	I	s	7.0	5.0
S2*	UT to East Prong Slocum Creek	R3	D	P	I	S/0	2.0	3.0
S3a*	UT to SW Prong Slocum Creek	R4	E/F	I	I	s	4.0	3.0
S3b*	UT to SW Prong Slocum Creek	R3	E/F	P	I	s	5.0	3.0
S3c	UT to SW Prong Slocum Creek	R3	G/F	P	I	s	4.0	3.0
S3d	UT to SW Prong Slocum Creek	R3	G/F	P	I	s	2.0	3.0
S4	UT to SW Prong Slocum Creek	R3	C/E	P	I	S/0	3.0	3.0
S5	UT to SW Prong Slocum Creek	R3	C/E/G	P	I	S/0	3.0	2.0
S6	UT to SW Prong Slocum Creek	R3	F	P	I	s	5.0	12.0
S7	UT to SW Prong Slocum Creek	R3	F	P	I	s	5.0	10.0
S9	UT to SW Prong Slocum Creek	R4	G	I	I	s	2.0	3.0
10*	SW Prong Slocum Creek	R3	D	P	I	S/0	3.0	8.0
S11*	UT to SW Prong Slocum Creek	R4	BICID	I	I	s	1.0	3.0
S12*	SW Prong Slocum Creek	R3	D	P	I	S/0	4.0	8.0
S13*	Black Swamp	R3	D	P	I	S/0	6.0	5.0
S14a*	UT to SW Prong Slocum Creek	R4	C/D	I	I	S/0	1.0	15.0
S14b*	UT to SW Prong Slocum Creek	R4	G	I	I	S/0	1.5	3.0
S15*	Black Swamp	R3	E	P	I	S/0	4.0	10.0
S16a	UT to SW Prong Slocum Creek	R3	E/G	P	I	s	2.0	3.0
S16b	UT to SW Prong Slocum Creek	R3	G	P	I	s	2.0	3.0
S17*	SW Prong Slocum Creek	R3	D	P	I	S/0	3.0	8.0
S18a*	UT to SW Prong Slocum Creek	R3	B	P	I	s	3.0	1.0
S18b*	UT to SW Prong Slocum Creek	R3	B	P	I	s	3.0	1.0
S19a*	UT to SW Prong Slocum Creek	R3	c	P	I	S/0	5.0	1.5
S19b*	UT to SW Prong Slocum Creek	R3	E	P	I	S/0	5. 0	1.5
S20a	UT to SW Prong Slocum Creek	R3	E/G	P	I	S/G	5.0	5.0
S20b	UT to SW Prong Slocum Creek	R3	E/G	P	I	S/G	5.0	5.0
S21*	UT to Black Swamp	R4	c	I	I	S/0	1.5	2.0
S22*	Tucker Creek	R3	E/G	P	I	s	3.0	5.0
S23*	UT to Tucker Creek	R4	DA	I	I	S/Si	1.5	12.0
S24	UT to Tucker Creek	R4	G	I	I	s	8.0	4.0
S25	UT to Tucker Creek	R4	G	I	I	S/0	4.0	3.0
S26	UT to Tucker Creek	R4	c	I	I	S/0	8.0	3.0
S27	UT to Tucker Creek	R4	G	I	I	S/0	6.0	4.0
S28	UT to Tucker Creek	R4	D	I	I	S/0	3.0	2.0
S29	UT to Goodwin Creek	R4	G	I	I	s	6.0	4.0
S30a	Tucker Creek	R3	E	P	I	S/0	2.0	6.0
S30b	Tucker Creek	R3	E	P	I	S/0	2.0	6.0
S30c	Tucker Creek	R3	E	P	I	S/0	2. 0	6.0

NOTES: Streams on NFS lands are denoted with asterisks.

[a] Stream Type: R3 upper perennial; R4 intermittent.
[b] Rosgen natural stream channel classification system.
[c] P= perennial stream, I= intermittent stream.
[d] I= important, U= unimportant.
[e] S= sand, O= organic, G= gravel, Si= silt.
[f] Average widths and depths are taken at the top of bank

- **S12** (Southwest Prong Slocum Creek) enters the western boundary of the Alternative 1 study corridor northwest of Gray Road, flows north and turns east to exit the northeastern boundary of the study corridor. Southwest Prong Slocum Creek continues northeast to enter the Alternative 3 study corridor as **S10** between Sunset Drive and Gray Road and exits the eastern boundary of the study corridor. Southwest Slocum Creek continues northeast to enter the Alternative 2 study corridor as **S17** between Sunset Drive and Gray Road and flows northeast to exit the eastern boundary of the detailed study corridor for Alternative 2 west of Greenfield Heights Boulevard. On the day of the field visit (4/08/04), water in the stream channel had moderate turbidity with a substrate consisting of sand, silt, and organic matter. This stream channel is approximately eight feet wide and four feet deep.

- **S13** (Black Swamp) is a small stream segment that originates in W18 at the northeastern boundary of the Alternative 1 study corridor, east of the Weyerhaeuser logging road. The stream flows south and loses its jurisdictional features before merging with S12 (Southwest Prong Slocum Creek). On the day of the field visit (4/07/04), the water had moderate turbidity and a substrate consisting of sand and organic matter. This stream channel is approximately five feet wide and six feet deep.

- **S14** originates at a culvert on the east side of the Weyerhaeuser logging road in the Alternative 1 study corridor and flows northeast to the corridor boundary and Black Swamp. This stream channel is approximately three feet wide and 1.5 feet deep. Between S14A and S14B the stream loses channel structure and consists of overland flow approximately 15 feet wide and 1-foot deep. On the day of the field visit (4/07/04), the water had high turbidity with a substrate consisting of sand, silt, and organic matter.

- **S15** (Black Swamp) is located near the east side of the Alternative 1 study corridor and west of the southern end of Sunset Drive. The stream channel flows southeast and exits the corridor boundary. On the day of the field visit (4/07/04), the water had moderate turbidity with substrate consisting of sand, silt, and organic matter. This stream channel is approximately 10 feet wide and 4 feet deep.

- **S16** originates in the middle of W27 in a powerline corridor northwest of Lake Road in the Alternative 2 corridor and flows north to exit the eastern boundary of the corridor, near the intersection of Gray Road and Greenfield Heights Boulevard. On the day of the field visit (3/23/04), water in the channel had moderate turbidity with a substrate consisting of sand and organic matter. This stream channel is approximately three feet wide and two feet deep.

- **S18** originates northwest of Southwest Prong Slocum Creek, near Sunset Drive in the Alternative 2 study corridor, and flows southeast out of the project study area (S18b). It reenters the project study area and continues to its confluence with S17 (Southwest Prong Slocum Creek) (S18a). On the day of the field visit (3/22/04), the water had low turbidity with a substrate consisting of gravel and sand. This stream channel is approximately one-foot wide and three feet deep.

- **S19** enters the northern boundary of the eastern extension of the Alternative 2 study corridor at its intersection with Sunset Drive. The stream flows southeast through W41 to a culvert under Sunset Drive (S19b) and emerges from the culvert on the south side of Sunset Drive (S19a). The channel continues through W36 to the boundary of the eastern extension of Alternative 2 south of Sunset Drive and northwest of Southwest Prong Slocum Creek (S10). On the day of the field visit (2/17/05), the water had low turbidity and a substrate consisting of sand and organic matter. The stream channels for both segments are approximately eight feet wide. Segment S19a is approximately five feet deep, while segment S19b has a stream channel approximately three feet deep.

- **S20** originates in W38 north of Sunset Drive within the western extension of the Alternative 2 study corridor at its intersection with Sunset Drive and flows south through a culvert at Sunset Drive (S20b). The stream emerges from the culvert and continues through W37 to exit the southeastern boundary of the project study area (S20a). On the day of the field visit (2/17/05), the water had low turbidity and a substrate consisting of sand and gravel. This stream channel is approximately three feet wide and five feet deep.

- **S21** is a small stream segment that originates at a culvert on the east side of the Weyerhaeuser logging road in the Alternative 1 study corridor and quickly loses its stream characteristics before flowing into the wetlands associated with Black Swamp. On the day of the field visit (4/12/04), the water had high turbidity with a substrate consisting of sand, silt, and organic matter. This stream channel is approximately two feet wide and 1.5 feet deep.

- **S22** (Tucker Creek) enters the combined study corridor for the northern terminus interchange and flows southeast through W75, W76, and W77 to exit the corridor. S22 reemerges in the combined study corridor as S30 (see below). On the day of the field visit (2/17/05), the water had low turbidity and a substrate consisting of sand. This stream channel is approximately five feet wide and three feet deep.

- **S23** a tributary to Tucker Creek, originates in W77 between an existing railroad bed and the existing US 70 in the combined study corridor for the northern terminus interchange and flows southeast to its confluence with S22. On the day of the field visit (2/17/05), the water had low turbidity and a substrate consisting of sand and silt. This stream channel is approximately 12 feet wide and 1.5 feet deep.

- **S24** identified as Daniels Branch originates on the east side of the existing US 70, and flows east to exit the boundary of the combined study corridor at the northern terminus. On the day of the field visit (2/17/05), the water had low turbidity and a substrate consisting of sand. This stream channel is approximately four feet wide and eight feet deep.

- **S25** a tributary to Daniels Branch, originates in the northern branch of W84, and flows southeast to its confluence with S24 near the eastern boundary of the combined study corridor for the northern terminus interchange. On the day of the field visit (2/17/05), the water had moderate turbidity and a substrate consisting of sand and organic matter. This stream channel is approximately three feet wide and four feet deep.

- **S26** also a tributary to Daniels Branch, originates near the east side of the existing US 70 in the combined study corridor for the northern terminus interchange, and flows southeast to its confluence with S24 in W84. On the day of the field visit (2/17/05), the water had moderate turbidity and a substrate consisting of sand and organic matter. This stream channel is approximately three feet wide and eight feet deep.

- **S27** is a small tributary to S26 on the east side of the existing US 70. The stream originates just north of S26 and flows south to the confluence of the two channels. On the day of the field visit (2/17/05), the water had moderate turbidity and a substrate consisting of sand and organic matter. This stream channel is approximately four feet wide and six feet deep.

- **S28** is a small tributary to S24 that originates in the southern branch of W84, east of the existing US 70. The channel starts just south of S24 and flows north to the confluence of the two streams. On the day of the field visit (2/17/05), the water had moderate turbidity and a substrate consisting of sand and organic matter. This stream channel is approximately two feet wide and three feet deep.

- **S29** a tributary to Goodwin Creek, originates on the east side of the existing US 70 in the combined study corridor for the northern terminus interchange. The stream flows east to exit the boundary of the study corridor. On the day of the field visit (8/28/06),

the water had low turbidity and a substrate consisting of sand. This stream channel is approximately four feet wide and six feet deep.

- **S30** (Tucker Creek) enters the southern extension of the northern terminus study corridor west of existing US 70 and flows to the east into a culvert under US 70 (30a) before briefly emerging (30b) and entering a second culvert under a service road to emerge again (30c) before exiting the study corridor.

3.15.1.2 Wetlands

Wetlands, also considered "Waters of the United States," are defined as: Those areas that are inundated or saturated by ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas [33 CFR 328.3(b)].

The USACE requires the presence of three parameters (hydrophytic vegetation, hydric soils, and evidence of jurisdictional hydrology) to support a jurisdictional wetland determination.

The wetland areas present within the project study area are primarily identified as palustrine in nature as defined by Cowardin *et al.* (1979), and as identified on National Wetland Inventory mapping. Palustrine systems include all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, and all such wetlands occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. Some wetland systems are defined as palustrine but are influenced hydrologically by adjacent streams through periodic overbank flooding and are considered riparian wetlands. The riparian wetlands are commonly referred to as riverine wetlands, not to be confused with the Riverine system of Cowardin *et al*. (1979). Non-riparian wetlands are not typically influenced by overbank flooding and are commonly referred to as non-riverine wetlands.

Wetlands within the project study area vary in vegetative composition, depending in part on hydrologic regime and site-specific disturbances. Three general wetland types were identified within the project study area, and are described below.

Palustrine forested (PFO)

These areas are identified as forested jurisdictional wetlands that are palustrine in nature. Vegetation within this wetland type varies throughout the project study area. This wetland type includes the jurisdictional portions of the vegetative communities Pine Flatwoods (hydric), Pine/Hardwood Forest, Streamhead Pocosin (tree dominated), Swamp Forest (along large streams), Swamp Forest (along small streams), Swamp Forest (in ponds), and

Pine Plantation (hydric). Specific descriptions of each of these communities are presented in Chapter 3.5.

Palustrine scrub-shrub (PSS)

These areas are identified as scrub-shrub jurisdictional wetlands that are palustrine in nature. Vegetation within this wetland type varies throughout the project study area. This wetland type includes jurisdictional portions of the shrub-dominated stages of the vegetative communities Streamhead Pocosin (shrub dominated), Powerline Corridor (hydric), Pine Plantation (hydric), and Successional/Ruderal Habitat. Specific descriptions of each of these communities are presented in Chapter 3.14.1.

Palustrine emergent (PEM)

These areas are identified as emergent jurisdictional wetland areas that are palustrine in nature. Vegetation within this wetland type varies throughout the project study area, but is marked by the presence of herbaceous vegetation and a lack of tree and shrub sized vegetation. This wetland type includes jurisdictional portions of the herbaceous-dominated phases of the vegetative communities Powerline Corridor (hydric) and Successional/Ruderal Habitat. Specific descriptions of each of these communities are presented in Chapter 3.13.

The system used for the wetland analysis was the *Guidance for Rating the Values of Wetlands in North Carolina: Fourth Version* (DEM, 1995) used by the N.C. Division of Water Resources (DWR). The procedure rates wetland value according to six attributes: water storage, bank/shoreline stabilization, pollutant removal, wildlife habitat, aquatic life value, and recreational/educational value. Attributes are weighted to enhance the results in favor of water quality value. Pollutant removal is weighted to be the most important wetland attribute, while water storage, bank/shoreline stabilization, and aquatic life values are given equal weight as secondary attributes. Wildlife habitat and recreation/education are given minimal credit. Scores range from 0 to 100; higher scores indicate higher wetland values.

For purposes of this study, wetland values derived from the N.C. Division of Water Resources rating system range from 6 to 90 (Wetland Rating Worksheets can be found in the *Natural Resources Technical Report* (May 2007). A score within the 60-100 range is usually considered high quality. High quality wetlands within the project study area include the undisturbed areas associated with large swamp systems and large undisturbed pine flatwoods and pocosin systems. All other wetlands within the project study area were not considered high quality because they are highly-impacted areas associated with pine plantations and successional communities or they are small depressional areas associated with streams but are disturbed in nature.

Table 3.15.2 lists the wetlands identified within the detailed study corridors and shown in Exhibits 3.15.1a-e. This table includes the Cowardin classification, DWR rating, and whether they are considered riparian or non-riparian. Jurisdictional classifications have been field reviewed by USACE officials.

TABLE 3.15.2
WETLANDS WITHIN THE PROJECT STUDY AREA

Wetland Number	Cowardin Classification[a]	DWR Rating	Riparian or Non-Riparian	Wetlands Number	Cowardin Classification[a]	DWR Rating	Riparian or Non-Riparian
W1*	PF07B	26	Non-riparian	W47*	PF06/7C	66	Non-riparian
W2*	PF06/7B	24	Non-riparian	W48*	PF06C	51	Non-riparian
W3*	PF06/7B	24	Non-riparian	W49*	PF06C	51	Non-riparian
W4*	PF04B	24	Non-riparian	W50*	PF04B, PEM1C	51	Non-riparian
W5*	PF04B	24	Non-riparian	W51*	PF06/7C	35	Non-riparian
W6*	PF04B	24	Non-riparian	W52*	PF04B	15	Non-riparian
W7*	PF06F, PF04B	45	Non-riparian, Riparian	W53*	PF06/7B	40	Non-riparian
W8*	PF04B	20	Non-riparian	W54*	PF01/4A	85	Non-riparian
W9	PF0617B	20	Riparian	W55*	PF06/7B	40	Non-riparian
W10	PF04A, PEMlB	19	Riparian	W56*	PF06/7B	18	Non-riparian
W11	PSS4B	10	Non-riparian	W57*	PF04B	18	Non-riparian
W12	PF0617A, PSS4B	18	Riparian	W58*	PF06/7B	41	Non-riparian
W13*	PF06F, PF01/4A	78	Riparian	W59*	PF01/4A	63	Non-riparian
W14*	PF04B	31	Non-riparian	W60*	PF04B	14	Non-riparian
W15*	PF04B	22	Non-riparian	W61*	PF04B	14	Non-riparian
W16*	PF04B	22	Non-riparian	W62*	PFO1B	38	Non-riparian
W17*	PF04B	12	Non-riparian	W63	PF04B	21	Non-riparian
W18*	PF06F, PF01/4A	40	Riparian	W64	PF04B	21	Non-riparian

TABLE 3.15.2 cont.
WETLANDS WITHIN THE PROJECT STUDY AREA

Wetland Number	Cowardin Classification[a]	DWR Rating	Riparian or Non-Riparian	Wetlands Number	Cowardin Classification[a]	DWR Rating	Riparian or Non-Riparian
W19*	PF01/4A	26	Riparian	W65	PF01/4A	26	Non-riparian
W20*	PF0114A	21	Riparian	W66	PF04B	16	Non-riparian
W21*	PF01/4A	21	Riparian	W67*	PF04B, PEM1B	23	Non-riparian
W22*	PF06/7B	26	Riparian	W68	PSS4B	23	Non-riparian
W23*	PF06/7B	13	Non-riparian	W69	PF04B, PSS4B	23	Non-riparian
W24*	PF04B	28	Riparian	W70*	PF06C	75	Non-riparian
W25*	PF04C	50	Non-riparian	W71*	PF06C	75	Non-riparian
W26*	PF04B	8	Non-riparian	W72*	PF06C	75	Non-riparian
W27	PF06C	89	Riparian	W73*	PF01B	75	Non-riparian
W28	PF04B	10	Non-riparian	W74*	PF06C	75	Non-riparian
W29	PSS6B	26	Riparian	W75*	PF06C	75	Riparian
W30	PSS6B	26	Non-riparian	W76*	PF06C	75	Riparian
W31	PF04B	8	Non-riparian	W77*	PF06C	75	Riparian
W32*	PF06F	60	Non-riparian	W78	PF06F	75	Non-riparian
W33*	PF06F	49	Riparian	W79*	PF06F	75	Non-riparian
W34*	PSS6B	58	Riparian	W80*	PF06/7B	75	Non-riparian
W35*	PF0617F	45	Non-riparian	W81*	PF06/7B	75	Non-riparian
W36*	PF06C	90	Riparian	W82*	PF06/7B	75	Non-riparian
W37*	PF0114A	78	Riparian	W83*	PF04B	75	Non-riparian
W38*	PF01/4A	26	Riparian	W84	PF06C	45	Riparian
W39*	PF04B	26	Non-riparian	W85*	PF06C	45	Non-riparian
W40*	PF04B	26	Non-riparian	W86*	PF0617B	6	Non-riparian
W41*	PF06C	26	Non-riparian	W87	PSS6C	53	Riparian
W42*	PF06/7B	51	Non-riparian	W88	PSS6C	49	Riparian

TABLE 3.15.2 cont.
WETLANDS WITHIN THE PROJECT STUDY AREA

Wetland Number	Cowardin Classificationa	DWR Rating	Riparian or Non-Riparian	Wetlands Number	Cowardin Classificationa	DWR Rating	Riparian or Non-Riparian
W43*	PF06C	51	Non-riparian	W89	PSS3/4B	33	Non-riparian
W44	PF0617B	51	Non-riparian	W90*	PSS3/4B	27	Non-riparian
W45	PF06C	51	Non-riparian	W91	PSS6C	53	Riparian
W46*	PF04B	38	Non-riparian				

NOTES: Wetlands on NFS lands are denoted with asterisks.

[a] Wetland Type: PFO palustrine, forested; PEM palustrine, emergent; PSS palustrine, scrub-shrub

3.15.2 Buffer Areas

The project study area is located within the Neuse River Drainage Basin. Features within the project study corridors that are mapped as either a blue-line stream channel or open water feature on the most recent version of either the USGS topographic quadrangle or the county soil survey are subject to the Neuse River Basin Buffer Rules unless review by N.C. Division of Water Resources (DWR) confirms these features are not present in the field. These Buffer Rules restrict land use within a 50-foot zone surrounding the stream.

On October 14, 2004, N.C. Division of Water Quality (now N.C. Division of Water Resources) staff reviewed selected features and confirmed which of these would be exempt from the Neuse River Basin Buffer Rules. One feature identified as a stream on the jurisdictional maps (feature S9 on Exhibit 3-15.1b) was determined to be exempt in regards to applicability of the Neuse River Basin Buffer Rules. All other features identified as streams on the jurisdictional features maps were determined to be streams subject to applicability of the Neuse River Basin Buffer Rules. Several features identified as blue-line stream channels on the USGS topographic quadrangle or the county survey were determined to be wetlands rather than streams and therefore exempt from the Neuse River Basin Buffer Rules. These features were delineated as wetlands and are labeled as wetland features W47 (including W48/W49 and W50/51) (Exhibit 3-15.1c), W27 (in part) (Exhibits 3.15.1b and c), W19/W21 (Exhibit 3.15.1b), W23 (Exhibit 3.15.1c), and W53 (Exhibit 3.15.1c). Chapter 4.15 discussed riparian buffer impacts.

3.15.3 Protected Species

All protected species surveys and evaluations within the project corridors were conducted by Environmental Services, Inc. with the exception of the surveys and evaluations for the red-cockaded woodpecker and the bald eagle which were prepared by Dr. J. H. Carter III & Associates, Inc.

The lists provided by the US Fish and Wildlife Service (USFWS) of federally-protected species with ranges extending into Craven and Carteret Counties was reviewed prior to initiation of field studies and updates checked regularly throughout the project investigation (latest referenced lists dated May 2014 - Craven County and September 2014 - Carteret County). Records maintained by the N.C. Natural Heritage Program (NCNHP) were consulted for documented occurrences of federal-listed and state-listed species before commencing the field effort and periodically updated (most recent update August 2006). BasinPro, Version 3.1, was reviewed to determine if any project study area streams were considered Significant Aquatic Endangered Species Habitat (NCGIA 2002). A general literature review provided information on the distribution and ecological requirements of various taxa. The US Forest Service was consulted to identify USFS rare species (formerly termed "Proposed, Endangered, Threatened, and Sensitive (PETS) species") on the Croatan National Forest (latest list update: October 2013) that will be evaluated for portions of the project study area that cross National Forest System (NFS) lands.

3.15.3.1 Section 7 of the Endangered Species Act

Species with the federal classification of Endangered (E), Threatened (T), or officially Proposed (P) for such listing are protected under Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543). The Act is administered by the U.S. Fish and Wildlife Service (USFWS). Species listed as Threatened due to Similarity of Appearance [T(S/A)] are not subject to Section 7 consultation. Table 3.15.3 presents the federally-protected species listed for Craven and Carteret Counties (USFWS list).

Shortnose sturgeon (*Acipenser brevirostrum*) – E (Date Listed: 11 March 1967)

This species is an anadromous, bottom-feeding fish which spends most of the year in estuarine environments and moves into fresh water only when spawning (NMFS 1998a). Sturgeons are unmistakable in appearance. Size, snout characteristics, and the absence of scutes between the anal fin and lateral row of scutes distinguish shortnose sturgeon from Atlantic sturgeon (*A. oxyrhynchus*) which occurs within the same range (Rohde *et al*. 1994). Adult shortnose sturgeon range in size from approximately 1.4 to 3.6 feet and have a short snout and wide mouth (Rohde *et al*. 1994). This species occurs in Atlantic seaboard rivers from the St. Johns River, Florida, to eastern Canada.

Shortnose sturgeon occupy different habitats and occur at different depths at different times of the year; seasonal habitat requirements described here are based on Burkhead and Jenkins (1991). In the fall and winter shortnose sturgeon are typically found in estuaries and lower sections of large rivers at depths of 33 to 100 feet; some adults reportedly move into the Atlantic as well. In the summer, adults are found in waters three to six feet deep. Shortnose sturgeon migrate upstream to spawn near the fall line at sites having swift water

flow over gravel and rubble. Juveniles reportedly remain in deeper portions of the lower reaches of rivers in areas just above the salt wedge.

TABLE 3.15.3
FEDERALLY-PROTECTED SPECIES IN CRAVEN AND CARTERET COUNTIES

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS[A]	COUNTY PRESENT[B]
Shortnose sturgeon	*Acipenser brevirostrum*	E	Ca
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	Cr, Ca
American alligator	*Alligator mississippiensis*	T(S/A)	Cr, Ca
Loggerhead sea turtle	*Caretta caretta*	T	Ca
Green sea turtle	*Chelonia mydas*	T	Ca
Leatherback sea turtle	*Dermochelys coriacea*	E	Cr, Ca
Hawksbill sea turtle	*Eretmochelys imbricata*	E	Ca
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	Ca
Piping plover	*Charadrius melodus*	T	Ca
Red-cockaded woodpecker	*Picoides borealis*	E	Cr, Ca
Rufa red knot	*Calidris cantus rufa*	T	Cr, Ca
Roseate tern	*Sterna dougallii dougallii*	T	Ca
West Indian manatee	*Trichechus manatus*	E	Cr, Ca
Northern long-eared bat	*Myotis septentrionalis*	P	Cr
Sensitive jointvetch	*Aeschynomene virginica*	T	Cr
Seabeach amaranth	*Amaranthus pumilus*	T	Ca
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Cr, Ca

SOURCE: (USFWS County List Updates: Craven – May 2014.; Carteret – January 2014)
[a] E - Endangered; T- Threatened; T(S/A) - Threatened due to Similarity of Appearance; P – proposed for official listing.
b Cr - Craven County, Ca - Carteret County

American alligator (*Alligator mississippiensis*) – T S/A (Date Listed: 11 March 1967)
This species is a large reptile with a broad snout, a short neck, a heavy body, and a laterally-compressed tail. Adults are blackish or dark gray, but faint yellowish crossbands are sometimes evident. The young are black with conspicuous yellow crossbands. The American alligator inhabits fresh water swamps, marshes, abandoned rice fields, ponds, lakes, and backwaters of large rivers. Females lay eggs in June and hatchlings emerge in late summer or early fall (Martof *et al.* 1980). American alligator is listed as threatened based on the similarity in appearance to other federally-listed crocodilians; however, there are no other crocodilians within North Carolina.

Sea turtles

Loggerhead sea turtle (*Caretta caretta)* – T (Date Listed: 28 July 1978)
Green sea turtle (*Chelonia mydas*) – T (Date Listed: 28 July 1978)

Leatherback sea turtle (*Dermochelys coriacea*) – E (Date Listed: 2 June 1970)
Hawksbill sea turtle (*Eretmochelys imbricata)* – E (Date Listed: 2 June 1970)
Kemp's ridley sea turtle (*Lepidochelys kempii)* – E (Date Listed: 2 December 1970)

Five marine turtles are listed for Carteret County: loggerhead sea turtle, green sea turtle, leatherback sea turtle, hawksbill sea turtle, and Kemp's ridley sea turtle. One marine turtle is listed for Craven County: leatherback sea turtle. All five species have similar habitat requirements and are treated together.

The loggerhead sea turtle is the most common sea turtle on the coast of the North Carolina and is most numerous from late April to October. This species averages 31 to 47 inches in length and weighs from 170 to 500 pounds (lbs) (Martof *et al*. 1980). The loggerhead sea turtle is temperate or subtropical in nature, and is primarily oceanic, but it may also stray into freshwater bays, sounds, and large rivers. Nesting habitat for loggerhead sea turtles consists of ocean beaches.

The green sea turtle is most commonly found in the Caribbean where it breeds on sandy beaches, although individuals, usually immatures, are occasionally found along the North Carolina coast and the species has been documented as rarely nesting in North Carolina. The green sea turtle reaches lengths of 30 to 60 inches and weights of 220 to 650 lbs, and has a smooth, heart-shaped shell (Martof *et al*. 1980). Green sea turtles are omnivorous, primarily eating jellyfish and seaweeds (NMFS 1998b).

Although primarily tropical in nature, the range of the leatherback sea turtle may extend to Nova Scotia and Newfoundland (Martof *et al*. 1980). The leatherback sea turtle sometimes moves into shallow bays, estuaries, and even river mouths. The leatherback sea turtle is distinguishable by its larger size [46 to 70-inch carapace, 650 to 1,500 lbs] and a ridged shell of soft, leathery skin. The leatherback sea turtle feeds extensively on jellyfish, although its diet often includes other sea animals and seaweed. The leatherback sea turtle typically nests on sandy beaches in tropical areas.

The hawksbill turtle is a small to medium-sized sea turtle that is distinguished from other sea turtles by a beak-like mouth, two claws on each flipper, and, when on land, an alternating gait, unlike the leatherback and green sea turtles. Hawksbill turtles are found in tropical ocean habitats and only rarely wander to the shores of North Carolina (Martof *et al*. 1980). Nesting typically occurs on beaches in tropical oceans, typically underneath vegetation (NMFS 1993).

The Kemp's ridley sea turtle is the smallest of the sea turtles with a carapace 23 to 30 inches in length, and weighing 79 to 110 pounds. It is generally considered the most endangered species of sea turtle in the world (Palmer and Braswell 1995). This species ranges from the

Gulf of Mexico and the east coast, to Nova Scotia and Europe. In addition to its small size, this species is discernible by the heart-shaped carapace and gray coloration. Kemp's ridley sea turtle prefers shallow coastal waters, including sounds and the lower portions of large rivers, where it feeds on crabs, shrimp, snails, clams, and some saltwater plants. Nearly all members of this species are believed to nest on a short strand of ocean beach in the state of Tamaulipas, Mexico.

Piping plover (*Charadrius melodus*) – T (Date Listed: 11 December 1985)
This species is a small shorebird with a light beige back, a black tail with a white edge, and white chest. These birds are the smallest of the plovers found in North Carolina, measuring only six to eight inches in length (Golder and Parnell 1987). These small Nearctic birds occur along beaches above the high tide line, sand flats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and washover areas cut into or between dunes (USFWS 1996a). Nests are most often on open, wide, sandy stretches of beach similar to those associated with inlets and capes. Piping plovers usually remain alone or in small flocks on the drier portions of beaches and mudflats (Potter *et al.* 1980). This species is migratory, but some individuals nest in North Carolina, and others migrate to spend the winter in the state. Critical Habitat has been designated for wintering piping plovers along selected beaches within Carteret County (USFWS 2007).

Red-cockaded woodpecker (RCW) (*Picoides borealis*) – E (Date Listed: 13 October 1970)
The RCW is a small, non-migratory woodpecker endemic to mature, fire-maintained pine forests in the southeastern U.S., where it was historically common. RCWs measure seven to eight and one half inches long, have a black cap, prominent white cheeks and a black-and-white, horizontally barred back. Adult males have red markings (cockades) behind the ear, but the cockades are difficult to see (USFWS 2003). Prime nesting habitat includes open, mature southern pine forests dominated by longleaf, loblolly, pond, slash or other southern pine species greater than 60 years of age with little or no mid- or understory development (USFWS 2003). Pine flatwoods and pine-dominated savannas, which have been maintained by frequent natural fires, serve as ideal nesting and foraging habitat for the RCW. Development of a thick understory may result in abandonment of cavity trees. Foraging habitat is comprised of open pine or pine/mixed hardwood stands 30 years of age or older (USFWS 2003).

Nest/roost cavities are excavated into the heartwood of living pine trees that are typically older than 60 years of age (USFWS 2003). The RCW excavates resin wells into the cambium around, above and below the cavity entrance, resulting in a shiny, resinous buildup around the cavity. An aggregate of cavity trees is called a cluster and may include one to more than twenty cavity trees. A cluster is occupied by a group of RCWs typically consisting of a

breeding male and female and often one or more helpers, usually male offspring from previous years (USFWS 2003) (Walters *et al.* 1988a).

In 1992, a *Croatan National Forest (CNF) RCW Management Plan* was developed by Dr. Jeff Walters of NC State University (NCSU) and Warren Starnes, a CNF biologist (at the time), which proposed to link the fragmented RCW population on the CNF. In the winter of 1992/1993, the USFS contracted the NCSU RCW Research Project to create nine RCW recruitment clusters with artificial cavities and provision cavities within 16 existing inactive clusters on the CNF. The artificial cavity provisioning was the first phase in a total five phase plan to link the five subpopulations (as defined by Walters and Starnes) on the CNF and to stabilize isolated clusters on the CNF. The population linkage design was eventually incorporated into the Croatan National Forest Land and Resource and Management Plan 2002. The 2002 Plan emphasizes recovery of RCWs on the CNF using cavity provisioning to attract new RCW breeding groups to existing unoccupied clusters or to newly created clusters. The subsequent four phases were not implemented according to the timeline suggested in the 1992 Management Plan.

RCW assessments for the proposed project were first conducted in 1996. The USFWS determined at that time that Alternative 3 was not likely to adversely affect the red-cockaded woodpecker (USFWS letter dated November 13, 1996). Due to subsequent changes in USFWS guidelines, the original RCW assessment was updated in 2003. The 2003 assessment concluded that suitable RCW foraging habitat would be taken by any of the alternatives. However, using both suitable and potentially suitable foraging habitat, all of the impacted RCW clusters would have enough foraging habitat to meet the USFWS Standard for Managed Stability (SMS). The 2003 study found that no cavity trees would be taken by Alternative 3 (nor any of the other proposed project alternatives) and none of the cleared right of way would be 400 feet away from the closest RCW cavity tree.

According to an extensive biological analysis in 2007, one or more of the three detailed study corridors will affect foraging habitat for four existing RCW clusters, one recruitment cluster, one future recruitment cluster and four habitat management areas (HMAs) proposed for future RCW recruitment clusters. Foraging habitat analyses (FHAs) were conducted to evaluate the direct effects from each detailed study alternative on the four existing RCW clusters, the one recruitment cluster, and the one future recruitment cluster. Future potential habitat for each HMA was also evaluated. Secondary and cumulative effects of each alternative were analyzed for all existing and future recruitment clusters. In October 2010, JCA biologists updated the activity status of the affected clusters and re-evaluated midstory measurements. The results of this analysis were submitted to NCDOT in an *Addendum to the Biological Alternatives Analysis for Red-cockaded Woodpecker and*

Bald Eagle Impacts, US Highway 70 Bypass (R-1015), Craven County, North Carolina (JCA 2011) and are included in Chapter 4.15.

Potential impacts to RCW clusters were evaluated in a Biological Assessment (BA) prepared by NCDOT. Copies of the BA were sent to USFWS and USFS staff on November 12, 2013. In a letter dated November 19, 2013, the USFWS stated that the BA adequately addressed potential effects to the RCW and that the USFWS concurred with the biological conclusion that the proposed project may affect, but is not likely to adversely affect the red-cockaded woodpecker. The full BA is included in Appendix C.

In addition to studies that supported the USFWS Biological Assessment for the RCW, NCDOT also performed a RCW Territory Analysis (NCDOT, 2014) on behalf of USFS, according to their specific provisions – to determine if the Croatan National Forest (CNF) would still meet its obligations under the Recovery Plan for the Red-cockaded Woodpecker (2003). The study evaluated the acres of pine stands in 7 RCW territories on CNF lands before and after the construction of the Havelock Bypass. Review by USFS biologists of this and other documents evaluating RCW habitat within the proposed project limits determined that the CNF will meet its obligations under the RCW Recovery Plan without requiring mitigation for the loss of RCW habitat. The results of this study are summarized in Chapter 4.14.4. The full RCW territory analysis is included in Appendix C.

Rufa red knot (*Calidris canutus rufa*) – T (Date Listed: January 12, 2015)[5]
This species is a robin-sized shorebird that reaches 9 inches in length with a 20-inch wingspan (USFWS 2013). The rufa red knot is one of the six recognized subspecies of red knots, and is the only subspecies that travels along the Atlantic coast of the United States during spring and fall migrations. Since the 1980s, the rufa red knot population has decreased by nearly 75 percent in some areas. On September 30, 2013, the rufa red knot was proposed by the US Fish and Wildlife Service to be listed as a "threatened" species (USFWS 2013). As of December 2014, the status is still in the final reviewing phase (USFWS 2014).

The rufa red knot uses a variety of marine habitats, especially those associated with inlets, including sandy beaches, tidal flats, mouths of bays and estuaries, peat banks, and occasionally rocky substrates. During the northward migration, red knots prefer to stop to refuel at sandy coastal habitats where they often feed on clams, crustaceans, and especially horseshoe crabs eggs (Baker et al. 2013). The suitable habitats and affected environment for the rufa red knot are similar to those discussed for the piping plover. They include beaches, shoals, pools, and intertidal areas, especially in the vicinity of inlets.

5 http://www.fws.gov/northeast/redknot/pdf/2014_28338_fedregisterfinalrule.pdf

Roseate tern (*Sterna dougallii dougallii*) – T (Date Listed: 2 November 1987)
This species is a medium-sized tern, 14 to 17 inches long with a long, deeply-forked, white tail which exceeds the wing length when the bird is at rest. In breeding plumage, the roseate tern has a black bill and cap, light gray mantle, red legs, and a rosy tinge on the chest and belly. Tern prey consists of small coastal fish which are caught by diving on them from the air. The roseate tern is a rare coastal migrant from late March to mid May and from late July to October (Potter *et al.* 1980). The nest of this colonial, ground-nesting seabird is generally a depression on open sand with shells or grasses, usually on the upper beach or dune areas. This species was documented as nesting in Carteret County in 1973 (Potter *et al.* 1980).

West Indian manatee (*Trichechus manatus*) – E (Date Listed: 11 March 1967)
This species is a large, gray or brown aquatic mammal that averages 10 to 13 feet in length and weighs up to 1,000 pounds. During summer months, manatees migrate from their normal Florida wintering areas to as far north as coastal Virginia. These mammals inhabit warm waters, both fresh and salt, where their diet consists mostly of aquatic vegetation (Webster *et al.* 1985).

Sensitive jointvetch (*Aeschynomene virginica*) – T (Date Listed: 20 May 1992)
This species is a robust, bushy-branched, annual legume often exceeding three feet in height. Young stems have bristly hairs with large swollen bases (Leonard 1985). The alternate, compound leaves are even-pinnate, approximately 1.25 to 2 inches wide, with 30 to 56 toothless leaflets (Radford *et al.* 1968). Flowers are bright greenish-yellow with red veins, about 0.5 inch long, and are subtended by bractlets with toothed margins (Leonard 1985). The flowers are produced on few-flowered racemes form July to October. The jointed legume (loment) is about two inches long, has 6 to 10 segments, and a 0.5 to 1-inch stalk. Habitat for this species in North Carolina consists of moist to wet coastal roadside ditches and moist fields that are nearly tidal (USFWS 1995a), especially in full sun (Leonard 1985). This species seems to favor microhabitats where there is a reduction in competition from other plant species, and usually some form of soil disturbance (USFWS 1995a).

Seabeach amaranth (*Amaranthus pumilus*) – T (Date Listed: 7 April 1993)
This species is an herb that grows on barrier island beaches. It is a succulent annual that is sprawling or trailing and may reach two feet or more in length (Radford *et al.* 1968). Inconspicuous flowers and fruits are produced in the leaf axils, typically beginning in July and continuing until frost. Primary habitat for seabeach amaranth consists of bare sand, especially on over wash flats at accreting ends of islands, and lower foredunes and upper strands of non-eroding beaches. The only remaining large populations are in coastal North Carolina (USFWS 1996b).

Northern Long-eared Bat (NLEB) (*Myotis septentrionalis*) – T

The final listing and interim rule for protection of the NLEB was published in the Federal Register on April 2, 2015 and the rule went into effect on May 4, 2015. As of March 25, 2015, this species was included in the USFWS's list of protected species for Craven and Jones Counties based on acoustic evidence; however, it is not currently on the USFWS list for Craven County. The nearest verified records are from New Hanover, Washington, and Wake Counties (USFWS 2014).

On March 25, 2015, the USFWS issued a programmatic conference opinion (PCO) in conjunction with the Federal Highway Administration (FHWA), the US Army Corps of Engineers (USACE), and NCDOT for NLEB in eastern North Carolina. The PCO covers the entire NCDOT program in numerous counties, including Craven County and the proposed Havelock bypass. The programmatic determination for NLEB for the NCDOT program is "May Affect, Likely to Adversely Affect".

Per an April 10, 2015 letter from USFWS to FHWA and NCDOT, effective May 4, 2015, the USFWS officially adopted their PCO as the Programmatic Biological Opinion (PBO) for the NLEB. Under the PBO, NLEB for the entire NCDOT program in Divisions 1 through 8, the programmatic determination for the NLEB is "May Affect, Likely to Adversely Affect." This determination applies to the Havelock Bypass Project. The PBO provides incidental take coverage for NLEB and will ensure compliance with Section 7 of the Endangered Species Act for five years for all NCDOT projects with a federal nexus in Divisions 1 through 8, which includes Craven County where the Havelock Bypass Project is located.

Since the PBO does not include the USFS, the following survey results are provided. NLEB surveys were conducted in the summer of 2014 on the west side of CNF by NCDOT. The acoustic survey results (from 39 acoustic monitoring nights) were analyzed by two software programs. Several calls were identified as NLEBs from both automated identification programs, BCID and EchoClass. Multiple calls were also identified as Indiana bats and gray bats by BCID and EchoClass, although neither species' range extends into central or eastern North Carolina; the results were false positives.

In conjunction with the software analysis, manual analysis was conducted to select calls with the most NLEB characteristics. Subsets of these calls were sent to two acoustic experts (Chris Corben, Titley Scientific, and Dr. Joy O'Keefe, Indiana State University) for further analysis. Neither expert saw conclusive evidence that the calls could be attributed to NLEB. According to these experts, a few calls had potential to be from NLEBs, but most were determined to be from Southeastern Bats (*Myotis austroriparius*).

As a follow-up to the acoustic surveys, 14 nights of mist-netting were conducted by NCDOT in and adjacent to western CNF but no NLEBs were captured. In addition to the negative mist-netting results from 2014, the following negative surveys results were also obtained in and adjacent to CNF:

- Six nights of mist-netting in CNF along proposed Havelock Bypass in 2005 (NCDOT).
- Five nights of mist-netting adjacent to CNF at the NCDOT CWMB from 2007-2010 (NCDOT).
- One night of mist-netting in Carteret County at southern edge of CNF in 2009 (NCDOT).

Based on limited and inconclusive evidence to suggest that NLEBs are present within the study area and CNF, if the species is added to the USFS list of rare species, the proposed project will not affect the viability of NLEB on CNF.

Rough-leaved loosestrife (*Lysimachia asperulaefolia*) – E (Date Listed: 12 June 1987)
This species is a rhizomatous perennial that often reaches the height of two feet; its leaves are sessile and entire, in whorls of three to four. Five-petaled yellow flowers, approximately 0.5-inch across, are produced on a loose terminal raceme from late May to June; seeds are formed by August, but the small, rounded capsules do not dehisce until October. Preferred habitat of the rough-leaved loosestrife consists of the ecotone between longleaf pine savannas and wetter, shrubby areas, where lack of canopy vegetation allows abundant sunlight into the herb layer (USFWS 1995b). The loosestrife is endemic to Coastal Plain and Sandhill regions of the Carolinas. This species is fire maintained; suppression of naturally-occurring fires has contributed to the loss of habitat in our state. Drainage of habitat may also have adverse effects on the plant (USFWS 1995b).

3.15.3.2 Bald and Golden Eagle Protection Act

The bald eagle (*Haliaeetus leucocephalus*) is protected under the Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668d, 54 Stat. 250) as amended -- Approved June 8, 1940, and amended by P.L 86-70 (73 Stat. 143) June 25, 1959; P.L. 87-884 (76 Stat. 1346) October 24, 1962; P.L. 92-535 (86 Stat. 1064) October 23, 1972; and P.L. 95-616 (92 Stat. 3114) November 8, 1978. The bald eagle was formerly listed as a threatened species and protected under Section 7 of the Endangered Species Act of 1973 (listed as threatened on March 11, 1967 and delisted in August 2007). The Bald and Golden Eagle Protection Act (referred to as the Eagle Act) is now the primary regulation that provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Eagle Act, or regulations issued pursuant thereto, and strengthened enforcement measures.

The bald eagle is a large, brown North American fish eagle in the hawk family (*Accipitridae*). It can range from 27-35 inches in length and weigh from seven to fourteen

pounds. Its wingspan is almost seven feet. The bald eagle's plumage is mostly dark brown and adults have a pure white head and tail. Both sexes look alike. Juveniles have dark brown heads and white mottling on the belly, wings and tail. Adult plumage is obtained in the fourth or fifth year (USFWS 1989).

The bald eagle is found throughout the lower 48 states of the United States and in Alaska and Canada. It typically inhabits mature conifer forests close to clean bodies of water populated with fish, most often rivers, estuaries, coasts or large lakes. It is sometimes a predator, catching surface fish and other prey in its talons, but more often a scavenger, eating carrion from the ground (e.g., dead fish washed up onshore) (USFWS 1989).

Bald eagles usually first breed at age four to five years and may mate for life. The nesting season in the southeast extends from October to May (USFWS 2007b). Nests are typically built in the tops of very tall conifers located near water. Eagles may live 30 or more years in the wild and often return to within 100 miles of their birthplace to nest (USFWS 1989).

Biologists from Dr. J. H. Carter III & Associates, Inc. surveyed each of the three detailed study corridors and a 660-foot radius around the corridors for bald eagle nests by helicopter in January 2011. To ensure 100 percent visual coverage, the corridors were flown using a grid system (both north/south and east/west). Transects were oriented depending on the prevailing wind and spaced 250 to 500 feet apart depending on stand density. No eagle nests were found during the aerial surveys. However, one sub-adult bald eagle was observed flying outside of the 660-foot radius survey area north of the project corridor.
In order to avoid disturbing nesting bald eagles, the *National Bald Eagle Management Guidelines* (USFWS 2007) recommend: 1) keeping a distance (at least 330 feet or 660 feet) between a proposed activity and an eagle nest (distance buffer), 2) maintaining a preferably forested (or natural) area between an activity and a nest tree (landscape buffer), and 3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory effects associated with human activities near nest sites. The USFWS guidelines recommend that if road construction activities will be visible to an eagle nest, construction activities should be at least 660 feet from the nest. In addition, landscape buffers are recommended. Construction activities that are not visible to a nest should occur at least 330 feet away from a nest and should be conducted outside the breeding season (USFWS 2007).

Eagle monitoring data provided by the North Carolina Wildlife Resources Commission listed 12 nests in Craven County and two in Carteret County in 2010. Two of these 14 nests are located in the vicinity of the project. One nest is located approximately 1.5 miles east of the project study corridor on the Cherry Point Marine Corps Air Station and the other nest is approximately 3.5 miles northwest of the project site near East Prong Brice Creek on CNF property. None of the known nests are located within the 660-foot radius around the survey corridors. Additionally, construction activities for the proposed Havelock Bypass will not occur within 330 feet of, or be visible from, any known nest trees.

3.15.3.3 Species of Concern

The U.S. Fish and Wildlife Service (USFWS) list also includes a category of species designated as "Federal Species of Concern" (FSC). The FSC designation provides no federal protection under the Endangered Species Act for the species listed. However, these are listed since they may attain federally-protected status in the future.

Table 3.15.4 includes the eighteen FSC species listed for Craven County, the twenty-four species for Carteret County, their state designations, and whether potential habitat for those species is present within the project study corridors. One additional FSC species identified as occurring in Carteret County, many-flowered grass pink (*Calopogon multiflorus*), and two additional FSC species identified as occurring in Craven County, coastal goldenrod (*Solidago villosicarpa*) and southeastern myotis (*Myotis austroriparius*) are also presented in Table 3.15.4.

Twenty-one FSC species with potential habitat within the study corridors are listed in Table 3.15.4. Three FSC species; the American eel, the black-throated green warbler, and the spring-flowering goldenrod, were observed within the project study corridors during field investigations. Another FSC species, Bachman's sparrow (*Aimophila aestivalis*), was observed adjacent to the project study corridors. NCDOT biologists also documented the southeastern bat just outside the study corridor.

TABLE 3.15.4
FEDERAL SPECIES OF CONCERN

Common Name	Scientific Name	County Listed[a]	State Designation[b]	Potential Habitat[c]
American eel	*Anguilla rostrata*	Cr, Ca	W1	Yes
Bachman's Sparrow	*Aimophila aestivalis*	Cr, Ca	SC	Yes
Black rail	*Laterallus jamaicensis*	Cr, Ca	SR	No
Black-throated green warbler	*Dendroica virens waynei*	Cr, Ca	SR	Yes
Bridle shiner	*Notropis bifrenatus*	Cr	SC (PE)	Yes
Carolina gopher frog	*Rana capito capito*	Ca	T	Yes
Bridle shiner	*Notropis bifrenatus*	Cr	E	
Carolina madtom	*Noturus furiosis*	Cr	SC (PT)	No
Eastern Henslow's sparrow	*Ammodramus henslowii susurrans*	Ca	SR	Yes
Eastern painted bunting	*Passerina ciris ciris*	Ca	SR	No
Mimic glass lizard	*Ophisaurus mimicus*	Ca	SC	Yes
Northern diamondback terrapin	*Malaclemys terrapin terrapin*	Ca	SC	No
Southern hognose snake	*Heterodon simus*	Cr, Ca	SC	Yes
A skipper	*Atrytonopsis* sp. 1	Ca	SR	No
Annointed sallow noctuid moth	*Pyreferra ceromatica*	Cr	SR	Yes
Buchholz's dart moth	*Agrotis buchholzi*	Cr, Ca	SR	Yes
Carter's noctuid moth	*Spartiniphaga carterae*	Ca	SR	Yes

TABLE 3.15.4 cont.
FEDERAL SPECIES OF CONCERN

Common Name	Scientific Name	County Listeda	State Designation b	Potential Habitatc
Eastern beard grass (arogos) skipper	*Atrytone arogos arogos*	Ca	SR	Yes
Venus flytrap cutworm	*Hemipachnobia subporphyrea*	Ca	SR	Yes
Coastal beaksedge	*Rhynchospora pleiantha*	Ca	T	No
Coastal goldenrod [d]	*Solidago villosicarpa*	Cr	E	No
Dune blue curls	*Trichostema* sp. 1	Ca	SR-L	No
Godfrey's sandwort	*Minuartia godfreyi*	Cr	E	No
Grassleaf arrowhead	*Sagittaria weatherbiana*	Cr	SR-T	Yes
Loose watermilfoil	*Myriophyllum laxum*	Cr, Ca	T	No
Many-flower grass pink [d]	*Calopogon multiflorus*	Ca	E	Yes
Pickering's dawnflower	*Stylisma pickeringii* var. *pickeringii*	Ca	E	No
Pondspice	*Litsea aestivalis*	Cr, Ca	SR-T	Yes
Raven's boxseed	*Ludwigia ravenii*	Cr, Ca	SR-T	Yes
Savanna campylopus	*Campylopus carolinae*	Ca	SR-T	Yes
Spring-flowering goldenrod	*Solidago verna*	Cr, Ca	T	Yes
Venus flytrap	*Dionaea muscipula*	Cr, Ca	SR-L, SC	Yes
Wagner's (Carolina) spleenwort	*Asplenium heteroresiliens*	Cr	E	No
White wicky	*Kalmia cuneata*	Cr	W1	No

SOURCE: USFWS County List Updates: Craven – May 2014; Carteret – January 2014.
[a] Cr= Craven county; Ca= Carteret County.
[b] E – Endangered; T – Threatened; SC – Special Concern; SR – Significantly Rare; PT – Proposed Threatened; PE – Proposed Endangered; SR-L – Significantly Rare, range of species is limited to North Carolina and adjacent states; SR-T – Significantly Rare, species is rare throughout its range; W1 – Watch List, species believed to be rare and of conservation concern.
[c] Potential habitat based on Franklin and Finnegan (2008), LeGrand, *et al.* (2008), and other literature previously cited.
[d] Species not included on the current FSC list available from USFWS but are included based on data available from the USFS and NCNHP documenting these species in Carteret and Craven Counties.

According to North Carolina Natural Heritage Program records, the southern hognose snake (*Heterodon simus*) was documented within the Croatan National Forest east of the Alternative 2 corridor and Lake Road, near an existing railroad crossing. Spring-flowering goldenrod has been documented throughout the project study corridors. The intensive surveys conducted during the course of the project indicated the spring-flowering goldenrod is a more numerous and widespread species than previously documented.

3.15.3.4 State-Protected Species

Species of mammals, birds, reptiles, amphibians, and plants with the North Carolina status of Endangered (E), Threatened (T), and Special Concern (SC) receive limited protection under the North Carolina Endangered Species Act (G.S. 113-331 *et seq.*) and the North Carolina Plant Protection Act of 1979 (G.S. 106-202.12 *et seq.*). No state-protected species, other than those noted under the Federal Protected Species or Federal Species of Concern accounts (previously listed) or USFS rare species (formerly termed "Proposed, Endangered,

Threatened, and Sensitive (PETS) species") have been documented in North Carolina Natural Heritage Program records or were observed during field investigations within the project study corridors.

3.15.4 USFS Rare Species

In addition to plant and animal species receiving protection under the Endangered Species Act, the U.S. Forest Service (USFS) maintains their own list of rare species (formerly termed "Proposed, Endangered, Threatened, and Sensitive (PETS) species") for the Croatan National Forest (CNF) and considers these species when determining impacts to National Forest System (NFS) lands. Since the Preferred Alternative crosses NFS lands, a special use permit from the USFS will be required to convert the lands from their current use to highway use for the proposed project. Prior to approving a special use permit for the project, the USFS requires that the project study area be evaluated for rare species. The NCDOT coordinated with the USFS to determine which rare species were to be evaluated. The surveys and evaluations were conducted by Environmental Services, Inc. and reviewed by NCDOT and the USFS.

Throughout the evaluation, the USFS has been amending and revising its list of rare species as new scientific data regarding species distributions on the CNF becomes available. The USFS identified 30 rare species with a high probability of occurring that were to be evaluated in the Environmental Assessment for the proposed project in 1996. At that time the USFS indicated that 73 rare species were listed for consideration on the CNF. When additional detailed evaluations were initiated in 2002 that list was amended to include 175 species. In January 2005, September 2007, May 2008, October 2010, and October 2013, the USFS further amended the rare species list removing species and requesting that additional species be incorporated into the project analysis.

3.15.4.1 Biological Evaluation Report for NFS Lands

On behalf of USFS, NCDOT prepared a Biological Evaluation (BE) to assess the potential effects to rare species on NFS lands from the proposed construction and maintenance of the US 70 Havelock Bypass by the NCDOT. There are three objectives of the BE: 1) to ensure that Forest Service approval of the proposed NCDOT actions does not contribute to loss of viability of any native or desired non-native plant or animal species across the CNF; 2) to include concerns for sensitive species and locally rare species within the planning process, thereby reducing potential negative effects to these species; and 3) to ensure that activities will not cause a species to move towards federal listing. This BE conforms with legal requirements set forth in Section 7(a)(2) of the Endangered Species Act (16 U.S.C. 1536), and the direction given in Forest Service Manual (FSM) 2671.44, 2672.41, and 2673.42. As part of the National Environmental Policy Act (NEPA) decision making process, this evaluation provides information in sufficient detail to determine how proposed actions may

affect rare species. Determinations of effects on each species are based on best available information. The full BE is included in Appendix C.

All USFS rare species that occur or could occur on the CNF were considered in the BE including: federally Proposed, Endangered, or Threatened species, Regional Forester's Sensitive (S) species, and Locally Rare (LR) species. The database of Element Occurrence (EO) records maintained by the North Carolina Natural Heritage Program (NCNHP) (as updated through October 2013), U.S. Fish and Wildlife Service (USFWS) lists of Endangered and Threatened species in the project counties, individual species Recovery Plans, records provided to or by USFS biologists, and scientific literature were reviewed to determine areas of known populations of rare species within the proposed project area. These databases and literature include survey information collected by private individuals, USFS personnel, and other federal and state agencies. Federally listed threatened and endangered species with known occurrence on the CNF include the red-cockaded woodpecker (*Picoides borealis*) and the rough-leaved loosestrife (*Lysimachia asperulaefolia*).

Survey of Potential Habitat for Rare Species – To supplement existing information available at the onset of the evaluation for the project study area, surveys and evaluations were completed by a combination of ESI and NCDOT biologists between 2004 and 2013. Initial habitat assessments, including field evaluations for USFS rare plant species were conducted in 2003-2004 for the species listed at that time. The field surveys conducted in 2003-2004 included a floristic inventory that documented several new plant species records for the CNF. Targeted surveys for USFS listed rare plants, terrestrial wildlife, and aquatic wildlife species were undertaken in 2003-2005. Additional surveys for selected species have been undertaken in subsequent years. A summary of site surveys and evaluations undertaken by NCDOT is provided below.

2003

- Habitat evaluation for 1000-foot wide study corridor 3.
- Field surveys for spring flowering USFS rare plant species for study corridor 3.
- Habitat evaluations and field surveys for USFS rare butterfly species for study corridors 1, 2, and 3.

2004

- Habitat evaluation for 1000-foot wide study corridors 1 and 2.
- Field surveys for spring flowering USFS rare plant species for study corridors 1 and 2.

2005

- Field surveys for USFS rare plant species for 1000-foot wide study corridors 1, 2, and 3.

- Habitat evaluations and field surveys for USFS rare bird species for study corridors 1, 2, and 3.
- Habitat evaluations and field surveys USFS rare butterfly and moth species for study corridors 1, 2, and 3 (see Attachments 1 and 2). Additional butterfly surveys were conducted by NCNHP on CNF, mostly in savanna and powerline habitats.
- Habitat evaluations and field surveys for USFS rare fish species for study corridors 1, 2, and 3.
- Habitat evaluations and field surveys for USFS rare mollusk and crustacean species for study corridors 1, 2, and 3.
- Habitat evaluations and field surveys for USFS rare reptile and amphibian species and Eastern Woodrat (*Neotoma floridana*) for study corridors 1, 2, and 3.
- Habitat evaluations and field surveys for USFS rare bat surveys for study corridors 1, 2, and 3.

2008/2009

- Field surveys for select USFS rare plant species identified by the USFS within portions of the Croatan National Forest outside study corridors 1, 2, and 3.
- Habitat evaluation and field surveys for USFS rare plant and animal species for the NCDOT Croatan Wetland Mitigation Bank.
- Bat surveys continued annually until 2010.
- GIS-based habitat evaluation for newly listed USFS rare plant and animal species for study corridors 1, 2, and 3 and indirect impact areas.
- Updated direct and indirect impact analysis for USFS rare plant and animal species.
- Field surveys for USFS rare butterfly species within portions of the CNF outside study corridors 1, 2, and 3.

2010

- Field surveys for Rough-leaved Loosestrife for the Alternative 3 corridor and alternatives identified within study corridors 1 and 2 (Alt.1 and Alt.2). Surveys conducted both on and off NFS lands.
- Seed collection for Spring-flowering Goldenrod (*Solidago verna*) was undertaken at the request of the USFS for occupied sites within the Alternative 3 corridor.

2011

- GIS-based habitat evaluation for newly listed USFS rare plant and animal species within the Alternative 3 evaluation areas.
- Direct and indirect impact analysis for USFS rare plant and animal species.
- Seed collection for Spring-flowering Goldenrod was undertaken at the request of the USFS for occupied sites within the Alternative 3 corridor.

2012

- Field surveys for select USFS rare plant species identified by the USFS within the Alternative 3 corridor.
- Field surveys and evaluation of known occurrences for select USFS rare plant species identified by the USFS within portions of the CNF outside the Alternative 3 corridor.
- GIS-based habitat evaluation for newly listed USFS rare plant and animal species within the Alternative 3 corridor.
- Seed collection for Spring-flowering Goldenrod was undertaken at the request of the USFS for occupied sites within the Alternative 3 corridor.

2013

- Updated direct and indirect impact analysis for USFS rare plant and animal species. The "CNF evaluation area" includes NFS lands where direct and indirect impacts could potentially occur.
- Field surveys within the CNF evaluation area for non-native invasive species (NNIS) of plants identified as concerns for CNF by USFS.
- Field surveys to locate new occurrences and evaluation of known occurrences for select USFS rare plant species (bryophytes) within portions of the Croatan National Forest outside the CNF evaluation area.
- Seed collection for Spring-flowering Goldenrod and LeConte's Thistle (Cirsium lecontei) was undertaken at the request of the USFS for occupied sites within the CNF evaluation area.

2014

- Field survey and evaluation for Awned Mountain-mint (*Pycnanthemum setosum*), a USFS rare plant species recently documented within the Alternative 3 project study area.
- Seed collection for Spring-flowering Goldenrod, LeConte's Thistle, and Awned Mountain-mint are being undertaken at the request of the USFS for occupied sites within the CNF evaluation area.

Habitats were visited within the Alternative 3 corridor at the onset of the rare species evaluations in 2003 and 2004 for the purposes of documentation of various habitat characteristics in the field. Controlled burning is conducted by USFS throughout much of this portion of CNF and influences the communities present. Habitats differ based on soil, hydrology, and topographic changes. Nine major habitat types were identified in the evaluation area. These include Pine Flatwoods, Pine/Hardwood Forest, Streamhead Pocosin, Swamp Forest, Small Pond, Powerline Corridor, Pine Plantation, Successional/Ruderal Habitat, and Rural/Urban Modifications. Five habitat types are further divided by characteristics of hydrology or vegetation. Pine Flatwoods is the most abundant habitat type within the Alternative 3 corridor and includes areas denoted as either mesic or

hydric. Streamhead Pocosin is divided into tree-dominated and shrub-dominated areas based on canopy coverage. Swamp Forest has been grouped into three distinct regimes with respect to hydrologic conditions and stream characteristics: large stream, small stream, and ponded/depressional. Powerline Corridor and Pine Plantation habitats are divided into mesic and hydric areas. One habitat type, Rural/Urban Modifications, is used to include all obvious human-maintained landscape modifications including roadsides, lawns, and other landscaped areas. Habitats sustaining regular disturbance are included under Successional/Ruderal Habitat.

Plant Species – There are 107 plant species on the most recent (October 2013) list of rare plant species maintained by the USFS for the CNF. Of these 107 rare plant species, 35 species were dropped from further consideration because no suitable habitat is present within or in close proximity to the evaluation area. The species dropped from further consideration due to absence of suitable habitats are summarized below by habitat types.

No Maritime Forests or Ocean Beaches were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from further consideration due to the lack of these habitats within the evaluation area. The following Sensitive plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: a Liverwort (Lejeunea dimorphophylla), a Liverwort (*Metzgeria unicigera*), Large-seed Pellitory (*Parietaria praetermissa*), Coastal Goldenrod (*Solidago villosicarpa*), and Sunrise Lichen (*Teloschistes flavicans*). The following Locally Rare plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Spreading Sandwort (*Arenaria lanuginosa var. lanuginosa*) and Coastal Virgin's-bower (*Clematis catesbyana*).

No Tidal Swamps or Freshwater/Brackish Marshes were identified in the evaluation area. The sensitive jointvetch (*Aeschynome virginica*), a federally Endangered, Threatened, or Proposed plant species was eliminated from further consideration due to the lack of these habitats: The following Sensitive plant species were eliminated from further consideration due to a lack of these habitats: Long's Bittercress (*Cardamine longii*), a Liverwort (*Frullania donnellii*), and Godfrey's Sandwort (*Minuartia godfreyi*). The following Locally Rare plant species were eliminated from further consideration due to a lack of these habitats: Twig-rush (*Cladium mariscoides*), Littlespike Spikerush (*Eleocharis parvula*), Beaked Spikerush (*Eleocharis rostellata*), Terrell Grass (*Elymus virginicus var. halophilus*), and Winged Seedbox (*Ludwigia alata*).

No marl outcrops, other habitats with exposed marl, or Basic Mesic Forest were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant

species are restricted to these habitats and none were eliminated from further consideration due to the lack of these habitats within the evaluation area. The following Sensitive plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Carolina Spleenwort (*Asplenium heteroresiliens*), a Liverwort (Cylindrocolea rhizantha), Quillwort (*Isoetes microvela*) and Piedmont Meadowrue (*Thalictrum macrostylum*). The following Locally Rare plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Tennessee Bladder-fern (*Cystopteris tennesseensis*) and Bluff Oak (*Quercus austrina*).

No Cypress Savannas, Carolina Bays, or Limesink Ponds were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from further consideration due to the lack of these habitats within the evaluation area. The following Sensitive plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Hirst's Panic Grass (*Dichanthelium hirstii*), Loose Watermilfoil (*Myriophyllum laxum*), Awned Meadow- beauty (*Rhexia aristosa*), Coastal Beaksedge (*Rhynchospora pleiantha*), and Chapman's Arrowhead (*Sagittaria chapmanii*). The following Locally Rare plant species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Robbin's Spikerush (*Eleocharis robbinsii*), Flaxleaf Seedbox (*Ludwigia linifolia*), Northern White Beaksedge (*Rhynchospora alba*), Harper's Beaksedge (*Rhynchospora harperi*), Southern Beaksedge (*Rhynchospora microcarpa*), and Dwarf Bladderwort (*Utricularia olivacea*).

No Sandhills or Pine Barrens habitat was identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from further consideration due to the lack of these habitats within the evaluation area. The following Sensitive plant species was eliminated from further consideration due to a lack of these habitats within the evaluation area: Southern Bogbutton (*Lachnocaulon beyrichianum*). The following Locally Rare plant species was eliminated from further consideration due to a lack of these habitats within the evaluation area: Showy Aster (*Eurybia spectabilis*).

Potentially suitable habitat or previously reported NCNHP or USFS records were identified in the evaluation area for 72 USFS rare plant species. The field surveys conducted in 2003-2004 included a floristic inventory that documented several new plant species records for the CNF. Additional surveys have been undertaken in subsequent years for selected species. Surveys conducted from 2003-2013 in combination with records available from NCNHP and the USFS resulted in documentation or confirmation of the presence within the evaluation area of 21 USFS rare plant species currently on the USFS rare plant list for the CNF. The botanical surveys did not identify the presence of 51 of the USFS rare plant

species currently on the USFS rare plant list for which potential habitat had been identified in the CNF evaluation area.

A summary of the evaluation for all 72 species with potentially suitable habitat identified or previously reported NCNHP records within the evaluation area is presented in Chapter 4.14.5. Table 3.15.5 lists USFS rare species for the CNF.

TABLE 3.15.5
USFS RARE PLANT SPECIES FOR THE CROATAN NATIONAL FOREST
OCTOBER 2013

SCIENTIFIC NAME	COMMON NAME	USFS STATUS[a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Asplenium heteroresiliens	Carolina Spleenwort	S	Marl, coquina limestone outcrops	No
Calopogon multiflorus	Many-flower Grass Pink	S	Savannas and sandhills	Yes
Campylopus carolinae	Savanna Campylopus	S	Savanna	Yes
Cardamine longii	Long's Bittercress	S	Tidal marshes, tidal cypress-gum forests	No
Carex basiantha	Widow Sedge	LR	Marl, mesic forests and bottomlands over calcareous rocks	Yes
Carex calcifugens	Calcium-fleeing Sedge	LR	Evergreen maritime forest, calcareous bluff forest	Yes
Carex emmonsii	Emmon's Sedge	LR	Dry, sandy woodlands	Yes
Carex lupuliformis	Hop-like Sedge	LR	Mesic bottomlands, especially in calcareous or mafic areas	Yes
Cirsium lecontei	LeConte's Thistle	LR	Savannas	Yes
Cladium mariscoides	Twig-rush	LR	Bog marshes, brackish fens, sandhill seeps	No
Cleistesiopsis oricamporum (=Cleistes bifaria)	Small Coastal Spreading Pogonia	S	Savannas, dry meadows	Yes
Clematis catesbyana	Coastal Virgin's-bower	LR	Dunes, maritime forest edge, dolomite	No
Corallorhiza wisteriana	Spring Coral-root	LR	Moist to dry nutrient-rich forests, especially over limestone, mafic rocks or shell-rich sands	Yes
Coreopsis helianthoides	Beadle's Coreopsis	LR	Swamp, peaty wetlands	Yes
Crocanthemum carolinianum	Carolina Sunrose	LR	Sandhills pinelands and dry savannas	Yes
Cylindrocolea rhizantha	A Liverwort	S	Marl outcrops	No
Cystopteris tennesseensis	Tennessee Bladder-fern	LR	Marl, calcareous rock outcrops	No
Dichanthelium fusiforme	Spindle-fruited Witch Grass	LR	Sandy pine or pine-oak forests	Yes
Dichanthelium hirstii	Hirst's Panic Grass	S	Cypress savannas	No

TABLE 3.15.5
USFS RARE PLANT SPECIES FOR THE CROATAN NATIONAL FOREST
OCTOBER 2013

SCIENTIFIC NAME	COMMON NAME	USFS STATUS[a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Dichanthelium sp. 9	Hidden-flowered Witch Grass	LR	Pocosins, wet meadows, ditchlines	Yes
Dichanthelium spretum	Eaton's Witch Grass	LR	Wet sands and peaty bogs, savannas	Yes
Dionaea muscipula	Venus Flytrap	S	Savannas, seepage bogs, pocosin edges with little competition	Yes
Eleocharis parvula	Littlespike Spikerush	LR	Tidal brackish and freshwater marshes	No
Eleocharis robbinsii	Robbin's Spikerush	LR	Ponds, lakes, Carolina bays	No
Eleocharis rostellata	Beaked Spikerush	LR	Tidal brackish and freshwater marshes	No
Elymus virginicus var. *halophilus*	Terrell Grass	LR	Brackish marsh, maritime forest	No
Eriocaulon aquaticum	Seven-angled Pipewort	LR	Pond or lake margins	Yes
Eurybia spectabilis	Showy Aster	LR	Pine barrens, woodland borders	No
Fissidens hallii	Hall's Pocket Moss	S	On bark in cypress-gum swamps	Yes
Frullania donnellii	A Liverwort	S	Ilex bark in marshes	No
Hibiscus aculeatus	Comfortroot	LR	Bay forests, sand ridges, roadsides	Yes
Isoetes microvela	Quillwort	S	Emergent or calcareous riverbanks	No
Lachnocaulon beyrichianum	Southern Bogbutton	S	Sandhills	No
Leersia lenticularis	Catchfly Cutgrass	LR	Low moist woods	Yes
Lejeunea bermudiana	A Liverwort	LR	On marl outcrops and on decaying logs in blackwater swamps	Yes
Lejeunea dimorphophylla	A Liverwort	S	On bark in maritime forests	No
Litsea aestivalis	Pondspice	S	Limesink ponds and other pools	Yes
Lobelia boykinii	Boykin's Lobelia	S	Depression ponds, meadows, clay-based cypress savannas	Yes
Ludwigia alata	Winged Seedbox	LR	Freshwater to brackish marshes	No
Ludwigia linifolia	Flaxleaf Seedbox	LR	Limesink ponds	No
Ludwigia ravenii	Raven's Seedbox	S	Savannas, swamps, marshes, wet open areas	Yes
Ludwigia sphaerocarpa	Globe-fruit Seedbox	LR	Bogs, pools, and lakeshores	Yes
Lysimachia asperulaefolia	Rough-leaved Loosestrife	E	Pocosin/savanna ecotones	Yes
Lysimachia loomisii	Loomis's Loosestrife	S	Moist to wet savannas and pocosin ecotones	Yes
Macbridea caroliniana	Carolina Birds-in-a-nest (Carolina Bogmint)	S	Blackwater swamps, savannas	Yes
Malaxis spicata	Florida Adder's Mouth	LR	Maritime swamp forest, calcareous mucky outer coastal plain swamps	Yes
Metzgeria unicigera	A Liverwort	S	On bark in maritime forests	No
Minuartia godfreyi	Godfrey's Sandwort	S	Tidal freshwater marshes	No

TABLE 3.15.5
USFS RARE PLANT SPECIES FOR THE CROATAN NATIONAL FOREST
OCTOBER 2013

SCIENTIFIC NAME	COMMON NAME	USFS STATUS[a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Myriophyllum laxum	Loose Watermilfoil	S	Limesink ponds, natural lakes	No
Nuphar sagittifolia	Narrowleaf Cowlily	S	Blackwater streams, rivers, and lakes	Yes
Oplismenus hirtellus ssp. *setarius*	Shortleaf Basket Grass	LR	Maritime forests, bottomlands	Yes
Oxypolis ternata (=O. denticulata)	Piedmont Cowbane	S	Pine savannas, sandhill seeps	Yes
Parietaria praetermissa	Large-seed Pellitory	S	Shell middens, disturbed sites, maritime forest	No
Parnassia caroliniana	Carolina Grass-of-parnassus	S	Wet calcareous savannas	Yes
Paspalum dissectum	Mudbank Crown Grass	LR	Mudbanks, open wet areas, wet ditches	Yes
Peltandra sagittifolia	Spoonflower	LR	Pocosins, wet peat-dominated sites	Yes
Persicaria hirsuta	Hairy Smartweed	LR	Limesink ponds, clay-lined Carolina bays, blackwater stream edges	Yes
Pinguicula pumila	Small Butterwort	LR	Savannas	Yes
Plagiochila ludoviaciana	A Liverwort	LR	On bark in swamps and maritime forests	Yes
Plagiochila miradorens miradorensis	A Liverwort	LR	On bark in maritime forests and swamps	Yes
Plantago sparsiflora	Pineland Plantain	S	Wet calcareous savannas	Yes
Platanthera integra	Yellow Fringeless Orchid	S	Savannas	Yes
Platanthera nivea	Snowy Orchid	LR	Wet savannas	Yes
Polygala hookeri	Hooker's Milkwort	S	Savannas	Yes
Ponthieva racemosa	Shadow-witch	LR	Blackwater forests and swamps over calcareous rock (marl)	Yes
Pycnanthemum setosum	Awned Mountain-mint	LR	Dry pinelands and blackwater swamps	Yes
Quercus austrina	Bluff Oak	LR	Bluff or basic mesic forest	No
Quercus minima	Dwarf Live Oak	LR	Pine flatwoods, coastal fringe sandhills	Yes
Rhexia aristosa	Awned Meadow-beauty	S	Clay-lined Carolina bays, limesink ponds	No
Rhynchospora alba	Northern White Beaksedge	LR	Limesink ponds, pocosin openings	No
Rhynchospora galeana	Short-bristled Beaksedge	S	Wet savannas, may colonize disturbed areas/roadsides	Yes
Rhynchospora harperi	Harper's Beaksedge	LR	Limesink ponds and cypress savannas	No
Rhynchospora macra	Southern White Beaksedge	S	Seepage or sphagnum bogs in frequently burned streamhead pocosins	Yes
Rhynchospora microcarpa	Southern Beaksedge	LR	Limesink ponds, maritime grasslands, clay-lined Carolina bays	No

TABLE 3.15.5
USFS RARE PLANT SPECIES FOR THE CROATAN NATIONAL FOREST
OCTOBER 2013

SCIENTIFIC NAME	COMMON NAME	USFS STATUS[a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Rhynchospora pleiantha	Coastal Beaksedge	S	Sandy margins of limesink ponds	No
Rhynchospora thornei	Thorne's Beaksedge	S	Wet savannas	Yes
Sagittaria chapmanii	Chapman's Arrowhead	S	Limesink ponds with drawdown	No
Sagittaria weatherbiana	Grassleaf Arrowhead	S	Fresh to slightly brackish marshes, swamps and ponds	Yes
Schoenoplectus etuberculatus	Canby's Bulrush	LR	On peat in depression ponds, in flowing blackwater streams	Yes
Scirpus lineatus	Drooping Bulrush	LR	Low rich swamp forests over coquina limestone	Yes
Scleria baldwinii	Baldwin's Nutrush	LR	Wet savannas associated with longleaf pine, pond pine, and pond cypress	Yes
Solidago leavenworthii	Leavenworth's Goldenrod	LR	Savannas, clay-based Carolina bays, peaty seeps, pocosin borders	Yes
Solidago pulchra	Carolina Goldenrod	S	Savannas	Yes
Solidago tortiflora	Twisted-leaf Goldenrod	LR	Dry savannas and moist flatwoods	Yes
Solidago verna	Spring-flowering Goldenrod	S	Moist pine savannas, lower slopes in sandhills, roadsides in pinelands	Yes
Solidago villosicarpa	Coastal Goldenrod	S	Maritime, edge of coastal fringe evergreen forest in outer coastal plain	No
Sphagnum cribrosum	Florida Peatmoss	S	Blackwater streams, ditches	Yes
Sphagnum fitzgeraldii	Fitzgerald's Peatmoss	S	Pocosins and savannas	Yes
Sphagnum torreyanum	Giant Peatmoss	LR	Millponds, beaver ponds	Yes
Spiranthes eatonii	Eaton's Ladies'-tresses	LR	Wet savannas	Yes
Spiranthes longilabris	Giant Spiral Orchid	S	Wet savannas	Yes
Sporobolus pinetorum	Carolina Dropseed	S	Wet savannas	Yes
Stylisma pickeringii var. *pickeringii*	Pickering's Dawnflower	LR	Dry sandy roadsides, sandhills	Yes
Teloschistes flavicans	Sunrise Lichen	S	Maritime forest	No
Thalictrum macrostylum	Piedmont Meadowrue	S	Bogs, wet woods, tidal freshwater marshes, associated with circumneutral soils and mafic outcrops over olivine	No
Tofieldia glabra	Carolina Asphodel	S	Wet pine savannas and sandhill seeps, savanna-pocosin ecotones	Yes
Tridens chapmanii	Chapman's Redtop	LR	Roadside, loamy sands of disturbed longleaf pine woodlands	Yes
Utricularia olivacea	Dwarf Bladderwort	LR	Limesink ponds, beaver ponds	No

TABLE 3.15.5
USFS RARE PLANT SPECIES FOR THE CROATAN NATIONAL FOREST
OCTOBER 2013

SCIENTIFIC NAME	COMMON NAME	USFS STATUS[a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Xyris floridana	Florida Yellow-eyed Grass	LR	Savannas	Yes
Xyris stricta	A Yellow-eyed Grass	LR	Savannas, depression ponds, depressional meadows, ditches	Yes

Terrestrial and Aquatic Animal Species – There are 92 animal species on the most recent (August 2013) list of rare animal species provided by the USFS for the CNF. One additional mammal, Northern Long-eared Bat (*Myotis septentrionalis*) is not on the August 2013 list of rare animal species provided by the USFS for the CNF, but is considered based on its recent status change and anticipated addition to the USFS. Of the total of 93 rare animal species considered, 56 species were dropped from further consideration because no suitable habitat is present within or in close proximity to the evaluation area. Table 3.15.6 lists rare animal species for the CNF.

Two species from the USFS list of rare animal species were eliminated from consideration since they are considered to be extirpated from North Carolina. The following federally Endangered, Threatened or Proposed animal species were eliminated from further consideration due to extirpation: Eastern Cougar (*Puma concolor cougar*) and Bachman's Warbler (*Vermivora bachmanii*). No Sensitive or Locally Rare animal species were identified as extirpated from the State and none were eliminated from further evaluation due to extirpation.

Several species were eliminated from consideration since the Croatan National Forest would be considered extralimital to known ranges and these species have not been documented in Carteret, Craven or Jones Counties. The following federally Endangered, Threatened, or Proposed animal species were eliminated from further consideration due to extralimital range: Red Wolf (*Canis rufus*) (experimental population reintroduced into North Carolina not documented as ranging south of Beaufort County) and Kirtland's Warbler (*Dendroica kirtlandii*). No Sensitive animal species were eliminated from further consideration due to extralimital range. The following Locally Rare animal species were eliminated from further consideration due to extralimital range: an undescribed Shrew (*Sorex* sp. 1), Dwarf Salamander (*Eurycea quadridigitata*), Wood Frog (coastal plain population) (*Rana sylvatica* pop. 3), a Noctuid Moth (*Melanapamea mixta*), a Mayfly (*Baetisca obesa*), a Noctuid Moth (*Bleptina sangamonia*), a Noctuid Moth (*Gabara* sp. 1), Blackwater Ancylid (*Ferrisia hendersoni*), Least Brook Lamprey (*Lampetra aepytera*), and Grooved fingernail Clam (*Sphaerium simile*).

No maritime forests, maritime thickets, dunes, ocean beach, or marine habits were identified in the evaluation area. The following federally Endangered, Threatened, or Proposed species were eliminated from further consideration due to the lack of these habitats within the evaluation area: West Indian Manatee (*Trichechus manatus*), Piping Plover (*Charadrius melodus*), Roseate Tern (*Sterna dougallii*), Loggerhead Seaturtle (*Caretta caretta*), Green Seaturtle (*Chelonia mydas*), Leatherback Seaturtle (*Dermochelys imbricata*), Hawksbill Seaturtle (*Eretmochelys imbricata*), and Kemp's Ridley Seaturtle (*Lepidochelys kempii*). No Sensitive animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of these habitats. The following Locally Rare animal species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Buxton Woods White-footed Mouse (*Peromyscus leucopus buxtoni*), Pungo White-footed Mouse (*Peromyscus leucopus eastii*), Gull-billed Tern (*Gelochelidon nilotica*), Caspian Tern (*Hydropogne caspia*), Peregrine Falcon (*Falco peregrinus*), Eastern Painted Bunting (*Passerina ciris ciris*), Glossy Ibis (*Plegadis falcinellus*), Outer Banks Kingsnake (*Lampropeltis getula sticticeps*), an undescribed Skipper (*Atrytonopsis* sp.), a Noctuid Moth (*Faronta aleada*), and Giant Swallowtail (*Papilio cresphontes*).

No large or medium sized river habitats were identified in the evaluation area. The following federally Endangered, Threatened, or Proposed fish species were eliminated from further consideration due to the lack of these habitats within the evaluation area: Shortnose Sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxrhynchus*). The following Sensitive species was eliminated from further consideration due to a lack of habitat within the evaluation area: Carolina Madtom (*Noturus furiusus*). No Locally Rare animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of these habitats within the evaluation area.

No tidal swamps or freshwater/brackish marshes were identified in the evaluation area. The Wood Stork (*Mycteria americana*) was eliminated from further consideration due to the lack of these habitats within the evaluation area. The Carolina Salt Marsh Snake (*Nerodia sipedon williamengelsi*) was eliminated from further consideration due to a lack of these habitats within the evaluation area. The following Locally Rare animal species were eliminated from further consideration due to a lack of these habitats within the evaluation area: American Bittern (*Botaurus lentiginosus*), Northern Harrier (*Circus cyaneus*), Black-necked Stilt (*Himantopus mexicanus*), Black Rail (*Laterallus jamaicensis*), Purple Gallinule (*Porphyrio martinica*), Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*), Marsh Killifish (*Fundulus confluentus*), and Spotfin Killifish (*Fundulus luciae*).

TABLE 3.15.6
USFS RARE ANIMAL SPECIES FOR THE CROATAN NATIONAL FOREST
August 2013 LIST

SCIENTIFIC NAME	COMMON NAME	USFS STATUS [a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
MAMMALS				
Canis rufus	Red Wolf	E	Upland and lowland forests, shrublands, coastal prairies, marshes with heavy cover – in North Carolina limited to Albemarle Peninsula	No[c]
Condylura cristata pop. 1	Star-nosed Mole (coastal plain population)	LR	Moist meadows, bogs, swamps, bottomlands	Yes
Corynorhinus rafinesquii macrotis	Rafinesque's Big-eared Bat	LR	Abandoned structures, caves, hollow trees, loose bark trees near wooded areas	Yes
Lasiurus intermedius	Northern Yellow Bat	LR	Roosts in Spanish moss and other thick vegetation near water, often in longleaf pine habitats	Yes
Myotis austroriparius	Southeastern Myotis	LR	Roosts in buildings and hollow trees, forages near water	Yes
Myotis septentrionalis	Northern Long-eared Bat	NA[g]	Summer roosts underneath bark, in cavities, or in crevices of live or dead trees	Yes
Neotoma floridana floridana	Eastern Woodrat (coastal plain population)	LR	Lowland deciduous forest with dense palmetto cover	Yes
Peromyscus leucopus buxtoni	Buxton Woods White-footed Mouse	LR	Maritime forests in Cape Hatteras area	No
Peromyscus leucopus easti	Pungo White-footed Mouse	LR	Dunes and maritime thickets along coast south to Corolla	No
Puma concolor couguar	Eastern Cougar	E	Extensive forests and remote areas – considered extirpated from North Carolina since 1880s	No[d]
Sorex sp. 1	An Undescribed Shrew	LR	Early successional fields, possibly low pocosin on the Albemarle Peninsula	No[b]
Trichechus manatus	West Indian Manatee	E	Warm waters of estuaries and river mouths	No
BIRDS				
Ammodramus henslowii susurrans	Eastern Henslow's Sparrow	LR	Clearcut pocosins, damp weedy fields	Yes
Botaurus lentiginosus	American Bittern	LR	Freshwater or brackish marshes, lake and pond edges with emergent vegetation	No
Charadrius melodus	Piping Plover	T	Sandy upper beaches especially where scattered grass tufts are present, sparsely vegetated shores and islands of shallow lakes, ponds, rivers, and impoundments	No
Circus cyaneus	Northern Harrier	LR	Marshes, meadows, grasslands	No
Dendroica kirtlandii	Kirtland's Warbler	E	Jack pine forests; migrates through NC	No[b]

TABLE 3.15.6
USFS RARE ANIMAL SPECIES FOR THE CROATAN NATIONAL FOREST
August 2013 LIST

SCIENTIFIC NAME	COMMON NAME	USFS STATUS [a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Dendroica virens waynei	Black-throated Green Warbler (coastal plain population)	LR	Nonriverine wetland forests, especially where white cedar or cypress are mixed with hardwoods	Yes
Falco peregrinus	Peregrine Falcon	S	Cliffs, bay, sound, tidal flats, river mouth, herbaceous wetland	No
Gelochelidon nilotica	Gull-billed Tern	LR	Coastlines, salt marshes, estuaries, sand flats on maritime islands	No
Haliaeetus leucocephalus	Bald Eagle	S	Large bodies of water with mature trees for perching	Yes
Himantopus mexicanus	Black-necked Stilt	LR	Fresh or brackish ponds	No
Hydroprogne caspia	Caspian Tern	LR	Seacoasts, bays, estuaries, lakes, marshes, and rivers	No
Laterallus jamaicensis	Black Rail	LR	Salt, brackish, and freshwater marshes; pond borders, wet meadows, grassy swamps	No
Mycteria americana	Wood Stork	E	Freshwater or brackish marshes, swamps, lagoons, ponds, flooded fields, nests in trees over water or on islands	No
Passerina ciris ciris	Eastern Painted Bunting	LR	Maritime shrub thickets, forest edges	No
Peucaea aestivalis (=Ammodramus aestivalis)	Bachman's Sparrow	LR	Open pine woods with grassy cover	Yes
Phalacrocorax auritus	Double-crested Cormorant	LR	Lakes, ponds, rivers, lagoons, swamps, and coastal bays with scattered trees for nesting	No
Picoides borealis	Red-cockaded Woodpecker	E	Pine savannas	Yes
Plegadis falcinellus	Glossy Ibis	LR	Forests or thickets on maritime islands	No
Porphyrio martinica	Purple Gallinule	LR	Freshwater ponds and rivers with floating vegetation	No
Sterna dougallii	Roseate Tern	E	Seacoasts, bays, estuaries, sand flats on maritime islands	No
Vermivora bachmanii	Bachman's Warbler	E	Moist hardwood forests, swamps, and canebrakes; last observed in NC in 1891	No[e]
REPTILES AND AMPHIBIANS				
Alligator mississippiensis	American Alligator	T(S/A)	Fresh and brackish marshes, ponds, lakes, rivers, swamps	Yes
Ambystoma tigrinum	Eastern Tiger Salamander	LR	Breeds in fish-free semi-permanent ponds; forages adjacent sandy pinelands	No[b]
Caretta caretta	Loggerhead Seaturtle	T	Nests on beaches, forages in ocean and sounds	No
Chelonia mydas	Green Seaturtle	T	Nests on beaches, forages in ocean and sounds	No

TABLE 3.15.6
USFS RARE ANIMAL SPECIES FOR THE CROATAN NATIONAL FOREST
August 2013 LIST

SCIENTIFIC NAME	COMMON NAME	USFS STATUS [a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Crotalus adamanteus	Eastern Diamondback Rattlesnake	LR	Pine flatwoods, savannas, pine-oak sandhills	Yes
Dermochelys imbricata	Leatherback Seaturtle	E	Oceans, rarely sounds	No
Eretmochelys imbricata	Hawksbill Seaturtle	E	Oceans, very rarely in sounds	No
Eurycea quadridigitata	Dwarf Salamander	LR	Pocosins, Carolina bays, pine flatwoods, savannas, wetland habitats	No[b]
Heterodon simus	Southern Hognose Snake	LR	Sandy woods, particularly pine-oak sandhills	Yes
Lampropeltis getula sticticeps	Outer Banks Kingsnake	LR	Maritime forests, thickets, and grasslands on the Outer Banks	No
Lepidochelys kempii	Kemp's Ridley Seaturtle	E	Oceans and sounds	No
Malaclemys terrapin terrapin	Northern Diamondback Terrapin	LR	Coastal marshes, tidal flats, coves, estuaries, lagoons	No[b]
Micrurus fulvius	Eastern Coral Snake	LR	Pine-oak sandhill, sandy flatwoods, maritime forests	No[b]
Nerodia sipedon williamengelsi	Carolina Salt Marsh Snake	S	Salt or brackish marshes	No
Ophisaurus mimicus	Mimic Glass Lizard	S	Dry, sandy pine flatwoods, savannas, pine/oak sandhills	Yes
Rana capito	Carolina Gopher Frog	S	Dry turkey oak-pine associations, sandy areas in pine savannas	Yes
Rana sylvatica pop.3	Wood Frog (coastal plain population)	LR	Mesic to moist hardwood forests on Albemarle Peninsula	No[b]
Regina rigida	Glossy Crayfish Snake	LR	Marshes, cypress ponds, other wetlands	Yes
Seminatrix pygaea	Black Swamp Snake	LR	Lush vegetation of ponds, ditches, sluggish streams	Yes
INSECTS				
Acronicta perblanda	Cypress Daggermoth	LR	Cypress swamps	Yes
Acronicta sinescripta	A Daggermoth	LR	Savannas and flatwoods	Yes
Agrotis carolina	A Dart Moth	LR	Open longleaf pine or longleaf pine-oak savanna with pyxie-moss	Yes
Amblyscirtes alternata	Dusky Roadside Skipper	LR	Open grassy pine flatwoods, savannas, sandhill ridges	Yes
Melanapamea mixta (=Apamea mixta)	A Noctuid Moth	LR	Savannas, wet meadows	No[b]
Apantensis sp. 1 nr. *carlotta*	A Tiger Moth	LR	Savannas and sandhill seeps	Yes
Atrytone arogos arogos	Arogos Skipper	S	Mesic to boggy reedgrass savannas	Yes
Atrytonopsis sp. 1	An Undescribed Skipper	LR	Dunes and sandy flats	No

TABLE 3.15.6
USFS RARE ANIMAL SPECIES FOR THE CROATAN NATIONAL FOREST
August 2013 LIST

SCIENTIFIC NAME	COMMON NAME	USFS STATUS [a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Baetisca obesa	A Mayfly	LR	Lower Tar River	No[b]
Bleptina sangamonia	A Noctuid Moth	LR	Ecology not yet assessed; only NC record from Bladen County	No[b]
Calephelis virginiensis	Little Metalmark	LR	Grassy fields, savannas, marshes	Yes
Callophrys irus	Frosted Elfin	LR	Grassy openings or burn scars in barrens and savannas, ROW and powerlines	Yes
Chlorochroa dismalia	Dismal Swamp Stink Bug	LR	Canebrakes	Yes
Datana robusta	A Prominent Moth	LR	Savannas, flatwoods, and sandhills	Yes
Euphyes berryi	Berry's Skipper	LR	Wet prairies, marshes, savannas with pitcher plants	Yes
Euphyes bimacula	Two-Spotted Skipper	LR	Wet savannas, bogs, sedge areas near wet woods	Yes
Euphyes dukesi dukesi	Duke's Skipper	S	Ecotones of brackish or freshwater marshes with swamps	Yes
Faronta aleada	A Noctuid Moth	LR	Maritime grasslands	No
Gabara sp. 1	A Noctuid Moth	LR	Savannas; southeastern NC	No[b]
Hemipachnobia subporphyrea	Venus Flytrap Cutworm Moth	S	Large stands of Venus flytraps in wet pine savannas, around pocosins	Yes
Hesperia attalus slossonae	Dotted Skipper	S	Xeric natural communities on sterile white sands (or disturbances within)	No
Hypomecis buchholzaria	Buchholz's Gray	LR	Fire-maintained glades and pine barrens, xeric scrub-oak	No
Papilio cresphontes	Giant Swallowtail	LR	Primarily coastal in maritime forests or thickets	No
Pyreferra ceromatica	Anointed Sallow Moth	LR	Flatwoods and pocosins, ecotones between mesic woodland and bottomlands	Yes
Spartiniphaga carterae	Carter's Noctuid Moth	S	Savannas and sandhills with Pinebarren Sand-reedgrass (*Calamovilfa brevipilis*)	Yes
Tornos cinctarius	A Gray Moth	LR	Savannas and sandhills	Yes
FRESHWATER FISH, MOLLUSKS, AND CRUSTACEANS				
Acipenser brevirostrum	Shortnose Sturgeon	E	Brackish water of large rivers and estuaries; spawns in freshwater areas	No
Acipenser oxyrhynchus	Atlantic Sturgeon	S	Coastal waters, estuaries, large rivers	No
Elliptio folliculata	Pod Lance	LR	Coastal plain, mainly Lake Waccamaw	No [b,f]
Ferrissia hendersoni	Blackwater Ancylid	LR	Mainly margins of Carolina Bay lakes	No[b]
Fundulus confluentus	Marsh Killifish	LR	Fresh to brackish waters along coast	No
Fundulus luciae	Spotfin Killifish	LR	Ponds and pools along coast	No

TABLE 3.15.6
USFS RARE ANIMAL SPECIES FOR THE CROATAN NATIONAL FOREST
August 2013 LIST

SCIENTIFIC NAME	COMMON NAME	USFS STATUS [a]	HABITAT TYPE	HABITAT PRESENT (STUDY AREA)
Lampetra aepyptera	Least Brook Lamprey	LR	Tar and Neuse drainages	No[b]
Lampsilis sp. 2	Chameleon Lampmussel	LR	Neuse, Tar, and Cape Fear systems; above Fall Line	No
Lasmigona subviridis	Green Floater	S	Tar, Neuse, and Cape Fear systems downstate; New and Watauga systems in mountains	No[b,f]
Leptodea ochracea	Tidewater Mucket	LR	A number of systems primarily in the coastal plain, abundant in Lake Waccamaw	No[b,f]
Lynceus gracilicornis	Graceful Clam Shrimp	LR	Temporary ponds, pools, and ditches	Yes
Notropis bifrenatus	Bridle Shiner	LR	Stream near lower Neuse River	Yes
Noturus furiosus	Carolina Madtom	S	Tar and Neuse drainages, small to medium rivers	No[b]
Sphaerium simile	Grooved Fingernail Clam	LR	White Oak River	No[b]
Strophitus undulatus	Creeper	LR	Tar, Neuse, Cape Fear, and other systems	No[b]

[a] E – Endangered; LR – Locally Rare; S – Sensitive; T – Threatened.
[b] No documented occurrence in Craven, Carteret, or Jones Counties; not carried forward for further evaluation.
[c] Red wolf is extirpated from North Carolina except for an experimental population on the Albemarle Peninsula and there are no documented occurrences in Craven, Carteret, or Jones Counties; not carried forward for further evaluation.
[d] Eastern cougar is extirpated from North Carolina, last records in 1880s; not carried forward for further evaluation.
[e] Bachman's warbler is considered extinct, last records documented in North Carolina were 1891; not carried forward for further evaluation.
[f] Streams in the evaluation area are too acidic to provide suitable habitat for freshwater mussels.
[g] Not on August 2013 USFS list, but considered as an USFS rare species due to recent change of status and anticipated addition to list.

Streams in the evaluation area were determined to be too acidic to support suitable habitat for several species. No CNF-listed federally Endangered, Threatened, or Proposed animal species were eliminated from further consideration due to the acidic nature of stream habitats in the evaluation area. The following Sensitive animal species was eliminated from further consideration due acidic nature of stream habitats in the evaluation area: Green Floater (*Lasmigona subviridis*). The following Locally Rare animal species were eliminated from further consideration due to acidic nature of stream habitats within the evaluation area: Pod Lance (*Elliptio folliculata*), Chameleon Lampmussel (*Lampsilis* sp. 2), Tidewater Mucket (*Leptodea ochracea*), and Creeper (*Strophitus undulata*). In addition, NCDOT surveys for mollusks in evaluation area streams did not document the presence of any freshwater mussel fauna.

No lakes were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were

eliminated from consideration due to the lack of this habitat. No Sensitive animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of this habitat. The following Locally Rare animal species was eliminated from further consideration due to a lack of this habitat within the evaluation area: Double-crested Cormorant (*Phalacrocorax auritus*).

No Sandhills or Pine Barrens were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from consideration due to the lack of these habitats. The following Sensitive plant species were eliminated from consideration due to a lack of these habitats within the evaluation area: Dotted Skipper (*Hesperia attalus slossonae*). The following Locally Rare plant species were eliminated from consideration due to a lack of these habitats within the evaluation area: Eastern Tiger Salamander (*Ambystoma tigrinum*), Eastern Coral Snake (*Micrurus fulvius*), and Buchholz's Gray (*Hypomecis buchholzaria*).

Site survey results and/or NCNHP/USFS records for USFS rare animal species are presented in the Biological Evaluation contained in Appendix C. A discussion of potential impacts to the 15 USFS rare animal species presumed to occur within the CNF evaluation area is presented in Chapter 4.14.5.1.

3.15.4.2 Management Indicator Species

Management Indicator Species (MIS) on the CNF were chosen by the USFS to provide insight into the forest trends, species diversity, and habitat changes resulting from proposed alternatives. A list of the MIS selected for the CNF and their habitats are shown in Table 3.15.7. A discussion of the detailed study alternatives and their impacts to the MIS on the CNF is included in Chapter 4.14.5. The full MIS report is included in Appendix C.

TABLE 3.15.7
USFS MANAGEMENT INDICATOR SPECIES

MANAGEMENT INDICATOR SPECIES	HABITATS UTILIZED
Eastern black bear (*Ursus americanus*)	**Pocosin** Oak Gum Cypress Oak-Beech Hickory Pond-Pine Woodlands
Longleaf pine (*Pinus palustris*)	Dry Sandhills Pine Savanna Mesic and Wet Pine Flatwoods
Red-cockaded woodpecker (*Picoides borealis*)	**Pine Savanna** Pine Flatwoods

TABLE 3.15.7 cont.
USFS MANAGEMENT INDICATOR SPECIES

MANAGEMENT INDICATOR SPECIES	HABITATS UTILIZED
Wild Turkey (*Meleagris gallapavo*)	Maritime Forest Mature Pine/Hardwood Forests Oak Gum Cypress **Oak-Beech Hickory**
Wiregrass (*Aristida stricta*)	Dry Sandhills Pine Savanna Mesic and Wet Pine Flatwoods

Bold = Preferred Habitat

3.15.4.3 Migratory Birds

The following discussion provides additional information and analysis for migratory birds, requested by the USFS for NFS lands within the direct and indirect impact areas under evaluation for the US 70 Havelock Bypass project as well as on the Croatan Wetland Mitigation Bank (CWMB); these areas are collectively referred to as the evaluation area for the migratory bird evaluation. Specifically, the USFS identified the migratory bird assessment conducted for the *Uwharrie National Forest Land and Resource Management Plan Final Environmental Impact Statement* (FEIS) (2012) as a suitable example of the additional information and analysis requested for the Havelock Bypass FEIS. Following an example assessment provided by the USFS, this evaluation provides an assessment on NFS lands for migratory birds identified as being of conservation concern by the USFWS on the appropriate regional list from USFWS's *Birds of Conservation Concern 2008* (referred to hereafter as *BCC 2008*) document. This report is included in Appendix C.

The USFS considers migratory birds to be a focus of conservation concern based on range-wide declining population trends for many species and on a mandate to maintain viable populations of existing native and desired non-native vertebrate species on NFS lands. Because migratory birds may nest in one area with specific habitat requirements and migrate hundreds or thousands of miles annually to wintering areas with other specific habitat requirements, their conservation is dependent on the distribution of suitable habitats across large regions. Currently, NFS lands provide some of the largest blocks of forested habitat when viewed at a physiographic area scale. As habitat quality and quantity continues to change on many privately-owned lands due to conversion to other land uses, NFS lands will become even more important to migratory birds in the future. Efforts by the USFS to coordinate closely with partners in bird conservation and to incorporate proactive conservation measures into forest plan revisions are designed to ensure national forests continue to support at-risk migratory birds.

The USFWS Migratory Bird Office created the list of Birds of Conservation Concern (BCC) to fulfill a 1988 mandate to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act [ESA] of 1973." The *BCC 2008* is the most recent effort by the USFWS to carry out this mandate.

TABLE 3.15.8
USFWS BIRDS OF CONSERVATION CONCERN ON NFS LANDS

BIRDS OF CONSERVATION CONCERN	STATUS: GLOBAL/NC [A]	DOCUMENTED OCCURRENCES [B]
Solitary Sandpiper (*Tringa solitaria*)	G5/SNA	0 (nb) [C]
Semipalmated Sandpiper (Eastern) (*Calidris pusilla*)	G5/SNA	1 (nb)
Chuck-will's-widow (*Antrostomus carolinensis*)	G5/S5B	1
Eastern Whip-poor-will (*Antrostomus vociferus*)	G5/S4B	0
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	G5/S4B, S4N	78
Brown-headed Nuthatch (*Sitta pusilla*)	G5/S5	195
Sedge Wren (*Cistothorus platensis*)	G5/SUB, S4N	0 (nb)
Wood Thrush (*Hylocichla* mustelina)	G5/S4B	56
Blue-winged Warbler (*Vermivora cyanoptera*)	G5/S2B	0 (nb)
Prairie Warbler (*Setophaga discolor*)	G5/S5B, S1N	812
Prothonotary Warbler (*Protonotaria citrea*)	G5/S5B	362
Swainson's Warbler (*Limnothlypis swainsonii*)	G4/S3S4B	70
Kentucky Warbler (*Geothlypis formosa*)	G5/S4B	10
LeConte's Sparrow (*Ammodramus leconteii*)	G4/SNA	0 (nb)
Rusty Blackbird (*Euphagus carolinus*)	G4/S3N	0 (nb)

[a] Status rankings obtained from:
NatureServe Explorer. 2013. Data Search (last updated July 2013). http://explorer.natureserve.org/aboutd.htm. Accessed 4/15/2014.
Status Definitions:

- Conservation Status Scale:
  G – Global Level. The overall status of a species across its entire range.
  S – State Level. The status of a species determined for a particular state, here North Carolina.
- Status Rank:
  1 – Critically Imperiled. At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
  2 – Imperiled. At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
  3 – Vulnerable. At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
  4 - Apparently Secure. At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
  5 – Secure. At very low risk of extinction or elimination due to a very extensive range, abundant population or occurrences, and little to no concern from declines or threats.
  NA –Not Applicable. A conservation status rank is not applicable because the species is not a suitable target for conservation activities. Applied here to long-distance migrants passing through the state or irregularly wintering species.
  U – Unrankable. Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
- Breeding Status Qualifiers:
  B – Breeding. Conservation status refers to the breeding population in the state.
  N – Nonbreeding. Conservation status refers to the non-breeding population in the state.

[b] As documented in CNF annual breeding surveys from 1997-2013
[c] (nb) - not breeding on the CNF

The CNF is located within Bird Conservation Region (BCR) 27, which comprises the Southeastern Coastal Plain. The *BCC 2008* lists 53 species within BCR 27 for consideration in planning and evaluating conservation efforts. The BCR 27 list was reviewed and initial screening determined that 34 of these species would not be expected to occur, would not have suitable nesting or wintering habitat, nor regularly occur as migrants in the Havelock Bypass evaluation area on NFS lands in the CNF. Four species (Bald Eagle, Black-throated Green Warbler, Bachman's Sparrow, and Henslow's Sparrow) for which potentially suitable habitat is present in the evaluation area are also listed as BCC, but are also considered Sensitive or Locally Rare on the CNF by the USFS and are treated in the evaluation for USFS-listed rare species. Occurrence data for the CNF for the remaining 15 species (Table 3.15.8) were provided by the USFS from annual breeding bird data that have been conducted on the CNF for the period 1997-2013. This data is supplemented with data from NCDOT studies associated with the Natural Resources Technical Report fieldwork and studies conducted for USFS rare species in the evaluation area between 1997 and 2013. A discussion of potential impacts to BCCs is included in Chapter 4.15.

3.15.4.4 Non-native Invasive Species (NNIS) Surveys

In order to address the concern that construction of the proposed project could result in indirect effects to USFS rare species as the result of the introduction and/or expansion of non-native invasive species (NNIS) of plants, the Alternative 3 corridor was evaluated for the presence of known infestations of NNIS and potential effects.

Non-native invasive plant species surveys on NFS lands in the Alternative 3 corridor were conducted in September 2013 to delineate infestations of species listed by USFS as warranting management consideration. Most of the NNIS infestations occurred in areas identified as Rural/Urban Modifications habitat, with some species or occurrences also present in adjacent habitats. Non- native invasive plant species of concern to USFS that were identified as present in the Alternative 3 corridor were Sericea Lespedeza (*Lespedeza cuneata*), Bicolor Lespedeza (*Lespedeza bicolor*), Mimosa (*Albizia julibrissin*), Chinese Privet (*Ligustrum sinense*), Multiflora Rose (*Rosa multiflora*), Japanese Honeysuckle (*Lonicera japonica*), Johnson Grass (*Sorghum halapense*), English Ivy (*Hedera helix* var. *helix*), Chinese Wisteria (*Wisteria sinensis*), and Brazilian Vervain (*Verbena brasiliensis*).

3.15.5 Anadromous Fish and Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) defines essential fish habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" [16 USC 1802(10)]. The ultimate goal of this regulation is to protect commercially and recreationally viable fish populations through habitat protection and improved interagency coordination. The Atlantic States Marine Fisheries Commission (ASMFC) and the South Atlantic Fishery Management Council (SAFMC)

jointly handle the management of these fish populations by creating fishery management plans for each species and identifying areas of important habitat.

Anadromous Fish Habitat – The The East Prong and Southwest Prong of Slocum Creek have been identified as anadromous fish spawning areas. Portions of Goodwin Creek and Tucker Creek downstream from the project have also been identified as anadromous fish spawning areas. Correspondence from the NMFS, dated November 4, 1998 and contained in DEIS Appendix A, notes that the upper reaches of Slocum and Tucker Creeks are tributaries of the Neuse River. The Neuse River supports estuarine dependent and anadromous fishery resources for which the NMFS is responsible. These species include striped bass (*Morone saxatilis*), American shad (*Alosa sapidissma*), blueback herring (*Alosa aestivalis*), spot (*Leiostomus xanthrus*), flounders (*Paralichthys spp.*), Atlantic menhaden (*Brevoortia tyrannus*), striped mullet (*Mugil cephalus*), shrimp (*Penaeus spp*), and blue crab (*Callinectes sapidus*).

The *North Carolina Coastal Habitat Protection Plan* (Deaton, 2010) identifies the upper reaches of Tucker Creek and Slocum Creek as "riparian wetlands" which are defined in the plan as wetlands that are connected to coastal water bodies by surface water of sufficient depth to allow fish utilization. The plan categorizes riparian wetlands into several groups; wetlands along Tucker and Slocum Creeks in the project study area are considered "riverine wetlands" which are characterized as having hydrology that is determined or heavily influenced by proximity to a perennial stream. Riverine wetlands include freshwater marshes, bottomland hardwood forest, and riverine swamp forest (Deaton, 2010). Seasonally flooded wetlands are a source of organic detritus that is flushed into estuarine areas, contributing an important component of the aquatic food chain that supports fishery resources.

At the request of the North Carolina Wildlife Resources Commission (NCWRC), NCDOT has committed to an in-water work moratorium for February 15 to June 15 for East Prong and Southwest Prong Slocum Creek throughout the project study area. Goodwin Creek and Tucker Creek upstream of the US 70 structure will not require a moratorium; however, if the current structures are replaced or extended downstream, the construction moratorium will apply.

Essential Fish Habitat – No streams or wetlands within the project study area are identified by NMFS as a waterbody containing EFH and NMFS Fisheries has not requested further consultation regarding EFH. Therefore no EFH studies are warranted. Potential impacts to fish habitat are discussed in Chapter 4.14.

3.15.6 N.C. Coastal Area Management Act Areas of Environmental Concern

The Coastal Zone Management Act of 1972 (CZMA) (16 USC 1451) initiated the creation of the Coastal Area Management Act (CAMA) (15A NCAC 7), which identifies and regulates Areas of Environmental Concern (AECs) in the 20 coastal counties of North Carolina. The NC Division of Coastal Management (DCM) administers CAMA regulations. Section 307 of the federal CZMA stipulates that the state is allowed to require that the activity comply with the state's coastal management program (CMP). If the activity is found consistent with the NC CMP, CAMA regulations, local land use plans, and other state regulations, a "consistency determination" is issued by the DCM.

The proposed project would not impact any CAMA AECs; however, because the project is in a coastal county, it will require a consistency determination to ensure compliance with the State's coastal management program. Chapter 4.1.2 includes a review of the project consistency with the NC Coastal Management Program and applicable CAMA land use plans. Chapter 4.15 provides additional information on AECs within the project vicinity.

3.16 VISUAL AND AESTHETIC VALUES

A Visual Analysis was conducted by the U.S. Forest Service in 1996 to assist in the evaluation of the proposed project (Highway 70 Bypass, Croatan National Forest, Analysis of the Scenic Resource, Prepared by Kathy Ludlow, Landscape Architect, November 1996). For the inventory and analysis of the aesthetic values of National Forest lands, the Forest Service uses a system called the Scenery Management System (SMS). This system evolved from and replaces the Visual Management System that was used in writing the Croatan and Uwharrie Land and Resource Management Plan, 1986. The revision of the Croatan Plan was done utilizing SMS.

The Scenery Management System process involves identifying scenery components as they relate to people, mapping these components, and developing a value unit for aesthetics from the data gathered. This value unit provides information for planning and leads to rational decisions relative to scenery as a part of ecosystems. These scenery components include the following elements. Scenic Attractiveness classes which are developed to determine the relative scenic value of the lands within a particular landscape character. They are the primary indicator of the intrinsic beauty of the landscape and the positive responses it evokes in people. The three classes are Class A, Distinctive; Class B, Typical; and Class C, Indistinctive. On the Croatan, Class A landscapes include rivers, lakes and sounds, marshes and tidal influence areas, swamp forests, low pocosin, long leaf pine savannas with wire grass understory, and hardwood slopes. Class B landscapes include High pocosin, Pond Pine forest, mixed pine forest, and mixed pine and hardwood forest. Class C landscapes include areas where the vegetation and/or landform have been significantly altered by human activity.

Existing Scenic Integrity is a measure of the degree to which a landscape is visually perceived to be intact or whole. It provides the current status of a landscape; and indicates the existing degrees of alteration from the attributes – form, line, color, and texture- of the landscape character. The six scenic integrity levels and descriptions for the Croatan are: Very High (unaltered) and includes wilderness, low pocosin, and other undisturbed areas; High (appears unaltered) and includes vegetative stands over 60 years old and some evidence of prescribed burning and/or fire plow lines or skid roads; Moderate (slightly altered) and includes vegetative stands 41–60 years old, some drainage ditches and some evidence of prescribed burning, rows in timber plantations not apparent; Low (moderately altered) and includes wildlife openings with geometric shapes, vegetative stands 21–40 years old where rows are evident, and recreation, summer home and administrative sites where the structures are evident; Very Low (heavily altered) and includes vegetative stands 1-20 years old with rows very evident, roads which are mostly straight with drainage ditches, transmission lines which are straight but have vegetative understory, and fire plow lines; and Unacceptably Low and includes borrow pits, railroads, landfill and urban development.

Landscape Visibility is composed of two parts: human values as they relate to the relative importance to the public of various scenes and the relative sensitivity of scenes based on distance from the observer.

Human Values – Constituent Analysis serves as a guide to perceptions of attractiveness, helps identify special places, and helps to define the meaning people give to a landscape. It discusses visitor values, desires, and expectations for what they will encounter in terms of landscape character and scenic integrity in the Forest. These are defined by sites, travelways, and special places and use a rating of high, medium and low. The Croatan is becoming a major tourist draw along the central North Carolina coast because of its year-round recreation opportunities. Visitors come for nature study and to view the unique habitats and inhabitants. Although people living near the Forest are less interested in the visual issues associated with timber management, visitors to the Forest often have preconceived images of huge white oaks draped in Spanish moss growing along white sandy beaches. The US 70 highway corridor under this system is a secondary travelway with high use and the people using the highway probably have moderate interest in the scenery they are driving past.

Seen Areas and Distance Zones – These are mapped from the areas determined by constituent analysis as having a level of concern. Mapping indicates the relative sensitivity of scenes based on their distance from an observer. The zones are Foreground (up to ½ mile from the viewer), Middleground (up to 4 miles from the

Foreground), and Background (4miles from the viewer to the horizon). The Croatan because of the flat topography has only Foreground and Middleground distance zones.

The area being analyzed for the US 70 Havelock Bypass includes the existing US 70 corridor from the beginning of the proposed Bypass on the north to where it ties back in to US 70 on the south and the national forest land primarily west of existing US 70. The analysis area breaks down to include approximately 25 to 40 percent Scenic Attractiveness Class A (distinctive), 10 to 20 percent Class B (typical), and 40 to 50 percent Class C (indistinctive). Scenic Integrity of these areas includes primarily Moderate (slightly altered) with some High (appears altered), road corridors which are Low and power line corridors which are Very Low. Distance Zone is Foreground because of the topography and the Concern Level is Moderate, consistent with the existing use and designation of US 70.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter addresses impacts associated with the Preferred Alternative (Alternative 3), as identified in Chapter 2.10. This chapter includes updated analyses of the Preferred Alternative based on current socioeconomic and demographic data, updated natural resources surveys, and ongoing coordination with US Forest Service (USFS).

4.1 LAND USE AND TRANSPORTATION PLANNING

4.1.1 Direct Impacts to Existing Land Uses

The Preferred Alternative (Alternative 3) typically requires a 250-foot right-of-way with the exception of a 200-foot width for approximately 5,500 feet in the area of red-cockaded woodpecker (RCW) habitat. Additional right-of-way is required at proposed interchanges. Based on current right-of-way estimates, the Preferred Alternative requires approximately 430 acres of land. As shown in Exhibit 3.3.1, the majority of land traversed by the Preferred Alternative is within the Croatan National Forest (CNF); these National Forest System (NFS) lands are designated as RCW habitat management areas (HMA) and hardwood-cypress wetland management areas. Management activities for the RCW HMAs include prescribed burning, timber harvesting, planting, and other appropriate practices to maintain stand structure and provide for pine regeneration (USFS, 2002). The remaining portions of the Preferred Alternative cross privately-owned lands that are primarily used for silviculture and hunting and residential areas along roadways crossed by the project corridor. Of the total 430 acres of land needed for the Havelock Bypass, 240 acres are NFS lands (including rural/urban modifications); the remaining 190 acres are privately-owned lands, public right-of-ways, and other human-dominated land uses.

Construction of the proposed project would create relocations and alter current land uses within the Preferred Alternative corridor. Relocations are discussed in Chapter 4.2.1. Measures to mitigate impacts to the CNF are discussed in Chapter 4.14.

4.1.2 Consistency with Land Use and Transportation Plans

The proposed project is consistent with the Craven County *CAMA Core Land Use Plan* (Holland Consulting Planners, 2009), which identifies the project as one of a number of transportation projects to improve safety and access in the county. The plan notes that increasing traffic congestion and access problems continue to be a concern along the US 70 corridor.

Construction of the proposed bypass is included in the City of Havelock's *2030 Comprehensive Plan* (City of Havelock, 2009) as well as its predecessor, the *Draft Havelock Comprehensive Transportation/Land Use Plan* (City of Havelock, 2007). Given the long

planning history of the proposed project and the original selection of the LEDPA dating back to 1998, the City has been involved in the project's planning for many years and has developed its land use plan to include the Preferred Alternative corridor. Upon completion of the proposed bypass, the City plans to "establish land use controls for protecting investment in the proposed bypass and set a new vision for the US 70 Corridor that will transform Main Street back into a community asset."

The *Croatan National Forest Land and Resource and Management Plan* (USFS, 2002) guides the natural resource management activities and establishes management standards within the Croatan National Forest (CNF). The US 70 Bypass is noted as an example of a project that serves a public benefit that would require a special use permit from the USFS.

The USFS has been involved in the planning of the proposed bypass since 1992. Coordination with the CNF on the proposed projects has included assessing the anticipated impacts to many resources on NFS lands. NCDOT and CNF have coordinated on impacts to various resources including wildlife and rare species habitat and management, vegetative communities, visual resources, recreation, aquatic resources, air quality, soils, and archeology.

North Carolina Eastern Region Military Growth Task Force's *Regional Growth Management Plan* (Marstel-Day, 2009) notes that the US 70 corridor is a major link in the state's transportation system and that high traffic volumes and unpredictable access have created safety hazards for both regional and local motorists. The Plan states that improving the corridor will enhance regional mobility, alleviate safety concerns, improve the efficiency of evacuations, and enhance east-west travel times for freight and military traffic.

NCDOT would manage driveway permits along existing US 70 adjacent to the interchanges in a manner consistent with the SHC (now STC) program in order to maintain the mobility and through-capacity of US 70. In addition to recommending the proposed Havelock Bypass, the US 70 Access Management Study (Kimley Horn, 2011) also includes recommendations to improve and maintain mobility along existing US 70. In the Havelock area and northward, the study recommends retrofitting certain intersections into "ramp-over" interchanges that can be constructed within a 130-foot right-of-way. The study also recommended the recently completed median improvements along US 70 from NC 101 to Forest Hill Drive (Project No. W-5101).

CAMA Consistency Review

In accordance with federal regulations related to coastal management (16 USC 1456), the proposed project must be evaluated for consistency with the NC Coastal Management Program. The proposed project was reviewed for consistency with applicable CAMA land

use plans, including the Craven County *CAMA Core Land Use Plan* (Holland Planning Consultants, 2009) and the City of Havelock *2030 Comprehensive Plan* (City of Havelock, 2009). The proposed project would not cross any currently-designated Areas of Environmental Concern (AECs), although it would impact non-AEC environmentally-sensitive jurisdictional wetlands and forested areas.

Craven County and the City of Havelock have both recently completed new land use plans. Land use plans for Craven County and the City of Havelock were prepared in accordance with Coastal Area Management Act (CAMA) requirements and certified by the Coastal Resources Commission (CRC) in October 2009. The county and city land use plans support the construction of a US 70 Bypass along the western edge of the City of Havelock and consider the probable effects of the bypass in the plans.

As stated in previous paragraphs, the Preferred Alternative corridor is identified in the county and city CAMA land use plans. The City of Havelock notes the challenges associated with US 70's dual role as a regional and local route and acknowledges the project's goal to divert regional traffic for those traveling through, rather than within, the Havelock area. Future land use mapping shows the Preferred Alternative (Alternative 3) corridor and identifies future land uses adjacent to the proposed bypass. Much of this area is planned to remain consistent with current land uses, with the exception of additional single-family residential development occurring at the western end of SR 1747 (Sunset Drive), additional high density residential development extending westward from Havelock along SR 1756 (Lake Road) and a commercial area in the eastern quadrants of the SR 1756 (Lake Road) interchange. The plan notes that direct connections will be limited to proposed interchanges and that areas for commercial development will be limited to interchange locations. The Plan states that land use preservation and access management restrictions should be in place before interchanges are constructed or expanded. It is the City's vision to utilize the benefits of removing through-traffic as a means to redevelop Havelock as a vibrant urban landscape with an identifiable city center that balances growth with livability.

This consistency review indicates that the Preferred Alternative does not conflict with the goals set forth in the afore-mentioned land use plans and that the City of Havelock land use plan is most supportive of the Preferred Alternative (Alternative 3).

Transportation Plans

US 70 provides state and regional connectivity with the Port of Morehead City, Global TransPark in Kinston, industries in New Bern and Craven County, Cherry Point US Marine Corps Air Station, Camp Lejeune and other military facilities, and it functions as a primary route for seasonal beach traffic. These factors have economic and national security

implications that must be considered in a regional context. As stated in Chapter 1.8, improvements to the US 70 corridor are being developed through a coordinating partnership of local, regional, state, and federal agencies. As such, the proposed project is consistent with the goals of the Strategic Transportation Corridor Program (formerly Strategic Highway Corridors Program), State Transportation Improvement Program (including the US 70 Access Management Study), the Craven County Comprehensive Transportation Plan, the City of Havelock Thoroughfare Plan (City of Havelock, 1993) and Cherry Point MCAS Transportation Demand Management Plan (Military Growth Task Force, 2011). The North Carolina Maritime Strategy Final Report (East Carolina Council, 2002) identifies the proposed Havelock bypass as one of a number of infrastructure projects recommended to improve the regional transport of goods. US 70 is identified as part of the US Department of Defense Strategic Highway Network for moving military personnel and equipment, which also illustrates a regional need for the proposed project.

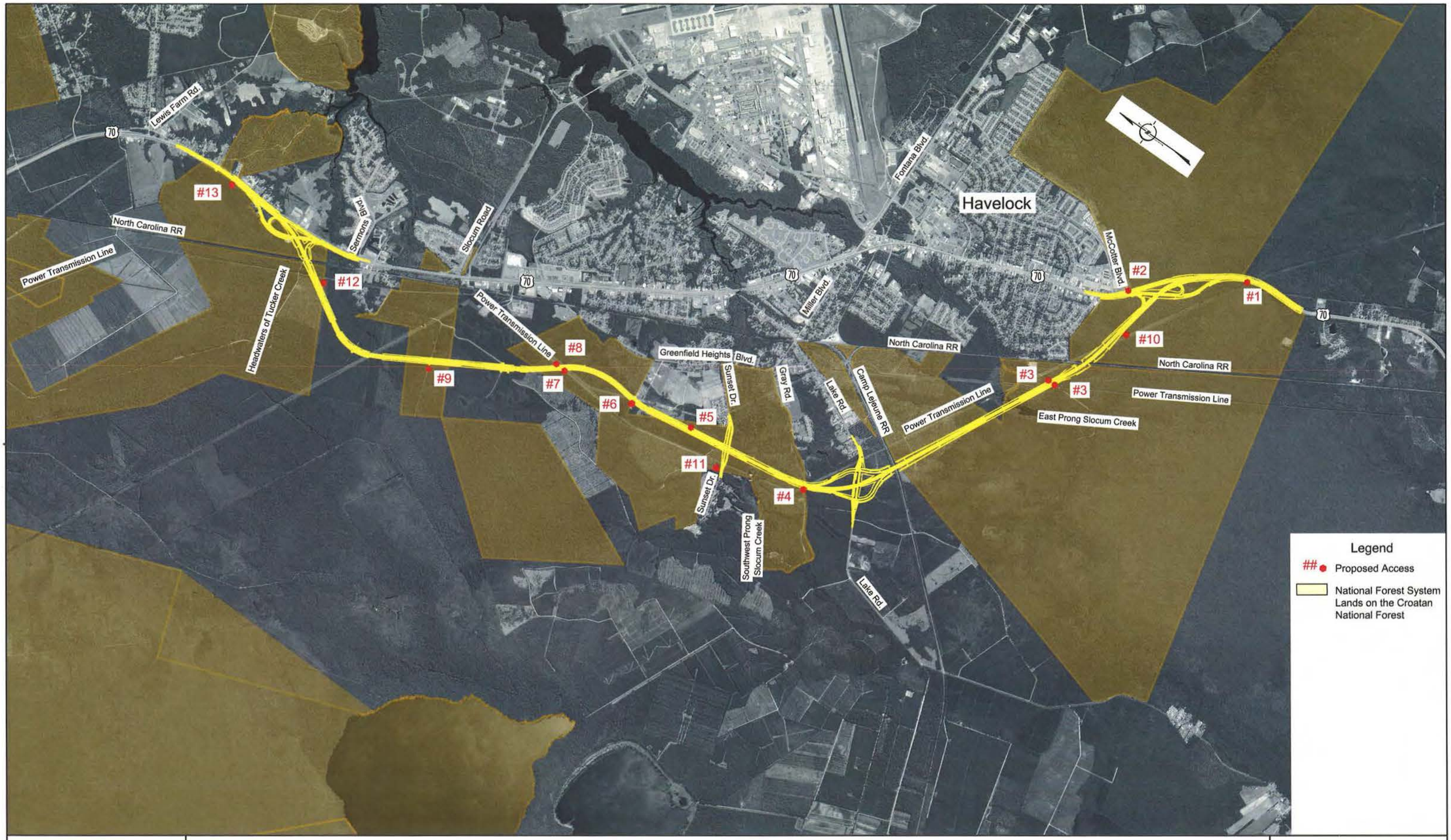
4.1.3 Transportation Impacts

4.1.3.1 Vehicular Travel Patterns

Construction of the proposed project would most notably affect travel patterns by removing through traffic from the existing route. Truck traffic to and from the Port of Morehead City as well as seasonal beach traffic will utilize the new route in lieu of driving through Havelock. Because the bypass is proposed to be a full access-controlled highway, changes to local traffic travel patterns on existing US 70 within Havelock would be largely unaffected by the bypass and limited to effects associated with access to the bypass at the SR 1756 (Lake Road) interchange.

Minor travel pattern changes would be created at the northern project terminus, where the proposed interchange with existing US 70 would require closing four median crossovers along existing US 70, prohibiting U-turns, and closing three service road connections (SR 1158, SR 1162, and SR 1163). The residential development currently served by SR 1158 would be relocated by the proposed project and the existing roadway removed. Alternate access to US 70 from SR 1162 and SR 1163 is available at locations a short distance north of the affected area. At the southern project terminus, the interchange with existing US 70 would require closing two median crossovers that allow U-turns.

USFS access to NFS lands would be affected by the Preferred Alternative. To mitigate this effect, the preliminary designs of the Preferred Alternative include 13 new, gated driveway connections to various USFS parcels and service roads whose access is affected by the proposed bypass. USFS agreed to these access points during coordination in 2014, as shown in Exhibit 4.1.1.



US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Access Points
Scale: 1" = 1 mile
Exhibit 4.1.1

This page intentionally left blank to facilitate double-sided printing.

4.1.3.2 Bicycle/Pedestrian Travel Patterns

As discussed in Chapter 3.1, no notable sidewalk/greenway networks or designated bicycle routes currently exist in Havelock. The most recent land use plans for Havelock do not identify specific bicycle routes but rather include qualitative statements indicating the City's intent to "increase the amount of pedestrian and bicycle activity within the City by providing adequate facilities that promote friendly pedestrian and bicycle environments" (City of Havelock, 2009). This notion dovetails with the City's redevelopment visions for the US 70 corridor through Havelock, after construction of the proposed bypass.

The Down East Rural Planning Organization (RPO) *Bicycle Routes Map* (Down East RPO, 2005) identifies SR 1756 (Lake Road) as a potential regional bicycle route from existing US 70 to the county line; construction of the proposed bypass would not prohibit the roadway from becoming a regional bicycle route at some future point.

The Croatan Regional Bike + Trails Plan (NCDOT, 2006) identifies the existing route for the Mountain to Sea Trail as loosely paralleling US 70 west of Havelock through the Croatan National Forest. The trail turns east on SR 1746 (Gray Road), crossing US 70 and continuing eastward on NC 101. The plan also identifies a conceptual route that would utilize an alternate alignment west of the existing route but still within the Croatan National Forest. At the time this FEIS was prepared, the conceptual route was still in development. The existing and conceptual Mountain to Sea Trail routes are shown in Exhibit 1.8.1.

The existing route utilizes several USFS access roads that cross the Preferred Alternative; however, because there is currently no timeline for the future reroute, it is uncertain how the proposed bypass will affect the Mountain to Sea Trail. NCDOT will continue to monitor the proposed relocation of the Mountains to Sea Trail throughout the development of the Havelock Bypass and will coordinate with the USFS to maintain access for USFS operations and to provide connectivity along the trail.

It is noted that the two grade-separated bridge crossings on SR 1747 (Sunset Road) and SR 1756 (Lake Road) include six-foot paved shoulders and bike-safe rails (transitioning to four-foot paved shoulders along the bridge approaches), which will provide accommodation for bicyclists. Based on these design considerations, the proposed bypass will accommodate and advance regional bicycle plans. In addition, removing through traffic from existing US 70 will help foster the City of Havelock's goal of promoting bicycle and pedestrian friendly facilities.

4.1.3.3 Rail Travel Patterns

The Preferred Alternative includes two grade-separated crossings of the North Carolina Railroad and one grade-separated crossing of the Camp Lejeune Railroad (operated by the Norfolk Southern Corporation). Final design of these crossings will be developed as discussed in Chapter 2.7 to provide adequate horizontal and vertical clearances over the railroads. Designs do not provide for additional rail lines in the future, as none were requested during the planning phase. Therefore, no changes to rail travel patterns would be associated with the Preferred Alternative.

4.1.3.4 Travel Time

Improvements to the US 70 corridor (including bypasses around Clayton, Smithfield-Selma, Goldsboro, and Kinston, as well as other projects described in Chapter 1.8.3) are projected to result in a travel time savings of 68 minutes between Morehead City and Raleigh (Cambridge Systematics, Inc., 2014). Collectively, these regional improvements would provide better access to the Global TransPark, Port of Morehead City, and I-95, which would enhance competitiveness by reducing freight traffic logistics.

As detailed in Chapter 2.8.3, a travel time analysis was prepared for the proposed project. Expected travel times for existing US 70 for all 2035 No-Build scenarios between the bypass termini range from 17.4 minutes to 63.0 minutes. The estimated travel time for the proposed freeway in the 2035 project traffic forecast at 2% growth (highest traffic volumes) is 9.5 minutes. So the estimated travel time on the bypass is lower than any of the simulated travel times on existing US 70 or those reported by the floating car study.

4.1.3.5 Safety

As stated in Chapter 1.4, it is expected that the proposed bypass facility would perform similar to other rural median-divided facilities which typically experience much lower crash rates compared to urban facility types. The large percentage of rear-end collisions on existing US 70 indicates a congested roadway with numerous driveway access points and at-grade intersections. It therefore stands to reason that the addition of a median-divided, fully access-controlled facility with uninterrupted flow would serve as an attractive option for through traffic. A reduction in traffic volumes on the existing section of US 70 would reduce congestion and in turn would likely reduce the potential for rear-end collisions.

Additionally, the US 70 corridor from Morehead City to Raleigh has been identified by the North Carolina Division of Emergency Management as a major hurricane evacuation route. The proposed project will improve public safety by enhancing the area's hurricane evacuation ability with more capacity - especially during the summer vacation season when the demands are highest. This benefits both seasonal and local travelers alike.

4.2 SOCIOECONOMIC IMPACTS

4.2.1 Relocations

The Preferred Alternative requires the relocation of an estimated 16 residences. Five of these are owned and eleven are rented. None of these are minority residences. Eight (50% of the total) are estimated to have an annual household income more than $50,000. None are estimated to have an annual household income less than $25,000. According to the relocation report (Appendix G), it is anticipated that adequate relocation replacement facilities for the residences and businesses are available for the proposed project.

The Preferred Alternative would relocate the Liberty Motel at the project's northern terminus, which has two employees. The proposed project would also displace the Craven County Waste Transfer Facility also located near the project's northern terminus. Although not a business per se, three county employees work at this facility. The waste transfer facility is located on NFS lands through a special use permit with the USFS. Craven County planners are currently searching for an alternative location, and would obtain any environmental permits and clearances as part of a county initiative.

Relocation Assistance Program

It is the policy of the NCDOT to ensure that comparable replacement housing would be available prior to construction of highway projects. Furthermore, the North Carolina Board of Transportation has approved the following three programs to minimize the inconvenience of relocations:

- Relocation Assistance,
- Relocation Moving Payments, and
- Relocation Replacement Housing Payments or Rent Supplement.

With the Relocation Assistance Program, experienced NCDOT staff will be available to assist relocatees with information such as availability and prices of homes, mobile homes, or businesses for sale or rent, and financing or other housing programs. The relocations Moving Payments Program, in general, provides for payment of actual moving expenses encountered in relocation. Where relocation will force an owner or tenant to purchase or rent property of higher cost or to lose a favorable financing arrangement (in case of ownership), the Relocation Replacement Housing Payments or Rent Supplement Program will compensate up to $22,500 to owners who are eligible and qualify, and up to $5,250 to tenants who are eligible and qualify.

The relocation program for the proposed action will be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), and the North Carolina Relocation Assistance Act (GS-133-5 through

133-18). The program is designed to provide assistance to displaced persons in relocating to a replacement site in which to live or do business. At least one relocation officer is assigned to each highway project for this purpose.

The relocation officer will determine the needs of displaced families, individuals, businesses, non-profit organizations, and farm operations for relocation assistance advisory services without regard to race, color, religion, sex, or national origin. The NCDOT will so schedule its work to allow ample time, prior to displacement, for negotiations and possession of replacement housing that meets decent, safe, and sanitary standards. The displacees will be given 90 days to vacate from the date that the offer of relocation benefits is made. Relocation of displaced persons will be offered in areas not generally less desirable in regard to public utilities and commercial facilities. Rent and sale prices or replacement housing offered will be within the financial means of the families and individuals displaced, and be reasonably accessible to their places of employment. The relocation officer will also assist owners of displaced businesses, non-profit organizations, and farm operations in searching for and moving to replacement property.

All tenant and owner residential occupants who may be displaced will receive an explanation regarding all available options, such as (1) purchase of replacement housing, (2) rental or replacement housing, either private or public, or (3) moving existing owner-occupant housing to another site (if possible). The relocation officer will also supply information concerning other state or federal programs offering assistance to displaced persons and will provide other advisory services as needed in order to minimize hardships to displaced persons in adjusting to a new location.

The Moving Expense Payments Program is designed to compensate the displacees for the costs of moving personal property from homes, businesses, non-profit organizations, and farm operations acquired for a highway project. Under the Replacement Program for Owners, NCDOT will participate in reasonable incidental purchase payments for replacement dwellings such as attorney's fees, surveys, appraisals, and other closing costs and, if applicable, make a payment for any increased interest expenses for replacement dwellings. Reimbursement to owner-occupants for replacement housing payments, increased interest payments, and incidental purchase expenses may not exceed $22,500 (combined total), except under the Last Resort Housing provision.

A displaced tenant may be eligible to receive a payment, not to exceed $5,250, to rent a replacement dwelling or to make a down payment, including incidental expenses, on the purchase of a replacement dwelling. The down payment is based upon what the state determines is required when the rent supplement exceeds $5,250.

It is a policy of the state that no person will be displaced by the NCDOT's construction projects unless and until comparable or adequate replacement housing has been offered or provided for each displacee within a reasonable period of time prior to displacement. No relocation payment received will be considered as income for the purposes of the Internal Revenue Code of 1954 or for the purposes of determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law.

Last Resort Housing is a program used when comparable replacement housing is not available, or when it is unavailable within the displacee's financial means, and the replacement payment exceeds the state legal limitation. The purpose of the program is to allow broad latitudes in methods of implementation by the state so that decent, safe, and sanitary replacement housing can be provided. It is not felt that this program will be necessary for this project since there appear to be adequate opportunities for relocation within the area.

4.2.2 Community Cohesion

Residential areas affected by the Preferred Alternative are mostly limited to single-family residences along existing US 70, SR 1747 (Sunset Drive), and SR 1756 (Lake Road). At the proposed northern terminus at existing US 70, a small community consisting of six parcels would be relocated by the new interchange. Three relocations associated with the Preferred Alternative would occur in the southwest corner of the Greenfield Mobile Estates along SR 1747 (Sunset Drive). SR 1747 (Sunset Drive) would bridge the Preferred Alternative at this location, requiring the placement of fill material to raise existing SR 1747 (Sunset Drive) over the bypass. The required slopes for the fill material extend within close proximity to three mobile homes; methods to further avoid or minimize these impacts will be considered during final design.

The proposed bypass could create a physical barrier between existing houses on SR 1747 (Sunset Drive) and SR 1756 (Lake Road); however, the grade separations proposed at these locations would minimize this effect. Community cohesion effects would also be limited due to the more rural nature of residential development in this area.

4.2.3 Title VI of the 1964 Civil Rights Act and Environmental Justice

As described in Chapter 3.2.4, Title VI of the Civil Rights Act of 1964 requires that there be no discrimination in Federally-assisted programs, and Executive Order 12898 directs all federal agencies, or those who receive federal funding, to determine whether a proposed action will have a disproportionately high and adverse impact on minority and/or low income populations. Only one population group, a predominantly African-American neighborhood, was identified in close proximity to the detailed study corridors. This neighborhood surrounding Hickman Hill Road, is located adjacent to existing US 70 near the northwestern terminus of the proposed project. None of the properties along Hickman Hill Road would be

relocated by the proposed project or otherwise experience disproportionately high and adverse impacts.

The Preferred Alternative would not impact any childcare or senior facilities identified in Exhibit 3.3.1. Because of the distance between the proposed project and Havelock proper, senior and youth facilities in Havelock would not be disproportionately affected by the proposed project.

As noted in Chapter 3.3.3, three schools within the Direct Community Impact Area (DCIA) have minority populations greater than 50%. None of these schools are directly affected and due to their distance from the proposed alternatives, none of these schools would experience adverse or disproportionate effects from the proposed Havelock Bypass.

There are no disproportionately high and adverse impacts to minority, low-income or elderly populations. Benefits and burdens resulting from the proposed project are anticipated to be equitably distributed throughout the community. Public involvement and outreach activities, discussed in Chapter 7.2, were conducted to ensure full and fair participation of all potentially-affected communities in the project decision-making process.

4.2.4 Economic Impacts

The proposed bypass may result in negative economic impacts to highway-oriented businesses along existing US 70 in Havelock, but overall negative economic impacts are expected to be minimal. The following paragraphs provide additional information on likely economic impacts associated with the proposed bypass.

A review of bypass studies conducted throughout the nation indicates that the degree of impact experienced by a bypassed community is generally correlated to several factors, including: 1) size of the community; 2) economic base; 3) distance from bypass; and 4) proximity to other population centers.

Size of the Community – A national study of 141 bypasses conducted by the National Cooperative Highway Research Program (NCHRP) found that population size is a major factor in determining how well a community's economy will fare after construction of a bypass. Of the total 141 bypassed communities, 71 had populations less than 5,000 people. Ten of the 141 communities experienced negative economic effects; seven of these ten communities had populations less than 5,000 (System Metrics Group, 2006).

A study conducted by the Wisconsin Department of Transportation (WisDOT) (WisDOT, 1998) compared the economic conditions of 17 bypassed communities to those of 14 communities with state highways through town. The study found that there is little adverse

impact to the overall economies of most communities, but that smaller communities (less than 1,000 people) are more likely to experience adverse effects. Smaller communities do not have the same attractions as larger communities and are not considered "destinations" for the region. Medium (2,000 – 5,000 people) and large (greater than 5,000 people) communities typically have a complete K-12 school system, a large clinic or hospital, government offices, churches, and parks, as well as retail and other services that define the communities as commercial and cultural centers. Over the long term, average traffic levels on "old routes" in medium and large communities are closer to pre-bypass levels, maintaining economic activity in the communities.

Medium and large communities experienced an average traffic loss of 18% and 30% respectively, while small communities experienced a 72% traffic loss. Focus group interviews conducted for the WisDOT study indicated that communities consider their bypasses to be beneficial overall, while understanding that a bypass can bring a number of changes for a community and individual businesses that need to be addressed proactively to ensure the most benefits and least adverse impacts.

A study by the University of Texas at Austin (UT) (Srinivasan and Kockelman, 2002) assessed economic effects on four industry sectors (total retail sales, gas station sales, eating/drinking places, and service receipts) in relation to population size. The study analyzed 23 small and medium sized bypassed communities and 19 control communities over a nine-year period (where small and medium size communities were defined as having populations between 2,500 and 50,000 people). The results found that bypasses negatively affected these four retail sectors, with the most notable effects found in gas station sales and least notable effects found in service industries. These effects are stratified across population sizes, as larger communities were found to retain more traffic volumes and thereby retail sales. The study notes that gas stations and eating/drinking places respectively accounted for 7% and 8% of retail sales; total retail sales represent 50% of total sales and sales in service industries comprise approximately 16% of total sales. The small percentages of total sales attributed to gas stations and eating/drinking places indicate that negative impacts on these industrial sectors do not necessarily indicate a significant negative effect on a bypassed community's overall economy.

Economic Base (Business Mix) – Communities with a higher level of dependence on travel-oriented business may experience more negative economic effects than communities with a broad range of commercial services. Specific destinations such as residential areas, employment centers, schools, government offices, parks, churches, cultural institutions, businesses, and stores act as buffers against negative economic effects by attracting traffic into the community. This is particularly true in cases where removing truck traffic and congestion can enhance access to these destinations (System Metrics Group, 2006).

A Washington State University study (Gillis, 1994) compared three bypass projects in Washington to determine the effect of bypasses. This research concludes that travel-oriented businesses are more likely to be adversely affected by a reduction in drive-by traffic and that bypasses can reduce travel times and open commuter routes to regional employment centers. The study also found that communities with a large portion of local customer traffic are less adversely affected than communities highly dependent on drive-by traffic.

A study conducted by the University of Texas (Handy et al., 2001) found that changes in bypassed communities are largely the result of factors other than the bypasses, but the bypasses tend to amplify the trends of the community, either positive or negative.

Distance from Bypass – Bypasses located close to existing downtowns are less likely to affect local economies, primarily because they facilitate access to existing businesses. It is noted that it can be difficult to encourage traffic to divert from a high speed freeway, but that measures such as enhanced access and signage can ameliorate this tendency (System Metrics Group, 2006).

A University of Kentucky study (UK, 2001) of bypassed communities found that retail flight typically does not occur and that only 7.6% of businesses located in bypassed areas relocate to bypasses. The study concluded that although the opening of a bypass was found to reduce aggregate retail sales, it was not found to affect retail employment, total employment, or population. This study cited previous literature, which concluded that travel-oriented businesses were most likely to be affected by bypasses and were therefore most likely to relocate or be replaced along the bypass itself.

The 1998 WisDOT study found that less than 5% of businesses were located within 0.5 mile of a bypass interchange or intersection. This condition is attributable to several factors. Among other reasons, it was found that the cost and feasibility of providing municipal services along the bypass often outweighed the potential revenues of new development on some bypasses, traffic levels were sometimes not high enough to support new businesses, and/or communities made planning and zoning decisions to control development. As a related issue, the trend of "big box" retailers and strip malls locating on the edges of smaller communities creates competition for traditional downtown retailers. This study also found that communities were pleased with improved traffic flow and congestion relief.

Proximity to Other Population Centers – The University of Texas study (2001) found that larger communities located close to metropolitan areas or that serve as natural stopping points benefit more from opportunities created by bypasses. This study also references the

"central place theory" which suggests that a bypass may expand the service area of an adjacent community and therefore expand the economy of the adjacent community at the expense of the bypassed community.

Local Research – A 2011 study by the East Carolina University's Bureau of Business Research (Kleckley, 2011) assessed improvements to the US 70 corridor as they relate to local economies and intermodal transportation. Of particular interest, interviews with the Clayton Planning Department indicate that the US 70 Clayton Bypass (completed in 2008) has been successful at reducing congestion and that there has not been any apparent decline in businesses along the old route. The new bypass is not serviced by water and sewer, which the City views as an opportunity to control the pace and types of development within its jurisdiction.

Summary of Effects – Based on the research findings detailed in the previous paragraphs, Havelock's travel-oriented businesses may experience negative effects from the proposed bypass, but these effects would be tempered by Havelock's population (20,735 people) and its numerous in-town employment centers, institutions, and commercial destinations, including the Cherry Point MCAS and Fleet Readiness Center East, Craven Community College, and Wal-Mart. The WisDOT study (1998) concluded that communities that are considered "destinations" are less likely to experience negative economic effects associated with the construction of a bypass. Of the 3,287 civilian employees at the Fleet Readiness Center East at Cherry Point MCAS, 1,481 employees commute into Havelock from areas outside Craven County (Craven County EDC, 2010).

As shown in Table 3.2.9, retail trade represents a modest amount of employment in the county, but not a disproportionately high amount in comparison to other employment sectors. Based on available data, there were 12 gas stations and 31 eating/drinking places in Havelock in 2007 (NCSDC, 2013). Based on the area population, in addition to the number of people commuting into Havelock, it is reasonable to assume that the effects of the proposed bypass on these travel-oriented businesses in Havelock would be limited.

Commercial centers along existing US 70 generally lie within two to three miles from the northern project terminus and the SR 1756 (Lake Road) interchange, which would minimize travel times from the bypass to existing commercial areas. Although located between New Bern and Morehead City, Havelock is a well-established population center with a number of core elements (noted above) that draw people into the city. It is not likely that the travel time savings of the bypass, discussed in Chapter 4.1.3, would cause the service areas of businesses in New Bern or Morehead City to expand enough to draw Havelock residents away from Havelock businesses they currently support.

As traffic conditions in Havelock deteriorate under no-build conditions, congestion on existing US 70 may have a negative economic effect on local businesses by diminishing the perceived accessibility of these locations. One noted benefit of a bypass is the elimination of trucks and seasonal traffic from the local route, making traffic patterns safer and more predictable (WisDOT, 1998). Perceived problems such as noisy truck traffic, the potential for damage to parked vehicles, and pedestrian safety may dissuade visitors to local retailers (Gillis, 1994).

Nationwide studies of bypassed communities indicate that retail flight (i.e., relocation after construction of a bypass) typically does not occur and is minimal at best. Many of Havelock's businesses are supported by local traffic; therefore, it is anticipated that the effects on local eateries and commercial services would be minimal. In contrast to the No-Build Scenario, maintaining accessibility to community facilities may provide economic benefits to local businesses. Further, the City has a number of planning objectives related to redevelopment of the existing US 70 corridor; maintaining accessibility to this area and safety along the roadway would help the City achieve their vision and encourage economic growth.

Local Planning Efforts – As stated in Chapter 3.1.4, the City of Havelock *2030 Comprehensive Plan* (City of Havelock, 2009) was developed with the assumption that the city will have a bypass around the southwestern side of the City. The bypass would provide the opportunity to establish land use controls to protect the bypass investment and to transform Main Street (the existing US 70 corridor) back into a community asset once the proposed bypass is completed.

This plan recognizes that the direct connections to the bypass will be limited to proposed interchanges and suggests Havelock consider developing a small area plan for the proposed interchange at Lake Road. It also suggests that land use preservation and access management restrictions should be in place before interchanges are constructed. The plan states "The City of Havelock strongly supports construction of the US 70 Bypass to relieve congestion along existing US 70" (Policy 4.1.2). This plan follows previous land use plans in continuing to stress the importance of constructing a US 70 Havelock Bypass in order to relieve congestion along existing US 70.

4.3 COMMUNITY FACILITIES

4.3.1 Community Facilities and Services

As shown in Exhibit 3.3.1, community facilities are concentrated within Havelock and there are no facilities within the western portion of the project study area. The proposed project would not adversely affect any community facilities.

4.3.2 Schools

The Preferred Alternative would not directly impact or adversely affect access to any schools within the project study area. Eliminating through-traffic on existing US 70 would help reduce congestion on the existing route and thereby improve travel times for school bus routes.

4.3.3 Churches

There are no churches located within the Preferred Alternative corridor; no impacts to churches are associated with the proposed project. The reduction of through-traffic along existing US 70 will improve access to churches accessed via the existing route.

4.3.4 Parks & Recreational Facilities

As stated in Chapter 3.3.2, although the project study area is used for dispersed recreational activities such as hunting, hiking, and bird watching, the nearest designated recreational area for the Croatan National Forest (CNF) is along the Neuse River. Although primitive camping is allowed on National Forest Service (NFS) lands within the project corridor, there are no designated recreational areas within the Preferred Alternative corridor. No direct impacts to CNF recreational facilities are associated with the Preferred Alternative. No local parks or other recreational facilities are located within the Preferred Alternative corridor. The proposed project is anticipated to reduce travel times to local parks and recreational facilities accessed via existing US 70.

It is worthy to note that the Croatan Wetland Mitigation Bank (CWMB) will provide recreational opportunities when it becomes part of the CNF. The USFS identified dispersed recreational activities (i.e. hunting, hiking, and bird watching), as well as primitive camping, as potentially occurring in the bypass project study area; all of these activities will be available at the CWMB site.

The addition of the CWMB to the CNF could increase the percentage of semi-primitive recreation opportunities in the forest. These semi-primitive classifications are currently provided in only 15% of the Forest (Croatan NF LRMP, 2002) and have been identified as one of the unique contributions of southern national forest lands. The CWMB retains approximately 5.1 miles of dirt/gravel road access through its center that can facilitate recreation throughout the property interior. In addition, the CWMB offers new access to 1.4 miles of shoreline along Long Lake, where non-motorized boat launching could be made available. The transfer of 4,035 acres and new access to Long Lake will enhance and create new recreational opportunities. Thus, the significant 3,795 acre net-gain afforded by the CWMB acquisition will provide a net gain in recreational benefit to the USFS.

4.3.5 Emergency Response Services

Police and fire protection for the local community and the CNF would not be adversely affected by the construction of the Preferred Alternative. Representatives of the local EMS/Fire Service indicated that the proposed project would have a neutral effect on emergency services. Representatives from the U.S. Forest Service indicated that the bypass may expedite the movement of fire equipment and personnel, assisting with the management of prescribed burns. The proposed project's three grade-separated rail crossings allow the bypass to act as alternate route that could be utilized to access western portions of the project study area when at-grade crossing devices at SR 1746 (Greenfield Heights Boulevard) and SR 1756 (Lake Road) are activated.

4.3.6 Hospitals, Nursing Homes, and Daycares

None of the facilities listed in Chapter 3.3.7 are located within the Preferred Alternative corridor. No impacts to hospitals, nursing homes, or daycares are associated with the Preferred Alternative.

4.4 CULTURAL RESOURCES

4.4.1 Historic Architectural Resources

As stated in Chapter 3.4.1, the historic Needham B. White house is located along existing US 70 in Havelock; however this resource, is not located within the Area of Potential Effect (APE) of the Preferred Alternative. The proposed project would not affect any properties listed, or potentially-eligible for listing, on the National Register of Historic Resources.

4.4.2 Archaeological Resources

Archaeology surveys, discussed in Chapter 3.4.2 indicate that two archaeological sites lie on NFS lands near the Preferred Alternative corridor (Sites 31CV170** and 31CV302). The preliminary designs of the Preferred Alternative were developed to avoid these sites and as such, no impacts to archaeological resources are associated with the proposed project.
Although no archaeological sites would be affected by the proposed project, Site 31CV302 is located roughly 300 feet away from the construction limits of the project. NCDOT is taking additional precautions to ensure that Site 31CV302 is protected throughout the duration of the project's construction. The project commitments include specific instruction regarding delineation and fencing of the site to avoid accidental disturbance from errant construction-related activities.

Through the Federal Highway Administration, tribal coordination has been initiated which requests a Tuscarora Nation (American Indian) review of the proposed project and the Preferred Alternative. Coordination with the Tuscarora Nation is discussed in Chapter 7.1.4

4.5 SECTION 4(F) AND SECTION 6(F) RESOURCES

According to United States Code (USC) Title 23 in Section 138 (Section 4(f)), the United States Department of Transportation (USDOT):

> "..... shall not approve any program or project ..... which requires the use of any publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use."

Correspondence from the USFS, dated May 1, 1998 and contained in DEIS Appendix A.1, states "The propose highway project does not require the use of lands from any presently used or planned park or recreational area within the Croatan National Forest. The project does not encroach on any special interest areas, preserves, sanctuaries, reservations or other specially designated lands established by Congress. The project will not affect any historic site on or eligible for the National Register of Historic Places, nor will it require the use of lands from any historic site of state or local significance." The USFS determined, "The proposed State Project to construct US 70 Bypass (TIP #R-1015) located in Craven County, North Carolina, has been reviewed against the criteria of Section 4(f) of the Department of Transportation Act of 1966 (28 USC 138), as amended. With this, I have determined that this project does not encroach on or use land from (sic) any of the types of specifically designated areas described above and consideration under Section 4(f) is not required." The FHWA further agrees with this assessment under current law and that a Section 4(f) evaluation is not necessary for this project as proposed.

The Preferred Alternative would not impact any Section 4(f) resources. Although NFS lands would be impacted by the Preferred Alternative, the lands are not significant recreational areas or national wildlife refuge lands.

There are no lands within the project study area, categorized as Section 6(f) resources under the Land and Water Conservation Fund Act. No Section 6(f) impacts are associated with the proposed project.

4.6 UTILITIES

4.6.1 Electric Power Transmission

Electric service lines belonging to Carteret-Craven Electric Cooperative, Duke Energy, and the City of New Bern will be crossed by the Preferred Alternative; however, local service will not be disrupted.

In addition to overhead distribution lines, there are several Progress Energy high-voltage

electric power transmission lines located in easements that traverse the western portion of the project study area. Near the northwestern terminus of the project, the Preferred Alternative crosses the New Bern Switching Station - Havelock 115 KV Line, which is approximately 2,000 feet north of SR 1760 (Hickman Hill Road) on NFS lands. Further south and east, approximately 1,800 feet west of Hickman Hill Road, the Preferred Alternative crosses the New Bern - Havelock 230 KV Line and the Jacksonville - Havelock 230 KV Line on private lands. The Preferred Alternative crosses the Havelock - Morehead City 115 KV South Feeder Line, and the Havelock - Morehead Wildwood 230 KV Line approximately 1,150 feet east of the North Carolina Railroad on NFS lands. Another 115 KV line is crossed approximately 1,640 feet to the west of the railroad on NFS lands.

No disruption of service is expected with the construction of the Preferred Alternative. The NCDOT will coordinate with the appropriate service provider should relocation or upgrading of these facilities be required during construction. The USFS notes that any new or relocated utilities lines to be located on NFS lands can only be permitted by the USFS. Utility companies cannot use NCDOT easements on NFS lands.

4.6.2 Water & Sewer Service

Water and sewer services provided by the City of Havelock do not generally extend beyond the City limits. The County's water and sewer systems extend into the project study area for a distance along SR 1756 (Lake Road); however, these services would not be crossed by the Preferred Alternative. No impacts to water and sewer service would be created by the proposed project.

4.6.3 Solid Waste Disposal

The Craven County Waste Transfer Facility (Hickman Hill site) located near the northern project terminus will be displaced by the construction of the Preferred Alternative. The transfer station is located on NFS lands. This is the only solid waste disposal facility within the Havelock area. Craven County officials plan to relocate the site in order to provide local solid waste disposal services.

NCDOT has coordinated with local governments to provide advanced notice of the required relocation. During right-of-way acquisition, NCDOT will coordinate with local governments to provide compensation for impacts to the existing site and coordinate driveway access for a new site.

4.6.4 Natural Gas Transmission

Since there are no natural gas lines within the project study area, the proposed project would not affect natural gas service.

4.6.5 Communications

As stated in Chapter 3.6.5, CenturyLink provides local telephone services within the project study area and vicinity. Cables are buried along US 70, SR 1791 (Sunset Drive) and SR 1756 (Lake Road). Aerial wires are also present along SR 1791 (Sunset Drive). There are no aerial wires or cables on NFS lands. The proposed project may require the relocation of these lines during construction. As a result, there is a possibility of short-term service interruptions during construction. NCDOT will coordinate with the USFS on any relocations located on NFS lands.

4.7 AIR QUALITY

The project is located in Craven County, which has been determined to comply with the National Ambient Air Quality Standards. The proposed project is located in an attainment area: therefore, 40 CFR, Parts 51 and 93 are not applicable. This project is not anticipated to create any adverse effects on the air quality of this attainment area. This evaluation completes the assessment requirements for air quality of the 1990 Clean Air Act Amendments and the NEPA process.

Mobile Source Air Toxics (MSATs)

This project has low potential for MSATs because it is intended to improve the operations of a highway, transit or freight without creating a facility that is likely to meaningfully increase emissions, and the Design Year traffic is not projected to meet or exceed the 140,000 to 150,000 AADT criterion.

A qualitative MSAT analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives found at:
www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For the Preferred Alternative, the amount of MSAT emitted would be proportional to the vehicle miles traveled (VMT) for through-traffic diverted to the bypass (assuming that other variables such as fleet mix are the same). The VMT estimated for the No-Build Alternative is higher than the VMT for the amount of through-traffic that would be diverted to any of the detailed study alternatives. As such, higher levels of MSAT are not expected from the detailed study alternatives compared to the No-Build. Refer to Table 4.7.1. In addition, because the estimated VMT for the detailed study alternatives are nearly the same, varying by less than 31 percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent from 2010 to 2050. Local conditions may differ from these national projections in

terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

The travel lanes contemplated as part of the proposed Havelock Bypass will have the effect of moving some traffic closer to nearby homes, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under the Preferred Alternative than under the No-Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along Lake Road and Sunset Drive, where the proposed bypass will create new intersections/interchanges with existing roads near residential areas. However, the magnitude and the duration of these potential increases, when compared to the No-Build alternative, cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

TABLE 4.7.1
VEHICLE MILES TRAVELED
US 70 HAVELOCK BYPASS; FROM US 70 NORTH TO US 70 SOUTH

DESIGN YEAR 2035	VEHICLE MILES TRAVELED (VMT)
No-Build	346,610
Build	240,014

In sum, under all detailed study alternatives in the design year it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs.

4.8 NOISE

4.8.1 Analysis Methodology

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Additionally, variables such as weather and intervening topography affect the transmission of traffic noise from the vehicle(s) to noise sensitive receptors.

In accordance with industry standards and accepted best-practices, detailed computer models were created using the Federal Highway Administration Traffic Noise Model® (FHWA TNM v.2.5). The computer models were validated to within acceptable tolerances of field-monitored traffic noise data, and were used to predict traffic noise levels for receptor locations in the vicinity of the US 70, Havelock Bypass project. Traffic noise consists of three primary parts: tire/pavement noise, engine noise, and exhaust noise. Of these sources, tire noise is typically the most offensive at unimpeded travel speeds. Sporadic traffic noises such as horns, squealing brakes, and screeching tires are considered aberrant and are not included within the predictive model algorithm. Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM algorithm distinguishes between the source emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles, as shown in Table 4.8.1. The computer traffic noise prediction model uses the number and type of vehicles on the planned roadway, vehicle speeds, physical characteristics of the road (curves, hills, depressions, elevations), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier segment top elevations.

A preliminary design of the Preferred Alternative (Alternative 3) was used in this traffic noise analysis. Per FHWA guidance, the predictions documented in this report are based upon the potential project Design Year 2035 build-condition traffic conditions (including horizontal alignment alternatives) resulting in the loudest predicted hourly-equivalent traffic noise levels for each receptor. The posted speed limit for the northern portion of existing US 70 is 55 mph. For the southern section of existing US 70 the posted speed limit is 40 mph. Design speeds for the proposed Bypass are 70 mph for the mainline, 50 mph (35 mph minimum) for ramps, 30 mph (25 mph minimum) for loops and 30 to 50 mph for connecting side streets.

TABLE 4.8.1
TRAFFIC NOISE MODEL (TNM) VEHICLE CLASSIFICATION TYPES

TNM VEHICLE TYPE	DESCRIPTION
Autos	All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 10,000 pounds or less
Medium Trucks	All vehicles having two axles and six tires, weighing between 10,000 and 26,000 pounds
Heavy Trucks	All vehicles having three or more axles, weighing more than 26,000 pounds
Buses	All vehicles designed to carry more than nine passengers
Motorcycles	All vehicles with two or three tires and an open-air driver / passenger compartment

Sources: FHWA Measurement of Highway-Related Noise, § 5.1.3 Vehicle Types. FHWA Traffic Monitoring Guide, § 4.1 Classification Schemes

4.8.2 Analysis Results

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dB(A) of the NAC values listed in Table 3.8.3), or [b] substantially exceed the existing noise levels (refer to Table 3.8.4). FHWA and NCDOT require that feasible and reasonable measures be considered to abate traffic noise at all predicted traffic noise impacts. Measures considered include highway alignment selection, traffic systems management, buffer zones, noise walls, and earth berms.

Traffic noise is predicted to create 42 traffic noise impacts due to predicted design year 2035 build-condition noise levels that will approach or exceed FHWA noise abatement criteria. Five traffic noise impacts are predicted to occur as a result of design year 2035 build-condition noise level increases over existing ambient noise levels (four receptors also approach or exceed FHWA noise abatement criteria) for a total of 43 impacts. The number and types of predicted traffic noise impacts are shown in Table 4.8.2, with impacts delineated as either approaching or exceeding the FHWA NAC, by a substantial increase in Design Year 2035 build-condition traffic noise levels over existing ambient noise levels, or by meeting both criteria. The locations of the impacted receptors in relation to the Preferred Alternative are shown in Exhibits 3.8.1a-d.

Predicted build-condition traffic noise level contours are not a definitive means by which to assess traffic noise level impacts; however, they can aid in future land use planning efforts in presently undeveloped areas.

TABLE 4.8.2
TRAFFIC NOISE IMPACT SUMMARY[1]

ALT. DESC.	APPROXIMATE # OF IMPACTED RECEPTORS APPROACHING OR EXCEEDING FHWA NAC[2]							SUBST'L NOISE LEVEL INCR.[3]	IMPACTS DUE TO BOTH CRITERIA[4]	TOTAL IMPACTS PER 23 CFR 772
	A	B	C	D	E	F	G			
Existing	0	34	2	0	0	0	0	N/A	N/A	36[5]
No-Build	0	46	2	0	1	0	0	0	0	49[5]
Alternative 3	0	40	2	0	0	0	0	5	4	43[5,6]

1. This table presents the number of build-condition traffic noise impacts as predicted for the build-condition alternatives and no-build alternative presently under consideration.
2. Predicted traffic noise level impact due to approaching or exceeding NAC. Refer to Table 3.8.3 for receptor descriptions.
3. Predicted "substantial increase" traffic noise level impact (refer to Table 3.8.4).
4. Predicted traffic noise level impact due to exceeding NAC *and* "substantial increase" in build-condition noise levels.
5. The total number of predicted impacts is not duplicated if receptors are predicted to be impacted by more than one criterion.
6. The number of build-condition impacts is lower than the number of no-build condition impacts because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.

Correlating to the traffic noise impact threshold for FHWA NAC "E" land uses, the 71 dB(A) noise level contour is predicted to occur 67 feet from the center of the proposed US 70, Havelock Bypass alignment. Correlating to the traffic noise impact threshold for NAC "B" and "C" land uses, the 66 dB(A) noise level contour is predicted to occur 122 feet from the center of the proposed US 70, Havelock Bypass alignment.

Per 23 CFR 772.9(c) and NCDOT Policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level contour information should assist local authorities in exercising land use control over the remaining undeveloped lands, so as to avoid development of incompatible activities adjacent to the roadways within local jurisdiction.

4.8.3 Potential Traffic Noise Abatement Measures

FHWA and NCDOT require that feasible and reasonable noise abatement measures be considered and evaluated for the benefit of all predicted build-condition traffic noise impacts. Feasibility and reasonableness are distinct and separate considerations. Feasibility is the consideration as to whether noise abatement measures *can* be implemented. Reasonableness is the consideration as to whether noise abatement measures *should* be implemented. Per NCDOT Policy, the following traffic noise abatement measures may be considered: highway alignment selection, traffic systems management, buffer zones, noise barriers (earth berms and noise walls), and noise insulation of Activity Category D land use facilities.

Highway Alignment Selection – Highway alignment selection for traffic noise abatement measures involves modifying the horizontal and vertical geometry of the proposed facility to minimize traffic noise to noise-sensitive receptors. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of locating the roadway at a sufficient distance from noise sensitive receptors. Appreciable reductions in traffic noise transmissions to sensitive receptors can be made by adjusting the vertical highway alignment and/or section geometry.

Traffic System Management Measures – Traffic management measures such as prohibition of truck traffic, lowering speed limits, limiting of traffic volumes, and/or limiting time of operation were considered as possible traffic noise impact abatement measures. The proposed bypass will reduce the total amount of traffic on existing US 70. Prohibition of truck traffic, reduction of the speed limit or screening total traffic volumes would diminish the functional capacity of both the existing US 70 and the proposed bypass and are not considered practicable.

Buffer Zones – Buffer zones are typically not practical and/or cost effective for noise mitigation due to the substantial amount of right-of-way required, and would not be a feasible noise mitigation measure for this project. Furthermore, if the acquisition of a suitable buffer zone had been feasible, the associated costs would exceed the NCDOT Policy reasonable abatement cost threshold per benefited receptor.

Noise Barriers – Passive noise abatement measures are effective because they absorb sound energy, extend the source-to-receptor sound transmission path, or both. Sound absorption is a function of abatement medium (e.g. earth berms absorb more sound energy than noise walls of the same height because earth berms are more massive). The source-to-receptor path is extended by placement of an obstacle, such as a wall, that sufficiently blocks the transmission of sound waves that travel from the source to the receptor.

Highway sound barriers are primarily constructed as earth berms or solid-mass walls adjacent to limited-access freeways that are in close proximity to noise-sensitive land use(s). To be effective, a sound barrier must be long enough and tall enough to shield the impacted receptor(s). Generally, the noise wall length must be eight times the distance from the barrier to the receptor. For example, if a receptor is 200 feet from the roadway, an effective barrier would be approximately 1,600 feet long – with the receptor in the horizontal center and the wall would need to be continuous, without breaks, in order to be effective. On roadway facilities with direct access for driveways, sound barriers are typically not feasible because the openings render the barrier ineffective in impeding the transmission of traffic noise. Due to the requisite lengths for effectiveness, sound barriers are typically not economical for isolated or most low-density areas. However, sound barriers may be economical for the benefit of as few as one predicted traffic noise impact if the barrier can benefit enough total receptors – impacted and non-impacted combined – to meet applicable reasonableness criteria.

Noise Insulation – One location, Liberty Church (on the southern end of the project at 91 Shepard Street and US 70), was considered as an interior noise sensitive area (NAC "D"), however, as there are areas of exterior activities (a playground and basketball goals) it was determined that this location should be designated as an Activity Category C receptor. Therefore, interior noise insulation was not considered as a potential traffic noise impact mitigation measure as part of the analysis for this Traffic Noise Analysis. Of note, this location is impacted in the existing year as well as with the No-Build scenario and actually improves by one dB(A) with the Build Alternative. Also of note, the church is situated within the Air Installation Compatibility Zone (AICUZ) of the Marine Corps Air Station (MCAS) Cherry Point and is designated as a Noise Exposure Level N1 (below 65 ldn): Area of some impact.

Conclusion – Based upon the proposed project, mitigation measures are considered unlikely for the predicted traffic noise impacts in the vicinity of the US 70, Havelock Bypass project. The recommendation of the Traffic Noise Analysis is that additional detailed study of potential mitigation measures shall not be necessary subsequent to selection of the final design of the US 70, Havelock Bypass project.

4.9 HAZARDOUS MATERIALS

As discussed in Chapter 3.9, there are no known UST sites within the Preferred Alternative corridor. The Preferred Alternative would not impact Foss Auto Salvage, identified in Chapter 3.9 as a potential hazardous material site on SR 1756 (Lake Road). A recent geoenvironmental investigation of the Craven County Waste Transfer Facility, discussed in Chapter 3.9, indicates that there are no hazardous materials concerns associated with the site or the adjacent closed landfill (GEL Engineering of NC, Inc., 2013). The assessment recommends that background soil samples be collected and analyzed for arsenic as part of any planned excavation at the Transfer Station in order to confirm the presence or absence of soil impact from arsenic; however, earthwork associated with the proposed project would be limited to the placement of fill material; no major excavation is planned at the Craven County Waste Transfer Facility site. If excavation work is required at the Craven County Waste Transfer Facility, NCDOT will coordinate with Craven County officials for the collection and analysis of background soil samples to confirm the presence or absence of soil impact from arsenic, in accordance with NCDOT Policy on hazardous materials.

No impacts to hazardous material sites are associated with the Preferred Alternative. In accordance with NCDOT Policy on hazardous materials, if any additional contaminated sites or underground storage tanks are discovered on the project, they will be assessed and recommendations for right-of-way and construction will be provided.

NCDOT will compensate Craven County for relocation expenses associated with the displacement of the Waste Transfer Facility; however it is the County's decision whether to build a new facility. Thus, the County accepts responsibility to locate and obtain a new site, conduct any appropriate environmental studies, and obtain permits for a new facility. The Craven County Solid Waste & Recycling Department informed NCDOT that it is presently coordinating with the County Planning Department to search for a new replacement facility location for the center. DENR Solid Waste Management is also aware of the planning effort.

If the county provides a replacement facility in the project vicinity, no change to solid waste activities is envisioned (other than route to the site). It is possible that a County decision to not build a replacement facility could affect illegal dumping activity in this area; however

this speculation is a County issue to manage. As of November 2014, the Craven County Solid Waste & Recycling Department informed NCDOT that it is currently coordinating with the County Planning Department to search for a new replacement facility location for the center. DENR Solid Waste Management is also aware of the planning effort.

In coordination with its USFS agreement, the County must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on future effort associated with relocating the site will be updated in the ROD.

4.10 PRIME, IMPORTANT, AND UNIQUE FARMLANDS

As discussed in Chapter 3.11, lands identified with prime, unique, statewide or locally important farmland designations are classified by soil type regardless of whether they are being used for agricultural purposes. However, it is stated in the USDA Natural Resources Conservation Service *Soil Survey for Craven County* that public land cannot be considered prime farmland. Public land is land not available for farming in national forests, national parks, military reservations, and state parks (USDA, 1989). Most of the lands within the Preferred Alternative are public lands within the Croatan National Forest which do not qualify for these farmland designations.

As required by the Farmland Protection Act, the proposed project was developed in coordination with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS also known as the Soil Conservation Service [SCS]). According to NRCS mapping, NCDOT estimates that 71 acres in the Preferred Alternative proposed right-of-way are classified as prime farmlands. The approximate area of lands within the proposed right-of-way is shown in DEIS Table 4.3 and Table 4.21.1.

The NRCS Farmland Conversion Impact Rating Form (Form AD-1006), is included in DEIS Appendix A.1. NRCS has completed their review and the Preferred Alternative received a total point value of 116.8. Therefore, this alternative falls below the NRCS minimum criteria rating of 160 points and will not be evaluated further for farmland impacts. These alternatives will not have a significant impact to farmland.

4.11 MINERAL RESOURCES

As stated in Chapter 3.9, one inactive mine is located in the project study area. The use of the site as a landfill precludes its future use a mine. No other mining sites are located in the project area. The proposed project would not impact the availability of mineral resources in the Havelock area.

4.12 BIOTIC RESOURCES

Since the publication of the DEIS, NCDOT has updated previous studies and developed a number of additional studies, several at the request of the USFS. Several studies were prepared as stand-alone documents while the results of others were folded into the

Biological Evaluation (BE) prepared for the proposed project. The results of these studies are reflected in this chapter of the FEIS. Conclusions related to protected species, USFS rare species, USFS management indicator species (MIS), and USFWS Birds of Conservation Concern (BCCs) are included in Chapters 4.14.4 and 4.14.5. These additional studies are listed below.

- Updated Spring Species (Solidago verna) Report (Sept. 2012);
- RCW Management Plan for CWMB (Nov. 2012);
- Summer Species Report (Aug. 2013);
- Fall species (Paspalum) report (Aug. 2013);
- Updated stream and wetland delineations (Aug. 2013)
- Indirect and Cumulative Impacts Assessment (Sept. 2013);
- Rare Plant /Non-native Invasive Species Analysis (Oct. 2013);
- Bryophyte report (Nov. 2013);
- RCW Biological Assessment (Nov. 2013)
- Herbicide Evaluation Report (Jun. 2014)
- Summary of Evaluation for Awned Mountain Mint (*Pycnanthemum setosum*) (Jun. 2014)
- Migratory Bird Evaluation (Jun. 2014)
- Updated rare species assessment and Biological Evaluation Report (Jul. 2014)
- CNF RCW Territory Analysis (Aug. 2014)
- CNF Management Indicators Species Report (Sept. 2014)

4.12.1 Terrestrial Communities

4.12.1.1 Direct Impacts to Terrestrial Communities

Terrestrial community descriptions are presented in Chapter 3.13.1. Vegetative community mapping is depicted in Exhibit 3.13.1. The following section discusses impacts to terrestrial communities associated with the Preferred Alternative.

As shown in Table 4.12.1, the majority of impacts outside the CNF fall within upland (non-hydric) terrestrial communities, primarily Mesic Pine Flatwoods, Rural/Urban Modifications, and Mesic Pine Plantation. Excluding human-dominated terrestrial communities (i.e., Rural/Urban Modifications, Successional /Ruderal Habitat, Powerline Corridor), the Preferred Alternative would impact approximately 123 acres of land categorized as natural vegetative communities outside the CNF. These totals include 92 acres of pine plantation (mesic and hydric). Pine plantations, which are intensively altered from natural vegetative community structure for the purposes of commercial timber production, typically have additional soil and hydrological modifications and represent lower quality habitat, although not necessarily as low as the Rural/Urban Modification and Successional/Ruderal Communities.

Impacts to terrestrial communities on NFS lands are shown in Table 4.12.2. Excluding human-dominated terrestrial communities (i.e., Rural/Urban Modifications, Successional /Ruderal Habitat, Powerline Corridor), the Preferred Alternative would impact approximately 220.8 acres of NFS lands categorized as natural vegetative communities. These totals include 15 acres of pine plantation (mesic and hydric).

TABLE 4.12.1
TERRESTRIAL COMMUNITY IMPACTS OUTSIDE THE CROATAN NATIONAL FOREST

TERRESTRIAL COMMUNITY TYPE	ACRES*	PERCENT OF TOTAL
Pine Flatwoods (hydric)	3.5	1.8%
Pine Flatwoods (mesic)	6.9	3.6%
Pine/Hardwood Forest	2.5	1.3%
Streamhead Pocosin (tree-dominated)	<0.1	<0.1%
Streamhead Pocosin (shrub dominated)	0.8	0.4%
Swamp Forest (along large streams)	0.2	0.1%
Swamp Forest (along small streams)	12.0	6.3%
Swamp Forest (in ponds)	3.5	1.9%
Small Pond	0	0%
Powerline Corridor (hydric)	0.6	0.3%
Powerline Corridor (mesic)	1.6	0.8%
Pine Plantation (hydric)	32.8	17.2%
Pine Plantation (mesic)	59.8	31.3%
Successional Ruderal Habitat	17.4	9.1%
Rural/Urban Modifications	49.3	25.8%
TOTAL	191.0	100%

NOTES: ***Impact quantities are based on the right-of-way limits of the Preferred Alternative.*** Direct impacts are projected to be less than those shown in the table.

TABLE 4.12.2
TERRESTRIAL COMMUNITY IMPACTS IN THE CROATAN NATIONAL FOREST

TERRESTRIAL COMMUNITY TYPE	ACRES [1, 2]	PERCENT OF TOTAL
Pine Flatwoods (hydric)	48.2	20.2%
Pine Flatwoods (mesic)	83.5	34.9%
Pine/Hardwood Forest	16.7	7.0%
Streamhead Pocosin (tree-dominated)	13.8	5.8%
Streamhead Pocosin (shrub dominated)	0.8	0.3%
Swamp Forest (along large streams)	10.1	4.2%
Swamp Forest (along small streams)	12.9	5.4%
Swamp Forest (in ponds)	19.7	8.3%
Small Pond	0.1	<0.1%
Powerline Corridor (hydric)	1.3	0.6%
Powerline Corridor (mesic)	5.5	2.3%
Pine Plantation (hydric)	5.6	2.4%
Pine Plantation (mesic)	9.4	3.9%
Successional/Ruderal Habitat	1.0	0.4%
Rural/Urban Modifications	10.3	4.3%
TOTAL	238.9	100%

NOTES:

1 ***Impact quantities are based on the right-of-way limits of the Preferred Alternative.*** Direct impacts are projected to be less than those shown in the table.

2 The NCDOT will pay the USFS, or their approved contractor, to measure to USFS specifications, the volume of timber on USFS land within the right-of-way limits. The NCDOT will then pay the USFS for the measured timber volume when easement for the right-of-way is granted. The USFS and NCDOT will determine the precise monetary value of the timber through appraisal at rates effective at the time of the timber sale contract.

4.12.1.2 Indirect Effects to Terrestrial Communities

Soil disturbance from construction may encourage the growth of non-native, invasive species, especially if they are already present in the area. Non-native invasive seeds or plant material may be deposited by construction equipment or regular traffic (von der Lippe and Kowarik, 2007), increasing the risk of invasive plants growing along the proposed bypass. Roadsides can provide linkage allowing the spread of invasives into formerly isolated areas of high-quality habitat (von der Lippe and Kowarik, 2007).

To minimize soil disturbance and the spread of invasive species, NCDOT has coordinated with the USFS on a landscaping plan for NFS lands, which is reflected in project commitments. The plan details appropriate native seed mixes for erosion control and site specific control methods for invasive species, including acceptable herbicides for the corridor. The Plan also outlines future coordination between NCDOT and USFS personnel to maintain vegetation diversity and ensure no long-term impacts to rare species along the project corridor.

4.12.2 Aquatic Communities

4.12.2.1 Direct Impacts to Aquatic Communities

Aquatic habitats within the project study area range from ephemeral waters present in intermittent, channelized, first-order streams - to perennial stream channels and flooded palustrine habitat. Characteristics of aquatic communities are presented in Chapter 3.13.2.

Aquatic wildlife may be temporarily impacted during the construction of bridges proposed for crossing streams. Most adverse effects should only be temporary if permanent impacts to stream channels are avoided. If bridge footings are kept out of waterways, effects are further reduced.

A portion of the Southwest Prong of Slocum Creek within the project study area is identified as anadromous fish spawning area; however, this reach does not extend into the Preferred Alternative alignment. No other anadromous fish habitat has been identified in the project corridors.

NCDOT has committed to an in-water work moratorium for February 15 to June 15 for East Prong Slocum Creek, Southwest Prong Slocum Creek, and Tucker Creek at the proposed extension of the existing culvert at US 70. Goodwin Creek and Tucker Creek upstream of the existing US 70 structures will not require a moratorium. No other streams are subject to the anadromous fish construction moratorium.

4.12.2.2 Indirect Effects to Aquatic Communities

Indirect effects of road crossing structures in waterways may displace aquatic organisms. This can be caused by channel scour downstream of bridge footings or culverts, or by aggradation, which can bury macroinvertebrates upstream of structures, particularly culverts (Wellman et al., 2000). Culverts may create flow depths and velocities that aquatic organisms cannot negotiate. Channel degradation and scour pools at the outlet of culverts may cause them to become "perched" over time, which prevents passage of aquatic organisms. Blocking movements of aquatic organisms may prevent access to feeding areas, refuge from predators, areas for spawning and breeding, and areas that remain inundated in dry periods; it also increases population isolation.

The level terrain and gently-sloping streams in the project study area would not contribute to creating high velocity flow, which helps to minimize the potential for soil loss and deposition. In addition, the bottoms of NCDOT culverts are typically buried to prevent perching from occurring. The use of sills in single barrel box culverts and high flow/low flow barrels in multiple barrel culverts can also help maintain adequate flow for the passage of organisms.

Changes to water temperature from tree removal, nutrient loading, and toxins from stormwater runoff could affect species distribution. Permanently inundated ditches may increase aquatic habitat for some organisms, but may increase their exposure to pollutants from highway runoff. Measures to control sediment and erosion during construction will be implemented to protect water quality for aquatic organisms. These measures are discussed in Chapter 4.13.

4.12.3 Wildlife Communities

In addition to direct impacts to habitat, as detailed in Chapter 4.12.1, construction of the proposed bypass will likely create other biotic impacts including loss of organisms due to construction and roadway mortality. Road mortality could adversely affect certain wildlife populations - especially small, isolated, declining populations, or those with low reproductive rates. Increased road mortality has been linked to increased highway speed (Case, 1978). In some cases, high traffic volumes can increase the barrier effect which, although increasing habitat fragmentation, decreases road mortality (Alexander et al., 2005).

4.12.3.1 Habitat Connectivity

Open habitat created along the roadside and the highway itself will affect the movements of organisms to varying degrees. Movements including migration, home-range movements for food and shelter, and the dispersal of young from their natal area could all be affected by the bypass, which could act as a barrier or filter to some species. The proposed control-of-access (exclusion) fencing along the roadway corridor would alter some current movement patterns and help minimize the number of large animals struck by vehicles, but

standard control-of-access fencing is not tall or sturdy enough to deter most large animals found in the area from climbing or jumping over.

Most of the mammals documented within the project study area are conspicuous large and medium-sized species that have wide habitat tolerances and commonly occur in anthropogenic landscapes. Highly mobile and wide-ranging species, such as black bears, are also susceptible to road mortality (Nicholson, 2009). Impacts to large mammals may include avoidance of the bypass and reduced passage through the bypass vicinity. Reptile and amphibian species documented in the project study area represent a range of species mostly with wide habitat tolerances and found across the southeastern United States. Most of the amphibian species require access to ephemeral, fish-free water for breeding. The construction of the project could restrict movements to and from such breeding areas. Movement of less agile species, such as turtles, may be hampered by roadside exclusion fencing. If erosion control matting containing plastic mesh is used, it has the potential to entangle turtles and snakes. As stated in the project commitments, NCDOT has committed to rolled matting or mulch for erosion control on NFS lands, which avoids this potential effect.

Fencing may direct animals toward the 945-foot long bridge at East Prong and 1,620-foot long bridge at Southwest Prong of Slocum Creek. Both bridges span their respective floodplains and provide safe wildlife passages under the proposed bypass. The bridge at the Southwest Prong of Slocum Creek extends over more than 650 feet of adjacent wetlands and offers a vertical clearance ranging from 4 to 10 feet. As such, the bridge offers considerable wildlife passage opportunities. These wildlife crossings would provide connectivity to NFS lands fragmented by the bypass near the southern and central portions of the project. The proposed culvert at the tributary to Tucker Creek will provide passage for small and medium-sized animals, as long as one culvert barrel remains dry. Although these crossings could also provide safe passage for hunters and their dogs, human activity can repel black bears (Clevenger and Waltho, 2000) and other human-sensitive species.

Isolation of populations caused by habitat conversion, habitat fragmentation, wildlife exclusion fencing and traffic reduces gene flow, leading to inbreeding and other deleterious effects, including a reduced ability to adapt/evolve to changing environmental conditions. Isolated populations are more subject to local extirpation due to fluctuating demographics or catastrophic environmental events (such as drought), since they cannot be bolstered or repopulated from other populations. These effects may be minimized at the two large bridge crossings, which will allow for wildlife passage beneath the bypass. Animal populations in other NFS lands to be fragmented by the bypass have an increased risk of becoming isolated if no wildlife crossings are provided.

4.12.3.2 Habitat Alteration

More edge habitat and open habitat would be created by construction of the Preferred Alternative. Habitat alteration increases the suitable habitat for various invasive species such as multiflora rose, Johnson grass, Chinese wisteria, Japanese honeysuckle, and mimosa, which thrive on edge habitats. Additionally, this could result in the local loss or displacement of organisms that require forest interior habitat. Organisms that prefer forest edges, are habitat generalists, or those that thrive in sunlight may increase in numbers. Sun-loving plants, such as grasses, asters and other early successional species may increase along the edges of the highway. Effects to small mammals may include reductions in some forest species, such as golden mice (*Ochrotomys nuttalli*), and increases in species that prefer open, grassy environments. Open space created along the bypass may act as a barrier to forest-dwelling species such as southern flying squirrels (*Glaucomys volans*) and some types of forest specialist salamanders (Hels and Buchwald, 2001).

Effects to bird species may include decreased bird density and diversity near the bypass and areas of secondary growth. Traffic noise can affect forest breeding birds, reducing their density near roads (Reijnen et al, 1995). There is likely to be a localized increase in nest parasitism of songbirds by cowbirds, which prefer edge habitat, causing reductions to forest interior species. Bird species documented in the project study area are typical of forested communities and disturbed areas of North Carolina. Some species are habitat-specific, being limited by narrow ecological requirements, while others have more-general habitat requirements. Studies indicate a correlation between hardwood wetland corridor width and density/diversity of interior neotropical migratory bird species. Corridors less than 100 meters (328 feet) are dominated by short-distance migrants while wider corridors had more species diversity. The number of species continued to increase as corridor widths increased, but increased more gradually in areas wider than 200 meters (656 feet). Research also indicates that average bird abundance increases in relation to wetland streamside widths (USFS, 2002).

Generalized effects to bird species may include changes in density and diversity near the proposed bypass and forest bird species may be adversely affected by habitat loss. Additional information and analysis for migratory birds was requested by the USFS for NFS lands within the direct and indirect impact areas under evaluation for the US 70 Havelock Bypass project as well as on the Croatan Wetland Mitigation Bank (CWMB). Chapter 3.15.4 includes descriptions of the regional USFWS Birds of Conservation Concern (BCCs). Chapter 4.14.4 includes a discussion of potential impacts to BCCs. This report is included in Appendix C.

Some small mammal species may be excluded by species that are better adapted to the road verge habitat (Goosem, 1997). Open habitat and wildlife exclusion fencing along the bypass will allow the growth of cover and forage and may increase overall small mammal richness and density (Adams and Geis, 1983). Some small mammal populations may be

able to extend their range using dense herbaceous growth along the edge of the highway (Getz et al, 1978).

If small mammal populations increase along the bypass, they may attract predators such as foxes and red-tailed hawks (*Buteo jamaicensis*). Predators along the roadside are vulnerable to being struck by vehicles. Amphibians and turtles attempting to move from terrestrial to aquatic habitat may also be struck. Road kill will attract scavengers such as crows, vultures and coyotes (*Canis latrans*).

Secondary growth along existing roads radiating west out of Havelock may further exacerbate fragmentation and isolation of populations; however, induced growth associated with the proposed bypass would be limited due to the project's full control-of-access and single interchange at SR 1756 (Lake Road).

4.12.3.3 Measures to Minimize Fragmentation and Alteration

As discussed in Chapter 2.10, the Preferred Alternative is the most practicable alternative for minimizing and mitigating habitat fragmentation effects because it is the best compromise between minimizing habitat fragmentation and allowing habitat management through prescribed burns. Conducting prescribed burns would help maintain the Pine Flatwoods (i.e., long-leaf pine savanna) natural community and its associated niche species, including RCWs.

To compensate for effects to federal lands, NCDOT offered the USFS the Croatan Wetland Mitigation Bank (CWMB) in Craven County, N.C. This property comprises approximately 4,035 acres and borders existing USFS property along a perimeter of 8.7 miles, filling in a substantial gap in NFS lands between the City of Havelock and the Sheep Ridge Wilderness Area. The property was purchased in 1998 in coordination with USFS personnel who recommended the site for acquisition. The CWMB is identified as an acquisition priority in the Croatan National Forest Land and Resource Management Plan (2002) to promote the Natural Resource Management Objective, described as "lands that would protect or promote the management of natural resources". The CWMB is discussed further in Chapter 4.12.4.

4.12.4 Protected Lands

4.12.4.1 Wild and Scenic Rivers

No stream that flows through the project study corridors is designated as a National Wild and Scenic River or a State Natural and Scenic River.

4.12.4.2 State/National Forests

As shown in Exhibit 3.3.1, the majority of land traversed by the Preferred Alternative is within the CNF (City of Havelock, 2009); these areas are designated as RCW habitat management areas (HMA) and hardwood-cypress wetland management areas. The proposed project would impact 240 acres of NFS lands within the CNF. There are no other State or National Forests in the project area. A highway easement deed from the USFS issued to the North Carolina Department of Transportation under the provisions of 23 U.S. C. Section 107 (d) and Section 317 will be required to provide the lands for the proposed project. Impacts to RCW populations are contained in Chapter 4.15.

4.12.4.3 Gamelands

In addition to the direct conversion of public gamelands within the CNF, the proposed bypass would alter access to CNF gamelands. To facilitate management of NFS lands, NCDOT will provide the USFS with 13 access points along the controlled access freeway, as an exception to normal Federal Highway Administration design standards for freeway facilities. This topic is discussed in detail in Chapter 4.1.3.

Impacts to Hunting Access – Because the proposed bypass is a freeway facility, 48-inch high right-of-way fence (with barbed wire) will be installed on both sides of the highway. This fence will act as a preventive barrier to inhibit hunting dogs (and hunters) from straying onto the highway. Hunters will not be allowed to pull-off or park on the sides of the freeway to access hunting areas and resultantly, the proposed bypass does in some areas lengthen the on-foot travel distance from nearby roads to hunting areas. At the two proposed bridge locations over the East Prong and Southwest Prong of Slocum Creek, dogs can travel underneath the bypass; hunters will have to plan accordingly.

In August 2014, NCDOT staff met with the CNF District Ranger and staff to discuss accessibility issues related to CNF management and recreational use. Subject to final FHWA approval, NCDOT agreed to provide CNF with 13 specific access points (with gates in the right-of-way fence) with driveways that extend from the freeway facility. It was specifically discussed that these access points will not serve hunters, and would be signed as "No Hunting Access" or similar.

It is noted that the CWMB offers over five miles of gravel road access though its interior that will facilitate future forest management and hunting access, and it provides road access to the shoreline of Long Lake, which the USFS currently does not have.

4.12.4.4 Preservation Areas

The Preferred Alternative would cross the Southwest Prong Flatwoods Natural Heritage Natural Area (NHA) and the Havelock Station Flatwoods and Powerline Corridor NHNA. Impacted quantities for these areas are included in impacts to NFS lands, detailed in

Chapter 4.12.1. The alignment of the Preferred Alternative was developed to avoid and minimize impacts to the Southwest Prong Flatwoods SNHA at the powerline crossing and by following the eastern boundary of the site to the maximum extent possible.

As noted in Chapter 3.13.3, these SNHAs host a large number of rare plant species, including the spring-flowering golden rod (*Solidago verna*) and mudbank crown grass (*Paspalum dissectum*). To mitigate impacts to the spring-flowering goldenrod, NCDOT began collecting seed in 2010 and will continue this effort up to construction. Mitigation will be through planting seeds at locations identified by the USFS. NCDOT will coordinate with the USFS prior to construction to distribute seeds on NFS lands where there is appropriate habitat but the species does not currently occur.

In addition to collecting spring-flowing goldenrod seeds, NCDOT began collecting seed from existing Leconte's thistle populations in 2013 and will coordinate with the USFS to develop a seed increase bed for augmentation in occupied or previously occupied habitat. Seed collection will continue through 2016. Mitigation will be through growing plugs from collected seeds then planting at locations identified by the USFS. NCDOT will also collect seed from existing awned mountain mint populations and coordinate with the USFS to identify sites to seed to establish new populations. Seed collection for awned mountain mint began in 2014 and will continue up to construction. Additional details will be developed as part of ongoing coordination with the USFS.

4.12.4.5 Croatan Wetland Mitigation Bank (CWMB)

Although the purpose and function of the 4,035-acre Croatan Wetland Mitigation Bank (CWMB) is to provide compensatory mitigation for the proposed project and other projects in the region, the location of the CWMB augments its benefits to include habitat connectivity to thousands of acres of black bear sanctuary and other natural areas within the CNF. As shown in Exhibit 4.15, it connects the CNF Sheep Ridge Wilderness Area with isolated NFS lands just west of Havelock. The conversion of this area from its former silvicultural use will help mitigate habitat alteration effects along the Preferred Alternative corridor by creating a substantial amount of wetland interior habitat to counter the amount of edge habitat created by the proposed project.

As discussed in Chapter 3.13.3, natural communities present within the CWMB, as described by Schafale and Wealkey (1990), include Bay Forest, Coastal Plain Small Stream Swamp, Nonriverine Swamp Forest, Nonriverine Wet Hardwood Forest, Mesic Pine Flatwoods, and Natural Lake Shoreline.

USFS Rare Species – Six USFS rare species potentially affected by the proposed project have been documented on the CWMB. These species are Florida Peatmoss, Loomis's Loosestrife,

Rafinesque's Big-eared Bat, Southeastern Myotis, Black-throated Green Warbler, and American Alligator. Bald Eagle has been observed on the CWMB, but nesting of this species has not been confirmed.

Management Indicator Species – In addition to providing the opportunity to expand the CNF, the CWMB provides potential habitat for all of the Forest's management Indicator Species. Little habitat exists in the project corridor for two Management Indicator Species: wild turkey and black bear. Substantially more habitat for both of these species exists at CWMB in the form of pocosin, oak gum cypress forest, pond pine woodland, and mature pine/hardwood forest. With the addition of the CWMB property, the CNF will realize a sizable gain in habitat for both species.

RCW and Longleaf Pine/Wiregrass Habitat Management – The Final Mitigation Plan for the CWMB (NCDOT, 2002) permits prescribed burning of "pine dominated stands". Implied in this allowance are the practices required to achieve such prescribed burning, such as the establishment of burn units and fire breaks. In addition, the mitigation plan states that "For pine-dominated natural communities, management may be used according to accepted methods for improving or restoring selected areas for RCW use." The Umbrella Mitigation Banking Instrument (UMBI) between NCDOT and the water resources agencies (2009) allows activities identified in the mitigation plan and in the 2002 Memorandum of Understanding (MOU) between NCDOT, USFS, and the U.S. Army Corps of Engineers (USACE). NCDOT is currently coordinating with the USACE and USFS to develop an updated MOU that will address the feasibility of managing the CWMB for RCW habitat.

Although the USFS has determined that the CNF will meet its obligations under the RCW Recovery Plan without requiring mitigation for the loss of RCW habitat, it is noted that the CWMB includes land that could potentially be managed to support RCW foraging and nesting habitat. The USFS notes that it would be impracticable to manage RCW habitat on the CWMB due to logistics (e.g., limited access to potential management areas, the need for more frequent burning on hydric soils to control denser understories, personnel time, and funding) and that it could take 30 to 60 years before any of the potential clusters could provide suitable nesting trees.

The practicality and logistics of management notwithstanding, NCDOT has identified areas within the CWMB that could potentially be managed as future RCW recruitment partitions, as identified in the RCW Management Plan for the CWMB (NCDOT, 2012). These potential recruitment partitions occur in portions of the property with pine habitats ranging in age from approximately 30 to 60 years, with inclusions of scattered mature longleaf pines. Some of these sites are close to other identified RCW territories on NFS lands (CNF 104, CNF 105, and CNF 176) and could be incorporated into RCW Subpopulation 2 as identified in the

Croatan National Forest RCW Management Plan (1992). Details regarding the management needs of each proposed RCW territory are provided in the RCW Management Plan for the CWMB (NCDOT, 2012). The full plan is included in Appendix C. Because the proposed Havelock Bypass does not eliminate any existing RCW territories, any clusters established at the CWMB would be in addition to those previously identified in the Recovery Plan.

Longleaf/wiregrass communities occur in the proposed highway corridor and throughout the CNF principally on Mesic and Wet Pine Flatwood sites with mineral soils. Areas of mineral soils occur on approximately 54% of the CWMB (NCDOT, 2012), though most have not been managed with prescribed fire for many years. Although there are logistical issues associated with developing a long term management plan for the CWMB, the land does offer opportunities to establish areas of mixed pine flatwoods communities with longleaf pine components. Any longleaf pine/wiregrass communities established at the CWMB would supplement those identified for restoration in the CNF Land and Resource Management Plan (2002).

4.13 WATER RESOURCES

4.13.1 Surface Waters

Twenty-five streams are present within the project study area, as detailed in Chapter 3.14.1. Principal streams [defined as named rivers and creeks depicted on the USGS 7.5 minute (1:24,000) topographic quadrangles] within the project study area include Tucker Creek, the Southwest Prong of Slocum Creek and the East Prong of Slocum Creek. These watercourses flow into Slocum Creek which is a tributary to the Neuse River.

These three streams drain from west to east and are crossed at relatively perpendicular angles by the proposed bypass. No stream channels are proposed to be relocated. Each of these stream crossings has been reviewed by the U.S. Army Corps of Engineers, the North Carolina Department of Environment and Natural Resources, Division of Water Quality, and the North Carolina Wildlife Resources Commission. The inter-agency NEPA/404 Merger Team has completed meetings and reached agreement for stream, riparian buffer, wetland, and surface water impacts addressed during Concurrence Point 4A (Avoidance and Minimization) and Concurrence Point 4B (Hydraulic Review).

Construction of the proposed project may impact water resources by one or more of the following processes: bridge construction, box culvert and/or pipe construction, and box culvert and pipe extension. Construction activities could alter and/or interrupt stream flows and water levels at each stream crossing. This type of disruption to a stream reduces stream

flow downstream of the project. Temporary diversions of water flow tend to raise the water level upstream from the project and lower the water level downstream of the project.

Project construction may result in the following impacts to surface waters:

- Increased sedimentation and siltation from construction and/or erosion.
- Alteration of water levels and flows due to interruptions and additions to surface and groundwater flow from construction.
- Changes in light incidence and water clarity due to increased sedimentation and vegetation removal.
- Changes in water temperature due to vegetation removal.
- Increased nutrient loading during construction via runoff from exposed areas.
- Increased concentration of toxic compounds from highway runoff, construction, toxic spills, and increased vehicular use.

Temporary construction impacts due to erosion and sedimentation will be minimized through implementation of a stringent erosion control schedule and use of best management practices. The contractor will be required to follow erosion control measures contained in NCDOT's *Standard Specifications for Roads and Structures* which are outlined in 23 CFR 650, Subpart B and Article 107-13): Control of Erosion, Siltation, and Pollution. These measures include:

- Use of dikes, berms, silt basins, and other containment measures to control runoff during construction. Regular maintenance and inspection of these structures to ensure effectiveness.
- Elimination of construction staging areas in floodplains or adjacent to streams and tributaries to help reduce the potential for petroleum contamination or discharges of other hazardous materials into receiving waters.
- Rapid reseeding of disturbed sites to help alleviate sediment loadings and reduce runoff. Partial mitigation of increased runoff from new highway surfaces by providing grassed road shoulders and limited use of ditching.
- Careful management and use of herbicides, pesticides, de-icing compounds, or other chemical constituents to minimize potential negative impacts on water quality. Roadside maintenance crews are well versed in the use of these chemicals.
- Avoidance of direct discharges into streams whenever feasible. Filtering runoff effluent through roadside vegetation in order to remove contaminants and to minimize runoff velocities.

No substantial adverse long-term impacts on water quality are anticipated as a result of the proposed bypass. Chapter 4.16 includes a water quality modeling analysis of future conditions after the proposed bypass is constructed. Discussion of physical impacts to jurisdictional streams and wetlands can be found in Chapter 4.14.

4.13.2 Proposed Major Drainage Structures

Table 4.13.1 indicates the proposed structure type and recommended size of the structure at each of the major creek crossings along the Preferred Alternative. The tributary to Tucker Creek will be crossed with a double 10-foot by 8-foot reinforced concrete box culvert (RCBC) that is 400 feet in length - perpendicular to the proposed roadway. The recommended bridge lengths for the Preferred Alternative include a 945-foot bridge at the Southwest Prong of Slocum Creek (identified as S10 in Table 3.15.1) and 1,620-foot bridge at the East Prong of Slocum Creek (identified as S1 in Table 3.15.1).

TABLE 4.13.1
PROPOSED DRAINAGE CROSSINGS FOR THE PREFERRED ALTERNATIVE

CROSSING	STRUCTURE TYPE	PRELIMINARY ESTIMATED SIZE
Tucker Creek Tributary	RCBC	2 @ 10 ft x 8 ft x 400 ft
Southwest Prong of Slocum Creek	Dual Bridges	945 ft
East Prong of Slocum Creek	Dual Bridges	1,620 ft
Tucker Creek	RCBC	Extend existing 25 ft and 78 ft

Note: The recommended structure types and bridge lengths were determined in consultation with the NEPA/404 Merger Team (see Appendix E). Sizes beyond the hydraulic minimum are based on field determinations to minimize wetlands impacts and allow wildlife crossings.

It should be noted that these bridge lengths far exceed the hydraulically-recommended minimum length, in order to minimize wetland impacts and to allow and encourage wildlife crossings under the bridges. The existing triple RCBC on Tucker Creek near US 70 will be retained and extended approximately 25 feet upstream and 78 feet downstream. Design of these structures will adhere to *Stream Crossing Guidelines for Anadromous Fish Passage* (NCDOT, 2012).

4.13.3 Floodplains and Floodways

The Preferred Alternative would encroach on the 100-year floodplains of Tucker Creek, the Southwest Prong Slocum Creek, and the East Prong Slocum Creek. The areas of floodplain encroachment within the proposed right-of-way were determined using data from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. The NCDOT Hydraulics Unit will coordinate with the N.C. Floodplain Mapping Program (FMP), to determine the status of the project with regard to applicability of NCDOT's Memorandum of Agreement, or approval of a Conditional Letter of Map Revision (CLOMR) and subsequent final Letter of Map Revision (LOMR). Table 4.13.2 summarizes the approximate area of 100-year floodplain encroachment at each crossing.

TABLE 4.13.2
ESTIMATED 100-YEAR FLOODPLAIN ENCROACHMENTS

FLOODPLAIN CROSSING (PREFERRED ALTERNATIVE)	ACRES
Tucker Creek	1.2 (0.5)*
Southwest Prong of Slocum Creek	5.0 (5.0)*
East Prong of Slocum Creek	4.1 (3.3)*
Less Bridged Areas	< 8.6 >
Total Floodplain Impacts	1.6

* (Acres within Croatan National Forest)

4.13.4 Stormwater

Both long and short-term water quality impacts can result from highway construction projects. Associated long-term impacts include increased impervious surface runoff and pollutants entering the streams with stormwater runoff. A decrease in water quality can occur due to highway runoff containing hydrocarbons, toxic substances, debris, and other pollutants associated with impervious surfaces. Increased runoff can also increase stream channel erosion and downstream sedimentation, though the existing low gradients decrease this danger. More important than the actual amount of runoff, however, may be the proximity of such runoff to designated public trust areas and areas of environmental concern. The closer those sources of impervious runoff occur, the less time for amelioration of effects of detrimental components in the runoff. Short-term impacts to the water quality associated with a construction project can include siltation and erosion.

Macroinvertebrates and fish can develop elevated levels of metals in their tissues, which may be locally related to the amount of traffic at upstream highway crossings (Van Hassel et al. 1980). The effect is likely to be greatest where small streams receive runoff from large stretches of highway (Maltby et al. 1995). Polycyclic aromatic hydrocarbons, derived from gasoline and oil, may not be acutely toxic to macroinvertebrates, but could cause long-term genetic damage, depending on the concentration (Levine et al. 2007).

Many of these contaminants will tend to adsorb or chemically bond to sediment particles. Therefore, if sediments can be removed from runoff before entering surface waters, transport of these contaminants is minimized. Mechanisms for performing such functions include settling basins, strips of vegetation along the roadway or vegetated drainage swales (as opposed to ditches), and other erosion and sediment control measures, many of which are included in the NCDOT *Best Management Practices for the Protection of Surface Waters* (NCDOT, 1997) and the *NCDOT Stormwater Best Management Practices Toolbox* (NCDOT, 2014). Moreover, appropriate planning and construction using the NCDOT *Best Management Practices for the Protection of Surface Waters* will manage local runoff so no substantial adverse effects are incurred.

The proposed project would require a State Stormwater Permit and an Erosion and Sediment Control Plan (15A NCAC 2H .1000). Among other criteria, the conditions of the permit require the minimization of impervious surface and the use of BMPs to minimize water quality impacts.

4.13.5 Groundwater/Wells

The Castle-Hayne Aquia aquifer is the groundwater source in the project study area. There are no expected or anticipated impacts to the Castle-Hayne Aquia aquifer as a result of construction of the Preferred Alternative. Construction will have limited excavation and no alteration of groundwater flow is anticipated.

No public wells will be impacted by the construction of the proposed bypass. However, the Preferred Alternative passes through areas served by private wells and septic systems and may impact well and septic systems associated with the three residential relocations within the Greenfield Mobile Estates near the proposed grade-separated crossing of SR 1747 (Sunset Drive).

4.14 JURISDICTIONAL ISSUES

4.14.1 Wetland and Surface Water Impacts

The Preferred Alternative crosses streams and wetlands considered to be jurisdictional under Section 404 of the Clean Water Act. Tables 4.14.1 and 4.14.2 summarize impacts to jurisdictional streams and wetlands located within the construction limits of the Preferred Alternative. ***Areas for NFS lands are presented separately in Table 4.14.3.***

The impacts presented for the Preferred Alternative are based on current minimization measures and calculated using preliminary design construction limits plus an additional 25 feet either side in accordance with NCDOT impact analysis guidelines. Actual impacts may be less than those shown once final design is completed.

4.14.2 Wetland and Stream Mitigation

Through the Section 404 permit program, USACE has enforced a national wetland policy that embraces the concepts of "no net loss of wetlands" and mitigation sequencing. The purpose of this policy is to restore and maintain the chemical, biological, and physical integrity of waters of the United States, specifically, wetlands. Mitigation of jurisdictional area impacts has been defined by the CEQ to include avoiding impacts, minimizing impacts, and compensating for impacts (40 CFR 1508.20). These three aspects (avoidance, minimization, and compensatory mitigation) must be considered sequentially.

TABLE 4.14.1
JURISDICTIONAL STREAM IMPACTS FOR THE PREFERRED ALTERNATIVE

STREAM NO.	STREAM NAME	IMPACT (FEET)
S1	East Prong Slocum Creek	---
S2	UT to East Prong Slocum Creek	---
S3a	UT to SW Prong Slocum Creek	---
S3b	UT to SW Prong Slocum Creek	---
S3c	UT to SW Prong Slocum Creek	---
S3d	UT to SW Prong Slocum Creek	---
S4	UT to SW Prong Slocum Creek	---
S5	UT to SW Prong Slocum Creek	---
S6	UT to SW Prong Slocum Creek	575
S7	UT to SW Prong Slocum Creek	473
S9*	UT to SW Prong Slocum Creek	593
10	Southwest Prong Slocum Creek	---
S11	UT to SW Prong Slocum Creek	---
S12	Southwest Prong Slocum Creek	---
S13	Black Swamp	---
S14a	UT to SW Prong Slocum Creek	---
S14b	UT to SW Prong Slocum Creek	---
S15	Black Swamp	---
S16a	UT to SW Prong Slocum Creek	---
S16b	UT to SW Prong Slocum Creek	---
S17	Southwest Prong Slocum Creek	---
S18a	UT to SW Prong Slocum Creek	---
S18b	UT to SW Prong Slocum Creek	---
S19a*	UT to SW Prong Slocum Creek	212
S19b*	UT to SW Prong Slocum Creek	128
S20a	UT to SW Prong Slocum Creek	34
S20b	UT to SW Prong Slocum Creek	32
S21	UT to Black Swamp	---
S22*	UT to Tucker Creek	662
S23*	Tucker Creek	229
S24	UT to Tucker Creek	---
S25	UT to Tucker Creek	---
S26	UT to Tucker Creek	---
S27	UT to Tucker Creek	---
S28	UT to Tucker Creek	---
S29	UT to Goodwin Creek	---
S30a	Tucker Creek	---
S30b	Tucker Creek	---
S30c	Tucker Creek	---
	TOTAL STREAM IMPACTS	**2,938**

NOTES: Impacted streams on NFS lands are denoted with asterisks. Impact calculations based on slope stake limits plus an additional 25 feet to each side.

Avoidance examines all appropriate and practicable possibilities for averting impacts to waters of the United States. According to a 1990 Memorandum of Agreement (MOA) between the USEPA and the USACE, in determining "appropriate and practicable" measures to offset unavoidable impacts, such measures should be appropriate to the scope and degree of those impacts and practicable in terms of cost, existing technology, and logistics in light of overall project purposes. Certain unavoidable impacts to

jurisdictional areas are expected because of the nature of the project; however use of appropriate BMPs per NCDOT's *Best Management Practices for Protection of Surface Waters* and *Design Standards for Sensitive Watersheds* will be utilized to avoid as many wetland impacts as practicable. Avoidance of jurisdictional resource impacts played a major factor in the decisions related to the development of the detailed study alternatives. Alignments of highway on new location were located with particular care to avoid aquatic resources to the extent practicable.

Minimization includes the examination of appropriate and practicable steps to reduce adverse impacts to waters of the United States. Partial minimization has already occurred and has been approved by the project's NEPA/404 Merger Team as documented by the Concurrence Point 4A form, contained in Appendix E. Minimization typically focuses on decreasing the footprint of the proposed project through the reduction of median widths, right-of-way widths, fill slopes, and/or road shoulder widths and will continue through the final design stage to the extent practicable.

The NEPA/404 Merger Team revisited Concurrence Point 4A (Avoidance and Minimization), on August 20, 2014 and reached agreement on avoidance and minimization measures, some of those originally identified on the 2001 CP4 signature form (DEIS Appendix B).
The updated CP4A signature form is contained in FEIS Appendix E. These measures include:

1) No new ditching in wetlands with inverts below existing wetland elevations Relocated ditches shall match existing ditch elevations
2) Forty-six (46) foot median (original CP4A 1/18/01)
3) Bridge structures as listed below (reaffirmed CP3 4/10/12):
    - Tributary of Tucker Creek – Double Box Culvert at 10 'x 8 ' x 400'
    - Southwest Prong of Slocum Creek – 925-foot Bridge (now 945-foot)
    - East Prong of Slocum Creek – 1,618-foot Bridge (now 1,620-foot)
    - Tucker Creek – retain and extend existing triple 9'x 7' box culvert approximately 25 feet upstream and 78 feet downstream.

In 2013, NCDOT completed additional design studies to reduce the proposed roadway cross section to result in a 200-foot cleared width for a distance of 5,500 feet along the Preferred Alternative. Although the right-of-way width was refined primarily for the purposes of maintaining RCW habitat, this reduction contributed to a reduction in wetland impacts as well. Combined with on-going design changes since 2011, an approximate total of 9 acres of wetland impacts have been further avoided.

TABLE 4.14.2
JURISDICTIONAL WETLAND IMPACTS FOR THE PREFERRED ALTERNATIVE

WETLAND NUMBER	DWQ RATING	RIPARIAN OR NON-RIPARIAN	IMPACT (AC)	WETLAND NUMBER	DWQ RATING	RIPARIAN STATUS	IMPACT (AC)
W1*	26	Non-riparian	6.56	**W47***	66	Non-riparian	0.12
W2*	24	Non-riparian	34.41	**W48***	51	Non-riparian	0.36
W3*	24	Non-riparian	1.76	**W49***	51	Non-riparian	0.14
W4*	24	Non-riparian	---	**W50***	51	Non-riparian	2.87
W5*	24	Non-riparian	---	**W51***	35	Non-riparian	0.004
W6*	24	Non-riparian	6.21	**W52**	15	Non-riparian	---
W7*	45	Non-riparian, Riparian	21.09	**W53**	40	Non-riparian	---
W8*	20	Non-riparian	2.89	**W54**	85	Non-riparian	---
W9	20	Riparian	14.44	**W55**	40	Non-riparian	---
W10	19	Riparian, Non-riparian	2.14	**W56**	18	Non-riparian	---
W11	10	Non-riparian	---	**W57**	18	Non-riparian	---
W12	18	Riparian	0.01	**W58**	41	Non-riparian	---
W13*	78	Riparian	1.82	**W59**	63	Non-riparian	---
W14	31	Non-riparian	---	**W60**	14	Non-riparian	---
W15	22	Non-riparian	---	**W61**	14	Non-riparian	---
W16	22	Non-riparian	---	**W62**	38	Non-riparian	1.10
W17	12	Non-riparian	---	**W63**	21	Non-riparian	---
W18	40	Riparian	---	**W64**	21	Non-riparian	---
W19	26	Riparian	---	**W65**	26	Non-riparian	0.05
W20	21	Riparian	---	**W66**	16	Non-riparian	0.19
W21	21	Riparian	---	**W67***	23	Non-riparian	10.28
W22	26	Riparian	---	**W68**	23	Non-riparian	---
W23	13	Non-riparian	---	**W69**	23	Non-riparian	4.78
W24	28	Riparian	---	**W70***	75	Non-riparian	0.88
W25	50	Non-riparian	---	**W71**	75	Non-riparian	---
W26	8	Non-riparian	---	**W72**	75	Non-riparian	---
W27	89	Riparian	---	**W73**	75	Non-riparian	---
W28	10	Non-riparian	---	**W74***	75	Non-riparian	---
W29	26	Riparian	---	**W75**	75	Riparian	---
W30	26	Non-riparian	---	**W76***	75	Riparian	0.01
W31	8	Non-riparian	---	**W77***	75	Riparian	3.34
W32	60	Non-riparian	---	**W78**	75	Non-riparian	---
W33	49	Riparian	---	**W79**	75	Non-riparian	---
W34	58	Riparian	---	**W80**	75	Non-riparian	---
W35	45	Non-riparian	---	**W81**	75	Non-riparian	---
W36*	90	Riparian	1.45	**W82**	75	Non-riparian	---
W37	78	Riparian	0.05	**W83***	75	Non-riparian	7.03
W38*	26	Riparian	0.11	**W84**	45	Riparian	---
W39	26	Non-riparian	---	**W85**	45	Non-riparian	---
W40	26	Non-riparian	---	**W86**	6	Non-riparian	---
W41*	26	Riparian	0.40	**W87**	53	Riparian	---
W42	51	Non-riparian	3.20	**W88**	49	Riparian	---
W43	51	Non-riparian	---	**W89**	33	Non-riparian	---
W44	51	Non-riparian	0.72	**W90***	27	Non-riparian	1.56
W45	51	Non-riparian	0.96	**W91**	53	Riparian	---
W46	38	Non-riparian	---			**TOTAL WETLAND IMPACTS**	**130.93**

NOTES: Impacted wetlands on NFS lands are denoted with asterisks. Impact calculations based on slope stake limits plus an additional 25 feet to each side.

TABLE 4.14.3
SUMMARY OF IMPACTS TO JURISDICTIONAL STREAMS AND WETLANDS – NFS LANDS

	IMPACT
Stream Impacts (linear feet)	1,825 linear feet
Wetland Impacts (acres)	93 acres

Compensatory mitigation is normally not considered until it has been demonstrated that anticipated impacts to waters of the United States have been avoided or minimized to the maximum extent practicable. It is recognized that functions and values may not be achieved in each and every permit action as part of the "no net loss of wetlands" policy. In accordance with 15A NCAC 2H .0506(h), NCDENR DWQ may require compensatory mitigation for projects with greater than or equal to 0.1 acre of impacts to jurisdictional wetlands or greater than or equal to 150 linear feet of total stream impacts. Furthermore, in accordance with 67 FR 2020, 2092; (January 15, 2002), the USACE requires compensatory mitigation when necessary to ensure that adverse effects to the aquatic environment are minimal. The size and type of the proposed project impact and the function and value of the impacted aquatic resource are factors considered in determining acceptability of appropriate and practicable compensatory mitigation. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts that remain after all avoidance and minimization opportunities have been implemented.

Compensatory actions often include restoration, preservation, enhancement, and creation of streams, wetlands, and waters of the United States. Restoration involves the reestablishment of natural/historic functions of a stream or wetland. Preservation involves the purchase of land or conservation easements that prevent impacts to water resources in the future. Enhancement improves the functions of degraded streams and wetlands. Wetland creation is defined as the creation of a wetland on a site that was historically not a wetland. Typically, a wetland is created by excavation of upland soils in order to establish wetland hydrology that will support the growth of wetland vegetation. Compensatory actions should reasonably be undertaken first in areas adjacent to or contiguous to the impacted site.

Temporary impacts to jurisdictional areas associated with construction activities can be mitigated by removing temporary fill material upon project completion and replanting disturbed areas with native vegetation.

As alternatives were developed for the proposed project, the project team realized that impact mitigation would comprise a necessary component. Avoidance and minimization strategies were first employed during preliminary and detailed alternative study; however as impacts then began to crystallize, appropriate discussions of potential mitigation also

occurred. Therefore, mitigation opportunities and strategies were developed concurrent with alternative studies. The following paragraphs discuss the compensatory mitigation opportunities developed for the proposed project. On-site mitigation strategies will be evaluated by NCDOT and documented in the Record of Decision (ROD).

Croatan Wetland Mitigation Bank (CWMB)

The NCDOT purchased the CWMB, an approximate 4,035-acre tract of land approximately 3.6 miles northwest of Havelock in Craven County, with the purpose, in part, of restoring, enhancing, and preserving riverine and nonriverine wetland systems and their functions and values to compensate for unavoidable stream and wetland impacts associated with the proposed US 70 Havelock Bypass and other projects in the region separately authorized under Section 404 of the Clean Water Act. The parcel is contiguous to the CNF Sheep Ridge Wilderness area to the west and other NFS lands to the east, as shown in Exhibit 4.14.1. Table 4.14.4 contains a summary of the mitigation treatments developed at the CWMB. Table 4.14.5 shows the available mitigation credits of the CWMB.

TABLE 4.14.4
CROATAN WETLAND MITIGATION BANK COMPONENTS

		ACRES
Non-riverine Wetlands	Restoration	1,308.52
	Enhancement	1,514.37
	Preservation	264.02
Riverine Wetlands *	Restoration	176.28*
	Enhancement	561.03*
	Preservation	134.78*
	Total Acres	**4,034.60**
		LINEAR FEET
Riparian Headwater Stream	Restoration	14,187.49
	Enhancement	37,143.61
	Preservation	9,652.90
	Total Linear Feet	**60,984.00**

SOURCE: Croatan Wetland Mitigation Bank Addendum to the Umbrella Mitigation Bank Instrument (UMBI), 2009.

TABLE 4.14.5
CROATAN WETLAND MITIGATION BANK
STREAM AND WETLAND CREDITS

	TOTAL CREDITS
Non-riverine Wetlands	**2,030.63**
Riverine Wetlands	**372.07**
Riparian Headwater System	**34,689.88**

SOURCES: Croatan Wetland Mitigation Bank Addendum to the Umbrella Mitigation Bank Instrument (UMBI), 2009. Email communication with Beth Harmon, NCDENR Ecosystem Enhancement Program, February 12, 2013.
NOTES: Approximately 140.00 acres of riverine wetlands (32.57 acres restoration, 85.27 acres enhancement, and 22.16 acres preservation are classified as Riparian Headwater System stream mitigation. Other parts of the CWMB include 46.00 acres of non-restorable area and 29.60 acres of non-hydric soils.

US 70, Havelock Bypass

Craven County, North Carolina

STIP No. R-1015

Croatan Wetland
Mitigation Bank
Scale: 1" = 1 mile
Exhibit 4.14.1

This page intentionally left blank to facilitate double-sided printing.

As a condition of the 2003 Mitigation Banking Instrument (MBI) entered into by NCDOT, USACE, USEPA, USFWS, NMFS, NCWRC, NCDCM, and NCDWQ, the CWMB title will ultimately be conveyed to the USFS. Prior to conveying the site to the USFS, the USACE, NCDOT, and USFS will execute a Memorandum of Understanding (MOU) concerning the disposition and long-term management of the CWMB. The MOU will identify NCDOT as being responsible for the mitigation success of the site and will include the requirement that the USFS allow for the long-term maintenance and preservation of CWMB wetland mitigation components in perpetuity. The MOU's intention is to allow the other lands within the CWMB to be managed according to the *Croatan National Forest Land and Resource Management Plan* (Forest Plan) (USFS, 2002). Maintenance of roadways, culverts, habitat, and forest stands for fire risk will occur as prescribed by the Forest Plan.

4.14.3 Buffer Areas

Table 4.14.6 presents the Neuse River riparian buffer impacts for the Preferred Alternative. The calculations are based on the stream segments within the construction limits plus an additional 25 feet on each side. The tables indicate Zone 1 and Zone 2 buffer impacts for each individual stream.

TABLE 4.14.6
RIPARIAN BUFFER IMPACTS FOR THE PREFERRED ALTERNATIVE

STREAM NO.	STREAM NAME	IMPACT (Linear Feet)	BUFFER IMPACT (sq ft) (zone 1 / zone 2)
S1	East Prong Slocum Creek	---	---
S2	UT to East Prong Slocum Creek	---	---
S3a	UT to SW Prong Slocum Creek	---	---
S3b	UT to SW Prong Slocum Creek	---	---
S3c	UT to SW Prong Slocum Creek	---	---
S3d	UT to SW Prong Slocum Creek	---	---
S4	UT to SW Prong Slocum Creek	---	---
S5	UT to SW Prong Slocum Creek	---	---
S6	UT to SW Prong Slocum Creek	575	34,765 / 23,172
S7	UT to SW Prong Slocum Creek	482	28,898 / 18,832
S9	UT to SW Prong Slocum Creek	593	---
S10	Southwest Prong Slocum Creek	---	---
S11	UT to SW Prong Slocum Creek	---	---
S12	Southwest Prong Slocum Creek	---	---
S13	Black Swamp	---	---
S14a	UT to SW Prong Slocum Creek	---	---
S14b	UT to SW Prong Slocum Creek	---	---
S15	Black Swamp	---	---
S16a	UT to SW Prong Slocum Creek	---	---
S16b	UT to SW Prong Slocum Creek	---	---
S17	Southwest Prong Slocum Creek	---	---
S18a	UT to SW Prong Slocum Creek	---	---
S18b	UT to SW Prong Slocum Creek	---	---
S19a	UT to SW Prong Slocum Creek	212	11,852 / 7,635
S19b	UT to SW Prong Slocum Creek	129	7,466 / 4,218

TABLE 4.14.6 cont.
RIPARIAN BUFFER IMPACTS FOR THE PREFERRED ALTERNATIVE

STREAM NO.	STREAM NAME	IMPACT (Linear Feet)	BUFFER IMPACT (sq ft) (zone 1 / zone 2)
S20a	UT to SW Prong Slocum Creek	34	1,806 / 1,185
S20b	UT to SW Prong Slocum Creek	32	2,050 / 1,429
S21	UT to Black Swamp	---	---
S22/23	UT to Tucker Creek/Tucker Creek	891	35,566 / 21,670
S24	UT to Tucker Creek	---	---
S25	UT to Tucker Creek	---	---
S26	UT to Tucker Creek	---	---
S27	UT to Tucker Creek	---	---
S28	UT to Tucker Creek	---	---
S29	UT to Goodwin Creek	---	---
S30a	Tucker Creek	---	---
S30b	Tucker Creek	---	---
S30c	Tucker Creek	---	---
		Zone 1 / Zone 2 Totals	***129,402 / 81,142***
		Total Riparian Buffer Impacts	***200,544***

NOTES: Calculated based on slope stake limits plus an additional 25 feet to each side. Impacts for S22 and S23 are combined because the buffer zones for each stream overlap each other.

4.14.4 Protected Species

All protected species surveys and evaluations within the project corridors were conducted by Environmental Services, Inc. with the exception of the surveys and evaluations for the red-cockaded woodpecker and the bald eagle which were prepared by Dr. J. H. Carter III & Associates (JCA), Inc., and the northern long-eared bat which was conducted by NCDOT. Table 4.14.7 lists the protected species for Craven and Carteret Counties. Detailed analysis of potential impacts to RCWs is contained in Chapter 4.14.4.1.

4.14.4.1 Section 7 of the Endangered Species Act

Species with the federal classification of Endangered (E), Threatened (T), or officially Proposed (P) for such listing, are protected under Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543). Species listed as Threatened due to Similarity of Appearance [T(S/A)] are not subject to Section 7 consultation. The following federal protected species are listed for the project study area for Craven County as of May 2014 and Carteret County as of September 2014. Biological conclusions for each protected species are contained in the following paragraphs. The USFWS concurred with the biological conclusion for the red-cockaded woodpecker (RCW) in a letter dated November 19, 2013, contained in Appendix C.

Atlantic sturgeon (*Acipenser oxyrinchus brevirostrum*) – E (Date Listed: 6 April 2012)
Streams crossed by the project study area are too small and shallow to support suitable habitat for the Atlantic sturgeon. In addition, these channels each contain culverts, beaver dams and/or other passage impediments downstream of the project study area which may

preclude the movement of this species upstream into the project study area. North Carolina Natural Heritage Program (NCNHP) records do not document any occurrences of this species within three miles of the project study area. This project will not affect Atlantic sturgeon.

Biological Conclusion: No Effect.

TABLE 4.14.8
FEDERALLY-PROTECTED SPECIES IN CRAVEN AND CARTERET COUNTIES

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS[1]	COUNTY PRESENT[2]	BIOLOGICAL CONCLUSION
Atlantic sturgeon	*Acipenser oxyrinchus oxy rinchus*	E	Cr	No Effect
Shortnose sturgeon	*Acipenser brevirostrum*	E	Ca	No Effect
American alligator	*Alligator mississippiensis*	T(S/A)	Cr, Ca	Not Required
Loggerhead sea turtle	*Caretta caretta*	T	Ca	No Effect
Green sea turtle	*Chelonia mydas*	T	Ca	No Effect
Leatherback sea turtle	*Dermochelys coriacea*	E	Cr, Ca	No Effect
Hawksbill sea turtle	*Eretmochelys imbricate*	E	Ca	No Effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	Ca	No Effect
Piping plover	*Charadrius melodus*	T	Ca	No Effect
Red-cockaded woodpecker	*Picoides borealis*	E	Cr, Ca	May Affect, Not Likely to Adversely Affect
Rufa red knot	*Calidris canutus rufa*	T	Cr, Ca	No Effect
Roseate tern	*Sterna dougallii dougallii*	T	Ca	No Effect
Bald Eagle	*Haliaeetus leucocephalus*	NA[3]	Cr, Ca	NA[3]
Northern long-eared bat	*Myotis septentrionalis*	T[4]	Ca, Cr	No Effect
West Indian manatee	*Trichechus manatus*	E	Cr, Ca	No Effect
Sensitive jointvetch	*Aeschynomene virginica*	T	Cr	No Effect
Seabeach amaranth	*Amaranthus pumilus*	T	Ca	No Effect
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Cr, Ca	No Effect

SOURCE: USFWS County List Updates: Craven – September 2014; Carteret – January 2014

NOTES:
1 E - Endangered; T- Threatened; T(S/A) - Threatened due to Similarity of Appearance
2 Cr - Craven County, Ca - Carteret County
3 N/A=not applicable. The bald eagle was removed from the federal list of Threatened and Endangered species on August 8, 2007. However, the species is still afforded protection under the Migratory Bird Species Act and the Bald and Golden Eagle Protection Act. A Biological Conclusion is not required under Endangered Species Act Section 7 provisions.
4 Based on acoustic evidence.

Shortnose sturgeon (*Acipenser brevirostrum*) – E (Date Listed: 11 March 1967)

Streams crossed by the project study area are too small and shallow to support suitable habitat for the shortnose sturgeon. In addition, these channels each contain culverts, beaver dams and/or other passage impediments downstream of the project study area which may preclude the movement of this species upstream into the project study area. North Carolina Natural Heritage Program (NCNHP) records do not document any

occurrences of this species within three miles of the project study area. This project will not affect shortnose sturgeon.

Biological Conclusion: **No Effect.**

American alligator (*Alligator mississippiensis*) – T S/A (Date Listed: 11 March 1967)

Species listed as Threatened due to Similarity of Appearance [T(S/A)] are not subject to Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS). Southwest Prong Slocum Creek, Black Swamp, and East Prong Slocum Creek all support suitable habitat for the American alligator. Southwest Prong Slocum Creek and East Prong Slocum Creek are crossed by all three corridors and Black Swamp is only crossed by the study corridor for Alternative 1. The use of bridges at these corridor crossings would negate any long-term effects to the habitat for this species. Individuals temporarily displaced during construction would likely return to these areas after construction is completed. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area; however, this species has been documented by the biologists at Environmental Services, Inc. as relatively common on the CWMB and in Long Lake both within three miles of the project study area. No long-term effects to American alligator are anticipated.

Biological Conclusion: **Not Required.**

Sea Turtles

Loggerhead sea turtle (*Caretta caretta)* –T (Date Listed: 28 July 1978)
Green sea turtle (*Chelonia mydas*) – T (Date Listed: 28 July 1978)
Leatherback sea turtle (*Dermochelys coriacea*) – E (Date Listed: 2 June 1970)
Hawksbill sea turtle (*Eretmochelys imbricata)* – E (Date Listed: 2 June 1970)
Kemp's ridley sea turtle (*Lepidochelys kempii)* – E (Date Listed: 2 December 1970)

Habitat for these five sea turtles is not present in the project study area. The project study area lacks oceanfront sandy beaches that would provide nesting habitat or marine or estuarine aquatic habitats that would provide foraging opportunities. North Carolina Natural Heritage Program records do not document any occurrences of any of these five sea turtle species within three miles of the project study area. The proposed project will not have an effect on sea turtles due to the lack of suitable nesting and foraging habitat for these species.

Biological Conclusion: **No Effect.**

Piping Plover (*Charadrius melodus*) – T (Date Listed: 11 December 1985)

Suitable habitat for piping plover is not present within the project study area. No beaches, sand flats or similar habitats area present within the project study area. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area. This project will not affect the piping plover.

Biological Conclusion: **No Effect.**

Red-cockaded woodpecker (RCW) (*Picoides borealis*) – E (Date Listed: 13 October 1970)
Potential impacts to RCW clusters were evaluated in a Biological Assessment (BA) (NCDOT, 2013) and a RCW Territory Analysis (NCDOT, August 2014), prepared by NCDOT at the USFS's request to assess impacts to RCW territory on NFS lands. The BA surveys and analysis results are summarized in Chapter 4.14.4.2. The full BA and RCW territory analysis are included in Appendix C.

No RCW cavity trees will be "taken" by the Havelock Bypass project and the design will not come within 200 feet of any known RCW cavity trees. The Preferred Alternative will remove 104.96 acres of RCW foraging habitat associated with one active RCW cluster (CNF 901), four inactive clusters (CNF 12-44R, 144, 58 and 902) and four HMAs (168, 169, 170 and 186), plus an additional 112.15 acres of forested habitat located on the CNF outside of the foraging partitions and HMAs (NCDOT, 2013).

Construction of the Preferred Alternative would not prohibit the USFS from managing within the individual territories for active clusters or recruitment clusters (NCDOT, 2014). Implementation of the Croatan National Forest RCW Recovery Plan will not be significantly affected by the proposed highway project. The USFS reviewed the BA and RCW Territory Analysis, and determined that the CNF will meet its obligations under the RCW Recovery Plan without requiring mitigation for the loss of RCW habitat.

In a letter dated November 19, 2013, the USFWS stated that the BA adequately addressed potential effects to the RCW and that the USFWS concurred with the biological conclusion that the proposed project may affect, but is not likely to adversely affect the red-cockaded woodpecker. The letter also indicated that USFWS concurrence is also based, in part, on the reduced clearing width through RCW habitat (as described in Chapter 2.10.3) and NCDOT's agreement to allow periodic closures of the Preferred Alternative in order for CNF staff to conduct prescribed burns as management for the RCW.
Biological Conclusion: May Affect Not Likely to Adversely Affect.

Rufa red knot (*Calidris canutus rufa*) – T (Date Listed: January 12, 2015)
Suitable habitat for this species does not exist within the study area. The study area does not include ocean beach or other open sand habitats that provide suitable habitat for this species. A review of NCNHP records indicates no known red knot occurrence within 1.0 mile of the study area.
Biological Conclusion: No Effect.

Roseate tern (*Sterna dougallil dougallii*) – T (Date Listed: 2 November 1987)
The coastal fringe habitats typically occupied by the roseate tern for either foraging or nesting do not occur in the project study area. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area. This project will have no effect on the roseate tern.
Biological Conclusion: No Effect.

Bald Eagle (*Haliaeetus leucocephalus*) – (Delisted as Threatened Species 28 June 2007)
The bald eagle was removed from the USFWS list of Threatened and Endangered species in 2007 and is not subject to the provisions of Section 7 of the ESA. However, the species is still afforded protection under the Migratory Bird Species Act and the Bald and Golden Eagle Protection Act.

Biologists from Dr. J. H. Carter III & Associates, Inc. surveyed the project study area for bald eagle nests by helicopter in January 2011. No eagle nests were found during the aerial surveys. However, one sub-adult bald eagle was observed flying outside of the 660-foot radius survey area north of the Preferred Alternative study corridors. Eagle monitoring data provided by the North Carolina Wildlife Resources Commission listed 12 nests in Craven County and two in Carteret County in 2010. Two of these 14 nests are located in the vicinity of the project. One nest is located approximately 1.5 miles east of the project study corridor on the Cherry Point Marine Corps Air Station and the other nest is approximately 3.5 miles northwest of the project site near East Prong Brice Creek on NFS lands. None of the known nests are located within the 660-foot radius around the survey corridors. Additionally, construction activities for the proposed Havelock Bypass will not occur within 330 feet of, or be visible from, any known nest trees. Based on apparent absence of nest sites, communal roost sites, or foraging areas for this species, it is determined that the proposed project will have no impact on Bald Eagle.
Biological Conclusion: Not Applicable.

Northern long-eared bat (*Myotis septentrionalis*) – P (Formal Listing Pending)
Northern Long-eared Bat (NLEB) (*Myotis septentrionalis*) is not on the current USFS list of rare animals for the CNF, but was considered in the Havelock Bypass Biological Evaluation based on its recent status change and anticipated addition to the USFS list. A USFWS proposal for listing the NLEB as a protected species was published in the Federal Register in October 2013. The final listing and interim rule for protection of the NLEB was published in the Federal Register on April 2, 2015 and the rule went into effect on May 4, 2015. As of March 25, 2015, this species was included in the USFWS's list of protected species for Craven and Jones Counties based on acoustic evidence; however, it is not currently on the USFWS list for Craven County.[1] The nearest verified records are from New Hanover, Washington, and Wake Counties (USFWS 2014).

1 USFWS list of protected species for Craven County. Updated April 20, 2015.
http://www.fws.gov/raleigh/species/cntylist/craven.html

On March 25, 2015, the USFWS issued a programmatic conference opinion (PCO) in conjunction with the Federal Highway Administration (FHWA), the US Army Corps of Engineers (USACE), and NCDOT for NLEB in eastern North Carolina. The PCO covers the entire NCDOT program in numerous counties, including Craven County and the proposed Havelock bypass. The programmatic determination for NLEB for the NCDOT program is "May Affect, Likely to Adversely Affect".

Per an April 10, 2015 letter from USFWS to FHWA and NCDOT, effective May 4, 2015, the USFWS officially adopted their PCO as the Programmatic Biological Opinion (PBO) for the NLEB. Under the PBO, NLEB for the entire NCDOT program in Divisions 1 through 8, the programmatic determination for the NLEB is "May Affect, Likely to Adversely Affect." This determination applies to the Havelock Bypass Project. The PBO provides incidental take coverage for NLEB and will ensure compliance with Section 7 of the Endangered Species Act for five years for all NCDOT projects with a federal nexus in Divisions 1 through 8, which includes Craven County where the Havelock Bypass Project is located.

Since the PBO does not include the USFS, the following survey results are provided. NLEB surveys were conducted in the summer of 2014 on the west side of CNF by NCDOT. The acoustic survey results (from 39 acoustic monitoring nights) were analyzed by two software programs. Several calls were identified as NLEBs from both automated identification programs, BCID and EchoClass. Multiple calls were also identified as Indiana bats and gray bats by BCID and EchoClass, although neither species' range extends into central or eastern North Carolina; the results were false positives.

In conjunction with the software analysis, manual analysis was conducted to select calls with the most NLEB characteristics. Subsets of these calls were sent to two acoustic experts (Chris Corben, Titley Scientific, and Dr. Joy O'Keefe, Indiana State University) for further analysis. Neither expert saw conclusive evidence that the calls could be attributed to NLEB. According to these experts, a few calls had potential to be from NLEBs, but most were determined to be from Southeastern Bats (*Myotis austroriparius*).

As a follow-up to the acoustic surveys, 14 nights of mist-netting were conducted by NCDOT in and adjacent to western CNF but no NLEBs were captured. In addition to the negative mist-netting results from 2014, the following negative surveys results were also obtained in and adjacent to CNF:

- Six nights of mist-netting in CNF along proposed Havelock Bypass in 2005 (NCDOT).
- Five nights of mist-netting adjacent to CNF at the NCDOT CWMB from 2007-2010 (NCDOT).
- One night of mist-netting in Carteret County at southern edge of CNF in 2009 (NCDOT).

Based on limited and inconclusive evidence to suggest that NLEBs are present within the study area and CNF, if the species is added to the USFS list of rare species, the proposed project will not affect the viability of NLEB on CNF.

West Indian manatee (*Trichechus manatus*) – E (Date Listed: 11 March 1967)
Streams crossed by the project study area are too small and shallow to support suitable habitat for the manatee. In addition, these channels each contain beaver dams and/or culverts or other passage impediments downstream of the project study area which would preclude the movement of this large species upstream into the project study area. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area. This project will have no effect on manatees.
Biological Conclusion: **No Effect.**

Sensitive jointvetch (*Aeschynomene virginica*) – T (Date Listed: 20 May 1992)
The streams and ditches present in the project study area are located upstream of the influence of both wind and lunar tidal influence. In addition, open water areas in the project study area are generally heavily shaded or have intense competition from other herbaceous species. Streams and other open water areas in the project study area do not support suitable habitat for this species. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area. This project will have no effect on sensitive jointvetch.
Biological Conclusion: **No Effect.**

Seabeach amaranth (*Amaranthus pumilus*) – T (Date Listed: 7 April 1993)
Ocean beaches and other similar coastal fringe habitats are not present in the project study area. North Carolina Natural Heritage Program records do not document any occurrences of this species within three miles of the project study area. This project will not affect this species.
Biological Conclusion: **No Effect.**

Rough-leaved loosestrife (*Lysimachia asperulaefolia*) – E (Date Listed: 12 June 1987)[2]
Rough-leaved loosestrife is found in pocosin/savanna ecotone habitat. Potentially suitable habitat was identified in the USFS rare species survey evaluation area. Surveys targeting rough-leaved loosestrife were conducted for NFS lands in July 2004 and again in June 2010 for Alternative 3 (Preferred Alternative) (NFS lands as well as non-NFS lands) in June 2010. No rough-leaved loosestrife plants were observed within the evaluation area during site surveys. The nearest known occurrence is approximately 4.5 miles from the Preferred Alternative corridor. This location off Little Road in a Carolina Vegetation Survey (CVS) plot was

2 This summary is excerpted from the Biological Evaluation Report for the US 70 Havelock Bypass (R-1015). Croatan Ranger District. Croatan National Forest. Craven and Carteret Counties, NC. July 16, 2014

recorded in 1991 and not updated since that initial survey. Gary Kauffman (USFS) relocated the CVS plot and searched for Rough-leaved Loosestrife in 2010 and 2011. No individuals were located nor did the habitat appear as clearly defined as other occupied sites in the southern portion of the CNF. Based on the absence of individuals and lack of potentially suitable habitat in the previously documented occurrence in the CVS plot in Craven County, and the apparent absence of this species based on surveys in 2004 and 2010, it is determined that the proposed project will have No Effect to rough-leaved loosestrife. The USFWS concurs with the biological conclusion of "No Effect" for rough-leaved loosestrife and recommends that prior to construction, NCDOT resurvey the project corridor for any unrelated clearing activities since the time of the last survey as any suppressed populations would respond favorably to more sunlight.

Biological Conclusion: No Effect.

4.14.4.2 Red-cockaded woodpecker (RCW) Impacts Analyses

2013 Surveys – The activity status of all known RCW cavity trees within the project study area was updated in May 2013. Newly found RCW cavity trees were flagged and their locations were surveyed and plotted on aerial photography. In November 2013, potential impacts to RCW clusters were evaluated in a Biological Assessment (BA) prepared by NCDOT. The 2013 studies are described in the following paragraphs. The full BA is included in Appendix C.

In 2013, forest stand data on NFS lands was gathered for RCW Clusters CNF 12-44R, 144, 58, 901 and 902. Plots were placed every 5 chains (1 chain = 66 feet) along transects spaced approximately 10 chains apart within each 0.50 mi. radius foraging habitat partition. The number of plots ranged from 43 (CNF 901) to 66 (CNF 144). Foraging substrate for the partitions was measured with a 10-factor basal area (BA) prism using the prism-plot method. Pine BA, the number of pines ≥4 inches in diameter at breast height (dbh) in 2-inch diameter classes and the age of a representative dominant pine were obtained in each plot. Habitats were divided into 5 types: sparse pine (< 40 square feet (sq ft) of pine BA/acre), moderately dense pine (≥ 40 to 70 sq ft of pine BA/ acre), dense pine (>70 sq ft of pine BA/acre), pine plantation and unsuitable habitat. Unsuitable habitat consisted of hardwood-pine drains and pine plantations ≤30 years old. Non-foraging habitat consisted of clearcuts, agricultural lands, permanently cleared areas, treeless developed areas and road and powerline right-of-ways.

Pine stands were assessed by the density and height of the midstory in accordance with the 2003 RCW Recovery Plan (USFWS 2003) and its designation of quality requirements for RCW foraging habitat. Determining midstory density was subjective, but followed these basic criteria: a stand with a sparse hardwood midstory had few or no hardwoods present, a stand with a dense hardwood midstory had limited visibility and movement through the stand was difficult, and a stand with a moderately dense hardwood midstory was intermediate. Each

habitat type was further subdivided according to hardwood midstory height. Midstory hardwoods less than 7 feet in height were considered low, hardwoods from 7-15 feet high were considered moderate and hardwoods more than 15 feet high were considered tall.

Impacts were assessed pursuant to Sections 7 and 9 of the Endangered Species Act, as amended, using the Standard for Managed Stability (SMS) and the Recovery Standard Guidelines (RSG) (USFWS 2003). Foraging habitat was also evaluated pursuant to a memorandum issued by then USFWS Assistant Regional Director, Noreen E. Walsh, on 4 May 2005. According to the guidance presented in the memorandum, an incidental take is assumed for the group/cluster if the post-project foraging habitat totals are below the minimum pine BA and/or acreage required by the SMS.

Standard for Managed Stability (SMS) – The SMS requires a minimum of 3,000 sq ft of pine BA in stems ≥10 inches dbh on at least 75 acres of good quality foraging habitat as defined below (USFWS 2003).

- Pine stands must be at least 30 years of age or older.
- Average BA of pines ≥ 10 inches dbh should be between 40 and 70 sq ft /acre.
- Average BA of pines < 10 inches dbh should be less than 20 sq ft/acre.
- No hardwood midstory exists, or if a hardwood midstory is present, it must be sparse and less than 7 feet in height.
- Total stand BA, including overstory hardwoods, should be <80 sq ft /acre.

Additionally, all land counted as foraging habitat must be within 200 feet of another foraging stand and the cluster and all stands counted as foraging habitat should be within 0.25 mi. of the cluster (USFWS 2003). USFWS guidance (W. McDearman, USFWS, pers. comm.) since the 2003 Recovery Plan has established the following clarifications of the total stand BA requirement:

- Overstory hardwood BA must be ≤10 sq ft/acre.
- Total stand BA can exceed 80 sq ft/acre if the maximum limits for overstory hardwood BA and pines <10 inches dbh are not exceeded, and the BA in pines 10- 14 inches dbh is 40-70 sq ft/acre (in other words, the excess BA is comprised of pines ≥14 inches dbh) (USFWS 2011; W. McDearman, USFWS, pers. comm.).

Pine stands that met the SMS overstory guidelines and had a sparse hardwood midstory, a moderately dense hardwood midstory that was low in height or a dense hardwood midstory that was low in height were considered "suitable" foraging habitat. "Potentially suitable habitat" was described as stands that met most requirements, but exceeded the maximum limits for pine BA in certain dbh classes, hardwood midstory density/height and/or overstory hardwood density. These stands have the necessary pine BA and could meet the

SMS with midstory removal, prescribed burning and/or thinning. Stands with suitable overstory characteristics containing a moderately dense or dense midstory that was moderate or tall in height were in this potentially suitable category. All stands on sites managed for pine dominance that did not fall into the suitable or potentially suitable categories were classified as "future potential habitat." These stands will require time and management to meet the SMS requirements. Foraging habitat available for a cluster was first evaluated using a 0.25 mi. radius foraging partition. If the minimum SMS requirements were not met within the 0.25 mi. radius partition, a 0.50-mile radius partition was used.

Recovery Standard Guidelines (RSG) – The RSG requires a minimum of 120 acres of good quality foraging habitat in areas with high site productivity and 200-300 acres of good quality foraging habitat in areas of low productivity. The RSG defines good quality foraging habitat as follows (USFWS 2003):

- There should be a minimum of 18 pine stems >14 inches dbh per acre that are ≥ 60 years old. The minimum BA for these pines should be 20 sq ft/acre.
- The BA for pines from 10-14 inches dbh should be from 0-40 sq ft/acre.
- The BA of pines <10 inches dbh should be below 10 sq ft/acre and below 20 stems / acre.
- The minimum BA for categories 1 and 2 above should be 40 sq ft/acre.
- Native herbaceous ground cover should total 40 percent (%) or more.
- No hardwood midstory exists, or if present, is sparse and less than 7 feet in height.
- Canopy hardwoods are absent or less than 10% of the number of canopy trees in longleaf forests and less than 30% of the number of canopy trees in loblolly and shortleaf forests. Restoration of longleaf pine has been identified as a high priority in the management of the national forests (USFWS 2003). Therefore, the <10% canopy hardwoods standard was used.
- All habitat is within 0.50 mi. of the center of the cluster.
- Foraging habitat is not separated by more than 200 feet of non-foraging habitat.

Classification of suitable, potentially suitable and future potential habitat was the same as the classification used for the SMS analysis. To determine the foraging habitat acreage requirements, the site indices associated with the soils in each partition were evaluated. These data provided the total number of acres that must be managed to meet the RSG for good quality foraging habitat per cluster (USFWS 2003). Soil types present in each partition were determined using soil survey data provided by USFS and the US Department of Agriculture, Natural Resources Conservation Service (USDA NRCS) web soil survey (USDA, NRCS 2012). Soils were analyzed based on a recommendation submitted to the USFWS to amend the site index parameters in the RCW Recovery Plan (USFWS 2003) to include 3 categories of site productivity. Soils with a high site index (> 75 for the dominant pine species) would require 120-150 acres of suitable or potentially suitable habitat, soils with a medium site index (51-75 for the dominant pine species) would require 150-200 acres of suitable or potentially suitable habitat and soils with a low site index (≤ 50 for the dominant

pine species) that would require 200-300 acres of suitable or potentially suitable foraging habitat (J.H. Carter, pers. comm., 2004). In partitions where there was a combination of high, medium and/or low productivity soils, the amount of habitat needed for the RCW cluster was based on the percent of soil productivity types present. For example, the percent of low productivity soils present was multiplied by the mean number of acres required to be managed, approximately 250 acres. These totals were then added together to obtain the total number of acres that would need to be managed for that particular partition.

Foraging habitat removals for affected partitions (excluding CNF 12-44R) and HMAs were based on the construction limits provided by NCDOT including an additional 40 feet on each side (impact area) (July 2013). Foraging habitat removals for CNF 12-44R were based on the right-of-way project design provided by NCDOT in August 2013 (R. Beauregard, NCDOT, pers. comm.). CNF 12-44R would have been a "direct take" since the impact area (construction limits plus 40 feet) exceeded 200 feet in width, thus making the other part of the partition noncontiguous and not counted as foraging habitat. Therefore, NCDOT redesigned the highway through the 12-44R partition for a distance of approximately 1.1 mile, to keep the ROW clearing width and in turn the impact area, less than 200 feet wide. There was a high degree of confidence that the impacts will not occur beyond the impact area because of coordination of the drainage, geotechnical and utility sections of NCDOT had worked on that section of the design (B. Yamamoto, pers. comm.). To calculate project removals, biologists created and overlaid a geographic information system (GIS) layer of the project design onto an aerial photograph. JCA biologists calculated foraging habitat removals using ArcGIS™ software. As defined in the RCW Recovery Plan (USFWS 2003), RCW foraging habitat separated by more than 200 feet of non-habitat from another foraging stand or the cluster itself was considered noncontiguous and was not counted as available habitat (USFWS 2003). Habitat made noncontiguous by project impacts was subtracted from post-project totals.

Determination of Anticipated Incidental Take – Guidance issued by the USFWS on 4 May 2005 (USFWS 2005) further defined the Recovery Plan's (USFWS 2003) specifications on conducting analyses of project impacts on the RCW by describing 5 levels of analysis: 1) foraging partition, 2) group, 3) neighborhood, 4) population and 5) recovery unit (this analysis is conducted by the USFWS). An analysis will generally proceed to the next level only if incidental take occurs at the partition or group level. For example, if a partition does not have enough foraging habitat to meet the SMS, the cluster is considered "taken" and further analysis is needed at the group level. If a project is large enough (i.e., impacts multiple clusters), an independent population-level analysis is still required (memo from R. Costa, 27 August 2006) even though no cluster is "taken." This process is necessary to determine if the population has enough partitions with enough habitat to meet the RSG post-project and thus meet its recovery goal.

4.14.4.2.1 Cluster Level Analysis

Cavity Trees

Clusters were considered to be "taken" by cavity tree loss if cavity trees were removed, less than 4 suitable cavities remained and there was an insufficient number of suitable trees for artificial cavities to replace the lost cavities. In order to assess potential harassment impacts, active cavity trees within 200 feet of the proposed bypass were recorded.

No RCW cavity trees will be directly impacted by the proposed bypass and all cavity trees will be greater than 200 feet from the proposed impact area. No clusters will be "taken" by cavity tree loss.

Foraging Habitat

Foraging habitat was analyzed as described above and was assessed according to the SMS and RSG as defined in the Recovery Plan (USFWS 2003). According to the SMS guidelines, clusters were considered to be "taken" if the 0.50 mi. radius foraging habitat partition fell below 3,000 square feet of pine BA in stems ≥10 inches diameter at breast height (dbh) on at least 75 acres of good quality foraging habitat.

The impact area will remove 41.63 acres of suitable, potentially suitable and future potential RCW foraging habitat from 5 RCW cluster partitions (CNF 12-44R, 144, 58, 901 and 902) on the CNF, ranging from 10.48 to 17.95 acres per partition. Sections of the proposed road right-of-way are greater than 200 feet wide, resulting in approximately 50.94 acres of suitable, potentially suitable and future potential RCW foraging habitat becoming noncontiguous.

Guidance issued by the USFWS (2005) defines the SMS as the "take" standard. The RSG, previously considered the management standard for Recovery Populations (USFWS 2003), is now considered the "desired future condition of RCW foraging habitat" (USFWS 2005) or as the management standard for populations on federal land or certain other properties. No CNF RCW clusters are considered "taken" by the project according to the SMS guidelines if both suitable and potentially suitable foraging habitat is combined. Potentially suitable habitat was counted towards the available foraging habitat because improving this habitat can be accomplished over the short-term through pine thinning and hardwood midstory removal/suppression. Future potential habitat was not included because this habitat will take years, perhaps decades to become suitable. Clusters CNF 58 and 902 are the only clusters that meet the SMS pre- and post-project with suitable foraging habitat alone (Table 21). The other 3 clusters (CNF 12-44R, 144 and 901) need hardwood midstory clearing and/or thinning of pines <10 inches dbh to increase the amount of suitable foraging habitat within their partitions and meet SMS requirements. However, this is a USFS management issue and will not be affected by construction of the Preferred Alternative.

Using the SMS guidelines, the proposed project would result in a loss of 17.95 acres (8%) of the existing suitable and potentially suitable habitat from the foraging partition associated with

CNF Cluster 12-44R, 14.72 acres (4%) of suitable and potentially suitable habitat from CNF 144, 3.08 acres (1%) of suitable and potentially suitable habitat from CNF 58, 13.99 acres (8%) of suitable and potentially suitable habitat from CNF 901 and 14.92 acres (5%) of suitable and potentially suitable habitat from CNF 902. Section 6 of the BA in Appendix C contains cluster-specific breakdown of removals.

Because the CNF is part of the Primary Core Recovery Population, the USFS is required to manage the RCW habitat according to the RSG (USFWS 2003). Using the RSG in its strictest sense, only 4 of the 5 RCW partitions (CNF 12-44R, 144, 58 and 902) will meet the requirements pre- and post-project. CNF 901 does not meet the RSG requirements pre- or post-project and will not meet in the future due to non-contiguous habitat.

CNF 902 is the only cluster that meets the RSG using suitable habitat only. All other clusters need hardwood midstory clearing and/or thinning of pines <10 inches dbh to increase the amount of suitable foraging habitat over the short-term. The partitions will gain more pine habitat of suitable age (at least 60 years old) and size (≥14 inches dbh) with time. Without management, the potentially suitable foraging habitat has little chance of becoming suitable and therefore may never be available as quality foraging habitat.

Using the Recovery Standard guidelines, the proposed project would result in a loss of 17.95 acres (8%) of the existing suitable and potentially suitable habitat from the foraging partition associated with CNF Cluster 12-44R, 8.29 acres (3%) of suitable and potentially suitable habitat from CNF 144, 3.08 acres (2%) of suitable and potentially suitable habitat from CNF 58, 13.99 acres (11%) of suitable and potentially suitable habitat from CNF 901 and 14.92 acres (5%) of suitable and potentially suitable habitat from CNF 902. Section 6 of the BA in Appendix C contains cluster-specific breakdown of removals.

The impact area will remove 63.33 acres of future potential RCW foraging habitat from 4 HMAs (HMA 168, 169, 170 and 186) on the CNF, ranging from 0.80 to 46 acres per partition. There are some portions of the Preferred Alternative with a proposed right-of-way width greater than 200 feet, resulting in approximately 181.32 acres of future potential RCW foraging habitat becoming noncontiguous.

The locations of the clusters that will be created within the HMAs are unknown, therefore foraging partitions could not be created and analyzed according to the SMS guidelines and 'take' cannot be assessed. As previously stated, no CNF RCW clusters are considered "taken" by the project according to the SMS guidelines if both suitable and potentially suitable foraging habitat is combined in the assessment. Potentially suitable habitat was counted towards the available foraging habitat because improving this habitat can be accomplished over the short-term through pine thinning and hardwood midstory removal/suppression.

4.14.4.2.2 Group Level Analyses

Per USFWS guidance (USFWS 2005), when Incidental Take is found to occur in the cluster level analysis, it is necessary to assess the impact of that loss on the demographic stability of neighboring RCW groups. This is done by examining the density of active RCW clusters on the landscape.

Retaining sufficient foraging habitat alone does not ensure the persistence of an RCW cluster. The continued occupation of a cluster not only depends on the amount of foraging habitat, but also depends on the density of active clusters around it (Hooper and Lennartz 1995). Research has shown that the more aggregated RCW clusters are, the higher the probability of persistence, even with substantial foraging habitat loss (Crowder et al. 1998, Letcher et al. 1998). RCW clusters in moderately dense to dense populations have been shown to be less sensitive (e.g., in group size and productivity) to significant loss in habitat relative to sparser populations with seemingly more available foraging habitat (Hooper and Lennartz 1995). Therefore, in a situation where active RCW clusters would be "taken" for a project, it is necessary to assess the impact of that loss on the demographic stability of neighboring RCW clusters. This is done by examining the density of active RCW clusters on the landscape.

For the group density analysis, clusters having ≥ 4.7 active clusters within 1.25 mi. were considered healthy and were given a "dense" designation. Clusters with 2.6 to 4.6 active clusters within 1.25 mi. were considered to have "moderate" density. Clusters with ≤ 2.5 active clusters within 1.25 mi. were considered "sparse," and therefore more vulnerable to abandonment because of a lack of emigration/immigration (Conner and Rudolph 1991). A 1.25 mi. radius buffer was drawn around the cluster center for every active cluster within 0.50 mi. of the project design and adjacent to a cluster "taken" (directly or indirectly) or affected by the Preferred Alternative (some foraging habitat or cavity trees removed). For each cluster analyzed, the number of active clusters within 1.25 mi. of its cluster center was calculated and included in the cluster density totals. These totals did not include the subject cluster if it was expected to be "taken" by the project. However, "taken" clusters were included in the pre-project density totals of their neighboring clusters.

Clusters with ≥ 4.7 active groups within 1.25 mi. post-project were considered to be unaffected by the project. Clusters whose densities were reduced from "dense" or "moderate" to "sparse" were considered to be affected and therefore vulnerable to abandonment as a result of the proposed project.

The Group Level Analysis evaluates density effects to clusters directly impacted by the Preferred Alternative project, but not "taken" at the cluster level. None of the clusters were considered "taken" at the cluster-level, therefore group-level analysis is not required (Ralph Costa, email dated 27 August 2006).

4.14.4.2.3 RCW Neighborhood Analysis

Per the 2005 USFWS guidance, when an "is likely to adversely affect" determination is made at the cluster or group levels, a neighborhood analysis will typically be warranted. The neighborhood-level analysis involved assessment of the density of RCW groups that were within the project "neighborhood," but were not directly affected by the project (USFWS 2005).

Guidance set forth in the *Endangered species consultation handbook: procedures for conducting consultation and conference activities under Section 7 of the Endangered Species Act* (USFWS and National Marine Fisheries Service (NMFS) 1998) states that "when determining an action area, it must include the project site and all the areas surrounding the activity up to where the effects will no longer be felt by the listed species." The intent of the "neighborhood analysis" is to account for the potential negative impacts of a project on RCW demography through habitat loss or "fragmentation" at the neighborhood level (USFWS 2003). Fragmentation is defined by the 2003 Recovery Plan as "habitat loss that results in isolated patches of remaining habitat" (USFWS 2003).

When demographic data are available, the average dispersal distance for each population is typically used to define the RCW neighborhood/Action Area surrounding a project site or impact area (USFWS 2005). In order to calculate this number, all documented successful RCW dispersals to and from clusters on CNF since 1989 were analyzed. According to this data, the average dispersal distance within the entire CNF, when measured from the territory center, is 4.0 mi. However, due to the relative isolation of the RCW clusters in the project area (Subpopulation 3) from the rest of the CNF, RCWs must disperse greater distances in order to find breeding vacancies. USFS dispersal data shows that RCWs from Subpopulation 3 dispersed an average of 8.42 mi. to other active RCW clusters on the CNF. As a result, an 8.42-mile radius buffer was overlaid on the NCDOT project design and all RCW clusters within the buffer were included in the neighborhood analysis.

As with the group-level analyses, if the post-project analysis showed less than 2.5 RCW groups would remain post-project within a 1.25-mile radius of the subject cluster, it was considered "taken" at the neighborhood level.

Foraging habitat loss and fragmentation can have direct effects on cluster activity, group size and reproduction at the cluster level. Additionally, by affecting habitat configuration at the landscape level, projects may affect the health and distribution of RCWs at the neighborhood scale.

"Fragmentation" is defined by the 2003 Recovery Plan as "habitat loss that results in isolated patches of remaining habitat" (USFWS 2003). Habitat fragmentation may adversely affect dispersal of individuals to adjacent or nearby groups and lessen the likelihood that breeding vacancies are filled (USFWS 2003). Demographic viability of groups, neighborhoods and populations is primarily dependent on the ability of group members to freely disperse and find breeding opportunities. If dispersal is limited or inhibited by a project, even if adequate foraging habitat remains post-project, group status, group size and reproduction may be affected. It is important that these neighborhood effects be assessed during the analysis of project impacts (USFWS 2003). Because there were no cluster-level or group-level takes, the Neighborhood Analysis was not required (Will McDearman, USFWS, pers. comm.).

4.14.4.2.4 Population Level Analysis

Per USFWS guidance (USFWS 2006b), all major projects are to be analyzed at the population level, regardless of whether or not there is an Incidental Take at the partition level. This is necessary because some project-related impacts may not reach the threshold of incidental take for some groups (i.e., going below the SMS), but may preclude those groups' partitions from meeting the RSG in the future (i.e., not being able to achieve 120 acres of good quality foraging habitat) (memo from R. Costa, 27 August 2006), "Because recovery cannot be achieved at managing partitions at the SMS, on federal populations it is also necessary to determine if partitions will meet the RSG" (USFWS 2003). This analysis is necessary to determine if the population can reach its recovery goal population size in the future with a sufficient number of partitions meeting the RSG.

Calculating whether a population's recovery goal can be met sometime in the future, based on project-related impacts today, also requires knowledge, or estimates, of the percent of 1) inactive clusters, 2) solitary RCW groups and 3) captured clusters, at the time when the overall habitat-based population goal would likely be achieved (USFWS 2005). Values for these 3 parameters are subtracted from the population goal (measured in active clusters), along with estimates of groups that are predicted to be lost due to project-related impacts, to determine if the required number of potential breeding groups can be achieved in the future (USFWS 2005).

The population level analysis considers the ability of the CNF to meet its RCW population goal (137-169 potential breeding pairs (pbgs) post-project and to meet the RSG in each managed foraging partition. Each of the properties that make up the NC Coastal Plain Primary Core Population (Croatan National Forest, Holly Shelter Game Lands, and Marine Corps Base Camp Lejeune) should be managed for maximum population size (goal) (USFWS 2003). This includes providing and managing recruitment sites (clusters) in order to promote population growth.

During breeding season 2013, the USFS monitored 114 territories on the CNF, of which 67 had pbgs, 5 were captured, 2 contained solitary males and 40 were inactive. Growth of the individual populations should lead to increased dispersal between properties. Ideally these properties should be linked by habitat "bridges" in order to facilitate dispersal. There is evidence of dispersal between 2 of the 3 properties that make up the NC Coastal Plain Primary Core Population. In 2005, 4 RCWs from Camp Lejeune, 2 males and 2 females, were identified on the CNF (USFS dispersal data, unpub.) and between 1993 and 2005, 6 RCWs from the CNF were identified on Camp Lejeune (J.R. Walters, pers. comm.). Growth of the Camp Lejeune and CNF populations could further link these 2 populations and help promote recovery of this Primary Core Population. Since Camp Lejeune is located southwest of the CNF and the Preferred Alternative is on the eastern side of the CNF, it is unlikely that dispersal between these populations would be disrupted by the Preferred Alternative.

CNF Clusters 12-44R, 144, 58, 901 and 902 and 5 HMAs (132, 168, 169, 170 and 186) make up Subpopulation 3 (10 out of 172 RCW territories, 3,644 acres of 52,981 total acres or 6.9% of the total RCW habitat). Nine of the 10 territories that make up Subpopulation 3 will be directly impacted by the Havelock Bypass. Of the 10 territories, 5 have cavity trees in various stages of suitability. CNF 901 was the only active cluster during breeding season 2013. The Preferred Alternative will remove a total of 153.78 forested acres on the CNF, of which 112.15 acres are located outside of partitions and territories.

Analysis of CNF RCW dispersal data conducted by JCA demonstrated the value of RCW groups in Subpopulation 3 to the overall genetic connectivity of the CNF and the use of the Subpopulation 3 area as a dispersal corridor. Increasing the number of RCW groups within this area will strengthen the links to other subpopulations on the CNF and increase the number of pbgs therein. Direct habitat removal resulting from the Preferred Alternative should not have an adverse impact on the RCW recruitment potential for the proposed future HMAs in the project area, which will have enough forested habitat to support RCW recruitment clusters post-project. In addition, approximately 90% of the habitat set aside for the future HMAs south of the impacted clusters would lie to the west of the Preferred Alternative and would remain contiguous to the rest of the CNF. Thus the USFS should be able to provide the necessary recruitment clusters to promote RCW growth and linkage between the RCW subpopulations on the CNF after the Preferred Alternative is constructed.

Conservation biologists define fragmentation as "the process whereby a large, continuous area of habitat is both reduced in area and divided into two or more fragments" (Wilcove et al. 1986; Schonewald-Cox and Buechner 1992; Reed et al. 1996). The term "fragmented habitat" is used rather broadly to include any breaks in habitat, regardless of size, in an otherwise contiguous stretch of forested habitat. Subpopulation 3 is isolated or fragmented

from the other CNF subpopulations due to private property inholdings, unsuitable habitat and development. Fragmented habitat is not to be confused with "noncontiguous habitat" which refers only to breaks in RCW foraging habitat >200 feet wide (USFWS 2003). Habitat gaps less than 200 feet wide do not affect RCW dispersal (see discussion below). Unpublished USFS dispersal data shows that RCWs from the affected CNF clusters dispersed an average of 8.42 mi. to other active RCW clusters on the CNF in order to find breeding vacancies. RCW dispersal hinges directly on the quality, amount and distribution of habitat on the landscape. Thus large tracts of contiguous suitable habitat contribute to increases in the number of groups, group size and in the number of juveniles available to disperse. Territory isolation by fragmented habitat and/or reduction of group density decreases the likelihood of clusters being inhabited by potential breeding groups because dispersing females often fail to locate solitary males or find the territories substandard. This problem is a function of the number and spatial arrangement of active clusters. Home range follows and radio telemetry work conducted via Virginia Tech have indicated that female RCWs of any age are reluctant to cross openings between 492 and 2,132 feet, and will not cross openings of >2,132 feet (Walters et. al. 2011). Male RCWs are not as affected by forest gaps (J.R. Walters, pers. comm.). The clearing for the Preferred Alternative itself is not expected to impede dispersal of RCWs from their natal territories. This conclusion is further supported by the fact that both the habitat corridor and Bypass corridor run on a north-south axis. Thus, dispersing RCWs could move north and south without having to cross the highway. In addition, the highway corridor is too narrow to constitute a dispersal barrier.

However, existing private lands inholdings do constitute a significant barrier for RCW dispersal. These habitat "gaps" range from ~2170 feet to ~3350 feet Most of these lands are used for silviculture and stands are harvested on a 30 year (or shorter) rotation and therefore provide no to limited RCW foraging or dispersal habitat (depending on stand age). This situation is an existing condition and is not a result of the project.

All project affected foraging partitions and HMAs have the necessary pine acreage to meet the RSG with the exception of CNF Cluster 901 (breeding group in 2013). This partition does not meet the RSG either pre-project or post- project. Project removals totaled 13.99 acres of suitable and potentially suitable habitat, thus making an existing habitat deficiency worse. However, the Preferred Alternative project did not cause the pre- project habitat deficiency and if CNF 901 is ultimately not counted towards the CNF's population goal it would be because of the pre-existing lack of habitat capable of meeting the RSG.

4.14.4.2.5 Recovery Unit Level Analysis (Jeopardy Analysis)

The jeopardy analysis occurs at the Recovery Unit level (USFWS 2003a, USFWS 2006b). According to the 1998 USFWS Consultation Handbook (USFWS and NMFS 1998), when determining jeopardy, the USFWS is to analyze the impact of the action in question on the

species as a whole. To facilitate this analysis, Recovery Units can be identified in a species' Recovery Plan that will provide a smaller-scale definition of Jeopardy. According to the 2003 Recovery Plan (USFWS 2003a):

"Given that actions that appreciably impair or preclude the capability of such a recovery unit from providing the survival and recovery functions identified for it in a recovery plan may therefore represent jeopardy to the species, the Consultation Handbook indicates the jeopardy standard may be applied to individual recovery units identified as necessary for survival and recovery of the species in an approved final recovery plan."

Each Recovery Unit described in a species' Recovery Plan has a defined role in the downlisting, delisting and 'recovery' of the species. If an action is determined to jeopardize the ability of that Recovery Unit to serve the function described for it in the species' Recovery Plan, that action could be found to jeopardize the recovery of the species.

For the Mid-Atlantic Coastal Recovery Unit, the Recovery Plan (USFWS 2003) lists 2 Primary Core Populations: (1) Coastal North Carolina, consisting of CNF, HSGL and MCBCL and (2) the Francis Marion National Forest in SC. It also contains one essential support population: Northeast North Carolina/Southeast Virginia, consisting of Alligator River National Wildlife Refuge, Dare County Bombing Range, Palmetto- Peartree Preserve, Pocosin Lakes National Wildlife Refuge and Piney Grove Preserve. The Recovery Unit Level Analysis focuses on the ability of CNF to retain its function as part of the Primary Core Populations in the Mid-Atlantic Coastal Recovery Unit post-project. The Recovery Unit is discussed in the BA and the USFWS concluded that the proposed project "May Affect, But is Not Likely to Adversely Affect" the RCW. This analysis will be based upon information provided in the Biological Assessment for the other four levels of analyses.

The CNF is part of the Mid-Atlantic Coastal Plain Recovery Unit. This Recovery Unit includes the Coastal NC and Francis Marion National Forest Primary Core Populations, which are two of the 13 designated Primary Core Populations listed in the Recovery Plan (USFWS 2003). It also includes one Essential Support Population (Northeast NC/Southeast Virginia). The CNF subpopulations do not affect the MCBCL subpopulation or the HSGL subpopulation west of MCBCL.

4.14.4.2.6 NCDOT and USFS Road Closure Agreement

The USFS sent comments to NCDOT, dated July 20, 2010, on the preliminary DEIS (NCDOT 2010). USFS stated that the proposed project will reduce the likelihood of successfully using prescribed burning as a management tool east of the preferred alternative due to smoke management issues along the proposed highway (USFS 2010). In order to minimize fragmentation and impacts to the CNF prescribed fire program, NCDOT agreed, in a joint

agency meeting on March 17, 2011 to periodically close the Preferred Alternative in consultation with the USFS to facilitate prescribed burning. Related correspondence and the prescribed burn plan are contained in Appendix A. Baseline conditions notwithstanding, the potential for adverse effects will be reduced by enabling the USFS to conduct the prescribed burns necessary to restore and maintain suitable RCW habitat east of the Preferred Alternative.

4.14.4.2.7 Croatan Wetland Mitigation Bank (CWMB)

The Croatan Wetland Mitigation Bank, which is being offered as compensation to the USFS, contains lands that offer potential long term opportunities to expand RCW habitat. Establishment of RCW clusters on the CWMB would support dispersal between, and connectivity of, RCW subpopulations on the CNF. As discussed in Chapter 4.12.4.5, the USFS notes that it would be impracticable to manage RCW habitat on the CWMB due to logistics (e.g., limited access to potential management areas, the need for more frequent burning on hydric soils to control denser understories, personnel time, and funding) and that it could take 30 to 60 years before any of the potential clusters could provide suitable nesting trees. The practicality and logistics of USFS management notwithstanding, there are areas of the CWMB that could potentially be managed as future RCW recruitment partitions, as identified in the RCW Management Plan for the CWMB (NCDOT, 2012).

4.14.4.2.8 Indirect Effects and Cumulative Impacts

Indirect effects as defined by the *Endangered Species Consultation Handbook* (USFWS 1998) are "effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur." Indirect effects may result from traffic noise and development of some private properties along the highway corridor (such as at the Lake Rd. interchange). Such impacts could individually or collectively impact RCW dispersal to or from the area and inhibit unification of the CNF RCW population.

Based on RCW research conducted on the Fort Stewart Military Installation, woodpeckers did not flush from cavity trees when vehicles were greater than 164 feet from nests (Delaney et al. 2009). The nearest cavity tree is approximately 400 feet away, over twice this distance, indicating that RCWs are not likely to be flushed from their cavities by vehicles on the bypass.

Another possible indirect effect to RCWs as a result of the Preferred Alternative is mortality of RCWs attempting to cross the highway, particularly female RCWs because they are prone to foraging low on tree trunks which can result in them flying low across highways. RCWs have been found dead on roads in the NC Sandhills several times over the last 30 years and considering that most of these carcasses were located accidentally, highway related mortality for RCWs is undoubtedly underestimated (Sandhills Ecological Institute, unpublished data). Construction of the Preferred Alternative may present the possibility of an indirect

effect from highway mortality based on the creation of a road where there was not a road before. However, such incidents cannot be predicted with certainty as to time and number. Overall, these indirect effects are considered to be insignificant.

Cumulative impacts as defined by the *Endangered Species Consultation Handbook* (USFWS 1998) are "those effects of future State or private activities, not involving federal activities that are reasonably certain to occur within the action area of the federal action subject to consultation. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (40 CFR 1508.7). The implementing regulations of the Endangered Species Act defines cumulative impacts as "the effects of future State or private activities not involving federal activities that are reasonably certain to occur within the action area of an action subject to consultation" (50 CFR 402.02). These actions may include development of private property in the vicinity of the Preferred Alternative and at the Lake Rd. interchange, construction of other roads and timber harvesting on private lands in the area. Together with existing fragmented habitat issues on private lands in the project area, such impacts could further hamper RCW dispersal to or from the area and inhibit unification of the CNF RCW population.

The land available for development is mainly located north and south of Havelock's city limits. In addition there are scattered areas of potential development throughout the City of Havelock and between the impact area and the existing US Hwy. 70 (NCDOT 2013). The southern terminus of the Preferred Alternative, approximately 2,500 feet southeast of the City of Havelock boundary, could be developed. However, this area is shown as Least Suitable for development in the City of Havelock 2030 Comprehensive Plan (NCDOT 2011, Urban Resource Group 2009). It is zoned as Highway Commercial and development would be dependent upon extensive new water and sewer infrastructure and portions of the CNF being acquired by a private developer.

An interchange is proposed between CNF Clusters 901 and 902 along SR 1756 (Lake Road) and measures approximately 1,365 feet wide at its widest point. Habitat between CNF 901 and 902 is currently considered unsuitable for foraging habitat, but this does not mean the groups associated with these clusters are demographically isolated. CNF 901 had a solitary male in 2009 and a breeding pair of adults between 2010 and 2013. CNF 902 had a solitary male in 2006, 2010 and 2011. Private lands may provide dispersal habitat corridors between these clusters. Weyerhaeuser currently owns a pine plantation between CNF 901 and 902 that may provide a dispersal corridor. If the Preferred Alternative is constructed and if water and sewer service is extended, land use is expected to transition to higher density residential and highway commercial uses northeast of the interchange (NCDOT 2011). The area to the southwest of the interchange will remain primarily agricultural (NCDOT 2011). The northern terminus of the Preferred Alternative is located north of Tucker Creek. If the proposed project is constructed, exposure will increase for properties in this area and a new land use node will be created (NCDOT 2011). As a result, land use would be expected to transition to

higher density residential and highway commercial, particularly if sewer service is extended north of Tucker Creek.

4.14.4.2.9 Summary of RCW Impacts

No RCW cavity trees will be "taken" by the Havelock Bypass project and the design will not come within 200 feet of any known RCW cavity trees. The Preferred Alternative will remove 104.96 acres of RCW foraging habitat associated with one active RCW cluster (CNF 901), four inactive clusters (CNF 12-44R, 144, 58 and 902) and four HMAs (168, 169, 170 and 186), plus an additional 112.15 acres of forested habitat located on the CNF outside of the foraging partitions and HMAs.

Post-project, using both suitable and potentially suitable foraging habitat, all five impacted RCW clusters would have enough foraging habitat to meet the SMS guidelines. CNF Cluster 901 does not have enough acres of suitable and potentially suitable habitat to meet the RSG on NFS lands pre- or post-project. All other impacted clusters meet the RSG when suitable and potentially suitable habitat on the CNF is combined.

In addition to studies that supported the USFWS Biological Assessment for the RCW, NCDOT also performed a RCW Territory Analysis (NCDOT, 2014) at the USFS's request and in accordance with USFS guidance. The analysis was prepared to assess impacts to RCW territory on NFS lands only rather than the larger 0.5-mile partitions, so that the USFS could ensure compliance with its 2002 Forest Management Plan. The study evaluated the acres of pine stands in seven RCW territories on CNF lands before and after the construction of the Havelock Bypass. The study concluded that no RCW cavity trees will be "taken" by the Havelock Bypass project, that the design will not come within 200 feet of any known RCW cavity trees, and that construction of the Havelock Bypass will not prohibit the CNF from managing within the individual territories for active clusters or recruitment clusters in the future. The full RCW territory analysis is included in Appendix C.

In a letter dated November 19, 2013, the USFWS stated that the BA adequately addressed potential effects to the RCW and that the USFWS concurred with the biological conclusion that the proposed project may affect, but is not likely to adversely affect the red-cockaded woodpecker. The letter also indicated that USFWS concurrence is also based, in part, on the reduced clearing width through RCW habitat (as described in Chapter 2.10.3) and NCDOT's agreement to allow periodic closures of the Preferred Alternative in order for CNF staff to conduct prescribed burns as management for the RCW. Implementation of the Croatan National Forest RCW Recovery Plan will not be significantly affected by the proposed highway project.

The Croatan Wetland Mitigation Bank, which is being offered as compensation to the USFS, provides the long term opportunity to expand the RCW population beyond that detailed in

the Recovery Plan. As discussed in Chapter 4.12.4.5, the USFS notes that it would be impracticable to manage RCW habitat on the CWMB due to logistics (e.g., limited access to potential management areas, the need for more frequent burning on hydric soils to control denser understories, personnel time, and funding) and that it could take 30 to 60 years before any of the potential clusters could provide suitable nesting trees. The practicality and logistics of USFS management notwithstanding, NCDOT has identified areas within the CWMB that could potentially be managed as future RCW recruitment partitions, as identified in the RCW Management Plan for the CWMB (NCDOT, 2012).

4.14.5 USFS Rare Species

This chapter is an update to the DEIS analyses for USFS rare species (formerly termed "Proposed, Endangered, Threatened, and Sensitive (PETS) species").

As stated in Chapter 3.15.4, targeted surveys for USFS rare plants, terrestrial wildlife, and aquatic wildlife species were initiated in 2003. In subsequent years (2005, 2007, 2008, 2010, and October 2013), the USFS amended/revised its list of rare species and additional surveys for selected species were conducted, most recently in 2013. The USFS will continue to modify its rare species list as new scientific data regarding species distributions on the CNF becomes available.

4.14.5.1 Biological Evaluation Report for NFS Lands

A Biological Evaluation (BE) (NCDOT, July 2014) was prepared to assess the potential effects to rare species on NFS lands from the proposed construction and maintenance of the US 70 Havelock Bypass by the NCDOT at the request of the USFS. All USFS rare species that occur or could occur on the CNF were considered in the BE including: federally Proposed, Endangered, or Threatened species, Regional Forester's Sensitive (S) species, and Locally Rare (LR) species. The study area for the BE included the Preferred Alternative corridor and NFS lands east of the Preferred Alternative where indirect effects are a possibility. The BE was finalized on July 16, 2014, in coordination with the USFS.

Plant Species – Surveys conducted from 2003-2014, in combination with records available from NCNHP and the USFS, resulted in the identification of potentially suitable habitat for 72 USFS rare plant species. The CNF evaluation area included NFS lands where direct and indirect impacts could potentially occur. Subsequent botanical studies confirmation of the presence of 21 USFS rare plant species within the CNF evaluation area. An additional 51 species were not found to be present in the project study area during the surveys. Based on the apparent absence of these species, it is determined that the proposed project would not affect these species. These species include:

- Branched Gerardia (*Agalinis virgata*) (LR)
- Tall Bentgrass (*Agrostis altissima*) (LR)
- Ovateleaf Cacalia (*Arnoglossum ovatum*) (LR)
- Stalked Milkwort (*Asclepias pedicellata*) (LR)
- Many-flower Grass Pink (*Calopogon multiflorus*) (S)
- Savanna Campylopus (*Campylopus carolinae*) (S)
- Widow Sedge (*Carex basiantha*) (LR)
- Calcium-fleeing Sedge (*Carex calcifugens*) (LR)
- Emmon's Sedge (*Carex emmonsii*) (LR)
- Hop-like Sedge (*Carex lupuliformis*) (LR)
- Spring Coral-root (*Corallorhiza wisteriana*) (LR)
- Beadle's Coreopsis (*Coreopsis helianthoides*) (LR)
- Carolina Sunrose (*Crocanthemum carolinianum*) (LR)
- Spindle-fruited Witch Grass (*Dichanthelium fusiforme*) (LR)
- Hidden-flowered Witch Grass (*Dichanthelium* sp. 9) (LR)
- Venus Flytrap (*Dionaea muscipula*) (S)
- Seven-angled Pipewort (*Eriocaulon aquaticum*) (LR)
- Hall's Pocket Moss (*Fissidens hallii*) (S)
- Comfortroot (*Hibiscus aculeatus*) (LR)
- Catchfly Cutgrass (*Leersia lenticularis*) (LR)
- Pondspice (*Litsea aestivalis*) (S)
- Boykin's Lobelia (*Lobelia boykinii*) (S)
- Raven's Seedbox (*Ludwigia ravenii*) (S)
- Globe-fruit seedbox (*Ludwigia sphaerocarpa*) (LR)
- Rough-leaved loosestrife (*Lysimachia asperulaefolia*) (E)
- Carolina Birds-in-a-nest (*Macbridea caroliniana*) (S)
- Narrowleaf Cowlily (*Nuphar sagittifolia*) (S)
- Shortleaf Basket Grass (*Oplismenus hirtellus* spp. *setarius*) (LR)
- Carolina Grass-of-parnassus (*Parnassia caroliniana*) (S)
- Spoonflower (*Peltandra sagittifolia*) (LR)
- Hairy Smartweed (*Persicaria hirsuta*) (LR)
- Small Butterwort (*Pinguicula pumila*) (LR)
- A Liverwort (*Plagiochila miradorensis miradorensis*) (LR)
- Pineland Plantain (*Plantago sparsiflora*) (S)
- Dwarf Live Oak (*Quercus minima*) (LR)
- Southern White Beaksedge (*Rhynchospora macra*) (S)
- Thorne's Beaksedge (*Rhynchospora thornei*) (S)
- Grassleaf Arrowhead (*Sagittaria weatherbiana*) (S)
- Canby's Bulrush (*Schoenoplectus etuberculatus*) (LR)
- Drooping Bulrush (*Scirpus lineatus*) (LR)
- Baldwin's Nutrush (*Scleria baldwinii*) (LR)
- Leavenworth's Goldenrod (*Solidago leavenworthii*) (LR)
- Twisted-leaf Goldenrod (*Solidago tortifolia*) (LR)

- Giant Peatmoss (*Sphagnum torreyanum*) (LR)
- Giant Spiral-orchid (*Spiranthes longilabris*) (S)
- Carolina Dropseed (*Sporobolus pinetoreum*) (S)
- Pickering's Dawnflower (*Stylisma pickeringii* var. *pickeringii*) (LR)
- Carolina Asphodel (*Tofieldia glabra*) (S)
- Chapman's Redtop (*Tridens chapmanii*) (LR)
- Florida Yellow-eyed Grass (*Xyris floridana*) (LR)
- An Unnamed Yellow-eyed Grass (*Xyris stricta*) (LR)

The following paragraphs describe survey results for the remaining 21 USFS rare plant species. As stated previously, the evaluation area included areas where direct and indirect impacts could potentially occur. As discussed below, several species would be directly and indirectly affected by construction of the Preferred Alternative. Primary indirect effects include the potential spread of NNIS and increased sun exposure to currently shaded areas. The following paragraphs describe potential and indirect effects for USFS rare species as well as measures to mitigate these effects.

Associated with this Biological Evaluation through coordination with USFS, the project commitments include a number of commitments that NCDOT has made with regard to prescribed burns, pre-construction field surveys and seed collection, staging area locations, NNIS management, landscaping plans, fencing, USFS access points, herbicide treatments, and future coordination needs related to the RCW and Northern long-eared bat.

Bog Bluestem (*Andropogon mohrii*) (LR) is found in wet savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Bog Bluestem plants were observed within the Preferred Alternative corridor; however, one occurrence of this species has been documented in powerline corridor habitat located within the area being considered for indirect impacts. Including this occurrence, there are six known occurrences of Bog Bluestem on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of the mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Bog Bluestem.

Cumulative impacts identified consisted of the Duke Energy Progress (DEP) overhead ground wire (also known as static wire) replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Eaton's Witch Grass (*Dichanthelium spretum*) (LR) is found in wet sand, peaty bog, and savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Eaton's Witch Grass plants were observed within the Preferred Alternative corridor, however, one occurrence of this species is present in a powerline right-of-way located within the area being considered for indirect impacts in the evaluation area. Including this occurrence there are two known occurrences of Eaton's Witch Grass on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Eaton's Witch-grass.

Florida Adder's Mouth (*Malaxis spicata*) (LR) is found in maritime swamp forest habitats, and in calcareous but mucky swamp, spring-fed swamp, and wet hammock habitats. Potentially suitable habitat was identified in the evaluation area. No Florida Adder's Mouth plants were observed within the Preferred Alternative corridor. However, one occurrence of this species is present in the area being considered for indirect impacts in the evaluation area, in the vicinity of Southwest Prong Slocum Creek. The occurrence in the vicinity of Southwest Prong Slocum Creek is located in a swamp forest greater than 250 feet from the Preferred Alternative corridor. Including this occurrence, there are six known occurrences of Florida Adder's Mouth on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management to the swamp forest habitat are expected to result from project implementation, reducing concerns for indirect impacts. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including implementation of measures proposed for controlling the spread of NNIS plant species

along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Florida Adder's Mouth.

Yellow Fringeless Orchid (*Platanthera integra*) (S) is found in savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Yellow Fringeless Orchid plants were observed within the Preferred Alternative corridor; however, one occurrence of this species, most recently observed in 2014 as four individuals at three separate microsites not previously known for this species, is present in a powerline right-of-way located in within the area being considered for indirect impacts in the evaluation area. Including this occurrence, there are seven known occurrences on NFS lands in the CNF, but USFS reports that one roadside occurrence is apparently extirpated and one other has been greatly reduced in population size from recent disturbance in a savanna.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Yellow Fringeless Orchid.

Cumulative impacts considered include a wildlife habitat improvement project completed in the summer of 2003 in the Little Road savanna population, which resulted in a loss of habitat and individuals of this species. Mitigation measures at the site have since restored the habitat but the number of individuals has been low (approximately 27 based on 2014 survey results) compared to earlier counts that were as high as 200 individuals. Other cumulative impacts identified for this species consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Snowy Orchid (*Platanthera nivea*) (LR) is found in wet savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Snowy Orchid plants were observed within the Preferred Alternative corridor; however, one occurrence of this species is present in a powerline right-of-way within the evaluation area being considered for indirect impacts. This is the only known occurrence of Snowy Orchid on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Snowy Orchid. Cumulative impacts identified for this species consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Hooker's Milkwort (*Polygala hookerii*) is found in savanna habitats and is a Region 8 sensitive species. Potentially suitable habitat was identified in the evaluation area. No Hooker's Milkwort plants were observed within the Preferred Alternative corridor; however, one occurrence of this species is present in a powerline right-of-way located within the evaluation area being considered for indirect impacts. The occurrence being evaluated for potential indirect impacts is the largest known occurrence on the CNF and was conservatively estimated to include greater than 1,000 individuals in 2013. Including this occurrence, there are nine known occurrences of Hooker's Milkwort on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Hooker's Milkwort. Cumulative impacts identified for this species consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Shadow-witch (*Ponthieva racemosa*) (LR) During field reviews on 22 July 2008 and 6 May 2009, concentration of shadow-witch were observed over 250 feet from the Preferred

Alternative. Based on the apparent absence of this species in the evaluation area, there will be no direct impacts. No changes in management to the swamp forest habitat are expected to result from project implementation, reducing concerns for indirect impacts. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Shadow-witch.

Short-bristled Beaksedge (*Rhynchospora galeana*) (S), formerly known as *Rhynchospora breviseta*, is found in wet savanna habitats and may colonize disturbed areas and roadsides. Potentially suitable habitat was identified in the evaluation area. No Short-bristled Beaksedge plants were observed within the evaluation area during site surveys. One population had been depicted in the NCNHP database as extending into the Preferred Alternative corridor, but a review of the original record information submitted to NCNHP and discussion with NCNHP indicated that this extension was an error in interpretation. Based on survey results and the anticipated correction to NCNHP files for this August 2005 record, no Short-bristled Beaksedge plants have been documented in the Preferred Alternative and no direct impacts to Short-bristled Beaksedge are expected to occur. Approximately 44.2 acres of this population are in an area subject to indirect impact consideration for Alternative 3. This population contains an estimated 850 individual Short-bristled Beaksedge plants, the largest known population on NFS lands in the CNF. Including this occurrence, there are seven known occurrences of Short-bristled Beaksedge on NFS lands in the CNF, although one obscure record has not been observed for more than 50 years.

Based on the apparent absence of this species in the Preferred Alternative, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Short-bristled Beaksedge. Cumulative impacts identified for this species consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Carolina Goldenrod (*Solidago pulchra*) (S) is found in savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Carolina Goldenrod plants were observed within the Preferred Alternative during site surveys. One occurrence is located in an area subject to consideration for potential indirect effects. Including this occurrence, there are 38 known occurrences of Carolina Goldenrod on NFS lands in the CNF.

Based on the apparent absence of this species in the Alternative 3 (Preferred Alternative) study area, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Carolina Goldenrod. In addition, this species has been recommended to be removed from the USFS Region 8 sensitive plant list since it has been found to be locally abundant in the southern portion of the CNF and it responds to prescribed fire management (personal communication, Gary Kauffman).

Eaton's Ladies'-tresses (*Spiranthes eatonii*) (LR) is found in wet savanna habitats. Potentially suitable habitat was identified in the evaluation area. No Eaton's Ladies'-tresses plants were observed within the Preferred Alternative corridor, however, one occurrence of this species is present in a powerline right-of-way located within the area being considered for indirect impacts. This is the only known occurrence of Eaton's Ladies'-tresses on NFS lands in the CNF.

Based on the apparent absence of this species in the Preferred Alternative corridor, there will be no direct impacts. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. With implementation of these mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it is determined that the proposed project will have no impact on Eaton's Ladies'-tresses.

The following rare plant species were documented within the CNF evaluation area. A discussion of potential direct and indirect impacts, as well as measures to mitigate indirect impacts, are included in the following paragraphs.

LeConte's Thistle (*Cirsium leconteii*) (LR) is found in savanna habitats. Potentially suitable habitat was identified in the evaluation area. Recent surveys completed since 2004 including surveys completed in 2012 by ESI within all known populations on the CNF and surveys completed in 2013 and 2014 within five of the seven known populations on the CNF confirmed the continued presence of LeConte's Thistle in seven areas. These seven areas collectively have 307 plants dispersed across 24.8 acres of occupied or potentially occupied habitat documented on NFS lands in the CNF.
Alternative 3 directly affects two populations. One of the two populations is composed of two discrete sites that are dispersed across 8.5 acres; one of these sites will not be affected but approximately 1.7 acres of the other site will be directly affected. Individual LeConte's Thistle plants observed within this affected site occur to the north and south of the area to be directly impacted but no plants were observed within the direct impact area. The second population is composed of three discrete sites that in total were dispersed across 0.2 acre. Alternative 3 will impact these three sites in their entirety. A total of 31 individuals of this species were observed in 2005.

An additional 13.4 acres of reported occurrence are in areas subject to indirect impact consideration for the Preferred Alternative. The 2013 survey documented more than 171 individual plants that may be subject to indirect impacts. These individual plants were observed within the powerline right-of-way which is currently being managed by a combination of mowing by the utility company operating the lines within the ROW and periodic prescribed burns conducted by the USFS. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued.

The Preferred Alternative will result in unavoidable direct impacts to LeConte's Thistle habitat and has the potential for indirect impacts. The Preferred Alternative directly affects approximately 1.9 acres of two mapped LeConte's Thistle populations containing an estimated 31 individual plants. An additional 13.4 acres and more than 171 individual plants observed during the 2013 survey are located in areas subject to indirect impact consideration. The area subject to consideration for indirect impacts represents a relatively large percentage of the population and areal extent of LeConte's Thistle recently documented as extant or potentially extant on NFS lands in the CNF. These three populations with either indirect or direct impacts represent the three highest quality LeConte's thistle populations documented in the CNF. The project is not expected to result in changes that would prevent the utility company from continued mowing to maintain the powerline right-of-way.

Mitigation measures are needed to reduce the threat for a loss of viability for LeConte's Thistle on NFS lands in within the CNF. Implementation of mitigation measures agreed to between NCDOT and USFS, such as temporarily closing the Preferred Alternative to allow for prescribed burns, and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands would minimize viability concerns resulting from indirect impacts. In addition, NCDOT has agreed to collect seeds from viable populations for use in supplementing existing Populations where suitable habitat occurs but numbers of individuals are low or individuals have not been recently documented; this mitigation will be conducted in coordination with the USFS. Seed collection was initiated for Leconte's Thistle in 2013.

The proposed project may impact individuals of LeConte's Thistle, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for LeConte's Thistle on NFS lands in the CNF.

Cumulative impacts identified consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF. No cumulative impacts from other USFS or NCDOT projects on NFS lands on the CNF have been identified.

Small Coastal Spreading Pogonia (*Cleistesiopsis oricamporum*) (S), formerly known as *Cleistes bifaria* which was recently split into two separate taxa, is found in savannas and dry meadow habitats. Potentially suitable habitat was identified in the Preferred Alternative evaluation area. One occurrence of Small Coastal Spreading Pogonia is present within the Preferred Alternative corridor and two additional occurrences are present in the area being considered for potential indirect effects. Including these three occurrences, there are seven known occurrences of Small Coastal Spreading Pogonia on NFS lands in the CNF.

One occurrence of this species has direct impacts. The two occurrences in the indirect impact area are located in fire-maintained habitats. The ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the ROW across NFS lands. The proposed project may impact individuals of Small Coastal Spreading Pogonia, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Small Coastal Spreading Pogonia on NFS lands in the CNF. Cumulative impacts identified consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

A liverwort (*Lejeunea bermudiana*) (LR) is found on the bark on trees along the edges of swamp habitats. Potentially suitable habitat was identified in the evaluation area. *Lejeunea bermudiana* has been confirmed as present in seven watersheds on NFS lands in the CNF during surveys conducted in 2012 and 2013. Alternative 3 directly affects two watersheds that include Populations for this species.

Within the Tucker Creek watershed, Alternative 3 directly affects one population in its entirety, including the new confirmed sample locations documented in 2013. The occurrences in this watershed have been impacted by recent forest management activities (thinning) resulting in increased light penetration, but because the Havelock Bypass project would result in presumed loss of this population, the forest management activities would not contribute to significant adverse cumulative effects.

Within the Southwest Prong Slocum Creek watershed, Alternative 3 directly affects a portion of the population. The population could be directly affected by removal of one tree with confirmed occurrence, as well as other trees not sampled within the ROW clearing limits that could potentially harbor this species. The documented distribution of this species within this watershed extends approximately 3,000 feet upstream and 3,400 feet downstream of the potential impact associated with Alternative 3; however, the distribution of this species within this watershed is limited to suitable trees in appropriate hydrologic zones and is likely discontinuous. Direct impacts from the proposed project could result in loss of a portion of this population, but is not expected to result in a complete loss of the population in the Southwest Prong Slocum Creek watershed.

Within the Southwest Prong Slocum Creek watershed, Alternative 3 may result in indirect effects to a portion of the population. Indirect effects from clearing of forest canopy in the right-of-way may be expected to extend up to 250 feet outside the ROW, which could result in effects to additional occupied habitat within the population, including the two new confirmed sample locations documented in 2012. The portions of other populations are outside the zone considered for potential indirect effects from increased light penetration.

The Preferred Alternative will result in unavoidable direct impacts to *Lejeunea bermudiana* and additional areas occupied by *L. bermudiana* are subject to consideration for indirect impacts. The direct impacts for Alternative 3 may lead to a loss of the population in Tucker Creek and a portion of the population in Southwest Prong Slocum Creek.

Because the loss of one of two populations and partial loss of the second population known prior to 2012 on NFS lands in the CNF resulting from the US 70 Havelock Bypass project could lead to viability concerns, mitigation measures were required to reduce the threat for a loss of viability for *Lejeunea bermudiana* on NFS lands in the CNF. Because this species is cryptic and not widely studied or easily documented, the identification of new populations of this species in secure locations elsewhere on NFS lands is considered by the USFS to be an important mitigation measure. Five new populations of *L. bermudiana* have been identified in 2012-2013 on behalf of USFS by NCDOT on NFS lands in the CNF. These newly discovered

occurrences are located in stream systems well outside the area affected by the Preferred Alternative.

Implementation of additional mitigation measures agreed to between NCDOT and USFS, including implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, particularly for Chinese Privet, would minimize potential for loss of the remaining portion of the Southwest Prong Slocum Creek from indirect impacts.

With the identification of five new populations by NCDOT on NFS lands in the CNF in watersheds not subject to effects by the US 70 Havelock Bypass project and the implementation of the additional mitigation measures to minimize potential for indirect effects to the remaining portion of the population in Southwest Prong Slocum Creek, the Preferred Alternative may result in loss of one population (Tucker Creek) and partial loss of one population (Southwest Prong Slocum Creek), but is not likely to cause a loss of viability for *Lejeunea bermudiana* on NFS lands in the CNF.

Loomis's Loosestrife (*Lysimachia loomisii*) (S) is found in moist to wet savanna and pocosin ecotone habitats. Potentially suitable habitat was identified in the evaluation area. This species is not tracked by NCNHP. This species is considered to be secure on the CNF with more than 50 known occurrences (personal communication, Gary Kauffman, USFS). Loomis's loosestrife has been recommended to be removed from USFS Region 8 Sensitive plant list. This list is scheduled to be updated in 2015. Incidental observations of this species within the Powerline Corridors, wet Pine Flatwoods, and open areas within the Streamhead Pocosins during the 2003-2004 field surveys indicate that this species is relatively common and is presumed present in suitable habitat within the Preferred Alternative corridor and the areas being considered for potential indirect effects.

This species was observed in areas with direct impacts. The occurrences in the indirect impact area are located in fire-maintained habitats. The ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the right-of-way across NFS lands. The proposed project may impact individuals of Loomis's Loosestrife, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Loomis's Loosestrife on NFS lands in the CNF. In addition, surveys on the CWMB identified several occurrences of this species on the CWMB property. Contingent upon USFS release of right-of-way for the Havelock Bypass, the transfer of the CWMB property to USFS would provide an additional mitigation measure by adding these occurrences to NFS lands on the CNF.

Cumulative impacts identified consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Piedmont Cowbane (*Oxypolis ternata*) (S), formerly referred to as *Oxypolis denticulata*, is found in pine savannas and sandhill seeps. Potentially suitable habitat was identified in the evaluation area. Two occurrences of Piedmont Cowbane were identified within the Preferred Alternative corridor and two additional occurrences identified as present in the area being considered for potential indirect effects. The NC Natural Heritage Program (NCNHP) previously tracked this species but found the species to be so common it was downgraded to the watch list in the mid 1990's (Misty Franklin, former NCNHP botanist, personal communication 2010). It has been documented within 17 NC counties including all three containing the CNF (Gadd and Finnegan 2012). The species has recently been dropped from the NC watch list (Gadd and Finnegan 2012). It is unknown how many records of this species occur in the CNF but it is not inconceivable 40-50 separate sites occur (personal communication, Gary Kauffman). For these reasons the species has been recommended to be removed from USFS Region 8 Sensitive plant list. This list is scheduled to be updated in 2015.

Two occurrences of this species are subject to direct impacts. The occurrences in the indirect impact area are located in fire-maintained habitats. The ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the right-of-way across NFS lands. The proposed project may impact individuals of Piedmont Cowbane, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Piedmont Cowbane on NFS lands in the CNF. Cumulative impacts identified consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF.

Mudbank Crown Grass (*Paspalum dissectum*) (LR) is found on mudbank, open wet area, and wet ditch habitats. Potentially suitable habitat was identified in the evaluation area. This evaluation indicated that Mudbank Crown Grass is present in four discrete sites delineated on NFS lands, including one that is mostly on private lands and marginally extends onto NFS lands as depicted on Exhibit 3.14.1. A total of 1,079 individual Mudbank Crown Grass plants were estimated as present on NFS lands during the 2012 survey within these sites. These four sites collectively cover 5.9 acres of occupied habitat documented on NFS lands in the CNF.

Alternative 3 directly affects a population that consists of two sites that total 3.9 acres. Alternative 3 will directly impact approximately 1.7 acres of the total 1.9 acres of one site. All seven culms observed within the site are in the area that will be directly impacted. Alternative 3 avoids direct impacts to an estimated 1,072 estimated culms at the second site.

Approximately 4.2 acres of occupied habitat on NFS lands are in areas subject to indirect impact consideration for Alternative 3. The 2012 survey estimated that approximately 1,072 culms are present on NFS lands that may be subject to indirect impacts. These culms were observed within the powerline right-of-way which is currently being managed by a combination of mowing by the utility company operating the lines within the right-of-way and periodic prescribed burns conducted by the USFS.

The Preferred Alternative will result in unavoidable direct impacts to Mudbank Crown Grass and has the potential for indirect impacts. The Preferred Alternative directly affects approximately 1.7 acres and 7 culms of Mudbank Crown Grass identified within one occupied habitat site. An additional 4.2 acres and 1,072 culms estimated during the 2012 survey are located on NFS lands in areas subject to indirect impact consideration. Cumulative impacts identified for this species consisted of the DEP overhead ground wire replacement project, which may impact individuals of this species, but was determined to not likely result in viability concerns across the CNF. No additional cumulative impacts from other USFS or NCDOT projects on NFS lands on the CNF have been identified.

Based on the limited direct impact to this species for the Preferred Alternative, direct impacts are not likely to result in a loss of viability on NFS lands within the CNF. The area subject to consideration for indirect impacts represents the remainder of the population and areal extent of Mudbank Crown Grass known to occur on NFS lands in the CNF. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species along the right-of-way across NFS lands.

The proposed project may impact individuals of Mudbank Crown Grass, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Mudbank Crown Grass on NFS lands in the CNF.

A Liverwort (*Plagiochila ludoviciana*) (LR) is found on bark or moist rock in swamp habitats and mountain gorges. *Plagiochila ludoviciana* has been documented from three watersheds on NFS lands within the CNF during surveys conducted in 2012 and 2013. In each watershed it was found in similar habitat and often on the same trees documented as having *Lejeunea bermudiana* present. Within the Tucker Creek watershed, the Preferred Alternative directly affects the known occurrence in its entirety. This occurrence is located on a tree that has been damaged by a recent lightning strike and is sloughing off large areas of bark, with the tree expected to succumb to the lightning damage. However, this species may occur on other suitable, unsampled trees present in the direct impact area. Occupied habitat in the form of mature hardwood trees within the Southwest Prong Slocum Creek watershed is in an area that is subject to consideration for indirect effects by the Preferred Alternative. Patches of this species were observed on tree trunks within the area under consideration for indirect effects.

The Preferred Alternative will result in unavoidable direct impacts to *Plagiochila ludoviciana* and an additional area occupied by *P. ludoviciana* is subject to consideration for indirect impacts. The direct impacts for the Preferred Alternative may lead to a loss of the population in Tucker Creek. The occurrence in this watershed also has been impacted by recent forest management activities (thinning) resulting in increased light penetration, but because the Havelock Bypass project would result in presumed loss of this population, the forest management activities would not contribute to significant adverse cumulative effects. The Preferred Alternative may result in indirect effects to the population in Southwest Prong Slocum Creek. No significant adverse cumulative impacts from other projects were identified.

No changes in management to the swamp forest habitat are expected to result from project implementation, reducing concerns for indirect impacts. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including implementation of measures proposed for controlling the spread of NNIS plant species along the right-of-way across NFS lands. The identification of new populations of this species in secure locations on NFS lands is an important mitigation measure and one new population of *Plagiochila ludoviciana* has already been identified on behalf of USFS by NCDOT on NFS lands in the CNF in a watershed unaffected by the US 70 Havelock Bypass project. This new, unaffected occurrence was documented in 2013 in the Pettiford Creek watershed in association with *Lejeunea bermudiana*. Based on co-occurrences of *P. ludoviciana* with *L. bermudiana* at sites where *P. ludoviciana* has been documented so far, it is likely that *P. ludoviciana* may also be found in association with *L. bermudiana* at other sites in the CNF where *L. bermudiana* was documented in 2012-2013.

The proposed project may impact individuals of *Plagiochila ludoviciana*, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is

determined that the proposed project is not likely to cause a loss of viability for *Plagiochila ludoviciana* on NFS lands in the CNF.

Awned Mountain-mint (*Pycnanthemum setosum*) (LR) may be found in damp to wet fields, clearings, and forest borders in sandy soils, often associated with blackwater swamps. Potentially suitable habitat was identified in the evaluation area. One occurrence of this species has been recently reported as present in a powerline right-of-way that is crossed by the Preferred Alternative corridor. This population, originally documented in July 2012, was assessed in June 2014 resulting in documentation of approximately 4,300 individual plants dispersed across five discrete sites totaling 2.18 acres extending farther along the powerline right-of-way. This population represents one of two for Awned Mountain-mint reported on NFS lands in the CNF, with the other population located in the Holston Creek Natural Area approximately 15 miles from the Preferred Alternative corridor. This second population was reported as approximately 0-1% cover within a 400 square meter Carolina Vegetation Survey Plot, but recent surveys to find any occurrences of tis species have been unsuccessful (personal communication, Gary Kauffman).

The Preferred Alternative directly affects approximately 0.52 acre, resulting in direct impacts to approximately 500 individual plants.

Approximately 0.10 acre of this population containing an estimated 50 individual plants is located in an area subject to indirect impact consideration for the Preferred Alternative. These plants were observed within the powerline right-of-way which is currently being managed by a combination of mowing by the utility company operating the lines within the right-of-way and periodic prescribed burns by the USFS. No changes in management of the powerline right-of-way by mowing are expected to result from project implementation, reducing the concerns for indirect impacts.

The remaining portion of this population, comprising approximately 3,750 individual plants dispersed over 1.56 acres, is located outside the areas identified as subject to direct or indirect impacts from the Preferred Alternative.

The Preferred Alternative will result in unavoidable direct impacts to Awned Mountain-mint and has the potential for indirect impacts. No cumulative impacts from other USFS or NCDOT projects on NFS lands on the CNF have been identified.

Mitigation measures are needed to reduce the threat for a loss of viability for Awned Mountain-mint on NFS lands within the CNF. Conservation measures agreed to between NCDOT and USFS include closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures for controlling the spread of NNIS plant species on NFS lands. In addition, NCDOT has agreed to collect seeds from the impact areas for establishing new populations on NFS lands in areas identified as potentially suitable

based on favorable soil and hydrology conditions; this mitigation will be conducted in coordination with the USFS. Seed collection was initiated in 2014.

The proposed project may impact individuals of Awned Mountain-mint, but with implementation of these mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Awned Mountain-mint on NFS lands in the CNF.

Spring-flowering Goldenrod (*Solidago verna*) (S) is found in moist pine savanna habitats as well as lower slopes in sandhills and road sides in pineland habitats. Potentially suitable habitat was identified in the evaluation area and surveys confirmed this species is present in the Preferred Alternative corridor and the area being considered for potential indirect effects.

The Preferred Alternative directly affects 23.51 acres of occupied habitat on NFS lands and estimated 11,419 individual spring-flowering goldenrod plants. An additional 63.53 acres of occupied habitat is in areas that may be indirectly affected by the Preferred Alternative that include an estimated 43,415 individual spring-flowering goldenrod plants.
The Preferred Alternative will result in unavoidable direct impacts to spring-flowering goldenrod and additional areas occupied by spring-flowering goldenrod may be subject to indirect impacts. Cumulative impacts associated with the US 17 improvements in Jones County (R-2514B, C, and D) will directly impact another large population on NFS lands. The two largest spring-flowering goldenrod populations within the Croatan NF may be potentially impacted by the two road projects. Cumulative impacts associated with the Duke Energy overhead ground wire replacement project may impact individuals of this species, but the project was determined to not likely result in viability concerns across the CNF. The direct impacts for the Preferred Alternative are not likely to result in a loss of viability on NFS lands, but with the inclusion of indirect and cumulative impacts, the Preferred Alternative would contribute to an impact to a significant portion of the overall population on the CNF, particularly for the population within the Preferred Alternative evaluation area, that may result in viability concern on NFS lands within the CNF.

Mitigation measures are needed to reduce the threat for a loss of viability for spring-flowering goldenrod on NFS lands within the CNF. Conservation measures agreed to between NCDOT and USFS include closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures for controlling the spread of NNIS plant species on NFS lands. In addition, NCDOT has also agreed to collect seeds from spring-flowering goldenrod from the impact areas for establishing new populations on NFS lands in areas identified as potentially suitable based on favorable soil and hydrology conditions; this work will be conducted in coordination with USFS. Seed collection was initiated for spring-flowering goldenrod from the Preferred Alternative corridor in 2010.

The proposed project may impact individuals of Spring-flowering Goldenrod, but with implementation of the mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Spring-flowering Goldenrod on NFS lands in the CNF.

Florida Peatmoss (*Sphagnum cribrosum*) (S) is found in blackwater stream and ditch habitats. Potentially suitable habitat was identified in the evaluation area. There are 11 documented occurrences of Florida Peatmoss on NFS lands in the CNF that represent 6 populations (Gary Kauffman personal communication, 2013). One of these populations occurs in the evaluation area and consists of three individual sites with documented presence of Florida Peatmoss. One of the three sites (Site #1) is in the Preferred Alternative corridor and subject to consideration for direct impacts as well as indirect impacts. A second Florida Peatmoss site (Site #2) is located in a depression in a maintained powerline right-of-way outside the area of potential direct impact, but within the area for consideration for indirect impacts. A third Florida Peatmoss site in the project vicinity is located in a depression in a maintained powerline right-of-way approximately 600 feet south of the Preferred Alternative corridor and is outside the area considered for direct or indirect effects.

The Preferred Alternative directly affects a portion of one occurrence of Florida Peatmoss (Site #1). Approximately 0.03 acre of Florida Peatmoss Site #1 is located in approximately 466 feet of a railroad ditch where the Preferred Alternative corridor would bridge the ditch and railroad corridor. An additional 0.11 acre of this occurrence is located upstream of the Preferred Alternative will not be affected.
Two occurrences are located in areas subject to consideration for potential indirect impacts associated with the Preferred Alternative. This species was confirmed present in these occurrences; individual plant counts are not practicable for bryophyte species and total population was not determined. Approximately 0.04 acre of Florida Peatmoss Site #1 is located in an area for consideration of potential indirect effects by the Preferred Alternative. Potential indirect effects include shading associated with the bridge crossing.

An additional occurrence (Florida Peatmoss Site #2) is located within another area subject to consideration for indirect impacts by the Preferred Alternative. However, it is not anticipated to be affected by the Preferred Alternative due to its distance (approximately 3,300 feet east) from the Preferred Alternative corridor, with no changes in management of the powerline right-of-way in which it is expected to occur.

The Preferred Alternative will result in unavoidable direct impacts to one Florida peatmoss population as a result of the proposed bridging associated with the Preferred Alternative. The documented extent of this occurrence on NFS lands was substantially expanded by the NCDOT survey in 2012. With the new documentation that the majority of this occurrence extends a considerable distance farther upstream, only approximately 0.03 acre of the

0.21-acre known extent is being directly impacted and approximately 0.04 acre of this occurrence is downstream of the ROW and subject to consideration for indirect impacts. Cumulative impacts associated with the potential future widening of the Atlantic and East Carolina Railroad from a single track to multiple tracks may occur if railway construction alters the ditches adjacent to the railway. Potential effects to Florida Peatmoss will need to be evaluated as part of the planning process for the railway project, should it occur. Currently the rail expansion is not reasonably foreseeable. No cumulative impacts have been identified for any of the five known populations on NFS lands in the CNF.

The project is not expected to result in changes that would prevent the utility company and/or railroad from continued mowing to maintain the ROW in which these occurrences are found, reducing the threat for indirect impacts. Other potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. The proposed project may impact individuals of Florida Peatmoss, but with implementation of mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Florida Peatmoss on NFS lands in the CNF.

One new occurrence of Florida Peatmoss was identified on the CWMB as part of a previous evaluation by NCDOT in 2007. Contingent upon USFS release of ROW for the Havelock Bypass, the transfer of the CWMB property to USFS would provide an additional mitigation measure by adding this occurrence to NFS lands on the CNF. In addition, this species has been recommended to be removed from the USFS Region 8 sensitive plant list based on more potential habitat in the CNF (personal communication, Gary Kauffman).

Fitzgerald's Peatmoss (*Sphagnum fitzgeraldii*) (S) is found in pocosin and savanna habitats. Potentially suitable habitat was identified in the evaluation area. This species has been recently relocated by USFS in some historical sites as well as new sites across the CNF and is likely more common than previously determined. One occurrence of this species is located in the Preferred Alternative corridor and will be directly affected. Areal extent and population estimates are not available for this occurrence. This species is considered to be secure on the CNF. Including this occurrence, there are eleven known occurrences of Fitzgerald's Peatmoss on NFS lands in the CNF. This species has been recommended to be removed from the USFS Region 8 sensitive plant list based on more potential habitat in the CNF (personal communication, Gary Kauffman).

One occurrence of this species within a powerline right-of-way has direct impacts. No changes in the mowing used to manage the powerline are expected to result from the proposed project, reducing the concerns for indirect impacts. However, the ability for the USFS to conduct periodic prescribed burns in these powerline areas will need to be continued. Potential indirect impacts that could result from construction or maintenance

activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. The proposed project may impact individuals of Fitzgerald's Peatmoss, but with implementation of mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Fitzgerald's Peatmoss on NFS lands in the CNF.

Summary of Potential Effects on USFS Rare Plant Species – There are 107 plant species on the most recent (October 2013) list of rare plant species maintained by the USFS for the CNF. Of these 107 rare plant species, 35 species were dropped from further consideration because no suitable habitat is present within or in close proximity to the evaluation area. Potentially suitable habitat or previously reported NCNHP or USFS records were identified in the evaluation area for 72 USFS rare plant species. Surveys conducted from 2003-2014 within the evaluation area in combination with records available from NCNHP and the USFS resulted in documentation or confirmation of the presence of 21 USFS rare plant species within the evaluation area. Surveys did not document the presence of the remaining 51 USFS rare plant species within the evaluation area. Based on the apparent absence of these 51 species, it is determined that the proposed project will have no impact on these 51 species and these species are dropped from further consideration.

The proposed project will have no effect on Rough-leaved Loosestrife, the only federal endangered, threatened, or proposed plant species that potentially could occur. Surveys did not document the presence of this species in the evaluation area.

For sensitive plant species, with implementation of mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it was determined that the project would not impact Yellow Fringeless Orchid, Hooker's Milkwort, Short-bristled Beaksedge, or Carolina Goldenrod. For sensitive plant species, the project may impact individuals of Small Spreading Pogonia, Loomis's Loosestrife, Piedmont Cowbane, Spring-flowering Goldenrod, Florida Peatmoss, and Fitzgerald's Peatmoss, but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for any of the species across the CNF.

For locally rare plant species, with implementation of mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it was determined that the project would not impact Bog Bluestem, Eaton's Witch Grass, Florida Adder's mouth, Snowy Orchid, Shadow-witch, or Eaton's Ladies'-tresses. For locally rare plant species, the project may impact individuals of LeConte's Thistle, Mudbank Crowngrass, Awned Mountain-mint, and two liverworts (*Lejeunea bermudiana* and *Plagochila lucoviciana*), but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for any of the species across the CNF.

Non-native Invasive Species (NNIS) – Areas disturbed by road construction as well as the maintained road shoulders and right-of-way of the completed project could serve as potential areas for spread of NNIS on NFS lands. Without intervention, NNIS are expected to increase in some portions of the evaluation area. It is expected that with no control efforts along the existing road shoulders and other existing disturbed habitats, NNIS could potentially spread into adjacent natural areas. Specific measures to prevent the spread of NNIS are detailed in the project commitments and discussed in Chapter 4.15.5.4.

Terrestrial and Aquatic Animal Species – There are 92 animal species on the most recent (August 2013) list of rare animal species provided by the USFS for the CNF. One additional mammal, Northern Long-eared Bat (*Myotis septentrionalis*), is not on the August 2013 list of rare animal species provided by the USFS for the CNF, but was considered in this evaluation based on its recent status change and anticipated addition to the USFS list. Of this total of 93 rare animal species considered, 56 species were dropped from further consideration because no suitable habitat is present within or in close proximity to the evaluation area.

Two species from the USFS list of rare animal species were eliminated from consideration since they are considered to be extirpated from North Carolina. The following federally Endangered, Threatened or Proposed animal species were eliminated from further consideration due to extirpation: Eastern Cougar (*Puma concolor cougar*) and Bachman's Warbler (*Vermivora bachmanii*). No Sensitive or Locally Rare animal species were identified as extirpated from the State and none were eliminated from further evaluation due to extirpation.

Several species were eliminated from consideration since the Croatan National Forest would be considered extralimital to known ranges and these species have not been documented in Carteret, Craven or Jones Counties. The following federally Endangered, Threatened, or Proposed animal species were eliminated from further consideration due to extralimital range: Red Wolf (*Canis rufus*) (experimental population reintroduced into North Carolina not documented as ranging south of Beaufort County) and Kirtland's Warbler (*Dendroica kirtlandii*). No Sensitive animal species were eliminated from further consideration due to extralimital range. The following Locally Rare animal species were eliminated from further consideration due to extralimital range: an undescribed Shrew (*Sorex* sp. 1), Dwarf Salamander (*Eurycea quadridigitata*), Wood Frog (coastal plain population) (*Rana sylvatica* pop. 3), a Noctuid Moth (*Melanapamea mixta*), a Mayfly (*Baetisca obesa*), a Noctuid Moth (*Bleptina sangamonia*), a Noctuid Moth (*Gabara* sp. 1), Blackwater Ancylid (*Ferrisia hendersoni*), Least Brook Lamprey (*Lampetra aepytera*), and Grooved fingernail Clam (*Sphaerium simile*).

No maritime forests, maritime thickets, dunes, ocean beach, or marine habits were identified in the evaluation area. The following federally Endangered, Threatened, or Proposed plant species were eliminated from further consideration due to the lack of these

habitats within the evaluation area: West Indian Manatee (*Trichechus manatus*), Piping Plover (*Charadrius melodus*), Roseate Tern (*Sterna dougallii*), Loggerhead Seaturtle (*Caretta caretta*), Green Seaturtle (*Chelonia mydas*), Leatherback Seaturtle (*Dermochelys imbricata*), Hawksbill Seaturtle (*Eretmochelys imbricata*), and Kemp's Ridley Seaturtle (*Lepidochelys kempii*). No Sensitive animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of these habitats. The following Locally Rare animal species were eliminated from further consideration due to a lack of these habitats within the evaluation area: Buxton Woods White-footed Mouse (*Peromyscus leucopus buxtoni*), Pungo White-footed Mouse (*Peromyscus leucopus eastii*), Gull-billed Tern (*Gelochelidon nilotica*), Caspian Tern (*Hydropogne caspia*), Peregrine Falcon (*Falco peregrinus*), Eastern Painted Bunting (*Passerina ciris ciris*), Glossy Ibis (*Plegadis falcinellus*), Outer Banks Kingsnake (*Lampropeltis getula sticticeps*), an undescribed Skipper (*Atrytonopsis* sp.), a Noctuid Moth (*Faronta aleada*), and Giant Swallowtail (*Papilio cresphontes*).

No large or medium sized river habitats were identified in the evaluation area. The following federally Endangered, Threatened, or Proposed fish species were eliminated from further consideration due to the lack of these habitats within the evaluation area: Shortnose Sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxrhynchus*). The following Sensitive species was eliminated from further consideration due to a lack of habitat within the evaluation area: Carolina Madtom (*Noturus furiusus*). No Locally Rare animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of these habitats within the evaluation area.

No tidal swamps or freshwater/brackish marshes were identified in the evaluation area. The following federally Endangered, Threatened, or Proposed animal species were eliminated from further consideration due to the lack of these habitats within the evaluation area: Wood Stork (*Mycteria americana*). The following Sensitive animal species was eliminated from further consideration due to a lack of these habitats within the evaluation area: Carolina Salt Marsh Snake (*Nerodia sipedon williamengelsi*). The following Locally Rare animal species were eliminated from further consideration due to a lack of these habitats within the evaluation area: American Bittern (*Botaurus lentiginosus*), Northern Harrier (*Circus cyaneus*), Black-necked Stilt (*Himantopus mexicanus*), Black Rail (*Laterallus jamaicensis*), Purple Gallinule (*Porphyrio martinica*), Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*), Marsh Killifish (*Fundulus confluentus*), and Spotfin Killifish (*Fundulus luciae*).

Streams in the evaluation area were determined to be too acidic to support suitable habitat for several species. No CNF-listed federally Endangered, Threatened, or Proposed animal species were eliminated from further consideration due to the acidic nature of stream habitats in the evaluation area. The following Sensitive animal species was eliminated from further consideration due acidic nature of stream habitats in the evaluation area: Green Floater (*Lasmigona subviridis*). The following Locally Rare animal species were

eliminated from further consideration due to acidic nature of stream habitats within the evaluation area: Pod Lance (*Elliptio folliculata*), Chameleon Lampmussel (*Lampsilis* sp. 2), Tidewater Mucket (*Leptodea ochracea*), and Creeper (*Strophitus undulata*). In addition, NCDOT surveys for mollusks in evaluation area streams did not document the presence of any freshwater mussel fauna.

No lakes were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from consideration due to the lack of this habitat. No Sensitive animal species are restricted to these habitats and none were eliminated from further consideration due to a lack of this habitat. The following Locally Rare animal species was eliminated from further consideration due to a lack of this habitat within the evaluation area: Double-crested Cormorant (*Phalacrocorax auritus*).

No Sandhills or Pine Barrens were identified in the evaluation area. No CNF-listed federally Endangered, Threatened, or Proposed plant species are restricted to these habitats and none were eliminated from consideration due to the lack of these habitats. The following Sensitive plant species were eliminated from consideration due to a lack of these habitats within the evaluation area: Dotted Skipper (*Hesperia attalus slossonae*). The following Locally Rare plant species were eliminated from consideration due to a lack of these habitats within the evaluation area: Eastern Tiger Salamander (*Ambystoma tigrinum*), Eastern Coral Snake (*Micrurus fulvius*), and Buchholz's Gray (*Hypomecis buchholzaria*).

Potentially suitable habitat was identified in the evaluation area for 37 USFS rare wildlife species as noted in the BE (Appendix C). NCNHP and USFS records indicate that only a few of these species have been documented within the evaluation area or in close proximity. Animal surveys that included light trapping for moths, mist netting and acoustic monitoring for bats, and surveys for terrestrial and aquatic species were conducted in 2005. Surveys conducted in 2005 in combination with records available through January 2015 from NCNHP and the USFS resulted in documentation or confirmation, or presumed presence of 15 USFS rare animal species within the evaluation area. Based on the apparent absence of these species, it is determined that the proposed project will not affect 21 rare animal species, as well as Northern Long-eared Bat which is addressed in Chapter 4.14.4. These species are:

- Star-nosed Mole (*Condylurus cristata*) (LR)
- Northern Yellow Bat (*Lasiurus intermedius*) (LR)
- Eastern Woodrat (coastal plain population) (*Neotoma floridana floridana*) (LR)
- Bald eagle (*Haliaeetus leucocephalus*) (S)
- Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) (LR)
- Mimic Glass Lizard (*Ophisaurus mimicus*) (S)
- Carolina Gopher Frog (*Rana capito*) (S)

- Glossy Crayfish Snake (*Regina rigida*) (LR)
- Black Swamp Snake (*Seminatrix pygaea*) (LR)
- Cypress Daggermoth (*Acronicta perblanda*) (LR)
- A Daggermoth (*Acronicta sinescripta*) (LR)
- A Dart Moth (*Agrotis carolina*) (LR)
- Tiger Moth (*Apantensis* sp. 1 nr. *carlotta*) (LR)
- Frosted Elfin (*Callophrys irus*) (LR)
- Dismal Swamp Stink Bug (*Chlorochroa dismalia*) (LR)
- A Prominent Moth (*Datana robusta*) (LR)
- Venus Flytrap Cutworm Moth (*Hemipachnobia subporphyrea*) (S)
- Carter's Noctuid Moth (*Spartiniphaga carterae*) (S)
- A gray moth (*Tornos cinctarius*) (LR)
- Graceful Clam Shrimp (*Lynceus gracilicornis*) (LR)
- Bridle Shiner (*Notropis bifrenatus*) (LR)

A discussion of potential impacts to the 15 USFS rare animal species presumed to occur within the evaluation area is presented below. Site survey results and/or NCNHP/USFS records for USFS rare animal species are presented in the Biological Evaluation contained in Appendix C.

Mammals

Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii macrotis*) (LR) roosts in hollow trees, old buildings, and beneath bridges, usually near water. Potentially suitable habitat was identified in the evaluation area in the vicinity of Southwest Prong Slocum Creek. NCNHP records indicate one occurrence of this species within Craven County. This NCNHP occurrence of this species is includes portions of the evaluation area. NCNHP has designated the accuracy of this occurrence as very low. A very low accuracy occurrence characterization is described by NHP as one with less than 5 percent of the area occupied. NCNHP records indicate that this occurrence is based on an observation of this species at an unspecified location in Craven County. There are approximately 9.4 acres of potentially occupied habitat identified within the Preferred Alternative corridor. Mist netting and acoustic surveys conducted in the summer of 2005 did not identify the presence of Rafinesque's Big-eared Bat in the evaluation area.

No direct impacts are anticipated. If individuals of this species are present, indirect impacts may result from road construction, which would fragment the bottomland habitat and could decrease the likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Based on the widespread availability of similar habitats on NFS lands adjacent to the proposed project, the proposed project would not significantly affect the availability of suitable habitat in the evaluation area.

One new occurrence of Rafinesque's Big-eared Bat was identified on the CWMB as part of a survey by NCDOT in 2008. Contingent upon USFS release of ROW for the Havelock Bypass, transfer of this tract to the USFS from NCDOT would add this occurrence to NFS lands on the CNF and would help ensure this species is viable on the CNF.

Southeastern Myotis (*Myotis austroriparius*) (LR) roosts in buildings and hollow trees and forages near water. Potentially suitable habitat was identified in the evaluation area in the vicinity of Southwest Prong Slocum Creek. Mist netting and acoustic surveys conducted in the summer of 2005 identified the presence of Southeastern Myotis in the evaluation area.

Based on the mobility of this species, no direct impacts from project construction are anticipated. Indirect impacts may result from road construction, which would fragment the bottomland habitat and could decrease the likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Based on the widespread availability of similar habitats on NFS lands adjacent to the proposed project, the proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area.

One new occurrence of Southeastern Myotis was identified on the CWMB as part of a survey by NCDOT in 2008. Contingent upon USFS release of ROW for the Havelock Bypass, transfer of this tract to the USFS from NCDOT would add this occurrence to NFS lands on the CNF and would help ensure this species is viable on the CNF.

Birds

Eastern Henslow's Sparrow (*Ammodramus henslowii susurrans*) (LR) breeding habitat can be described as relatively large, open fields and other similarly open habitat with tall, dense grass and little or no woody vegetation. Typical winter habitat consists of extensive, open, moist to wet Pine Flatwoods (Pine Savanna) or other similarly open, moist to wet areas having dense herbaceous cover, such as some abandoned fields and clearcuts. Powerline corridors adjacent to Pine Flatwoods may be important as winter habitat. Nesting habitat is not present within the Preferred Alternative corridor. There is only one reported breeding season record for this species in the CNF, from 1985 at a site approximately 6.5 miles from the Preferred Alternative corridor. Potentially suitable wintering habitat is present in the evaluation area within some of the Powerline Corridors and contiguous Pine Flatwoods. Three individuals were observed within the Preferred Alternative corridor during 1999 and an additional individual was observed in the Preferred Alternative corridor in 2005, all in the winter season (John Fussell, personal communication, 2005). The only other reported site where this species has been documented as overwintering on the CNF is located approximately 6.5 miles from the Preferred Alternative. Although no breeding evidence has

been documented in the evaluation area, individuals of this species may be present during winter.

Based on the absence of suitable breeding habitat, the proposed project will not impact breeding sites or breeding individuals of this species. The proposed project may impact individuals of Eastern Henslow's Sparrow through fragmentation of wintering habitat and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Potential loss of individuals through road-crossing mortality is anticipated to be relatively low based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable wintering habitat in the evaluation area. Potential indirect impacts to Eastern Henslow's sparrow wintering habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the wintering habitat. Because there will be no impacts to breeding individuals or breeding habitat, with implementation of these habitat conservation measures agreed to between NCDOT and USFS to maintain the quality of adjacent wintering habitat, it is determined that the proposed project is not likely to cause a loss of viability for Eastern Henslow's Sparrow on NFS lands in the CNF.

Black-throated Green Warbler (coastal plain population) (*Dendroica virens waynei*) (LR) is a disjunct race found in eastern North Carolina in spring and summer as a nesting species in forested wetland habitats that occur on interstream flats or in the uppermost portions of streams. This species is associated with hardwoods, especially when a component of mature conifers is present, including White Cedar (*Thuja occidentalis*), Baldcypress (*Taxodium* spp.), or Pines (*Pinus* spp.). Potentially suitable nesting habitat is present in the evaluation area. One NCNHP mapped occurrence of this species is located within the Preferred Alternative corridor. This occurrence represents the identification of three singing male birds in this general location. Including this occurrence, this species is known from seven occurrences documented as Populations in NCNHP records for NFS lands in the CNF.

Based on the mobility of this species, no direct impacts from project construction are anticipated. The proposed project may impact individuals of Black-throated Green Warbler through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Potential loss of individuals through road-crossing mortality is anticipated to be relatively low based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat

in the evaluation area. Potential indirect impacts to Black-throated Green Warbler nesting habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the nesting habitat. Based on the number of occurrences on CNF and the implementation of these habitat conservation measures agreed to between NCDOT and USFS to maintain the quality of adjacent nesting habitat, it is determined that the proposed project is not likely to cause a loss of viability for Black-throated Green Warbler on NFS lands in the CNF.

One new occurrence of Black-throated Green Warbler was identified on the Croatan Wetland Mitigation Bank, consisting of several males singing on territory throughout the Non-riverine Swamp Forest/Bay Forest community on the tract. Contingent upon USFS release of ROW for the Havelock Bypass, transfer of this tract to the USFS from NCDOT would add this occurrence to NFS lands on the CNF and would help ensure this species is viable on the CNF.

Bachman's Sparrow (*Peucaea aestivalis*) (LR), formerly known as *Ammodramus aestivalis*, is a bird that occupies open pine woodland habitats with grassy cover. Potentially suitable habitat is present in the evaluation area. Two NCNHP documented occurrences of this species are present within the evaluation area, and additional occurrences have been documented in the vicinity. These occurrences represent the identification of solitary singing birds in each location, which would be assumed to be males singing on territory. Additional suitable habitat areas associated with these occurrences are located within the area being considered for potential indirect impacts. Continued use of fire and mowing for habitat management is important in maintaining open habitat for this species and allowing individuals displaced by project construction to disperse into unoccupied suitable habitat. Including these occurrences in and adjacent to the evaluation area, this species is known from 18 occurrences documented as Populations in NCNHP records for NFS lands in the CNF.

Based on the mobility of this species, no direct impacts from project construction are anticipated. The proposed project may impact individuals of Bachman's Sparrow through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Potential loss of individuals through road-crossing mortality is anticipated to be relatively low based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Bachman's Sparrow habitat that could result from construction or maintenance activities can be minimized through conservation

measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. Based on the number of occurrences on CNF and the implementation of habitat conservation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Bachman's Sparrow on NFS lands in the CNF.

Red-cockaded Woodpecker (*Picoides borealis*) (RCW) (E) is a federally endangered species with known occurrences on the CNF. The proposed US 70 Havelock Bypass would pass through foraging habitat partitions for five RCW clusters and four habitat management areas (HMA) proposed by USFS for future RCW recruitment clusters. A Biological Assessment was prepared by Dr. J.H. Carter III & Associates, Inc. (JCA) dated November 8, 2013. The USFWS concurred with the Biological Conclusion of "May Affect, Not Likely to Adversely Affect" the red-cockaded woodpecker in a letter dated November 19, 2013. Discussions of RCW evaluation and conclusions are located in Chapter 4.14.4.

Reptiles and Amphibians

American Alligator (*Alligator mississippiensis*) [T(S/A)] is widespread across the CNF and is known from 4 occurrences that represent watersheds. Potentially suitable habitat may be found in flooded areas within the evaluation area. Surveys were conducted in March – April 2005 in the bottomland swamps along the various tributaries of Slocum Creek. No nighttime surveys were conducted. Alligators have been observed in the CNF (NCNHP data; Dennis Foster, personal communication, 2005). Alligators can be assumed to be present in any of the larger creeks or swamps, especially the Southwest Prong Slocum Creek and East Prong Slocum Creek. Both creeks would be impacted by the Preferred Alternative. Individuals present in the proposed right-of-way would be expected to move out of the area during construction activities, but there is the potential for direct mortality of individuals. Based on the widespread availability of similar habitats on NFS lands adjacent to the proposed project, the proposed project would not significantly affect the availability of suitable habitat in the evaluation area. If individuals of this species are present, indirect effects may result from road construction.

Potential indirect impacts will be minimized through use of wildlife fencing and bridges. Wildlife fencing will prevent individuals from crossing the new roadway. Bridges will provide a few areas for wildlife passage. The proposed project may impact individuals of American Alligator during construction if individuals are present. American Alligator has been documented as relatively common on the Croatan Wetland Mitigation Bank property, with documentation of successful reproduction occurring on the site. Contingent upon USFS release of ROW for the Havelock Bypass, transfer of the CWMB lands to USFS would add this

reproducing population segment to NFS lands. It is determined that the proposed project is not likely to cause a loss of viability for American Alligator on NFS lands in the CNF.

Southern Hognose Snake (*Heterodon simus*) (LR) is found in sandy woodland habitats, particularly pine-oak sandhill habitats. One occurrence of this species is potentially located in the evaluation area. This is an historic occurrence that NCNHP has designated as low in accuracy. A low accuracy occurrence characterization is described by NHP as one with between 5% and 20% of the mapped EO area occupied. While typical sandhills habitat is not present in the evaluation area, the dryer phases of the open mesic pinelands in the evaluation area provide potentially suitable habitat for this species. Surveys conducted in 2005 indicate that this species is not likely present within the evaluation area. This species is known from four occurrences documented on NFS lands in the CNF. Because the North Carolina Museum of Natural Sciences (NCMNS) has records from north, east, and southwest of the Preferred Alternative corridor, it is possible that the southern hognose snake may be present. There are 113.8 acres of potentially occupied habitat within the evaluation area. These areas of potentially occupied habitat are predominately characterized as mesic Pine Flatwoods, mesic Pine Plantations, and mesic Powerline Corridors. However, these communities may be considered to provide low probability of occurrence compared to the dry pine-oak woodlands that this species typically inhabits. Based on the widespread availability of similar habitats on NFS lands adjacent to the proposed project, the proposed project would not significantly affect the availability of suitable habitat in the evaluation area.

The proposed project may impact individuals of Southern Hognose Snake. If individuals of this species are present, the proposed project may impact individuals of Southern Hognose Snake through habitat fragmentation and through decreased likelihood that individuals of this species could safely crawl across the road to suitable habitat on the opposite side. Potential loss of individuals through road-crossing mortality is anticipated to be relatively low based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Southern Hognose Snake habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Southern Hognose Snake on NFS lands in the CNF.

Insects

Dusky Roadside Skipper (*Amblyscirtes alternata*) (LR) is a skipper that inhabits open grassy pine flatwood and savanna habitats. Potentially suitable habitat is present in the evaluation area. Surveys by NCDOT in 2003 and NCNHP in 2005 did not document the presence of this species in the Preferred Alternative corridor. However, this species has been documented in the broader evaluation area, which represents the only known occurrence (two sites) of this species on NFS lands in the CNF.

Based on presence within the area being evaluated for indirect impacts and suitability of habitat for this species identified in the Preferred Alternative corridor, Dusky Roadside Skipper is presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Dusky Roadside Skipper habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Dusky Roadside Skipper on NFS lands in the CNF.

Arogos Skipper (*Atrytone arogos arogos*) (S) is a skipper that inhabits mesic to boggy savanna habitats as well as mesic and hydric powerline corridors where its host plant species, Pinebarren Sand-reedgrass (*Calamovilfa brevipilis*), is present. Potentially suitable habitat is present in the evaluation area. While surveys did not document the presence of this species in the evaluation area they did identify the presence of its host plant species, Pinebarren Sand-reedgrass, within powerline corridors in the vicinity of the Preferred Alternative corridor and the area being considered for potential indirect impacts. The closest and only known occurrence of Arogos Skipper from the CNF is approximately 6.6 miles from the Preferred Alternative corridor, although this population may no longer be extant due to impacts from a wildfire (personal communication, Gary Kauffman).

Although not documented from NCNHP or USFS records or during NCDOT surveys in the direct or indirect impact areas, Arogos Skipper has been presumed present in the Preferred Alternative corridor based on the suitability of habitat and presence of the host plant species. The proposed project will have direct impacts to powerline corridor habitat containing dispersed individuals of the host plant species, which in turn could result in impact to an undetermined number of adults and/or larvae. The host plant for this species, Pinebarrren Sand-reedgrass, has been reported in at least five powerline corridors in and near the evaluation area (John Fussell, personal communication, 2005). In addition to presence in powerline corridor habitat in the direct and indirect impact areas, Pinebarren Sand-reedgrass is also more widespread in the vicinity of the Preferred Alternative in powerline corridors that will not be affected by the project. The proposed project may impact Arogos skippers, if present, through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals presumed present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area post-project. Since the distribution of the host plant in the vicinity of the Preferred Alternative extends along powerline corridors well outside of the direct and indirect impact areas, the proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Arogos Skipper habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Arogos Skipper on NFS lands in the CNF.

Little Metalmark (*Calephelis virginiensis*) (LR) is butterfly that inhabits grassy field, savanna, and marsh habitat. Potentially suitable habitat is present in the evaluation area. Surveys by NCDOT in 2003 and NCNHP in 2005 did not document the presence of this species in the Preferred Alternative corridor, but the surveys did document this species within the area being evaluated for indirect impacts as well as another powerline in the immediate vicinity (within 600 feet to the south of the Preferred Alternative corridor). Including these occurrences, this species is known from seven occurrences documented on NFS lands in the CNF.

Based on presence within the area being evaluated for indirect impacts and suitability of habitat for this species identified in the Preferred Alternative corridor, Little Metalmark is

presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Little Metalmark habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Little Metalmark on NFS lands in the CNF.

Berry's Skipper (*Euphyes berryi*) (LR) is a skipper that inhabits wet prairie, marsh, and savanna habitats containing pitcher plants. Potentially suitable habitat is present in the evaluation area. While surveys did not document the presence of this species in the Preferred Alternative corridor, it has been documented in the area being evaluated for indirect impacts and it is likely present in suitable habitat in the Preferred Alternative corridor. The occurrence within the area being evaluated for indirect impacts represents one of three known occurrences of this species on NFS lands in the CNF.

Based on presence within the area being evaluated for indirect impacts and suitability of habitat and presence of host species for this species identified in the Preferred Alternative corridor, Berry's Skipper is presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Berry's Skipper habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the

Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Berry's Skipper on NFS lands in the CNF.

Two-spotted Skipper (*Euphyes bimacula*) (LR) is a skipper that inhabits wet savanna and bog habitats, and sedge areas near wet woods. Potentially suitable habitat is present in the evaluation area. While surveys did not document the presence of this species in the evaluation area, it is likely present in suitable habitat. There are two occurrences known from the CNF and the nearest known occurrence is from a powerline corridor approximately 3.3 miles from the Preferred Alternative corridor.

Based on the suitability of habitat within the Preferred Alternative corridor, Two-spotted Skipper is presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals, if present, through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Two-spotted Skipper habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Two-spotted Skipper on NFS lands in the CNF.

Duke's Skipper (*Euphyes dukesi dukesi*) (S) is a skipper that inhabits ecotones between brackish or freshwater marshes with swamp habitats, as well as sedge patches in forested swamps. Larval host species have been identified as sedges (*Carex* spp.). Potentially suitable habitat is present in the evaluation area. While surveys did not document the presence of this species in the evaluation area, it may be present in suitable habitat. There

are two occurrences known from the CNF and the nearest known occurrence is approximately 4.5 miles from the Preferred Alternative corridor.

Based on the suitability of habitat and presence of potential host species for this species identified in the Preferred Alternative corridor, Duke's Skipper is presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals, if present, through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Duke's Skipper habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Duke's Skipper on NFS lands in the CNF.

Anointed Sallow Moth (*Pyreferra ceromatica*) (LR) is a moth that inhabits flatwood and pocosin habitats, as well as ecotones between mesic woodland and bottomland habitats. Moth surveys were not conducted during the flight period for this species, but habitat evaluation determined that suitable host plant species are present and this species is likely to occur in the Preferred Alternative corridor. The closest and only known occurrence from the CNF is approximately 6.4 miles from the Preferred Alternative corridor. This species has been collected where Witch Hazel (*Hamamelis virginiana*) occurs near small streams with Dwarf Palmetto nearby. Such habitat occurs in the Preferred Alternative corridor on both sides of Southwest Prong Slocum Creek.

Based on suitability of habitat and presence of host species for this species identified in the Preferred Alternative corridor, Anointed Sallow Moth is presumed present in the Preferred Alternative corridor and the proposed project may have direct impacts to an undetermined number of adults and/or larvae. The proposed project may impact individuals, if present, through habitat fragmentation and through decreased likelihood that individuals of this species could safely fly across the road to suitable habitat on the opposite side. Direct loss of individuals from construction or maintenance activities and potential loss

of individuals from road-crossing mortality may impact a relatively low percentage of the individuals that may be present in the evaluation area based on the widespread availability of suitable habitat remaining in the evaluation area. The proposed project would not significantly affect the overall availability of suitable habitat in the evaluation area. Potential indirect impacts to Anointed Sallow Moth habitat that could result from construction or maintenance activities can be minimized through conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, which would maintain the quality of the adjacent habitat. With implementation of these habitat conservation mitigation measures agreed to between NCDOT and USFS, it is determined that the proposed project is not likely to cause a loss of viability for Anointed Sallow Moth on NFS lands in the CNF.

Summary of Terrestrial and Aquatic Animal Species – There are 92 animal species on the most recent (August 2013) list of rare animal species provided by the USFS for the CNF and one additional species, Northern Long-eared Bat, which is expected to be added based on recent change in federal status. Of this total of 93 rare animal species considered, 56 species were dropped from further consideration because no suitable habitat is present within or in close proximity to the evaluation area. Potentially suitable habitat or previously reported NCNHP or USFS records were identified in the evaluation area for 37 USFS rare wildlife species. Surveys conducted in 2005 in combination with records available through January 2015 from NCNHP and the USFS resulted in documentation or confirmation, or presumed presence of 15 USFS rare animal species within the evaluation area. Surveys did not document the presence of the remaining 22 rare animal species within the evaluation area. Based on the apparent absence of these remaining 22 species, including Northern Long-eared Bat, it is determined that the proposed project will have no impact on these 22 species and these species are dropped from further consideration.

Red-cockaded Woodpecker (RCW), the only federal Endangered or Threatened animal species for which potential habitat was identified or individuals confirmed present, is evaluated in Chapter 4.14.4. Northern Long-eared Bat is the only federal Proposed Animal species for which potential habitat was identified, as discussed in Chapter 4.14.4 surveys did not confirm the presence of this species. American Alligator, a species federally listed as Threatened due to Similarity of Appearance, does not require consultation with U.S. Fish and Wildlife. The project may impact individuals of American Alligator but is not likely to result in viability concerns for this species across the CNF.

The proposed project may impact one Sensitive animal species, Duke's Skipper. For Locally Rare animal species, the project may impact individuals of Rafinesque's Big-eared Bat, Southeastern Myotis, Eastern Henslow's Sparrow, Black-throated Green Warbler, Bachman's Sparrow, Southern Hognose Snake, Dusky Roadside Skipper, Arogos Skipper, Little

Metalmark, Berry's Skipper, Two-spotted Skipper, and Anointed Sallow Moth, but with implementation of conservation commitments agreed to by NCDOT, it was determined the project is not likely to result in viability concerns for any of the species across the CNF.

Determination of Effect – The Preferred Alternative would have no effect on rough-leaved loosestrife or any other federally listed Endangered, Threatened, or Proposed plant species. Red-cockaded woodpecker (RCW), the only federal Endangered or Threatened animal species for which potential habitat was identified or individuals confirmed present, was evaluated in a separate Biological Assessment by NCDOT that was previously transmitted to USFS. As discussed in Chapter 4.14.4, the biological conclusion was "May Affect, Not Likely to Adversely Affect." Northern Long-eared Bat is the only federal Proposed Animal species for which potential habitat was identified, as discussed in Chapter 4.14.4 surveys did not confirm the presence of this species. American Alligator, a species federally listed as Threatened due to Similarity of Appearance [T(S/A)], does not require consultation with U.S. Fish and Wildlife. The project may impact individuals of American alligator but is not likely to result in viability concerns for this species across the CNF.

Ten Regional Forester's Sensitive plant species have been recently or previously been located within the proposed activity area. Of these, the project may directly impact individuals of Small Coastal Spreading Pogonia, Loomis's Loosestrife, Piedmont Cowbane, Spring-flowering Goldenrod, Florida Peatmoss, and Fitzgerald's Peatmoss, but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for any of the species across the CNF. These mitigation measures include allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands; in addition, seed collection will be undertaken for Spring-flowering Goldenrod. For Yellow Fringeless Orchid, Hooker's Milkwort, Short-bristled Beaksedge, and Carolina Goldenrod, with implementation of the mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it was determined that the project would not impact these species or result in viability concerns for any of the species across the CNF. These mitigation measures include allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. The proposed project will not impact any other Sensitive plant species.

One Regional Forester's Sensitive animal has recently or previously been located within the proposed activity area, or is presumed present. The proposed project may impact individuals of Duke's Skipper, which is presumed present, but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for this species across the CNF. These mitigation measures include allowing for the closure of the highway to allow the USFS to conduct

periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands. The proposed project will not impact any other Sensitive animal species.

Eleven CNF Locally Rare plant species have recently or previously been located within the proposed activity area. Of these, the project may directly impact individuals of LeConte's Thistle, Mudbank Crowngrass, Awned Mountain-mint and two liverworts (*Lejeunea bermudiana* and *Plagochila lucoviciana*), but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for any of the species across the CNF. These mitigation measures include allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands; in addition, seed collection will be undertaken for LeConte's Thistle and awned mountain-mint. For Bog Bluestem, Eaton's Witch Grass, Florida Adder's Mouth, Snowy Orchid, Shadow-witch, and Eaton's Ladies'-tresses, with implementation of mitigation measures agreed to between NCDOT and USFS to minimize potential for indirect impacts, it was determined that the project would not impact these species or result in viability concerns for any of the species across the CNF. The proposed project will not impact any other Locally Rare plant species.

Twelve CNF Locally Rare animal species have recently or previously been located within the proposed activity area, or are presumed present. The project may impact individuals of Rafinesque's Big-eared Bat, Southeastern Myotis, Eastern Henslow's Sparrow, Black-throated Green Warbler, Bachman's Sparrow, Southern Hognose Snake, Dusky Roadside Skipper, Arogos Skipper, Little Metalmark, Berry's Skipper, Two-spotted Skipper, and Anointed Sallow Moth, but with implementation of mitigation measures agreed to between NCDOT and USFS, it was determined the project is not likely to result in viability concerns for any of the species across the CNF. For the species requiring open habitats or habitats free of NNIS shrub encroachment (the sparrow, snake, butterfly, skipper, and moth species), implementation of habitat conservation measures previously proposed by NCDOT, such as temporarily closing the Preferred Alternative to allow for prescribed burns and implementation of measures proposed for controlling the spread of NNIS plant species on NFS lands, would provide appropriate mitigation to maintain the quality of adjacent habitats for these species. Contingent upon USFS transfer of easement for the Havelock Bypass, transfer of the CWMB tract to the USFS from NCDOT would add occurrences of the two bat species and the warbler species to NFS lands on the CNF and would help ensure these species are viable on the CNF. The proposed project will not impact any other Locally Rare animal species.

4.15.5.2 Management Indicator Species

Management Indicator Species (MIS) on the CNF were chosen by the USFS to provide insight into the forest trends, species diversity, and habitat changes resulting from proposed

alternatives. A list of the MIS selected for the CNF and their habitats are shown in Table 3.15.7. The following paragraphs discuss the detailed study alternatives and their impacts to the MIS on the CNF.

Eastern black bear (*Ursus americanus*) – The estimated population trend for the Eastern black bear in the Coastal Plain of North Carolina is projected to increase slightly (NCWRC, 2012). Over the last 40 years the population of black bears in the Coastal Plain and its range has steadily increased through management activities, the establishment of black bear sanctuaries, consistent food sources, and contiguous habitat and travel corridors. Black bears prefer large, contiguous pocosin ecosystems, where there is little human disturbance and a good source of food from hardwood mast species or adjacent agricultural crops. The black bear trend on the CNF likely mimics the trends of the Coastal Plain of North Carolina since it is actively managed by the US Forest Service (USFS) and contains one of the largest core habitats for the Eastern black bear in the state (USFS, 2002). Big game hunting for black bear is the largest recreational activity on the CNF and aids in the management of the species (USFS, 2002). Long-term trends are dependent upon the fragmentation of existing habitats and travel corridors and the ability of the CNF to effectively utilize tools such as prescribed burning. Increased road densities may cause the black bear to shift their home range to avoid the disturbance. With an ever-growing human population in North Carolina, it will be important to maintain the existing black bear habitats and sanctuaries in the state. The black bear population on the CNF should have an upward trend over the next decade. This is due in part to the large quantity of preferred habitat (pocosin) on the CNF and the continued management of its resources by the USFS and NCWRC.

None of the proposed bypass alternatives, including the Preferred Alternative, directly impact the core black bear habitat on the CNF, so no suitable habitat loss is expected. The proposed bypass alternatives may cause the black bear to alter its movements and range due to their proximity to the core black bear habitat. However, this should not cause significant issues since the core black bear habitat lies south and west of US 70 and the proposed bypass alternatives. The proposed transfer of over 2,000 acres of suitable bear habitat (Cypress-Gum Swamp and Pocosin) from the Croatan Wetland Mitigation Bank (CWMB) to the CNF will provide greater connectivity throughout the CNF for the black bear and facilitate the overall management of the species. Since the suitable habitat for the black bear will not be impacted and additional acreage of suitable habitat for black bear will be added to the CNF in the future, the proposed bypass alternatives will not change the upward trend for the black bear populations on the CNF.

Red-cockaded woodpecker (*Picoides borealis*) – The statewide population trend for the RCW stabilized during the 1990s following the implementation of better management strategies for the species (NCWRC, 2014a). The species prefers mature to over mature, fire-maintained pine forests in the southeastern US such as pine flatwoods and pine dominated

savannas (NCDOT, 2011). In 1992, the Croatan National Forest RCW Management Plan was developed to link the fragmented RCW populations (NCDOT, 2011). The RCW and many other species have ultimately benefited from the management and restoration of longleaf pine/wiregrass communities on the CNF. The on-going conversion of stands from loblolly to longleaf pine coupled with the use of prescribed burning for controlling the understory has continually improved the RCW foraging habitat. Longer rotation periods for longleaf and other pine stands being implemented on the CNF will further increase the suitable habitat for the species (USFS, 2002). Currently, active clusters are increasing on the CNF as a result of forest management activities (Kauffman, 2014). Due to the CNF management activities for RCW and longleaf pine and the time required to restore or to create optimal RCW habitat, the projected population trend is likely to remain stable or slightly increase.

All of the proposed bypass alternatives would have some impacts on the RCW habitats and the CNF as a whole. According the 2011 DEIS, Alternative 2 would have the greatest impact to the most suitable RCW habitat and Alternative 1 causes the most fragmentation of the CNF. The Preferred Alternative removes the most pine forest habitat and causes a moderate amount of fragmentation.

As discussed in Chapter 2.10.2.2, Alternative 1 is not considered the least environmentally-damaging alternative because it fragments a large amount of CNF habitat, and because the USFS has stated that conducting prescribed burns would be extremely difficult, resulting in considerable long-term habitat fragmentation effects on RCW populations within the CNF. Alternative 2 is not considered the least environmentally-damaging alternative because it would create a very high number of business and residential relocations, including minority relocations, and is also not conducive to burning. Alternative 3 was identified as the least environmentally-damaging alternative (in 1998 and reconfirmed again in 2012) because it is the least cost alternative, causes a minimal number of relocations; minimizes habitat fragmentation effects; is most conducive to conducting prescribed burns; causes the least amount of stream impacts; causes a "middle ground" impact to prime farmlands; causes a "middle ground" impact to riparian buffers; and, is the best compromise between impacts to the CNF and the City of Havelock. A Biological Assessment was prepared for the LEDPA in 2013. The following paragraphs discuss this report.

The RCW Biological Assessment found that direct habitat removal resulting from the Preferred Alternative should not have an adverse impact on the current RCW clusters recruitment potential for future Habitat Management Areas (HMA) in the action area (NCDOT, 2013). These future HMAs will have enough forested habitat to support RCW recruitment clusters after the preferred action alternative has been constructed (NCDOT, 2013). Additionally, 90% of the habitat reserved for the future HMA lies to the west of the

preferred action alternative and remains contiguous to the rest of the CNF (NCDOT, 2013). According to the 2013 RCW Biological Assessment, the USFS should be able to provide the necessary recruitment clusters to promote RCW growth and linkage between RCW subpopulations on the CNF following the construction of the preferred action alternative (NCDOT, 2013). Therefore, the implementation of the preferred action alternative should not have an adverse impact on the stable to slightly increasing population trend for the RCW across the CNF.

Wild turkey (*Meleagris gallapavo*) – The statewide population of the wild turkey has steadily increased over the last four decades from just 2,000 birds in 1970 to over 150,000 in 2009 (NCWRC, 2014b). This tremendous increase is due primarily to better hunting regulations, increased habitat management, and a successful release program (NCWRC, 2014b). Wild turkeys need a mixture of open land and forested habitats to meet their cover, foraging, and roosting requirements (NCWRC, 2014b). A wild turkey requires good site visibility when selecting a habitat to utilize (NCWRC, 2010). Mature pine and hardwood forests with mast-producing species and an open midstory are one of the preferred habitats for the wild turkey (NCWRC, 2010; Peoples, 2014). Wild turkeys also prefer areas adjacent to streams and rivers such as bottomland hardwood stands for their mast producing hardwood species and use as travel corridors (USFS, 2002). Wild turkeys also utilize areas such as agricultural fields, grasslands, and open woods while roosting and foraging (NCWRC, 2010). The CNF has also seen an increase in the number of wild turkeys across its acreage since 1970 (USFS, 2002). This increase on the CNF is likely due to the sheer size of the CNF and its current management objectives. The CNF utilizes prescribed fire, long rotation periods, and thinning throughout the forest, which helps to improve the wild turkey habitat by providing mature, open forest stands. The long-term population trend for the wild turkey will likely remain stable to slightly increasing on the CNF with the current management objectives.

The proposed bypass alternatives will affect some suitable habitat (Pine/Hardwood Forest) for the wild turkey. Approximately 50 to 70 acres of suitable habitat for wild turkeys will be impacted by each of the proposed bypass alternatives. The impacts to the Pine/Hardwood Forest compared with the entire CNF are less than 0.1 % of the total acreage, which makes it unlikely that these impacts will significantly affect the population trend for the wild turkey. Additionally, the CWMB contains a wide range of pine and hardwood stands that will likely provide additional areas of suitable wild turkey habitat. Therefore, implementation of the proposed bypass alternatives will not affect the stable to slightly increasing population trend for wild turkey across the CNF.

Longleaf pine (*Pinus palustris*) – The current trend for longleaf pine is stable to slightly increasing across its original range in North Carolina. This is due to a renewed public interest in the species over the last two decades. With the management of longleaf pine being

directly linked to other species such as red-cockaded woodpecker (RCW) and wiregrass, its role in the ecosystem has returned to the forefront. Longleaf pine stands exist on dry sandhills to mesic pine flatwoods. This slow growing species is adapted to a range of habitats and its existence is linked to fire. The CNF management objectives are focused on restoring the longleaf pine through species conversions such as loblolly pine, on sites that have suitable moisture and soil conditions. Once the longleaf pine has been established on the converted site, the stands are then maintained through the use of prescribed burning and long rotation periods. The long-term trend for longleaf pine on the CNF will continue upward with the current management objectives and so many other species' objectives being linked to its sustained management.

All of the proposed bypass alternatives will impact some portion of a longleaf pine habitat. According to data from the Draft Environmental Impact Statement (DEIS), Alternative 3 (Preferred Alternative) will have the greatest impact (107.8 ac) and Alternative 1 the least impact (61.2 ac) on the longleaf pine habitats (NCDOT, 2011). However, due to the USFS's on-going restoration of longleaf pine stands (through the conversion of current loblolly stands) and subsequent management, the impacts from any of the proposed bypass alternatives would not significantly affect the suitable habitat for longleaf pine forest-wide. Therefore, the upward population trend for longleaf pine on the CNF will not change as a result of the implementation of the proposed bypass alternatives.

During production of this FEIS, the USFS raised concerns regarding impacts to longleaf pine habitat. NCDOT will continue discussions with the USFS on this subject during development of the ROD and resolve prior to USFS transfer of easement for the US 70 Havelock Bypass.

Wiregrass (*Aristida stricta*) – The current trend for wiregrass is stable to slightly increasing across its range in North Carolina. Increases in development throughout its range and its sensitivity to physical disturbance (i.e. compaction, plowing, grading, clearing, scraping) have led to a reduction in its total acreage. The species can be found in moist flatwoods to dry sandhills (Clewell, A. F. 1989. Natural History of wiregrass (Aristida stricta Michx., Gramineae). *Natural Areas Journal* 9:223-233). The species is shallow rooted, slow to spread, shade intolerant, and its seeds have difficulty germinating without optimal conditions. Established wiregrass communities are maintained through early summer prescribed burns and management prescriptions focused on reducing the hardwood shrub layer. Due to the difficulties in growing wiregrass, the CNF has management objectives that are focused on creating optimal conditions for its establishment. Since it is being actively managed together with longleaf pine and the RCW, its chances for increase are much greater on the CNF than other areas such as private lands. Therefore, the long-term trend for wiregrass on the CNF is stable to slightly increasing.

Suitable habitat for wiregrass will be affected by each of the proposed bypass alternatives through the loss of longleaf pine stands. The implementation of the proposed bypass alternatives will also fragment portions of the CNF, making certain management prescriptions (i.e. prescribed burning) more difficult to implement. However, due to the on-going conversion of stands from loblolly to longleaf pine on the CNF, the impacts from any of the proposed bypass alternatives may be offset and not substantially affect the population trend for wiregrass forest-wide. Therefore, the stable to slightly increasing population trend for wiregrass on the CNF will not change as a result of the implementation of the proposed bypass alternatives.

The status and future management of longleaf pine and wiregrass as Management Indicator Species will not be significantly affected by the proposed project. Furthermore, as stated in the CNF Land and Resource Management Plan (2002), the CNF currently possess over 16,000 acres of suitable sites for potential longleaf pine forest, awaiting future restoration and management by the USFS. According to USFS, ongoing longleaf restoration activities on these lands will recover the area of longleaf forest lost by the proposed project in 3-4 years. Any impact of the proposed project on the total area of longleaf pine/wiregrass on the CNF will be very short-lived. As stated by USFS, this loss of area represents less than 1% of the existing longleaf/wiregrass habitat on the CNF and will not have a significant effect on the amount of such habitat on the CNF.

4.15.5.3 Migratory Birds

As stated in Chapter 3.15.4, the following discussion provides analysis for migratory birds, requested by the USFS for NFS lands within the direct and indirect impact areas under evaluation for the US 70 Havelock Bypass project as well as on the Croatan Wetland Mitigation Bank (CWMB); these areas are collectively referred to as the evaluation area for the migratory bird evaluation. This evaluation provides an assessment on NFS lands for migratory birds identified as being of conservation concern by the USFWS on the appropriate regional list from USFWS's *Birds of Conservation Concern 2008* (referred to hereafter as *BCC 2008*) document. Report information is summarized in Chapter 3.15.4 and impact results for the Preferred Alternative are excerpted below. The full report, including an impact assessment of all three bypass alternatives, is included in Appendix C.

Indicators of effects to migratory birds used in this analysis include:

- Habitat loss
- Habitat fragmentation
- Changes in ability to use prescribed burning for habitat management
- Cumulative effects from other projects on NFS lands
- Habitat availability on the CWMB property

Direct habitat loss would result from clearing for the right-of-way for and construction of the Preferred Alternative. Direct impacts for this analysis are based on the construction limits plus an additional 35 feet. The area of NFS lands included for direct impact for the Preferred Alternative covers approximately 240 acres of NFS lands.

Fragmentation may also affect the use of prescribed burning as a management tool on NFS lands. NCDOT has agreed to periodically close the US 70 Havelock Bypass under general conditions outlined with USFS to accommodate prescribed burning in order to minimize the effects of fragmentation on NFS lands between the proposed bypass and existing US 70.

Cumulative effects on BCCs were assessed for the proposed project and other past, planned, and foreseeable actions on NFS lands. Actions proposed on NFS lands are subject to independent review by USFS to assess potential effects to the continued viability of these species on NFS lands in the CNF, as such, the potential for cumulative effects is limited to the range of activities conducted on NFS lands. The following projects on NFS lands were identified as having potential impacts to BCC for which potential habitat may be present within the US 70 Havelock Bypass evaluation area and therefore having the potential to contribute to cumulative impacts:

- NCDOT US 17 Improvements (R-2514 B, C, and D); NFS lands in Jones County. This project would result in habitat loss on NFS lands adjacent to the existing US 17. Because this project involves relatively limited clearing adjacent to the existing roadway, this project would not be expected to contribute significant impacts towards cumulative effects for BCC.
- Duke Energy Progress (DEP) Havelock-Morehead Wildwood 115kV North Line Overhead Ground Wire Replacement (OHGW) project; NFS lands in Carteret and Craven Counties. This project is a maintenance project for replacing the existing OHGW and selected poles with new OHGW and poles of similar size and location in an existing maintained powerline corridor. Because no additional clearing of trees is required or changes in habitat would occur, this project would not contribute to cumulative effects for BCC.
- North Carolina Wildlife Resources (NCWRC) Wildlife Habitat Improvement Project; Little Road savanna location, NFS lands in Craven County. This project was completed in 2003 and habitat restoration was undertaken. Because there are no long-term effects to BCC on NFS lands, this project would not contribute to cumulative effects for BCC.
- Atlantic and East Carolina Railroad, potential future widening from single track to multiple tracks, NFS lands in Craven and Carteret Counties. No information is available for this potential future action, but widening to multiple tracks may be anticipated to require clearing and loss of habitat on NFS lands adjacent to the existing tracks. Because this project would likely involve relatively limited clearing adjacent to the

existing infrastructure, this project would not be expected to contribute significant impacts towards cumulative effect considerations for BCC.

- USFS Forest Management Projects, various actions including habitat improvements and timber thinning, NFS lands across CNF. USFS considers effects to wildlife, including BCC, in forest management actions. Forest management improving habitat on NFS lands would be considered beneficial effects for BCC.
- Closure of Craven County Waste Transfer Facility at Hickman Hill Road, NFS lands in Craven County. This facility is not expected to be relocated on NFS lands elsewhere in CNF. Because no impacts would occur to NFS lands from siting of a new facility, this project would not contribute to cumulative effects for BCC.
- US 70 Slocum Road Cherry Point Gate Improvements (R-5516), Craven County. This project will not affect NFS lands based on most current project description. Because no effects would occur to NFS lands, this project would not contribute to cumulative effects for BCC.

In 2007, NCDOT conducted a preliminary habitat and rare species evaluation of the CWMB property, an in-holding located within the boundaries of the CNF to assess the potential for current use by, and as potential mitigation for USFS rare species. NCDOT purchased the 4,035-acre tract of land for the purpose of developing a mitigation bank for wetland impacts and mitigating NFS lands affected by the project. Contingent upon USFS transfer of easement for the US 70 Havelock Bypass, the CWMB property would be transferred to the USFS to become part of the CNF and managed by USFS.

Habitats present on the CWMB property include Swamp Forest (along small streams), Pine Flatwoods (hydric, mesic, and transitional phases), Successional/Ruderal Habitat (grass-sedge, shrub-scrub), Powerline Corridor (hydric phase), Non-riverine Wet Hardwood Forest, Non-riverine Swamp/Bay Forest, Lake Ridge Pine Forest, Pond, Pine Plantation (hydric phase), Pine Savanna (hydric phase), Upland Hardwood Forest, Pine/Hardwood Forest, and Rural/Urban Modifications (dirt/gravel access road and shoulders).

Effects to Migratory Birds – Potential effects are presented in detail in the BCC report (Appendix C) for the 15 migratory bird species from the BCR 27 list that were expected to occur, have suitable nesting or wintering habitat, or regularly occur as migrants in the Havelock Bypass evaluation area on NFS lands in the CNF and that are not otherwise addressed in the USFS rare species evaluation. Nine of the BCC species evaluated as migratory birds have been documented on the CWMB property, as well as have three other BCC species evaluated as USFS rare species (Sensitive or Locally Rare).

Each identified habitat type is present within the direct impact area for the Preferred Alternative. Construction of the proposed bypass would result in the loss of same habitat types identified, utilized, and/or potentially-utilized for each of the 15 migratory birds. The

Preferred Alternative would result in the separation of NFS land located on both sides of the roadway.

Species Viability Evaluation – The 1982 planning regulations implementing the National Forest Management Act (NFMA) (36 CFR 219.19) require national forests to provide habitat in order "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." These regulations focus on the role of habitat management in providing for species viability. Supporting viable populations for BCC on NFS lands on the CNF involves providing habitat in amounts and distributions that can support interacting populations at levels that result in continued existence of the species well-distributed over time.

Based on construction limits plus an additional 35 feet, the proposed US 70 Havelock Bypass project would result in loss of approximately 295.4 acres of habitats on NFS lands through implementation of Alternative 3 (Preferred Alternative), much of which currently may be or could be utilized by BCC on NFS lands in the CNF. The proposed US 70 Havelock Bypass would result in habitat fragmentation resulting from separation of approximately 1,239 acres of NFS lands located between the proposed Bypass and existing US 70 from contiguous NFS lands. To minimize fragmentation-induced habitat changes in USFS management of these areas, NCDOT has agreed to periodically close the US 70 Havelock Bypass under general conditions outlined with USFS to accommodate prescribed burning. No projects on NFS lands have been identified that would contribute significant adverse cumulative effects affecting BCC viability on the CNF. The 4,035-acre CWMB property acquired by NCDOT contains potentially suitable habitat for several of the BCC species affected by loss of habitat by the proposed project. Nine of the BCC species evaluated as migratory birds have been documented on the CWMB, as well as have three other BCC species evaluated as USFS rare species (Sensitive or Locally Rare). Contingent upon USFS transfer of easement for the US 70 Havelock Bypass, the CWMB property would be transferred to the USFS to become part of the CNF and managed by USFS. The addition of the CWMB to the CNF could have a positive effect on those BCC species for which suitable habitat is present on the CWMB.

Based on consideration of direct habitat loss, allowance for continued use of prescribed burning for management of fragmented NFS lands, identification of no projects that would contribute to significant cumulative effects affecting BCC viability on the CNF, and mitigation measures proposed by NCDOT, the US 70 Havelock Bypass project would not result in loss of viability for BCC on NFS lands in the CNF. Habitat required for BCC would continue to be of sufficient quality, abundance, and distribution across the CNF to allow species to stabilize in a pattern similar to reference distribution.

4.15.5.4 Mitigation Measures for Impacts to NFS Lands

Through consultation with USFS, NCDOT has agreed to provide appropriate mitigation measures to offset direct and indirect impacts associated with the US 70 Havelock Bypass. These measures are included in the project commitments and described in detail in the following paragraphs. In summary, these mitigation measures include:

- Periodic closure of the bypass to facilitate prescribed burns on NFS lands;
- Identification, propagation, and protection of rare plant species;
- Herbicide use specifications for right-of-way (ROW) maintenance;
- Non-native invasive plant species management; and,
- Transfer of the CWMB to the USFS.

4.15.5.4.1 Periodic Closure of the Bypass

The Preferred Alternative would fragment NFS lands that are currently being managed using periodic prescribed burns. Fragmentation may affect the use of prescribed burning as a management tool on NFS lands. The USFS has previously stated that the US 70 Havelock Bypass will need to be closed in order to maintain prescribed burning for NFS lands between the US 70 Havelock Bypass and existing US 70. NCDOT has agreed to periodically close the US 70 Havelock Bypass under general conditions outlined with USFS to accommodate prescribed burning.

4.15.5.4.2 Rare Plant Species Protection and Conservation

For selected USFS rare species of particular concern that may be directly or indirectly impacted, work was done to identify new populations that are on protected lands not impacted by the project or that can be protected. Seed collection has been determined to be an appropriate mitigation measure for three plant species, Spring-flowering Goldenrod, LeConte's Thistle, and Awned Mountain-mint; collected seeds would be used to help establish new populations in suitable areas or bolster existing populations, in coordination with the USFS.

In 2008, surveys were conducted on NFS lands within portions of the CNF not affected by the US 70 Havelock Bypass project to attempt to identify additional occurrences of specific USFS rare species of concern not previously documented by USFS or in NCNHP records. Non-targeted USFS rare species identified during the course of the surveys were also documented. Also at the request of USFS, known occurrences of several potentially affected USFS rare species were also reviewed to determine if they continued to exist. Specific areas surveyed within the CNF for new occurrences of USFS rare species were selected based on a combination of ecological factors including: soil type, vegetative community type, frequency of fire management, hydrology, slope aspect, forest age, and known occurrences of other rare species. During the course of these 2008 surveys two new

occurrences of Fitzgerald's Peatmoss, one new occurrence of Hooker's Milkwort, one new occurrence of Spoonflower (*Peltandra sagittifolia*), one new occurrence of Shadow-witch, one new occurrence of Venus Flytrap, and three new occurrences of Piedmont Cowbane were identified. Additional occurrences of Twining Screwstem (*Bartonia paniculata paniculata*) and a Bird Dropping Moth (*Lithacodia* sp.), species that have since been removed from the USFS rare species list for the CNF, were also identified during these surveys.

During 2012 and 2013, surveys were completed within portions of the CNF not directly affected by the US 70 Havelock Bypass project to attempt to identify additional occurrences of *Lejeunea bermudiana*, a cryptic species with a limited number of known occurrences. Specific areas surveyed within the CNF were selected based on a combination of ecological factors including: soil type, vegetative community type, frequency of fire management, hydrology, slope aspect, forest age, and known occurrences of other rare species. Non-targeted USFS rare species identified during the course of the surveys were also documented. During the course of these 2012 - 2013 surveys new occurrences of *L. bermudiana* were documented from five watersheds not impacted by the US 70 Havelock Bypass. Two new occurrences of another liverwort, *Plagiochila ludoviciana* were also identified in association with two of the new *L. bermudiana* occurrences, and this species is likely also present in association with *L. bermudiana* within each of the other three new watersheds.

As mitigation to offset direct impacts for LeConte's thistle, NCDOT has agreed to collect seeds from viable populations for use in supplementing existing populations where suitable habitat occurs but numbers of individuals are low or individuals have not been recently documented. NCDOT has also agreed to collect seeds from spring-flowering goldenrod and awned mountain-mint from the impact areas for establishing new populations on NFS lands in areas identified as potentially suitable based on favorable soil and hydrology conditions. Seed collection was initiated in the Preferred Alternative corridor for LeConte's thistle in 2013 and for spring-flowering goldenrod in 2010. Seed collection for awned mountain-mint was initiated in 2014.

Several areas have been identified as potentially suitable for establishment of new Spring-flowering Goldenrod sites, and sites where existing LeConte's thistle populations may be able to be augmented through sowing of seeds collected from the impact areas. NCDOT has initiated efforts to identify potentially suitable sites for establishing new awned mountain-mint populations from seeds collected from the impact areas and will coordinate with USFS for concurrence with site selection. For sites ultimately selected for sowing seeds for establishing or supplementing rare plant populations, the preference is to utilize sites with sparser understory under a regular burning regime that are appropriate to the species as to habitat and soils. Periodic burning would be the preferable maintenance tool. If initial site

preparation or manipulation is required, such as clearing or scarifying the soil initially to enhance seed germination, the site would be surveyed to ensure that no existing rare plant populations would be impacted by these actions. Prior to site construction, NCDOT will arrange for test germination of samples of the collected seeds for each species to check viability.

Prior to construction, NCDOT will coordinate with the USFS to identify occurrences of USFS rare plant species near the project construction limits and install protective orange fencing to be removed after completion of construction. NCDOT would avoid placing construction equipment staging areas within 250 feet of USFS rare plant species occurrences, where practicable, and would avoid placing heavy equipment within powerline corridors outside of the proposed slope stakes without prior approval from the USFS.

4.15.5.4.3 Herbicide Use Specifications

NCDOT will minimize the use of herbicides and avoid use of broadcast sprays for herbicides and pesticides on NFS lands, as summarized below and detailed in the project commitments. The Herbicide Evaluation Report prepared for the project includes a discussion of potential effects and project commitments related to herbicide application. The full report is included in Appendix C.

NCDOT will only use herbicides in specific areas on NFS lands in consultation with the USFS. All USFS guidelines and mitigation measures would be followed. If any new herbicides come onto the market, NCDOT will coordinate with USFS before using on NFS lands. Proposed treatments will be reviewed by forest resource specialists in the areas of wildlife biology, botany, aquatics, soils, recreation, and heritage resources. NCDOT will not use broadcast sprays for herbicides and pesticides on NFS lands. Herbicides and pesticides will only be used in specific areas on National Forest System lands in consultation with the USFS. In addition, NCDOT will coordinate with the USFS on any mechanical methods that would be allowed.

4.15.5.4.4 Non-native Invasive Species (NNIS) Management

The areas disturbed by road construction as well as road shoulders and maintained right-of-way of the completed project could serve as potential areas for the spread of NNIS on NFS lands. Without intervention, these NNIS are expected to increase in some portions of the evaluation area. It is expected that with no control efforts along the existing road shoulders and other existing disturbed habitats, NNIS will continue to spread within these areas and potentially into adjacent natural areas.

In coordination with the USFS, NCDOT has developed mitigation measures to minimize the spread of NNIS plant species on NFS lands within the CNF associated with the construction

and maintenance of the US 70 Havelock Bypass. Additional specifications are detailed in the project commitments. NCDOT Division 2 forces will work with USFS staff on a periodic basis to control NNIS along the Havelock bypass easement on CNF. NCDOT will also work on adjacent NCDOT right-of-way to prevent the encroachment of priority non-natives on to CNF. In turn, USFS will work cooperatively with NCDOT to identify and effectively control prioritized non-native invasive plant species. These commitments are detailed in the project commitment sheet for this FEIS. With the implementation of the mitigation measures developed by NCDOT, in coordination with the USFS, the threat of spread of NNIS plants on NFS lands associated with the construction and maintenance of the US 70 Havelock Bypass is expected to be minimal.

4.15.5.4.5 Croatan Wetland Mitigation Bank Transfer

NCDOT purchased the 4,035-acre tract of land for the purpose of developing a mitigation bank for wetland impacts and for mitigating impacts to NFS lands affected by the project. Contingent upon USFS transfer of easement for the Havelock Bypass, the CWMB property will be transferred to the USFS to become part of the CNF and managed by USFS. In 2008, NCDOT conducted a preliminary habitat and USFS rare species evaluation of CWMB, an in-holding located within the boundaries of the CNF to assess the potential for current use by, and as potential mitigation for USFS rare species. Chapter 4.12.4.5 includes a discussion of the vegetative communities and rare species present within the CWMB.

4.14.6 Anadromous Fish and Essential Fish Habitat (EFH)

As noted in Chapter 3.15.5, the East Prong and the Southwest Prong of Slocum Creek are identified as anadromous fish spawning areas. The upper reaches of Tucker Creek and Slocum Creek are classified as fish habitat. No waterbodies within the study area contain essential fish habitat (EFH).

NCDOT has committed to an in-water work moratorium for February 15 to June 15 for East Prong Slocum Creek, Southwest Prong Slocum Creek, and Tucker Creek at the proposed extension of the existing culvert at US 70. Goodwin Creek and Tucker Creek upstream of the existing US 70 structures will not require a moratorium. Design of these structures will adhere to *Stream Crossing Guidelines for Anadromous Fish Passage* (NCDOT, 2012).

The Magnuson-Stevens Act requires federal agencies to consult with NMFS when any activity proposed to be permitted, funded, or undertaken by a Federal agency may have adverse effects on designated EFH (NOAA, 2010). As stated in the NMFS's *Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies* (NOAA, 2010), "Wherever possible, NMFS intends to use existing interagency coordination processes to fulfill EFH consultations for Federal agency actions that may adversely affect EFH. Provided certain regulatory specifications are met, EFH consultations will be incorporated into

interagency procedures established under the National Environmental Policy Act, Endangered Species Act, Clean Water Act, Fish and Wildlife Coordination Act, or other applicable statutes." The NMFS is a member of the NEPA/404 Merger Team and as such, ongoing coordination will be maintained through the NEPA/404 Merger Process to ensure that any necessary EFH consultation requirements are satisfied.

4.14.7 N.C. Coastal Area Management Act Areas of Environmental Concern

Downstream of the project study area, Tucker Creek and Slocum Creek are designated public trust areas, which are Areas of Environmental Concern (AEC). However, there are no AECs within the project study area.

Chapter 4.1.2 includes an evaluation of the project's consistency with the NC Coastal Management Program, in accordance with federal regulations related to coastal management (16 USC 1456).

4.15 VISUAL AND AESTHETIC VALUES

The most obvious visual and aesthetic impacts of the project will be concentrated within the CNF and along SR 1756 (Lake Road), and SR 1747 (Sunset Drive). Construction activities for the facility will involve clearing trees and vegetation through primarily wooded areas. The visual impacts will result from the removal of trees and vegetative cover and the introduction of bridge structures. Furthermore, potential development of commercial, residential, or industrial properties associated with the SR 1756 (Lake Road) interchange could detract from the rural viewshed. Minimal provisions are currently included for landscaping to shield the facility from local residences and businesses.

There are several proposed new structures. Grade-separated crossings will be introduced at the three new interchanges – at both termini and SR 1756 (Lake Road) – and the three railroad crossings. An additional grade-separated crossing will be introduced at SR 1747 (Sunset Drive). Three stream crossings (bridges at the crossing of the Southwest Prong of Slocum Creek and the East Prong of Slocum Creek and a box culvert at the headwaters of Tucker Creek) will also be introduced. The new roadway with its interchanges, grade-separated crossings and box culverts, will change the visual environment since no such structures currently exist. Visual impacts in the developed areas can be reduced with proper landscaping and planting within the right-of-way to provide aesthetically-pleasing views.

The following is a summary of the USFS visual analysis of the Preferred Alternative. The Preferred Alternative corridor has approximately 240 acres of NFS land within the proposed right-of-way for the Preferred Alternative. Approximately 80 percent is divided evenly between Scenic Attractiveness Classes A and C. The other 20 percent is Class B. The southern end and central portions of this corridor contain most of the Class A and B, while

the areas that tie back into US 70 contain most of the Class C. Longleaf pine, sand ridges with pine, the Southwest Prong Creek, and a large Cypress-Gum Swamp help create the more attractive scenery in Classes A and B. A powerline runs along the corridor edge for half the length, approximately 24,000 feet, and crosses it four times.

To maintain high scenic quality, the natural features which create the scenic value are retained and considered during any ground disturbing activity. The areas that will be the most important to retain are immediately adjacent to the new roadway and areas that will be visible from viewing locations such as developed areas and waterways used by recreationists. Methods to help maintain the existing scenery include design to fit the natural contours, removal of all construction debris and cleared materials, providing gentle cut slopes, retaining large trees, and spanning swamp areas. If possible, dominant views of powerlines should be avoided.

4.16 INDIRECT AND CUMULATIVE EFFECTS

NEPA defines indirect effects as "impacts on the environment which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 1508.8). Induced development or altered growth patterns are typically the most common forms of indirect impacts. The rate and type of development usually coincide with other factors such as zoning and the availability of electricity and water service. Cumulative impacts are defined as those "…which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7).

This chapter is an update to previous indirect and cumulative analyses contained in the DEIS. An Indirect and Cumulative Effects (ICE) Analysis was completed in 2008 and was updated in 2011 to provide an assessment of the potential long-term, induced impacts of the proposed project (HNTB, 2008 and NCDOT, 2011). In 2013, studies were conducted to update future land use scenarios based on current data and to develop an ICI water quality modeling analysis that would quantify the project's potential indirect and cumulative impacts (ICIs) on water resources. The focus of the analysis is on the potential increases in stormwater runoff and non-point source loads of nitrogen, phosphorus, sediment, and fecal coliform resulting from a future development scenario associated with the bypass.

Indirect and cumulative effects on natural resources are discussed throughout this FEIS and summarized in Chapter 4.16.2. Chapters 4.16.3 through 4.16.8 discuss the ICI water quality modeling analysis. A summary of conclusions related to indirect and cumulative effects on the human and natural environment is contained in Chapter 4.16.9.

4.16.1 Summary of Previous ICE Analyses

The 2008 ICE analysis incorporated qualitative data, as well as the input of a focus group, which consisted of planning and real estate development professionals, and utilized modeling software in order to develop both the land suitability analysis and the growth scenarios. In terms of the growth scenarios, a 'no-build' scenario and two 'build' scenarios (10% and 15% additional growth above what was anticipated in the 'no-build' scenario) were presented to determine the additional households and employment expected within the study area as a result of the project. In addition, the 2008 ICE also provided baseline future land use data for an associated stormwater modeling study performed for STIP Project R-1015.

The 2011 ICE update utilized more recent data and utilized the NCDOT's ICE screening tool that was developed after the 2008 ICE analysis was finalized. This screening tool uses data to provide a numerical and therefore quantifiable output. The Screening ICE is an indicator of potential for change in land use or induced growth only, and is not an assessment of the specific locations or magnitude of such growth.

Based on demographic and employment trend data for the project area, and information gathered from local land use and transportation plans, town and county planners, mapping and field visits, the results of an early screening effort indicated the need for a Land Use Scenario Assessment. An analysis of probable development areas found that growth would be concentrated in the areas surrounding the interchanges, with land uses transitioning to highway commercial and higher-density residential uses.

Indirect Scenario Assessment Tool - R-1015 - US 70 Bypass of Havelock(2011)

Rating	Pressure / Demand for Typically Higher Impact Development	Future Shift of Regional Population Growth to the Growth Area	Pressure for Land Development Outside Regulated Areas	Pressure for Land Development Outside Planned Areas	Development Pattern	Planned / Managed Land Use and Impacts
More Concern	Commercial / Industrial Development with Large Parking Lots Likely	Strong Attraction of Development in this Area	A Large Number of Acres in the Probable Development Areas are Outside a Regulated Area	A Large Number of Acres in the Probable Development Areas are Outside a Planned Area	Strip or Sprawling Development Likely	Land Development and Storm Water Management Goals Not Set
⬆						
↑					No-Build Scenario	
↔	Build Scenario	Build Scenario No-Build Scenario				
↓	No-Build Scenario		Build Scenario No-Build Scenario	Build Scenario No-Build Scenario	Build Scenario	Build Scenario No-Build Scenario
⬇						
Less Concern	Commercial Development and / or Large Residential Developments Not Likely	No Population Shift Likely	All Probable Development Areas in a Regulated Area	All Probable Development Areas in a Planned Area	Likely to Support Clustered Development	Development Areas are Consistent with Land Development and Storm Water Management

4.16.2 Summary of Indirect & Cumulative Effects Assessments for Natural Resources

Indirect and cumulative effects on natural resources are discussed in several chapters of this FEIS. Chapters 4.12.1.2 and 4.12.2.2 include discussions of indirect effects on terrestrial and aquatic communities. Chapters 4.12.3.1 and 4.12.3.2 include discussions of habitat fragmentation and alteration. Chapter 4.14.4.2.8 discusses indirect and cumulative effects on RCWs. Chapter 4.14.5.1 contains an assessment of potential ICEs on rare species on NFS lands. Chapter 4.14.5.3 discusses potential ICEs on migratory birds. A summary of conclusions related to indirect and cumulative effects on natural resources is contained in the following paragraphs.

The reasonably foreseeable projects considered in these analyses include the transportation projects listed in Chapter 1.8.3 plus the following projects:

- NCDOT US 17 Improvements (R-2514 B, C, and D); NFS lands in Jones County.
- Duke Energy Progress (DEP) Havelock-Morehead Wildwood 115kV North Line Overhead Ground Wire Replacement (OHGW) project; NFS lands in Carteret and Craven Counties.
- North Carolina Wildlife Resources (NCWRC) Wildlife Habitat Improvement Project; Little Road savanna location, NFS lands in Craven County.
- Atlantic and East Carolina Railroad, potential future widening from single track to multiple tracks, NFS lands in Craven and Carteret Counties.
- USFS Forest Management Projects, various actions including habitat improvements and timber thinning, NFS lands across CNF.
- Closure of Craven County Waste Transfer Facility at Hickman Hill Road, NFS lands in Craven County.

As noted in Chapter 1.8.3, the 33-mile Northern Carteret Bypass from Havelock to Beaufort (STIP Project No. R-4431) is unfunded and no additional studies are planned in the foreseeable future. Given its low scores in the Strategic Mobility Formula analysis and absence of regional or local support for the project, the Northern Carteret Bypass is not considered a foreseeable project and was not included in ICE analyses for this FEIS.

As discussed in Chapters 4.12.1.2 and 4.12.1.2, soil disturbance from construction may encourage the growth of non-native, invasive species, especially if they are already present in the area. Non-native invasive seeds or plant material may be deposited by construction equipment or regular traffic (von der Lippe and Kowarik, 2007), increasing the risk of invasive plants growing along the proposed bypass. To minimize soil disturbance and the spread of invasive species, NCDOT has coordinated with the USFS to develop a landscaping plan for NFS lands, which is reflected in project commitments. The plan details appropriate native seed mixes for erosion control and site specific control methods for invasive species, including acceptable herbicides for the corridor. The plan also outlines future coordination between NCDOT and USFS personnel to maintain vegetation diversity and ensure no long-term impacts to rare species along the project corridor.

Indirect effects of road crossing structures in waterways may displace aquatic organisms. Blocking movements of aquatic organisms may prevent access to feeding areas, refuge from predators, areas for spawning and breeding, and areas that remain inundated in dry periods; it also increases population isolation. Fortunately, the level terrain and gently-sloping streams in the project study area would not contribute to creating high velocity flow, which helps to minimize the potential for soil loss and deposition. Measures to control sediment and erosion during construction will be implemented to protect water quality for aquatic organisms. These measures are discussed in Chapter 4.13.

Chapter 4.12.3.1 notes that open habitat created along the roadside and the highway itself will affect the movements of organisms to varying degrees. Movements including migration, home-range movements for food and shelter, and the dispersal of young from their natal area could all be affected by the bypass, which could act as a barrier or filter to some species. Isolation of populations caused by habitat conversion, habitat fragmentation, wildlife exclusion fencing and traffic reduces gene flow, leading to inbreeding and other deleterious effects, including a reduced ability to adapt/evolve to changing environmental conditions. Isolated populations are more subject to local extirpation due to fluctuating demographics or catastrophic environmental events (such as drought), since they cannot be bolstered or repopulated from other populations. These effects may be minimized at the two large bridge crossings, which will allow for wildlife passage beneath the bypass. Animal populations in other NFS lands that would be fragmented by the bypass have an increased risk of becoming isolated if no wildlife crossings are provided. The bypass does offer wildlife crossing capability at two bridge sites.

Chapter 4.12.3.2 states that more edge habitat and open habitat would be created by construction of the Preferred Alternative. Habitat alteration increases the suitable habitat for invasion by various species and could result in the local loss or displacement of organisms that require forest interior habitat. Open space created along the bypass may act as a barrier to forest-dwelling species such as southern flying squirrels (*Glaucomys volans*) and some types of forest specialist salamanders (Hels and Buchwald, 2001). If small mammal populations increase along the bypass, they may attract predators such as foxes and red-tailed hawks (*Buteo jamaicensis*). Predators along the roadside are vulnerable to being struck by vehicles. Amphibians and turtles attempting to move from terrestrial to aquatic habitat may also be struck. Road kill will attract scavengers such as crows, vultures and coyotes (*Canis latrans*). Secondary growth along existing roads radiating west out of Havelock may further exacerbate fragmentation and isolation of populations; however, induced growth associated with the proposed bypass would be quite limited due to the project's full control-of-access, the prevalence of CNF lands, and the single interchange at SR 1756 (Lake Road).

Chapter 4.14.4.2.8 discusses indirect and cumulative effects on RCWs. This chapter states that RCWs are not likely to be flushed from their cavities by vehicles on the bypass but notes that construction of the proposed bypass may present the possibility of an indirect effect from highway mortality based on the creation of a road where there was not a road before. However, such incidents cannot be predicted with certainty as to time and number. Overall, these indirect effects are considered to be insignificant.

Chapter 4.14.5.1 contains an assessment of potential ICEs on rare species on NFS lands. Potential indirect impacts that could result from construction or maintenance activities can be minimized through conservation commitments made by NCDOT, including allowing for the closure of the highway to allow the USFS to conduct periodic prescribed burns and implementation of measures proposed for controlling the spread of nonnative, invasive plant species along the ROW across NFS lands. Cumulative impacts identified consisted of the Duke Energy Progress (DEP) overhead ground wire replacement project, which may impact individuals of certain USFS rare species, but these actions were determined not likely to result in viability concerns across the CNF. No cumulative impacts from other USFS or NCDOT projects on NFS lands on the CNF have been identified.

Mitigation measures are needed to reduce the threat for a loss of viability for LeConte's thistle, awned mountain mint, and spring flowering goldenrod on NFS lands. Implementation of mitigation measures agreed to between NCDOT and USFS, such as temporarily closing the Preferred Alternative to allow for prescribed burns, and implementation of measures proposed for controlling the spread of nonnative, invasive plant species along the ROW across NFS lands would minimize viability concerns resulting from indirect impacts to these species. In addition, NCDOT has agreed to collect seeds from viable populations for use in supplementing existing populations where suitable habitat occurs but numbers of individuals are low or individuals have not been recently documented; this mitigation will be conducted in coordination with the USFS.

With respect to migratory birds, Chapter 4.14.5.3 states that the US 70 Havelock Bypass project would not result in loss of viability of Birds of Conservation Concern (BCC) on NFS lands in the CNF and that no projects have been identified that would contribute to significant cumulative effects affecting BCC viability on the CNF, based on consideration of direct habitat loss, allowance for continued use of prescribed burning for management of fragmented NFS lands, and other NCDOT minimization measures. Habitat required for BCC would continue to be of sufficient quality, abundance, and distribution across the CNF to allow species to stabilize in a pattern similar to reference distribution.

Because other indirect impacts at probable development areas are relatively minor, the cumulative effect of this project, when considered in the context of other past, present and future actions, and the resulting indirect impacts on the notable human and natural features, should be minimal.

Cumulative effects could result from the development of private property in the vicinity of the Lake Road interchange, construction of other service roads, and timber harvesting on private lands in the area. Due to the proposed project's location passing through large tracts of the CNF, given the highway's full control of access, and given that adjacent service roads cannot easily be located/connected, future development potential along the proposed bypass is primarily limited to the privately-owned lands surrounding the Lake Road interchange. If the Preferred Alternative is constructed and if water and sewer service is extended, land use is expected to transition to higher density residential and highway commercial uses northeast of the interchange (NCDOT 2011). The privately-owned tracts in the interchange area are bordered by undevelopable NFS lands, which minimize the size of probable development areas. The area to the southwest of the interchange will remain primarily agricultural (NCDOT 2011).

Development of lands at project termini is currently available for development, and will be after a bypass is constructed; however the size of these probable development areas is limited. The northern terminus of the Preferred Alternative is located north of Tucker Creek. If the proposed project is constructed, exposure will increase for properties in this area and a new land use node will be created (NCDOT 2011). As a result, land use would be expected to transition to higher density residential and highway commercial, particularly if sewer service is extended north of Tucker Creek. The southern terminus of the Preferred Alternative is located on undevelopable CNF lands.

In context of the entire project area, the total size of probable development areas is minor. Therefore, when considered in the context of other past, present and foreseeable actions, cumulative effects on natural resources are expected to be low. Table 4.16.1 contains a summary of cumulative effects. Through consultation with USFS, NCDOT has agreed to provide appropriate measures that will contribute to the future viability of the CNF. In summary, these measures include:

- Periodic closure of the bypass to facilitate prescribed burns on NFS lands;
- Identification, propagation, and protection of rare plant species;
- Herbicide use specifications for right-of-way (ROW) maintenance;
- Non-native invasive plant species management; and,
- Transfer of the CWMB to the USFS.

4.16.3 ICI Water Quality Modeling Analysis Study Area

The study area for the ICI focused on an area in the Neuse River Basin, draining to the Neuse River Estuary, in addition to crossing into the White Oak River Basin and draining to the Newport River. This study area was based on the previously defined ICE study area, and refined and expanded to include the extent of 14-digit hydrologic units (HUCs) for watershed modeling purposes. The ICI study area was delineated into sixty-five subbasins covering 142 mi^2 (367 km^2). Subbasins ranged in size from 1.0 to 4.9 mi^2 (2.6 to 12.7 km^2). The model study area contains portions of the following jurisdictions: Havelock, Newport, Craven County, and Carteret County.

TABLE 4.16.1
CUMULATIVE EFFECTS SUMMARY

IMPACT CATEGORY	DIRECT AND INDIRECT IMPACTS			CUMULATIVE EFFECTS			CONCLUSIONS
	Construction	Operations	Mitigation	Past Actions	Other Present Actions	Future Actions	
Streams and wetlands	High	Low	Pos	Low	Mod	Low	**LOW** • Construction will directly impact streams and wetlands • Creation of CWMB: 3,800 acres of restored & preserved wetlands • New development likely to create wetland and stream impacts in future • CWMB stream and wetland preservation offsets future impacts
Red-cockaded woodpecker	No effect	Low	Pos	Mod	Low	Low	**LOW** • No direct impacts to RCW • USFWS Biological conclusion: *May Effect, Not Likely to Adversely Effect* • NCDOT commitment to close bypass for USFS prescribed burns • RCW Recovery Plan objectives met without mitigation • Possibility of indirect effects on RCWs from highway mortality • Large amount of study area is within CNF; not subject to future land use changes • Some portions of the CWMB offer RCW habitat management potential • Past actions have altered RCW habitat; USFS management counters these actions to some extent • Most privately-owned lands provide limited to no RCW foraging or dispersal habitat (depending on stand age) • Future development along Lake Road and timber harvesting on private lands could hamper RCW dispersal.
Water quality	Low	Low	Pos	Low	Low	Low	**LOW** • Modeling analyses indicates that increase in pollutant loads and stormflow over the entire watershed is low • Development will result in increases in pollutant loads • Modeling analysis shows comparatively little increase over the No-Build scenario • 4,035 acres of land in CWMB not subject to land use changes
Air quality	Low	No effect	No effect	Mod	Low	Low	**LOW** • Negligible effects on air quality in this NAAQS attainment area • Construction and open burning of cleared vegetation would create temporary air pollutant emissions • Any burning will be done in accordance with applicable local laws and ordinances and regulations of the North Carolina SIP for air quality
Cultural Resources	No effect	No effect	No effect	Low	Low	Low	**LOW** • No NR or NR-eligible properties affected by the project • Project commitment to avoid potential for indirect effects on archaeology site during construction • Known historic resources are protected through regulations and location on NFS lands
USFS rare species/natural resources	Mod	Mod	Pos	Mod	Low	Low	**LOW** • Direct impacts from construction • Construction may encourage growth of non-native, invasive species (NNIS) • Minimal land conversion in recent years in Havelock due to economy and military realignment • NCDOT has committed to landscaping plan to minimize effects

TABLE 4.16.1 cont.
CUMULATIVE EFFECTS SUMMARY

IMPACT CATEGORY	DIRECT AND INDIRECT IMPACTS			CUMULATIVE EFFECTS			CONCLUSIONS
	Construction	Operations	Mitigation	Past Actions	Other Present Actions	Future Actions	
Habitat fragmentation	Mod	Mod	Pos	Mod	Low	Mod	**MODERATE** • Construction will fragment contiguous habitat • Indirect effects from highway mortality • CWMB preserves 4,035 acres of land in perpetuity • Past actions have altered habitat throughout the Havelock area • Minimal land conversion in recent years in Havelock due to economy and military realignment • Future development along Lake Road and timber harvesting on private lands could increase fragmentation • Presence of CNF and CWMB offsets and limits past and future private development actions that would further fragment habitat
Land use	High	Low	Pos	Mod	Low	Low	**LOW** • Construction will convert NFS lands to highway use, and cause relocations • Build scenario would alter land uses in the vicinity of the Lake Road interchange. The private land area in this vicinity is constrained due to bordering CNF lands. • CWMB created positive land use change by preserving 4,035 acres • CWMB creates a net-gain in NFS lands, increasing NFS lands by 3,795 acres • Past actions have altered land uses in the Havelock area • Minimal land conversion in recent years in Havelock due to economic recession and military realignment • Future land use changes tempered by the project's full access control, location of NFS lands at the project termini, and CWMB
Noise	Low	Low	No effect	High	Low	Low	**LOW** • Build scenario reduces noise in some locations • Past actions include MCAS Cherry Point • Noise increases from future land use changes are tempered by the project's full access control, presence of NFS lands at the project termini, and CWMB
Social /community	Mod	Pos	Low	Low	Low	Low	**LOW** • Direct relocation impacts from construction • Positive indirect effects related to removing through-traffic from Havelock • Positive effects from new recreational opportunities on CWMB
Economic	Pos	Low	No effect	Pos	Pos	Pos	**POSITIVE** • Reduced travel times to major economic centers in the region • Potential for negative economic effects on travel-oriented businesses along existing US 70; effects tempered by Havelock's large population, its role as an employment center for the region, and the proximity of Lake Road interchange to existing business on US 70 • Past and present actions include MCAS Cherry Point and establishment of the CNF • Local land use planning objectives in place to encourage economic growth

A particular focus in the analysis was the potential increase in predicted pollutant loads to Slocum Creek, Sassafras Branch, Cherry Branch, and segments of the Neuse River Estuary which have been designated as impaired by the NC Department of Environment and Natural Resources (NCDENR) Division of Water Resources (DWR). Stressors in the watershed include chlorophyll *a*, copper, high pH, and loss of shellfish harvesting use.

4.16.4 Future Land Use Scenario Development

The Havelock Comprehensive Plan, published in 2009, contained an estimate of the 2010 population as well as projections through 2030. The 2010 estimate was based on growth through 2005 and greatly exceeds the population that was counted during the 2010 census. The 2030 projection was based on a growth rate of 30.9% of the 2010 population. The City reevaluated its population projections in a 2011-2012 fiscal year planning report (Havelock, 2012). The reevaluation cited additional studies, demonstrating that growth rates are much lower than had been anticipated. The report included a graph of the different growth rates, including the 2030 Comprehensive Plan rate and annual rates of 0.3% and 1.5% (communities with healthy economies). The growth rates included in the Comprehensive Plan were significantly higher than rates for "communities with healthy economies."

The Office of State Budget and Management publishes population projections by county for North Carolina (NCOSBM, 2013). The population growth rate published for Craven County is an approximate annual rate of 0.83%, which falls between the suggested rates cited by the City in the 2011/2012 report. Therefore, the state projection numbers were chosen to determine the projected population of the ICI study area. According to the Office of State Budget and Management, the percent increase expected in Craven and Carteret Counties between 2010 and 2030 is 16.7% (0.83% annually) and 29.3% (1.5% annually), respectively. These rates were applied to the ICI study area 2010 Census population to determine the projected No-Build population in 2030.

The projections, along with average household size for each county, were then used to determine the number of houses necessary to accommodate the growth in population for the No-Build scenario. This methodology was selected as a conservative method to capture growth in the area based on population instead of using building permits which reflect the volatility of the housing market. The ICE used building permits from 2000 to 2005 and other information to quantify future households. This method resulted in a high growth rate as there was a building boom in the early 2000s. The rate drastically declined in the latter half of the decade. The City of Havelock had an annual average of 96 building permits per year between 2000 and 2010. However, a City report notes that the 7-year average (2000-2006) was 123 permits per year while the 4-year average (2007-2010) was only 21 permits per year (Havelock, 2012). Similar decreases in permits have occurred in Craven and Carteret Counties, although not as drastic as that seen in Havelock. When looking over an extended

time period of 20 years, basing housing needs on increase in population reduces housing projection errors induced by the effects of the volatility of the housing market.

To determine the number of additional houses necessary for the Build scenario, a percent increase was applied to the growth rate determined for the No-Build scenario. The ICE study (HNTB, 2008) investigated two growth scenarios: a 10% and 15% increase in the No-Build growth rate. These rate increases were developed based on three previous studies, as well as significant input from a focus group consisting of local planners and developers. The higher growth rate increase of 15% was selected for this ICI study as it is the more conservative choice in terms of determining impacts to water quality.

Additionally, future population attributed to MCAS Cherry Point was determined from other documents and studies, as increases in military personnel would not be reflected in population projections from the state. Similar to the other portions of the study area, military population projections are based on past population estimates and growth rates. According to the USMC F-35B East Coast Basing Final Environmental Impact Statement and Record of Decision (Department of the Navy 2010), an alternative for the new aircraft has been recorded that will result in eight new squadrons at MCAS Cherry Point. According to the document, this will result in a net gain of 1,194 personnel and 2,323 dependents. Assuming one household per military personnel, there would be an increase of 1,194 households. Additionally, MCAS Cherry Point will not be expanding housing on the base; therefore all of these additional households would be housed off base. Roughly half of the anticipated households (568) were added to the No-Build and Build scenarios to account for this population. This number was applied to both scenarios as the increase in personnel is not dependent on the construction of the bypass. A percentage of the total was used, as many military personnel live in New Bern or in Carteret County and commute to the base. This trend is likely to continue. Applying 50% of military households to the ICI study area is a conservative estimate, as population projections actually show significantly more growth in other portions of Craven County, as well as in Carteret County.

In order to determine No-Build and Build non-residential future land use needs of the ICI study area, an analysis of job growth was conducted based on a similar analysis in the Havelock Land Use Plan (Havelock, 2009). First, pertinent data used in the Havelock Land Use Plan including labor force statistics, number of housing units, unemployment, and jobs per household was updated using the 2010 Census data. The number of additional jobs anticipated in the No-Build and Build scenarios was calculated using number of households for each scenario and the average jobs per household rate for the two counties. The analysis included a breakdown of jobs by sector, a calculation of the square footage needed per job, and the ratio of building size to property size.

Land Availability – Areas available for development were calculated as 'moderate' using the indirect land use effects screening tool in the ICE Update (NCDOT, 2011). However, the study area contains a number of protected lands that surround a large portion of the proposed roadway leaving a limited amount of land available for development (Exhibit 3.1.1). The land available for development is mainly located north and south of Havelock's city limits. In addition, there are scattered areas throughout the City of Havelock and between the proposed bypass and the existing US Highway 70. Protected land includes a portion of the Croatan National Forest (USFS), the Marine Corps Air Station Cherry Point, and the CWMB (NCDOT). South of Long Lake and the CWMB, there are three privately held areas: Camp Bryan, Camp Brinson, and the Longstraw Wildlife Club. Although there are no conservation easements or deeds for these areas, they are included in the conservation category in the Craven County Future Land Use Plan (HCP 2009) and are considered not available for development for this study. Protected lands and their acreage are presented in Table 4.16.1.

An additional 4,502 acres (5%) in the study area are open water. Also, existing development encompasses 10,408 acres (11.5%), leaving approximately 14,561 acres (16%) of the watershed available for development. The area for development includes scattered parcels available for infill in many of the existing neighborhoods, as well as large tracts of land located along Lake Road and between the existing and proposed US 70 Bypass. There are also large tracts of land available south of the bypass near the county boundary and in the Town of Newport. While the percent of the study area available for development is low, it still exceeds the calculated demand.

TABLE 4.16.1
PROTECTED LAND, ICI STUDY AREA

PROTECTED LANDS	OWNER	AREA (ACRES)	% OF WATERSHED
Croatan National Forest	USFS	37,863	41.7%
Marine Corps Air Station Cherry Point	Dept. Navy	11,593	12.8%
Croatan Wetland Mitigation Bank	NCDOT	4,198	4.6%
Camp Bryan	Private	8,142	9.0%
Camp Brinson	Private	1,044	1.2%
Longstraw	Private	822	0.9%
Total		63,662	70.1%

Land Use Policies – All of the jurisdictions within the ICI study area have a CAMA Land Use Plan (Craven County 2009, Havelock 2009, Carteret County 2005, and Newport 2006). These plans contain information on infrastructure, stormwater, land availability, and land suitability. Each plan includes a future land use map based on gathered information and land suitability maps. Once approved, changes to the future land use maps require approval by the local jurisdiction as well as the Coastal Resources Commission.

In Havelock and Newport, zoning and ordinances provide additional support to the future land use maps. While there may be some discrepancies and the land use map is usually more general, the two should coincide. The largest discrepancy between the Havelock land use and zoning maps is the area surrounding the southern terminus of the proposed bypass. In this area, the future land use map shows national forest while the zoning map shows Highway Commercial. This was addressed in the ICE update which stated that if a private developer was able to acquire USFS land, any proposed development would likely be denied "due to its inconsistency with the Future Land Use Map within the 2030 Comprehensive Plan." Additionally, the ICE update stated that if an amendment was sought, approval would be needed from the City's planning board, commissioners and finally the Coastal Resources Commission (NCDOT, 2011). Furthermore, discussions with the USFS for this ICI study indicate that land swaps in this area are not common, as every acre of land in the vicinity of the proposed bypass is dedicated to red-cockaded woodpecker recovery. In general, the USFS follows its land management plan which includes a strategy for land adjustment (personal communication Ms. Rachelle Powell, wildlife biologist, Croatan National Forest, 12/2012). According to this strategy there are a limited number of small parcels in the Havelock area that USFS categorize as areas of "potential exchange" (USFS 2002). None of these small parcels is located at the southern terminus of the proposed bypass and therefore any exchange in this area is unlikely.

According to the Craven County Land Use Plan, the County was considering zoning for the US 70 corridor between New Bern and Havelock. It is mentioned twice in the plan: a) in the Citizens Participation Plan (part of the land use planning process), and b) as a solution to preventing additional stormwater runoff/drainage problems in the corridor. However, nothing has been adopted to date.

In Havelock's Land Use Plan, the City states that a small area plan may be developed for the proposed interchange at Lake Road in order to achieve a sustainable development pattern. The City would like to see certain restrictions in place before interchanges are constructed. Havelock has expanded their future land use map to encompass the bypass and all of the interchanges, however current zoning does not include the northern interchange or the western side of the Lake Road interchange.

Infrastructure – Public water service is generally available throughout the study area and is provided by the various local jurisdictions. According to the Craven County CAMA Land Use Plan (2009), the county "aggressively pursues the policy that central water service should be provided to all areas of the County as funds become available." The county plans on expanding the capacity of the water supply system as needed in the coming years. The City of Havelock provides water service within the city limits and to portions of the extraterritorial jurisdiction (ETJ). According to Havelock's CAMA Land Use Plan (2009), the

city will consider "costs and benefits for extending service into the extra-territorial jurisdiction on a project-by-project basis."

The Town of Newport provides water service within the town limits and to some portions of the ETJ. Newport will extend water services beyond its ETJ if the developer funds the expansion and the land will be annexed. This includes expanding water lines through conservation areas to serve new development. Carteret County currently has 15 facilities that provide water to certain areas of the county. The County plans to provide water service to areas classified on the future land use map as developed, limited transition, and rural with services. The portion of the study area within Carteret County and outside of the Newport ETJ is shown as rural (without services) and protected. Therefore it is unlikely these areas will have water service in the future unless provided by the Town of Newport.

Access to sewer service is currently limited to areas within the Havelock and Newport city limits in addition to MCAS Cherry Point. The City of Havelock operates a wastewater treatment plant with a capacity of 2.25 million gallons per day (MGD). MCAS Cherry Point is served by a 3.5 MGD capacity WWTP. Additionally, a package treatment plant serves the Carolina Pines neighborhood located approximately 1.5 miles north of the Havelock city limits. Sewered areas within the study area serviced by the City of Newport are served by a WWTP which discharges outside of the ICI study area. Portions of the northwest corner of the ICI study area are provided sewer service by the City of New Bern that is also served by a WWTP that discharges outside of the study area.

According to the Havelock 2030 Comprehensive Plan, the City was investigating means to temporarily expand WWTP capacity by linking into the New Bern sewer system until the planned expansion of the Havelock WWTP was completed. However, such planning has since ceased as an immediate need for increased capacity has dissipated since the recent economic downturn. Additionally, there are currently no plans to expand sewer service outside of the Havelock city limits (personal communication, Mr. Bill Ebron, Havelock Public Services Director).

Newport allows for the expansion of its sewer lines to portions of the ETJ as long as the developer funds the cost of the extension. The town also plans to continue to develop its wastewater treatment system while exploring other means of treatment including the use of on-site treatment in order to promote growth (Newport, 2006).

4.16.5 Future No-Build and Build Scenarios

Existing land uses were identified separately in the land use scenarios GIS layer as their modeled loading rates are different from new development due to regulations governing new development in the study area. All existing land areas that had been classified as

developed were put in their same categories in the future scenarios. It was assumed that existing stream buffers as well as marsh and open water wetlands as depicted on the existing land use map would remain. Protected lands were assigned the same land use category for both scenarios.

New development was added to the No-Build scenario based on the number of future households (one residential unit = one household). Residential units were generally placed in proportion to the predicted population of the census tracts. In some areas, including MCAS Cherry Point, development could not be placed in the appropriate census tract as there was no land available for development. In those cases, development was placed in the nearest neighboring census tract. Zoning and future land use maps were used to determine where to place development within each census tract. Residential land use was not placed in areas zoned or planned for other uses. In addition, the zoning classifications or future land use category descriptions were used to determine parcel size of new development, except for in-fill areas which were already parceled out. For in-fill areas, i.e. vacant lots in existing neighborhoods, the current parcel size was used even if the size of the lot was smaller than permitted by the zone. Commercial development was allocated to the existing commercial centers in the watershed. Some emphasis was placed on multi-family housing for the housing needs of MCAS Cherry Point as military personnel are likely to favor this over single-family housing (personal communication Mr. Skip Conklin, Facilities Director, MCAS Cherry Point). Many parcels did not change land use between the existing and the No-Build scenario as the quantity of land for development exceeded the quantity needed to accommodate the projected number of new households. This methodology for establishing the baseline No-Build scenario differs from the ICE methodology. It results in less land use development in the future No-Build condition and subsequently the Build scenario as well. This approach is consistent with the findings contained in the *Categorical Exclusion for the Proposed Improvements to US 70 and Slocum Road* (NCDOT, 2013), which note that the potential for indirect and cumulative effects with this project is moderately low because US 70 already exists in the project area and much of the ongoing development has been incorporated into local plans for the area.

Before adding development to the Build scenario, the proposed Bypass (including right-of-way and interchanges) were merged into the GIS land use data layer. Then, the new development (15% increase as established in the ICE) was allocated in a similar fashion to the No-Build scenario; however, more emphasis was put on placing development in accordance with the impact areas identified in the previous ICE studies. As stated in the 2011 ICE update, the City of Havelock Planning Director stated that future development would likely be concentrated at the proposed Lake Road interchange because the proposed bypass would be full control of access at the two interchanges with existing US 70 and the presence of NFS lands around the two US 70 interchanges. Therefore, rather than

following census tract data, non-residential land use needs were assigned to appropriately zoned areas around the interchanges and along existing US 70 to reflect the growth that the City predicts will occur there.

Build land use projections are 15% higher than No-Build land use projections. This difference is based on a very conservative approach given there is substantial quantity of undevelopable land in the study area, the limited access of the proposed bypass, and the lack of any local plans to extend water and sewer service beyond the city limits (as communicated by the City of Havelock Public Works Department, 2013 ICI).

The opportunity for additional growth because of the project is limited due to the amount of land owned and operated by the U. S. government. The land use within the Marine Corps Air Station at Cherry Point is controlled by the Marine Corps and Department of Defense. The U. S. Forest Service (USFS) manages the Croatan National Forest and development potential is limited by the USFS. In addition, the North Carolina Department of Transportation (NCDOT) has protective covenants for the Croatan Wetland Mitigation Bank (CWMB). These protected lands comprise approximately nearly 70% of the study area.

In addition to protected lands, constraints to development include 4,502 acres (5%) in the ICI study area that are open water. Also, existing development encompasses 10,408 acres (11.5%), leaving approximately 14,561 acres (16%) of the ICI study area available for development. The area for development includes scattered parcels available for infill in many of the existing neighborhoods, as well as large tracts of land located along Lake Road and between the existing and proposed US 70 Bypass.

The proposed bypass is a controlled access facility and the only access between its termini at US 70 is the proposed Lake Road interchange, which accesses developable land along Lake Road bounded by large tracts of the protected CNF. Due to the critical importance of land to the USFS RCW Recovery Plan, there is very little potential for any land transfers of CNF to private ownership.

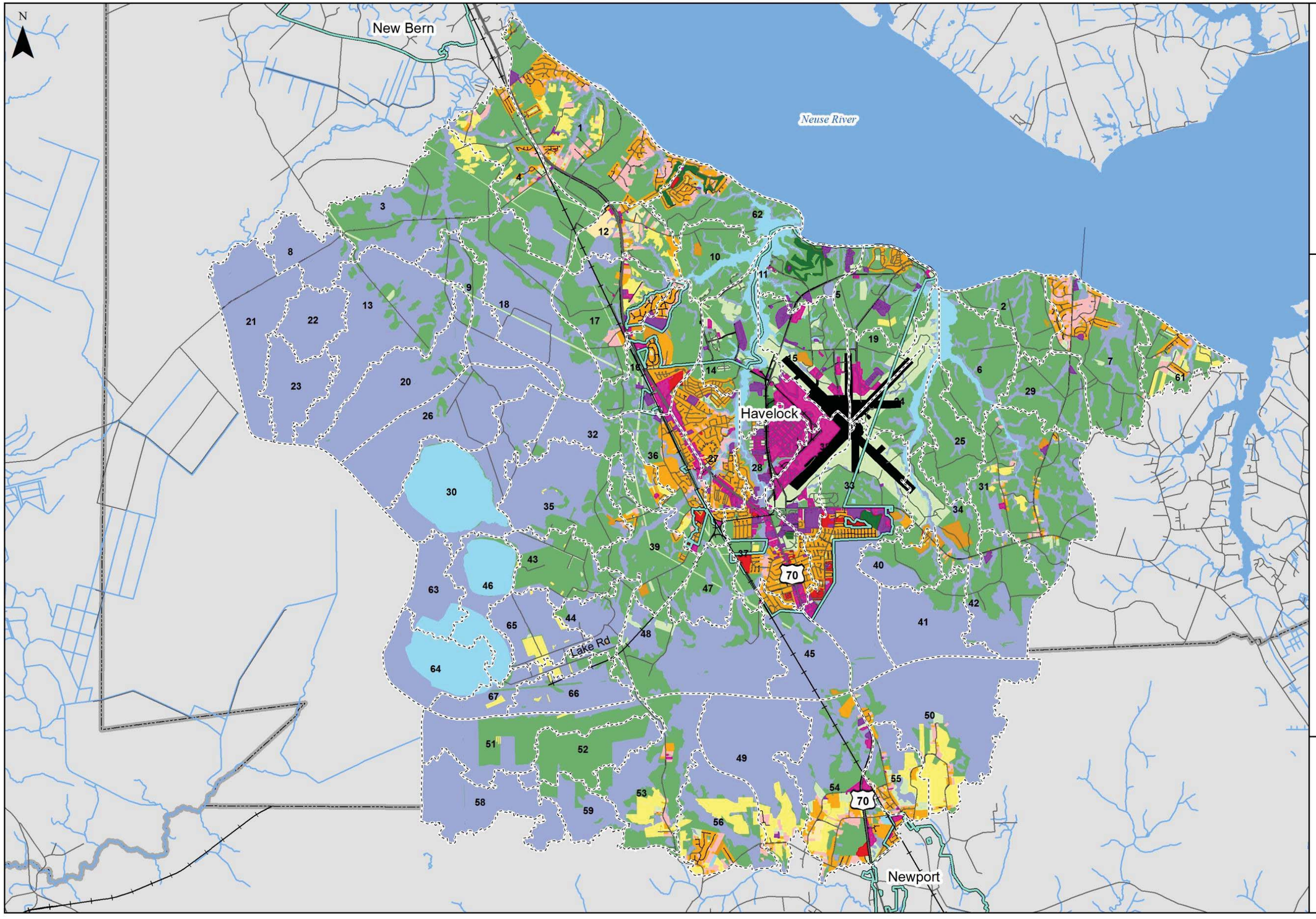
Exhibits 4.16.1 and 4.16.2 show the different land use scenarios color-coded by type. These exhibits demonstrate that growth forecasts are different for the No-Build and the Build scenarios and that the No-Build forecast is based on a transportation system without completion of the proposed bypass.

The proposed bypass includes a new interchange along Lake Road. Land adjacent to Lake Road already has access to the currently suburban/rural roadway. The new interchange is anticipated to change the type of land use along Lake Road by providing access to the higher speed multi-lane facility. Therefore the Build scenario is projected to

US 70
Havelock Bypass

Craven County,
North Carolina
STIP No.R-1015

Exhibit 4.16.1
Future Land Use
No Build Scenario



Future Land Use

- Cropland
- Pasture
- Open
- Forest
- Water
- Wetland
- Turf
- Disturbed
- Low-density Residential
- Medium-density Residential
- Multi-Family Residential
- Office/Institutional/Light Industrial
- Commercial/Heavy Industrial
- Paved Road with Right of Way
- DOT Primary Roads
- Railroads
- Model Subwatersheds
- Municipal Boundaries ETJ
- County Boundary
- Stream
- Waterbody

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

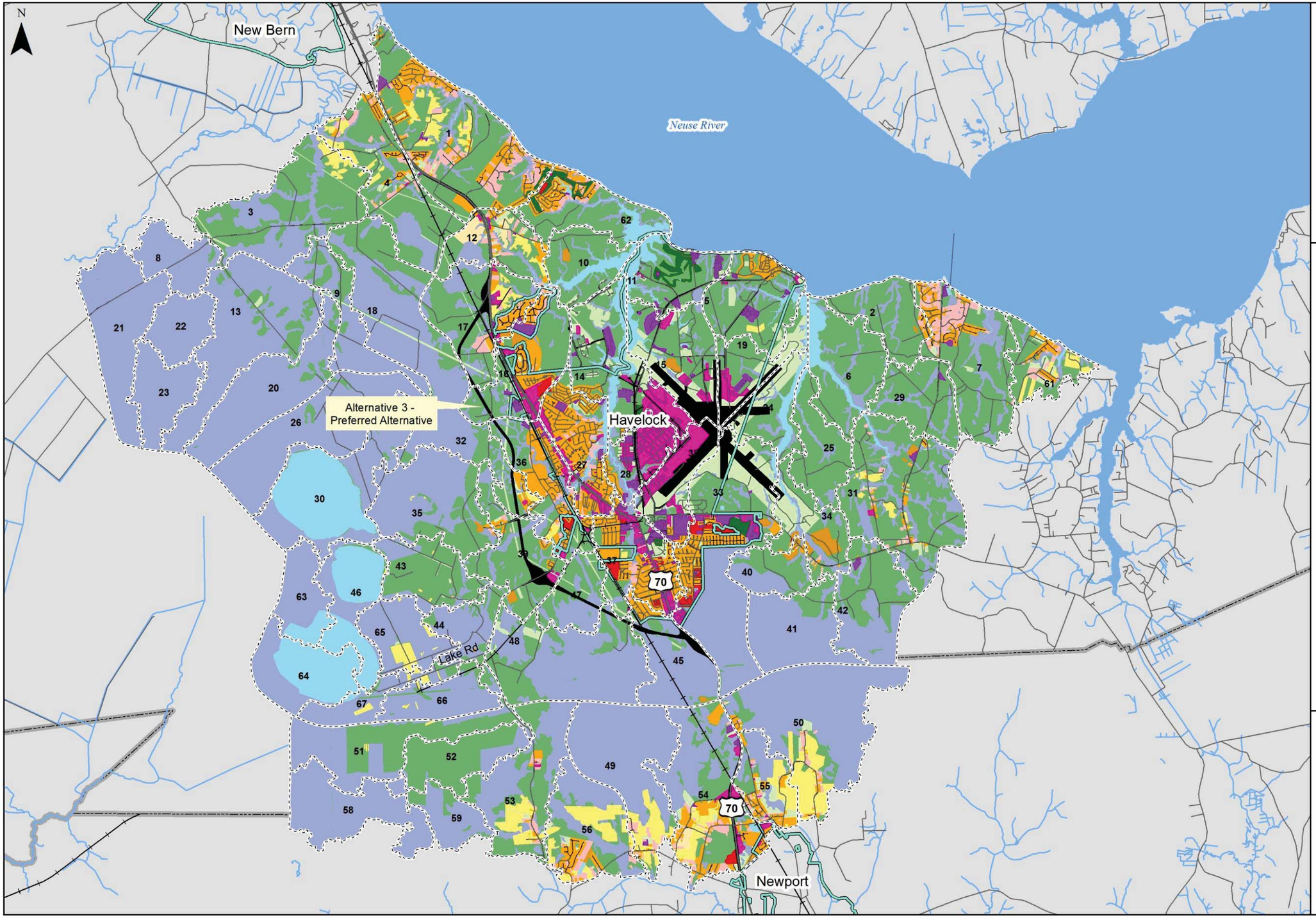
0 0.5 1 1.5 2 Miles

This page intentionally left blank to facilitate double-sided printing.

US 70
Havelock Bypass

Craven County,
North Carolina
STIP No.R-1015

Exhibit 4.16.2
Future Land Use
Build Scenario



Future Land Use

- Cropland
- Pasture
- Open
- Forest
- Water
- Wetland
- Turf
- Disturbed
- Low-density Residential
- Medium-density Residential
- Multi-Family Residential
- Office/Institutional/Light Industrial
- Commercial/Heavy Industrial
- Paved Road with Right of Way
- DOT Primary Roads
- Railroads
- Model Subwatersheds
- Municipal Boundaries
- County Boundary
- Stream
- Waterbody

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

0 0.5 1 1.5 2
Miles

This page intentionally left blank to facilitate double-sided printing.

have a different mix and density of land use than the No-Build scenario. Density and type of development projected along existing US 70 also is somewhat different in the Build vs. the No-Build due to the higher housing and employment assumed for the Build scenario.

Existing land use along Lake Road is primarily a mixture of medium-density residential and open land. FEIS exhibits 3.1.1 and 3.1.4 show the existing land use and the City of Havelock's future land use plan, respectively. The future land use plan extends to the bypass and includes the interchange.

Along Lake Road, the future land use plan shows the addition of commercial land use adjacent to three quadrants of the interchange and along Lake Road towards the City of Havelock. A shift to commercial development is typical for land adjacent to interchanges and this trend is observed throughout the state.

Trip generation software was utilized to forecast future number of vehicle trips generated by proposed development of the Lake Road interchange. The trip generation software considers the type of development, square footage, number of dwellings, number of employees and other measurable data in predicting vehicles. Proposed developments in the Lake Road interchange area were considered when developing the 2035 build traffic forecasts. These forecasts show an Average Annual Daily Traffic (AADT) of 18,800 vehicles per day (vpd) using the bypass of at the interchange and 17,400 vpd on Lake Road between US 70 and the proposed bypass. The future traffic on Lake Road in the No-Build scenario is forecasted to be 9500 vpd. Therefore, the forecasts show that the bypass is predicted to increase traffic on Lake Road by 7900 vpd due to development at the interchange and the direct access to the bypass for motorists within Havelock.

The differences in traffic volumes at the study area boundaries (No-Build vs. Build) are influenced by several factors. The construction of the bypass will result in traffic diversion onto US 70, as motorists will utilize the US 70 corridor as a quicker means to travel to and from coastal communities in Carteret County as opposed to the US 258/NC 24 and US 17/NC 58 corridors. In addition, more traffic is anticipated to travel into the study area for the Build scenario as a result of the different land use anticipated along US 70 and the Lake Road interchange.

Scenario Comparisons – Graphical depictions of the Build and No-Build scenarios are presented in Exhibits 4.16.1a-b. Approximately 95% of the increase in new development between the two scenarios was found in 10 subbasins (1, 16, 17, 32, 36, 37, 39, 45, 47, 48, and 54). All or a majority of the increase is a direct result of the planned bypass roadway and right-of-way in Subbasins 16, 17, 32, 36, 39, 45, 47, and 48. In addition to the roadway, Subbasins 17 and 39 saw increases in high-density mixed development and Subbasins 36

and 54 had an increase in medium-density residential. The majority of the increase in Subbasin 1 consisted of medium-density residential and some low-density residential. Medium-density residential accounted for almost all of the development in Subbasin 37. The remaining increases consisted mainly of medium-density residential and a small amount of low-density residential development.

4.16.6 Pollutant Loading Results

Two modeling tools were used to quantify impacts on water resources: the Generalized Watershed Loading Function (GWLF) watershed model and the SCS Curve Number Method. The GWLF model (Haith and Shoemaker, 1987; Haith et al., 1992) was selected to simulate long-term loading of non-point source pollutants. An additional parameter, runoff from the one-year, 24-hour storm event, was evaluated using the SCS Curve Number Method (SCS, 1986) to assess the potential risk of downstream channel erosion.

For each land use scenario, GWLF model output time series were generated reflecting an 11-year mean of annual total nitrogen (TN), total phosphorus (TP), sediment, and fecal coliform (FC) loads. The Build scenario resulted in changes in TN and TP loads ranging from 0% to 16.6% and 0% and 30.1%, respectively. The increase in mean annual nutrient loads over the entire model study area was 1.6% (TN) and 1.76% (TP). The largest increases in mean nutrient loads occur in undeveloped subbasins through which the proposed bypass occurs, including Subbasin 39, 45, and 47. The very low nutrient loads in these undeveloped subbasins in the No-Build scenario strongly influences the higher percent increase in the Build scenario loads. Notable increases in mean annual nutrient loads also occurred in Subbasin 1. This increase is a result of and is proportional to the increase in septic systems associated with new residential development in the Build scenario.

The Build scenario resulted in increases in TN and TP loading rates ranging from 0.01 to 0.5 kg/ha/yr and 0.01 to 0.03 kg/ha/yr, respectively. Of these, Subbasins 1, 39, 45, and 55 saw the highest increase in loading rate for nitrogen while Subbasins 1, 37, 39, and 45 were the highest for phosphorous. Subbasin 1 is located north of the bypass, Subbasin 39 contains the Lake Road proposed interchange and Subbasins 45 and 55 are at the southern end of the bypass. Subbasin 37 covers much of downtown Havelock. Approximately 57% of the predicted growth between the No-Build and Build scenarios occurred in Subbasins 1, 37, 39, 45, and 55.

While loading rate increases were predicted in the Build scenario subbasins where growth occurred, it is important to note that two of the highest loading rates for TN and TP in the watershed occur in Subbasins 11 and 28 where no additional growth over the No-Build scenario occurs. Subbasin 28 is already highly developed and Subbasin 11 contains the discharge for the Havelock wastewater treatment plant.

The average increase in sediment loads across all subbasins in the Build scenario was 2.6% higher than the No-Build scenario. Significant increases were estimated in Subbasin 18, 32, 39, 45, 47, and 48. Similar to nutrient loads, the magnitude of these increases is affected by the undeveloped condition of the watersheds and associated low sediment loads in the No-Build scenario. In the Build scenario, the direct impacts of the Bypass footprint replaces forested and wetland land uses, resulting in higher sediment loads. For example, Subbasin18, 47, and 48 are undeveloped watersheds comprised completely of either forest or wetland in the No-Build scenario with very low sediment loading rates of 1.26 to 2.35 kg/ha/yr.

In the Build scenario, the only development in these Subbasins is the proposed Bypass, resulting in estimated sediment loading rates of 1.64 to 8.68 kg/ha/yr. While this is a significant increase in loads by percentage, load rates remain low and are comparable to other undeveloped or low density developed subbasins in the model study area. Subbasins 32, 39, and 45 are primarily forest and wetland, with limited residential development in the No-Build scenario. The increase in sediment loads in Subbasin 45 is related to the footprint of the proposed Bypass, whereas in Subbasins 32 and 39 loads are associated with both the footprint of the proposed Bypass, in addition to new development associated with one of the three proposed interchanges in the Build scenario. These subbasins contribute a relatively low load of sediment compared to the loading rates in found in Subbasins 1, 16, 17, 27, 37, 38, and 55 where rates are over 100 kg/ha/yr in each. These subbasins have a large amount of developed land in both scenarios. Increases to loading rates were minor as a result of the additional development in the Build scenario.

Model results demonstrated an increase in fecal coliform loads in the Build scenario in eleven subbasins, with the most significant percent increases occurring in 1, 37, 45, 54, and 55. In all but one instance, the increase in fecal coliform loads is associated with and is proportional to the increase in the number of septic systems associated with new residential development in the Build scenario. However, in Subbasin 45 there are no septic systems in either the No-Build or Build scenarios. In this case, the increase in fecal coliform loads is directly related to the functionality of the model in its estimation of loads from wildlife sources. The model applies wildlife densities to 'natural areas' to develop wildlife fecal coliform loads; however, only forested lands are modeled as natural areas in GWLF – wetland is not included. Subbasin 45 is primarily wetland in the No-Build scenario, yielding very low baseline fecal coliform loadings. In the Build scenario, the proposed Bypass occurs almost completely in wetland areas generating a significant increase in fecal coliform loads within the model. Therefore, the model result is likely an over estimation of the percent increase in fecal coliform loads in Subbasin 45. Additionally, minor decreases in fecal coliform loads were estimated in Subbasins 18, 47, and 48. These decreases occur in subbasins where the Bypass replaces forested lands and its associated wildlife loads, and no other new development occurs in the Build scenario.

In summary, non-point source loading is increased slightly in the Build scenario relative to the No-Build scenario, though the increases are reduced by the stormwater regulations governing the jurisdictions. The greatest percent increase in pollutant loads is estimated to occur in undeveloped watersheds with low baseline loads, and in subbasins where direct impacts from the proposed Bypass or development along the proposed interchanges is expected to occur.

4.16.7 Stream Erosion Risk Analysis

The analysis suggests that development of the Build scenario would have no impact on storm event flow volumes for the one-year, 24-hour storm in 46 of the 65 subbasins. Minimal impact (i.e. less than 1% increase in runoff) will occur in 9 subbasins, and some impact will occur in the remaining 10 subbasins, with the greatest increase in Subbasin 39.

4.16.8 Water Quality ICI Analysis Conclusions

Predictions from the modeling analyses indicate that the increase in pollutant loads and stormflow over the entire watershed is low. This is due to a number of factors including the use of stormwater controls to mitigate the effects of new development and the low population growth and anticipated housing needs in the study area. Previous studies of this area had indicated over 1% growth in population a year and had then predicted residential development to meet or exceed that need. More recent data supports the assumption of moderate population growth and an increase in housing to match those needs. This results in a small increase from existing land use to the No-Build scenario. Adding an additional 15% for the Build scenario does not greatly impact the overall developed land acreage. The result is a small impact to pollutant loading in the watershed.

However, direct impacts from the proposed road yield high increases in pollutant loads in undeveloped basins with low baseline loads. This can be even further mitigated with additional stormwater controls on drainage from the proposed road. Growth areas with no sewer lines could occur in the Build scenario, causing an impact attributed to individual septic systems. However, additional zoning and the extension of sewer service to these areas could mitigate the projected impact. The analysis shows that the Bypass will not increase fecal coliform pollutant loads in the Cherry Branch or Sassafras Branch subbasins, waters impaired for loss of shellfish harvesting use.

Nutrients are a concern throughout the Neuse portion of the study area due to the impairment for chlorophyll *a*. Nutrient loading rates exceed the Neuse NSW stormwater program limit of 4 kg/ha/yr in eight of the subbasins that drain to the Neuse River. However, this is the case for the Build and No-Build scenarios and the increase in mean annual loads over the No-Build scenario for the Neuse portion of the study area is less than 2% for TN and TP. The increased loads are related to the induced residential growth and associated septic systems. Finally, the increase to sediment loading rates is less than 1 kg/ha/yr. The highest

increases occur along the Bypass although loads still remain low in comparison to other undeveloped or low-density developed subbasins.

While development in the area will result in increases in pollutant loads to impaired waterbodies, the increases suggested by the modeling analysis show comparatively little increase over the No-Build scenario.

4.17 ENERGY

The construction of the Preferred Alternative is anticipated to result in less total energy consumption than the No-Build Alternative. Construction of the Preferred Alternative will initially require energy that would not be necessary if the project were not constructed. However, the conservation of energy resulting from the opening of the Preferred Alternative will soon replace the energy afforded during construction, largely in the form of reduced energy consumption as an effect of reduced congestion in Havelock and reduced regional travel times.

The operation of a new controlled-access bypass of Havelock will result in a decrease in vehicle operation time, a decrease in travel time, and an increase in fuel efficiency through consistent travel speeds.

No lighting, either at the three interchanges or along the roadway itself, is currently proposed for the proposed bypass. No specific energy conservation measures are proposed to be implemented as part of the proposed project. The project is considered consistent with the Federal Energy Policy Conservation Act.

4.18 IMPACTS DURING CONSTRUCTION

The construction impacts of this project are expected to be similar to those normally associated with the construction of a new location roadway. The construction can be expected to result in borrow sites, contractor staging areas, a temporary increase in noise and air pollution, traffic and utility service disruptions, as well as erosion and siltation. These and other impacts will be minimized through the implementation of the NCDOT Standard Specifications for Roads and Structures.

All possible measures will be taken to ensure that the public's health and safety are not compromised during the movement of any materials to and from the construction site, and that inconveniences to the public are kept to a minimum.

4.18.1 Air Quality

The air quality impacts resulting from the construction of this project include air pollutant emissions from construction equipment and particulate matter (dust) emissions from clearing, demolition, excavation, embankment preparation and other such construction-

related activities. Air-borne particulate matter can be minimized by covering hauled and stockpiled material, and applying water to stabilized exposed earth.

Open burning of vegetation and construction debris is also a major air quality concern. Vegetation and other debris from land clearing, and other demolition and construction activities will be disposed of in accordance with applicable air pollution and solid waste regulations. During construction of the proposed project, all materials resulting from clearing and grubbing, demolition or other operations will be removed from the project, burned or otherwise disposed of by the contractor. No burning will be done on National Forest System lands without the written permission from the U.S. Forest Service. Any burning will be done in accordance with applicable local laws and ordinances and regulations of the North Carolina SIP for air quality in compliance with 15 NCAC 2D.0520. Care will be taken to ensure that burning will be done at the greatest practical distance from dwellings and not when atmospheric conditions are such as to create a hazard to the public. Burning will only be done under constant surveillance. Also during construction, measures will be taken to reduce the dust generated by construction when the control of dust is necessary for the protection and comfort of motorists or area residents. This evaluation completes the assessment requirements for air quality of the 1990 Clean Air Act Amendments and the NEPA process. No additional reports are necessary.

4.18.2 Water Quality

Soil erosion and siltation are the most common water quality impacts associated with highway construction activities. The primary source of erosion and sedimentation associated with highway construction is the required heavy earthwork to establish appropriate vertical alignments. Based on preliminary estimates, the amount of earthwork required for the construction of the project is similar for each of the three alternatives.

The NCDOT has developed an Erosion and Sedimentation Control Program which has been approved by the N.C. Sedimentation Control Commission. This program consists of the rigorous requirements to minimize erosion and sedimentation. The general requirements concerning erosion and siltation are covered in Article 107-13 of the Standard Specifications for Roads and Structures which is entitled "Control of Erosion, Siltation and Pollution."

Erosion and sedimentation will occur during the construction of this project. For this reason an erosion control schedule will be devised by the contractor before work is started. The schedule will show the time relationship between phases of work which must be coordinated to reduce erosion and shall describe construction practices and temporary erosion control measures which will be used to minimize erosion. In conjunction with the erosion control schedule, the contractor will be required to follow those provisions of the plans and specifications which pertain to erosion and siltation. Erosion will be minimized by providing temporary and permanent seeding and landscaping of exposed areas. Erosion and sedimentation will be mitigated through temporary erosion and sediment control

measures such as dikes, dams, sediment catch basins and diversion berms. Inspection of the erosion control devices will be made after each rain to determine if maintenance is needed. Construction activities will be conducted in stages to minimize exposure of cleared earth. Such Best Management Practices will be employed throughout the construction area.

No existing bridges are anticipated for demolition as part of this proposed project.

The contractor shall maintain the earth surface of any waste areas in a manner which will effectively control erosion and siltation, both during the work and until the completion of all seeding and mulching, or other specified erosion control measures.

4.18.3 Noise

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected particularly from paving operations and from the earth moving equipment during grading operations. However, considering the relatively short-term nature of construction noise and the limitation of construction to daytime hours, these impacts are not expected to be substantial.

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, and paving. Temporary and localized construction noise impacts will likely occur as a result of these activities (refer to Table 4.18.1).

During daytime hours, the predicted effects of these impacts will be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, steady-state construction noise emissions such as from paving operations will be audible, and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures ("slamming" of dump truck gates), will be perceived as distinctly louder than the steady-state acoustic environment, and will likely cause severe impacts to the general peace and usage of noise-sensitive areas – particularly residences, hospitals, and hotels.

Extremely loud construction noise activities such as usage of pile-drivers and impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the near vicinity of those activities (refer to Table 4.18.1). It is the recommendation of the Traffic Noise Analysis that construction activities that will produce extremely loud noises be scheduled during times of the day when such noises will create as minimal disturbance as possible.

TABLE 4.18.1
CONSTRUCTION EQUIPMENT TYPICAL NOISE LEVEL EMISSIONS[1]

Equipment	Noise Level Emissions (dB(A)) at 50 Feet From Equipment[2]
	70 80 90 100
Pile Driver[3]	
Jack Hammer	
Tractor	
Road Grader	
Backhoe	
Truck	
Paver	
Pneumatic Wrench	
Crane	
Concrete Mixer	
Compressor	
Front-End Loader	
Generator	
Saws	
Roller (Compactor)	

1. Adapted from *Noise Construction Equipment and Operations, Building Equipment, and Home Appliances*. U.S. Environmental Protection Agency. Washington D.C. 1971.
2. Cited noise level ranges are typical for the equipment cited. Noise energy dissipates as a function of distance between the source and the receptor. For example, if the noise level from a pile driver at a distance of 50 feet = 100 decibels (dB(A)), then at 400 feet, it might be 82 decibels (dB(A)) or less.
3. Due to project safety and potential construction noise concerns, pile driving activities are typically limited to daytime hours.
4. Some construction activities will create substantial noise impacts for nearby noise-sensitive land uses. For example, pile driving activities will pose a substantial noise impact for distances of up to one-quarter mile. It is the recommendation of this traffic noise analysis that considerations be made for any nearby residences for all evening and/or nighttime periods (7:00 p.m. – 7:00 a.m.) throughout which extremely loud construction activities might occur.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications to the extent possible. These measures include, but are not limited to, work-hour limits, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging", ambient-sensitive

backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

For additional information on construction noise, please refer to the FHWA Construction Noise Handbook (FHWA-HEP-06-015) and the Roadway Construction Noise Model (RCNM), available online at: http://www.fhwa.dot.gov/environment/noise/cnstr_ns.htm.

4.18.4 Borrow Sites and Construction Waste

Prior to the approval of any borrow source developed for use on this project, the contractor shall obtain a certification from the State Historic Preservation Office of the State Department of Cultural Resources certifying that the removal of material from the borrow source will have no effect on any known district, site, building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places. A copy of this certification shall be furnished to the Engineer prior to performing any work on the proposed borrow source.

Borrow pits used for bypass construction could result in the localized loss of wildlife and habitat, depending on their locations. No borrow or disposal sites related to this project are to be located on NFS lands without express written permission from the USFS and completion of all required environmental reviews. Contractors will coordinate with regulatory and resource agencies during the final permitting stage to ensure that other areas of non-disturbance (i.e., borrow pits, temporary access roads, staging areas, etc.) are set to minimize impacts to natural and cultural resources.

Borrow pits and all ditches will be drained insofar as possible to alleviate breeding areas for mosquitoes except as may be directed by the plans, specifications, special provisions or resident engineer for wetlands mitigation sites. In addition, care should be taken not to block existing drainage ditches.

Solid wastes will be disposed of in strict adherence to the Division of Highways Standard Specifications for Roads and Structures. The contractor shall be required to observe and comply with all laws, ordinances, regulations, orders and decrees regarding the disposal of solid waste. Solid waste will not be placed into any existing land disposal site which is in violation of State rules and regulations. Waste and debris shall be disposed of in areas that are outside of the right-of-way and provided by the contractor, unless otherwise required by the plans or special provisions or unless disposal within the right-of-way is permitted by the Engineer. Steps will be taken to prevent construction damage to standing trees and other vegetation outside of construction limits and/or the right-of-way boundary in an effort to reduce solid wastes. No borrow or disposal sites related to this project are to be located on NFS lands without express written permission from the U.S. Forest Service and completion of all required environmental reviews.

4.18.5 Maintenance of Traffic

Construction will be conducted in such a manner as to ensure sufficient traffic access, especially emergency service vehicle access. NCDOT will provide traffic control plans that identify and control any temporary traffic shifts to accommodate construction needs and motorist safety. Any necessary detours will be adequately signed.

The contractor shall provide proper traffic control devices and sufficient flagmen if necessary to direct traffic during construction. Precautions to protect the safety of the public and the construction workers will be exercised. All signing barricades, lighting, traffic control devices and traffic control operations shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways.

If alternating one-way traffic is required along any of the affected routes during construction, traffic will be directed by flagmen and/or traffic control devices in order to eliminate or minimize excessive delays.

4.18.6 Utilities

Coordination during the project design and construction will be necessary to prevent major disruptions to utility service. In most locations, electric and telephone service are the major utility concerns.

Before construction, a preconstruction conference will be held involving the contractor, pertinent local officials, the U.S. Forest Service, and the NCDOT Division of Highways to discuss various construction procedures, including precautionary steps to be taken during construction that will minimize the interruption of public utility and traffic services. Public utility officials may also be involved in the preconstruction conference.

4.18.7 Geodetic Markers

NCDOT will coordinate with the N.C. Geodetic Survey prior to construction to identify any geodetic survey markers that will be impacted by the proposed project. Any affected markers will be relocated before construction.

NCDOT will coordinate with the U.S. Forest Service (USFS) concerning any property corners, and/or witness trees that might be disturbed or destroyed as a result of this project. Land monuments and property corners or witness markers shall not be damaged, destroyed, or obliterated without the prior permission of the Forest Supervisor and shall be relocated or reestablished once construction is completed in accordance with standards established by the USFS.

4.19 IRRETRIEVABLE & IRREVERSIBLE COMMITMENT OF RESOURCES

The construction of the Havelock Bypass involves the irretrievable commitment of natural, physical, human and economic resources. The land required for the proposed action is

considered an irreversible commitment of natural resources during the life of the facility. Although it is possible to reconvert this land to the original uses, it is not anticipated that any such conversion would be desirable or necessary. The value of the prime farmland, wetlands, and the biotic communities associated with the land within the construction fill limits will, for all practical purposes, be permanently lost. This land will no longer provide the associated benefits to the natural environment.

Other irretrievable commitments of resources are the physical resources such as construction materials and fuels expended to construct the project. Human resources to design, construct, and maintain the facility will also be expended. A commitment of public highway construction funds is necessary for the project. The construction requires a substantial one-time expenditure of these public funds which are not retrievable. Construction of the proposed project would also commit the State to provide operating, maintenance, and repair costs throughout the life of the highway.

The commitment of these resources to the proposed action reflects a decision by the State to provide an improved transportation system to the citizens of the State. These benefits consist of improved motorist safety and accessibility as well as savings of time and energy.

4.20 RELATIONSHIP BETWEEN SHORT-TERM IMPACTS AND LONG-TERM PRODUCTIVITY

Limited, short-term, adverse impacts on the human and natural environments will occur during the construction phase of the proposed US 70 Havelock Bypass. Persons adjacent to the proposed action will experience the inconvenience of construction noise, dust and other disruptive activities normally associated with this type of construction work. Existing traffic patterns will be disrupted. Temporary inconveniences may also result from traffic delays and utility adjustments. Also during the short-term, the water quality in area streams and creeks may be adversely affected. Increased turbidity in creeks during construction can be expected. However, this will be minimized through the use of NCDOT standard erosion and sedimentation control measures.

The displacement of wildlife and the removal of biotic communities, wetlands, and prime farmlands within the proposed right-of-way are the primary impacts to the natural environment. The project may affect the long-term survival of some area wildlife due to the effects of habitat loss, fragmentation, and the isolation of some populations. Mitigation for wetland losses has been proposed and will be implemented for unavoidable losses.

The displacement of the Craven County Waste Transfer Facility will be necessary, and Craven County currently plans to relocate the facility. The relocation of numerous existing residences will also be necessary. However, adequate replacement properties are available for both homeowners and tenants within the project area. Therefore, a short-term benefit will be the stimulation of the local real estate market and associated relocation service businesses.

Another short-term benefit during the construction phase of the project will be the increased economic opportunities in the local area resulting from the additional services that will be required by the construction personnel. A secondary short-term benefit could be the reduction in local unemployment.

The Preferred Alternative will enhance long-term economic productivity. A primary State and regional transportation goal of greatly improving regional access will be achieved. Improved access to the coastal port and beaches of the region should expedite the movement of people and goods and may result in increased economic activity within the region. The reduction in traffic congestion as a result of the bypass could render the area more desirable for tourism and other industries.

Other long-term benefits include reduced travel time, accident rates and vehicle operating costs. Reduced traffic congestion may also result in an improvement in response time for fire and emergency vehicle services increasing area safety. In conclusion, the long-term impacts of the proposed action are consistent with the goal of greatly improving transportation not only for the local area, but for the region and State as well.

4.21 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 4.21.1 contains a summary of impacts associated with the Preferred Alternative.

TABLE 4.21.1
IMPACT SUMMARY FOR THE PREFERRED ALTERNATIVE

ENVIRONMENTAL FEATURES		ALT. AT LEDPA SELECTION	REFINED PREFERRED ALTERNATIVE	DIFFERENCE
Length (miles)		10.3	10.3	---
Relocations	**Residential**	16	16	---
	Businesses	1	1	---
	Non-profit [1]	1	1	
	Total Relocations	18	18	---
Disproportionate Impact to Minority/Low Income		No	No	---
Historic Properties (adverse effect)		No	No	---
Community Facilities Impacted		No	No	---
Section 4(f) Impacts		No	No	---
Noise Receptor Impacts [2]		31 [2]	43 [2]	---
Prime Farmlands (acres)		71	71	---
Forested Acres *(NFS lands)* (acres) [3]		345 (244)	332 (209)	- 13 (- 35)
CNF Habitat Fragmentation		699	534	165
Wetlands *(NFS lands)* (acres) [4]		140 (103)*	131 (93)*	- 9 (- 9)*
* *Reflects corrected wetland impact measurements. Refinement at Station 338+00 to 393+00 reduces impact by 1.7 acres. Combined with on-going design changes since 2011, an approximate total of 9 acres of wetland impacts have been further avoided.*				
Streams *(NFS lands)* (linear feet) [4]		2,505 (1,387)	2,938 (1,825)	+ 433 (+438)
***Calculations reflect reclassification of areas previously categorized as wetlands.*				

TABLE 4.21.1 cont.
IMPACT SUMMARY FOR THE PREFERRED ALTERNATIVE

ENVIRONMENTAL FEATURES		ALT. AT LEDPA SELECTION	REFINED PREFERRED ALTERNATIVE	DIFFERENCE
Riparian Buffer Impacts (sq feet) [5]	**Zone 1**	157,024	129,402	-27,622
	Zone 2	91,916	81,142	-10,774
	Total Buffer Impacts	248,939	210,544	-38,395
100 Year Floodplain and Floodway Impacts (acres)		1.6	1.6	---
Federally Protected Species [6]		May Affect, Not Likely To Adversely Affect (1 species: RCW) [6]		
Right of Way Cost		$10,600,000	$11,425,000	+ $825,000
Utilities Cost		$2,800,000	$951,440	- $1,848,560
Construction Cost [7]		$149,600,000	$161,000,000	+ $11,400,000
Total Cost		$163,000,000	$173,376,440	+ $10,376,440

NOTES: For purposes of this summary table, Business Relocations include non-profit relocations. The proposed project would not affect any archaeological resources, Section 4(f) properties, or water supply watersheds. It would not create any impacts to hazardous materials sites.

1. NCDOT will compensate Craven County for relocation expenses associated with the displacement of the Waste Transfer Facility; however it is the County's decision whether to build a new facility. Thus, the County accepts responsibility to locate and obtain a new site, conduct any appropriate environmental studies, and obtain permits for a new facility. The Craven County Solid Waste & Recycling Department informed NCDOT that it is presently coordinating with the County Planning Department to search for a new replacement facility location for the center. DENR Solid Waste Management is also aware of the planning effort. In coordination with USFS, the County must develop recommendations for a "site restoration plan" to return the current site to preexisting conditions. Coordination on this effort is ongoing and the results will be documented in the ROD.
2. The noise analysis presented in the DEIS was prepared in 2006, prior to the 2011 update of NCDOT's Traffic Noise and Abatement Manual. The updated manual requires a more sophisticated "validation model" and noise contours are no longer used to determine impacts. These more detailed models often pick up additional receptors as impacts as compared to the noise contour method. As such, noise impacts for the Refined Preferred Alternative increased due to the new methodology. It is noted that the new analysis indicates that the number of build-condition impacts is lower than the number of no-build condition impacts (49) because the proposed bypass will reduce sound levels in some locations and some residences will be taken for right of way.
3. Impacts to vegetative communities are based on proposed right-of-way limits. The total right-of-way required for the project is 430 acres (240 acres of NFS lands). The totals shown for forested areas include 92 acres of pine plantation outside the CNF and 15 acres within the CNF. The NCDOT will pay the USFS, or their approved contractor, to measure to USFS specifications, the volume of timber on USFS land within the right-of-way limits. The USFS and NCDOT will determine the precise monetary value of the timber through appraisal at rates effective at the time of the timber sale contract. Impact quantities shown for Alternative 3 at LEDPA selection are based on construction limits plus an additional 35 feet. Current quantities are based on the proposed right-of-way. A direct comparison of impacts is limited due to different impact calculation methods.
4. Impact quantities for the refined Preferred Alternative are based on construction limits plus an additional 25 feet buffer, in accordance with current NCDOT impact analysis guidelines. Direct impacts are projected to be less than those shown in the table. Chapter 2.10.3.4 discussed impact quantity changes since 2011.
5. Because S7 was extended in 2013 and is outside NFS lands, the impact reduction for NFS lands appears disproportionately larger than the total reduction. Adjusting for this change would increase previously calculated total buffer impacts to 248,939 square feet. From this adjusted total, it is apparent that overall riparian buffer impacts for the proposed project were reduced since the publication of the DEIS. This topic is discussed in Chapter 2.10.3.5.
6. The proposed project may affect, but is not likely to adversely affect, the red-cockaded woodpecker. USFWS concurrence with this biological conclusion is based, in part, on NCDOT's agreement to allow periodic closures of the Preferred Alternative in order for CNF staff to conduct prescribed burns as management for the RCW. Without this agreement, the USFS would be unable to conduct the necessary prescribed burns in the vicinity of the project thus causing an indirect adverse effect on the RCW.
7. The difference between the construction cost estimate in the 2011 DEIS and the current construction cost is due to updated quantities and unit prices. In addition to unit price increases, outside shoulder widths increased from 10 feet to 12 feet with paved shoulders increasing from 4 feet to 10 feet.

5.0 LIST OF PREPARERS

This document was prepared by the NCDOT with assistance from Stantec Consulting Services Inc., in cooperation with the US Department of Transportation Federal Highway Administration, and the US Department of Agriculture - National Forest Service (USFS). Associated technical reports were updated with assistance from Environmental Services Inc. and Dr. J.H. Carter, III & Associates.

To maintain brevity, the lists of preparers in this document includes only those participating in study updates and review; the lists of preparers for the DEIS and earlier EA are incorporated herein by reference (40 CFR 1500.4(j)).

Federal Highway Administration

Clarence Coleman, PE	Director, Preconstruction & Environment. Responsible for Federal Aid Highway Program in North Carolina. Twenty two years experience in engineering and transportation planning.
Ron Lucas, PE	Preconstruction & Environment Engineer. Responsible for NCDOT Highway Divisions 1, 2, 3, 4, and 6. Twenty two years experience in engineering and transportation planning.

North Carolina Department of Transportation

Robert P. Hanson, PE	Eastern Project Development Engineer, Project Development and Environmental Analysis Branch. Manager responsible for development of planning/environmental studies in eastern North Carolina. Twenty-four years experience in transportation.
Brian F. Yamamoto, PE	Project Engineer in the Eastern Project Development Unit, Project Development and Environmental Analysis Branch. Twenty-two years experience in transportation.
Thomas E. Devens, PE	Project Manager in Eastern Project Development Unit, Project Development and Environmental Analysis Branch. Twenty-seven years experience in transportation.
Tristram Ford	Community Planner in the Human Environment Section, Project Development and Environmental Analysis Unit. Responsible for reviewing community impacts and indirect and cumulative effects discussion in the FEIS. Responsible for preparing/reviewing community impact assessments and indirect and cumulative effects reports. Eight years experience in community planning.
Mary Frazer	Environmental Supervisor in the Biological Surveys Group, Project Development and Environmental Analysis Unit. Responsible for protected species surveys, reporting, coordination and mitigation. Seventeen years experience in biological surveys and environmental analysis.

James Speer, PE	Project Design Engineer, Roadway Design Unit. Responsible for the review of roadway design critera and preliminary designs. 28 years total in Civil Engineering, 23 years in roadway design, including the preparation, review, and direction of functional, preliminary, and final roadway design plans. Responsible for the review of roadway design criteria and preliminary designs for NCDOT.
Allison K. White, EI	Project Design Engineer, Roadway Design Unit. Assigned to roadway design elements of the proposed action. Thirteen years experience in highway design.
Stephen Morgan, PE	Hydraulics Project Engineer, Hydraulics Unit. Assigned to design and review the hydraulics elements of the project design. Twenty-six years experience in highway design.
Rachelle Beauregard	Environmental Supervisor in the Natural Environment Section, Project Development and Environmental Analysis Unit. Responsible for oversight and review of red-cockaded woodpecker data collection, reporting and coordination. Seventeen years experience in biological surveys, reporting and environmental analysis.
Gordon Cashin	Environmental Program Consultant in the Natural Environment Section, Project Development and Environmental Analysis Unit. Responsible for Section 404/401 permitting, wetland delineations, and natural resource investigations. Twenty four years experience in environmental analysis for transportation.
Chris Rivenbark	Environmental Biologist in the Biological Surveys Unit, Project Development and Environmental Analysis Branch. Responsible for reviewing natural resource investigations; Section 7 field investigations; protected species (terrestrial/aquatic) surveys; Section 404/401 permitting and wetland delineations. Eighteen years experience in biological surveys with seven years reporting.

Stantec Consulting Services, Inc.

Paul R. Koch, PE, AICP	Principal. M.C.E. and B.S. in Civil Engineering with 22 years experience in transportation engineering, environmental analysis, and NEPA document preparation. Responsible for environmental investigations, public involvement, and NEPA document development for Stantec.
Amy C. Sackaroff, AICP	Project Manager. B.S. in Environmental Engineering with 14 years experience in transportation planning, environmental analyses, and NEPA documentation. Responsible for the preparation of NEPA documents, agency coordination, and public involvement.

Mary M. Martin	Environmental Analyst/Design Technologist. 35 years experience in transportation planning, environmental documentation, roadway design and structural design. Responsible for the preparation of noise analysis and NEPA documentation.
Amber Coleman	Project Planner. Responsible for preparation of the Indirect and Cumulative Impact Assessment, land use mapping, and future growth scenarios. Thirteen years experience in natural resource investigations and water quality modeling.
Melissa Ruiz	Project Planner. Responsible for preparation of the Indirect and Cumulative Impact Assessment, land use mapping, and future growth scenarios. Thirteen years experience in natural resource investigations and water quality modelinig.
Kristin Weidner	Project Planner. Responsible for preparation of the Indirect and Cumulative Impact Assessment and future land use scenarios. Eleven years experience in water quality modeling and GIS services.

Environmental Services, Inc.

Kevin W. Markham	Manager responsible for quality control and oversight on natural resource investigations. Twenty-two years experience in environmental investigations and consulting.
Matt K. Smith	Biologist assigned to oversee Natural Resource Technical Report preparation and assessment of U.S. Forest Service Proposed, Threatened, Endangered, and Sensitive Species. Fourteen years experience in environmental investigations and consulting.
Jan U Gay	Biologist assigned to oversee wetlands and jurisdictional delineations and agency coordination. Eighteen years experience in environmental investigations and consulting.

J. H. Carter, III & Associates

Dr. J.H. Carter III	Principal. Directed red-cockaded woodpecker foraging habitat analyses and preparation of the Biological Alternatives Analysis report and Biological Assessment. Forty-one years experience in red-cockaded woodpecker conservation.
Jan Goodson	Supervising Biologist. Directed and participated in field surveys, participated in data analyses and contributed to preparation of the Biological Alternatives Analysis report. Twenty-five years experience in red-cockaded woodpecker conservation.
Jeanette Sabo	Project Manager Biologist. Participated in field surveys and led data analysis of potential impacts to the red-cockaded woodpecker. Responsible for preparation of Biological Alternatives Analysis. Ten years experience in red-cockaded woodpecker surveys and assessments.

6.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

The following agencies and organizations were provided a copy of the DEIS and this FEIS. Federal and state agencies that submitted comments on the DEIS are noted with an asterisk. DEIS comments and responses to these comments are contained in Appendix D.

Federal Agencies

U.S. Environmental Protection Agency – Raleigh & Atlanta *
U.S. Department of Transportation – FHWA, Federal Railroad Administration (FRA) *
U.S. Department of Agriculture, Forest Service – Asheville (re. Croatan National Forest) *
U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Fisheries - St. Petersburg and Beaufort
U.S. Department of the Interior, Fish and Wildlife Service - Raleigh and Atlanta *
U.S. Department of Health and Human Services, Office of Environmental Affairs
U.S. Department of Housing and Urban Development
U.S. Department of Defense
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Marine Corps - Cherry Point MCAS
Federal Emergency Management Agency
Federal Energy Regulatory Commission
Advisory Council on Historic Preservation

State Agencies

North Carolina Department of Cultural Resources
North Carolina Department of Environment and Natural Resources
- Division of Coastal Management *
- Division of Water Quality *
- Division of Parks and Recreation
- Division of Land Resources
- Division of Soil and Water Conservation *
- Division of Marine Fisheries
- Wildlife Resources Commission *

North Carolina Department of Human Resources
North Carolina Department of Public Instruction
North Carolina Department of Commerce – Travel and Tourism Division
North Carolina Department of Economic Development
State Clearinghouse

Local Governments and Agencies

Mayor of Havelock
City of Havelock Commissioners
City of Havelock, City Manager
City of Havelock, Director of Planning and Inspections
Havelock Chamber of Commerce
Chairman, Board of County Commissioners of Craven County
Craven County
Craven County Schools

Craven County Economic Development Commission
Craven - Pamlico Transportation Committee
Down East Rural Planning Organization

Other Government Entities
Tuscarora Nation

Public Review Locations
Havelock - Craven County Public Library
NCDOT Division 2 Office - Greenville, NC

Non-Government Organizations
Sierra Club
Southern Environmental Law Center

7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

7.1 AGENCY COORDINATION

7.1.1 Scoping Letter

A Scoping Letter requesting participation in the study and soliciting comments was sent in September, 1992 to the following agencies:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- City of Havelock
- Chairman, Craven County Commissioners
- N.C. Department of Administration, State Clearinghouse
- N.C. Department of Cultural Resources, Division of Archives and History
- N.C. Department of Environment and Natural Resources (DENR)
    - Division of Environmental Management
    - Division of Coastal Management
    - Parks and Recreation - Natural Heritage Program
    - Wildlife Resources Commission
- N.C. Department of Human Resources
- N.C. Department of Public Instruction
- N.C. Department of Transportation
    - Hydraulics Unit
    - Geotechnical Unit
    - Location and Surveys Unit
    - Right-of-Way Branch
    - Statewide Planning Branch
    - Roadway Design Unit
    - Office of Pedestrian and Bicycle Transportation
    - Chief Engineer – Operations
    - Division Engineer, Division 2

Written comments received from each agency are included in Appendix D.

7.1.2 Steering Committee and NEPA/404 Merger Team Coordination

To provide a structure for coordination and develop cooperation during the study process, an interagency Steering Committee headed by the North Carolina Department of Transportation was formed at the initiation of the study. An interagency Steering Committee was customary for complex projects in the 1990's and was the predecessor of the current

NEPA/404 Merger Team. This committee/team provided assistance, comments and review to ensure compatibility with local, state, and federal planning guidelines and objectives. When the Section 404/NEPA Merger Process was developed, many projects, inclusive of the Havelock Bypass project, adopted previous Steering Committee agreements as equivalent to NEPA/404 Merger Process concurrence points. For the Havelock Bypass project, Steering Committee members met periodically and were represented by the following agencies:

- N.C. Department of Transportation
    - Project Development and Environmental Analysis Branch
    - Roadway Design Unit
    - Transportation Planning Branch
    - Division 2 - Greenville
- Federal Highway Administration
- U.S. Army Corps of Engineers
- U.S. Forest Service
- U.S. Department of the Interior, Fish and Wildlife Service - Raleigh
- U.S. Marine Corps, Cherry Point Marine Corps Air Station - Havelock
- N.C. Department of Environment and Natural Resources (DENR)
    - Division of Environmental Management (Water Quality Section/Division)
    - Division of Coastal Management
    - Parks and Recreation - Natural Heritage Program
    - Wildlife Resources Commission
- Craven County
- City of Havelock

The initial steering committee meeting was conducted on May 15, 1993 to introduce the committee members to the project, discuss the need for and purpose of the project, and provide them with background study information developed prior to the meeting. Among the items discussed were scoping and project approach, tentative project schedule, suggestions for obtaining good public involvement, and alternatives to be considered. The need for updated traffic projections and methods for obtaining these projections were discussed. The need for more detailed natural resource information was also discussed and a decision was made to supplement the studies to provide this information at a following meeting.

The second steering committee meeting was conducted on October 19, 1994 to present the natural resource and capacity studies completed to date and to discuss project alternatives. As a result of this meeting, the number of preliminary bypass corridors was reduced to two study corridors that avoided a known red-cockaded woodpecker cluster (CNF 58). As discussed in Chapter 2.6.7, all bypass corridors east of existing US 70 were

eliminated from further study due to likely impacts to the Cherry Point MCAS and the City of Havelock. The remaining two bypass corridors were recommended to be revised to the extent possible in order to follow alongside the existing cleared power line easements in the Croatan National Forest (CNF) to avoid additional obstructions to wildlife migration. Further coordination with the U.S. Forest Service was emphasized due to the amount of CNF lands required within the bypass corridors. It was also determined that NCDOT would show the proposed existing alignment improvement impacts and the two revised feasible bypass corridors at the January 1995 citizens workshop.

A third steering committee meeting was conducted on December 19, 1995 to present and discuss the updated project studies and public input regarding the two initial bypass corridors. The U.S. Army Corps of Engineers and U.S. Fish and Wildlife could not attend this meeting due to a U.S. government furlough. Since the local officials and public preferred Corridor 1, furthest from the City, and the State natural resource agencies preferred Corridor 2, closer to the City, it was decided to conduct a foraging analysis on the RCW cluster to determine if a third corridor between 1 and 2 could be considered. It was also determined to eliminate further consideration of the Improve Existing Alternatives due to a high level of anticipated impacts, if the USACE and USFWS would agree. USACE and USFWS subsequently agreed that the human environment impacts would be unreasonably high for these alternatives and agreed to eliminate them at an interagency meeting on February 15, 1996.

A fourth steering committee meeting was conducted on December 18, 1996 to present the RCW foraging analysis, discuss a newly-developed Corridor 3, and determine a preferred corridor for the project. After discussing the impacts associated with each of the bypass corridors. It was agreed that Corridor 3 would satisfy the purpose of and need for the project while balancing impacts to the human and natural environment; therefore the interagency team selected Corridor 3 as the preferred corridor. The team determined that Corridor 3 was to be presented as the preferred corridor for the project at a public meeting (held March 1997 at Havelock High School). Also, the USFS explained that their studies would be incorporated into the NEPA environmental document for the project. (See DEIS Appendix B).

On January 27, 1998, an Environmental Assessment was approved, which named Corridor 3 as the preferred corridor. The document was publically distributed in February, 1998. After a sufficient document review period by the public and agencies, NCDOT held a corridor public hearing on May 26, 1998. Public (and other) input was collected and a Post-Hearing meeting was conducted (to review and consider comments) on July 20, 1998. Based on the Steering Committee recommendations and in conjunction with public and agency comments received on the Environmental Assessment, an interagency decision was made to formally select Alternative 3 as the Preferred Corridor. The NCDOT Corridor Selection

Committee endorsed the selection of Alternative 3 as the NCDOT Preferred Alternative on August 27, 1998. Design work then started on an alignment within that corridor.

Due to the formal development and initiation of the NEPA/404 Merger Process (May 1997), the steering committee of state and federal agencies evolved into what is now referred to as the NEPA/404 Merger Team. As the NEPA/404 Merger Process was being implemented, many projects, including the proposed project, adopted previous Steering Committee agreements as equivalent to NEPA/404 Merger Process concurrence points. The Steering Committee's decision on Purpose and Need was carried forward while decisions related to the Detailed Study Alternatives and LEDPA selection were reexamined before being carried forward.

On December 17, 1999, a NEPA/404 Merger Team meeting was held for Concurrence Point 4: Avoidance and Minimization (which at that time also included bridging decisions) for the Preferred Alternative (Alternative 3). At this meeting it was decided to conduct a field review of the three major stream crossings to determine appropriate structure sizes that satisfy hydraulic needs, yet minimize riverine wetlands impacts and provide permeability for wildlife. The proposed typical section was also discussed; it was noted to investigate the adequacy of the proposed 2:1 side slopes since a slope failure could result in damages to wetlands. After this meeting, a field site visit was conducted on April 20, 2000 by representatives of the N.C. Department of Transportation, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the N.C. Department of Environment and Natural Resources (DENR) Division of Environmental Management (Water Quality Section), and the N.C. Wildlife Resources Commission to determine the recommended structure sizes.

The NEPA/404 Merger Team reached concurrence on avoidance and minimization measures (CP 4) on January 18, 2001, based on NCDOT's previous agreement to bridge high-quality riverine wetlands, as stated at the December 17, 1999 NEPA/404 Merger Team meeting. On June 20, 2002, a NEPA/404 Merger Team meeting was held for Concurrence Point 4B (Hydraulic Design Review). The team reviewed the location and design of all proposed major drainage structures, equalizer pipes, ditches, and other drainage features. The team reached agreement on the proposed structures and hydraulic designs as detailed in meeting minutes contained in DEIS Appendix B.

In December 2003, FHWA and NCDOT determined the expected impacts of the proposed project were significant and would require preparation of a Draft Environmental Impact Statement (DEIS). On December 11, 2003, a NEPA/404 Merger Team meeting was held to discuss project's environmental documentation needs under NEPA and to reach consensus on whether to conduct additional wetland delineations, and whether to restudy the improve existing US 70 alternatives. It was agreed (and documented in meeting minutes)

that the previously reached concurrence point decisions would remain valid unless significant new information concerning the alternatives became available. The team also maintained that the improve existing US 70 alternatives could likely be eliminated as in previous studies (if the cost and relocation impacts were of similar magnitude). It was also agreed that wetland delineations would be verified for all three bypass alternatives. (An updated Natural Resource Technical Report was prepared in May 2007.) The DEIS was prepared under the original Notice of Intent for the project, and published in the Federal Register (FR 46426) on October 8, 1992. This NOI is contained in DEIS Appendix E. On August 21, 2008, a NEPA/404 Merger Team informational meeting was held to apprise the team of additional environmental studies and obtain input from review agencies.

A meeting was held on March 17, 2011 where representatives from the USFS, USFWS, and NCDOT developed a conceptual plan to periodically close the proposed bypass to conduct prescribed burns. In correspondence dated January 9, 2012, the NCDOT State Highway Administrator agreed to allow periodic closures of the bypass in order for the USFS to conduct prescribed burns. This correspondence and the prescribed conceptual burn plan are contained in Appendix A. The plan provides general descriptions of logistical issues such as public notification and coordination of traffic signals on existing US 70 during bypass closure.

The DEIS was approved on September 6, 2011, which identifies Alternative 3 as the Preferred Alternative. A Notice of Availability was published in the Federal Register on September 30, 2011 (76 FR 60822). The comment period ended on November 14, 2011. A number of federal and state regulatory and resource agencies provided comments on the DEIS as listed in Chapter 6. These comments and NCDOT responses are included in Appendix D. A Corridor Public Hearing was held on December 6, 2011 (described in Chapter 7.2.7), followed by a Post-Hearing Meeting on February 2, 2012 to review public comments received during the Corridor Public Hearing for consideration during subsequent design phases.

On April 10, 2012, a NEPA/404 Merger Team meeting was held to reinitiate the merger process and affirm the selection of Alternative 3 as the Least Environmentally Damaging Practicable Alternative (LEDPA) based on updated studies (2013) and the updated (2003) Red-cockaded Woodpecker (RCW) Recovery Plan. The team reaffirmed Alternative 3 as the LEDPA, for reasons detailed in Section 2.10.2. Because the Steering Committee results from the December 18, 1996 decision had not been rescinded and the recommendation for LEDPA was unchanged, the original CP3 memorandum, contained in DEIS Appendix B, still documents that decision.

In 2013, NCDOT completed additional design studies to reduce the proposed roadway cross section to a 200-foot cleared width where the alignment passes in close proximity to red-cockaded woodpecker habitat (CNF 12-44R). This reduction occurs for a distance of 5,550 feet along the Preferred Alternative from Station 338+00 to Station 393+00 (as shown in Exhibit 2.10.1). The reduced width was accomplished by re-design of the slopes, but maintains the median and shoulder widths required by the design criteria for this facility. The reduced highway footprint in this section, in conjunction with the Prescribed Burn Plan, was part of the basis of a November 2013 letter from the US Fish and Wildlife Service, which stated that under the Endangered Species Act - the proposed project may affect, but is not likely to adversely affect, the red-cockaded woodpecker.

The NEPA/404 Merger Team revisited Concurrence Point 4A (Avoidance and Minimization), on August 20, 2014. (This merger point was originally discussed and agreed upon on January 18, 2001.) The NEPA/404 Merger Team reviewed and agreed-to avoidance and minimization measures, including those identified on the 2001 CP4A signature form, and reached concurrence on an updated signature form, as contained in Appendix E. The revised CP4A form reflects the most current hydraulic recommendations as described in Chapter 4.14.2 and minimization measures detailed in Chapter 4.15. A NEPA/404 Merger Team meeting for Concurrence Point 4B (Hydraulic Design Review) was also held on August 20, 2014. The team reviewed the location and design of all proposed major drainage structures, equalizer pipes, ditches, and other drainage features. The team reached agreement on the proposed structures as detailed in meeting minutes contained in Appendix E.

7.1.3 U.S. Forest Service Coordination

The USFS has agreed to be a cooperating agency for this project under the National Environmental Policy Act (NEPA) (40 CFR 1501.6) and was consulted throughout the project development process. In addition to attending NEPA/404 Merger Team meetings, numerous meetings were held with U.S. Forest Service officials from the Croatan National Forest (CNF) and Forest Supervisor's office in Asheville, NC. USFS representatives provided input during the development of the build alternatives and recommendations regarding studies needed to assess project impacts. As the specific impacts to the CNF (including RCW populations) were identified, impact avoidance and mitigation options were also developed, in particular the Croatan Wetland Mitigation Bank and a conceptual plan for coordinating bypass operations with prescribed habitat management burns, as discussed in Section 4.15.4. Given the disparity between build alternatives regarding the feasibility to conduct prescribed burns, USFS input was pivotal in the selection of the Preferred Alternative and the minimization/mitigation of habitat fragmentation effects.

Since the DEIS was finalized in 2011, periodic meetings have been held with the USFS to coordinate on project commitments, natural resource survey updates, impact assessments, access locations, and other project components as documented in this FEIS. NCDOT has also maintained on-going, informal coordination with USFS officials via phone and email. Minutes for the two meetings held in 2014 are contained in Appendix E.

7.1.4 Tribal Coordination

In recognition of the Tuscarora Nation's cultural history in the Craven County area and in accordance with 36 CFR 800.3(f)(2), the Tuscarora Nation was invited to participate as a consulting party for the proposed project. One tribal archaeological site (Site 31CV302) lies outside the proposed construction limits but in close proximity to the northern interchange at existing US 70. No adverse effect on this site will occur as defined in Section 106 of the Historic Preservation Act, nor will a use occur as defined in "Section 4(f)" of the Department of Transportation Act. NCDOT initiated contact with the Tuscarora Nation in December 2013, and in January 2014 the FHWA provided copies of the 2000 Archaeological study and the 2011 DEIS, and requested comments from the Tuscarora Nation. This correspondence, dated January 6, 2014, is contained in Appendix F. NCDOT followed-up the letter with supplemental information via email, and spoke directly with the Tribal Environmental Planner/Officer (located in Lewiston, NY) in January 2014. A project commitment to protect Site 31CV302 from accidental disturbance was provided to the Tuscarora Nation for review on July 9, 2014. NCDOT will continue to consider the Tuscarora Nation as a consulting party and provide the Tribe's Environmental Officer with project updates related to site protection. To date, no response from the Tuscarora Nation has been received.

7.2 PUBLIC INVOLVEMENT

A Public Involvement Plan was developed to ensure public participation in the US 70 Havelock Bypass studies. The major components identified in the plan were as follows:

- Mailing List
- Key Contacts
- Toll-Free Phone Hotline
- Small Group Informational Meetings
- Local Public Officials Informational Meetings
- Citizens Informational Workshops
- Newsletters
- Coordination
- Corridor Public Hearing Map
- Corridor Public Hearing
- Post-Hearing Meeting

Following the circulation of the FEIS, a Design Public Hearing will be held to provide the public an opportunity for continued participation in the planning process and to update the public on the project's status. Comments and information received from the public are taken into consideration as work on this project progresses.

7.2.1 Mailing List

A mailing list consisting of local public officials, civic and business groups, governmental agencies, property owners, and interested citizens was developed at the beginning of the study and continually updated throughout the study process. The mailing list was used to provide public information concerning progress on the project and for notification of the public meetings.

7.2.2 Key Contacts

Officials from the U.S. Marine Corps Air Station at Cherry Point, the City of Havelock, Craven County, and the Croatan National Forest were established as key contacts for this project. The City of Havelock offered assistance for local arrangements. The principal local newspapers used to advertise meetings and workshops were the Sun Journal (daily) in New Bern in Craven County, and the News-Times (daily) in Morehead City in Carteret County.

7.2.3 Toll-Free Telephone Hotline

A toll-free telephone number was established in August 1992. The number was published in each newsletter, displayed at each workshop and made available to local organizations and agencies. Telephone responses to questions and comments were provided either immediately or within two business days.

7.2.4 Small Group Informational Meetings

The project team was available throughout the study process for presentations to neighborhood organizations, civic groups and local organizations. The public was informed of the team's availability for meeting through the newsletters. During the study process, three small group meetings were held; two with the local Chamber of Commerce, and one with County officials and business owners effected by the proposed bypass right-of-way and interchange along existing US 70.

The Havelock Chamber of Commerce requested NCDOT to present the project at their meeting on January 17, 1996. The NCDOT Board Member and representatives of the project team attended. Two bypass corridors were described and presented on a corridor map. A third bypass corridor under development was described but was not displayed. The attendees generally seemed to support Corridor 1 since it was estimated to cost less and cause less relocation impacts. Reporters from two local newspapers attended this meeting and reported the presentation with articles and graphics provided to the attendees.

The Craven County Planning Director set up a meeting on March 17, 1997, in the Craven County Managers office to discuss County concerns. The County representatives expressed concern about their waste transfer facility located near the northwestern terminus of the subject project. It was concluded the operations would need to cease at this site when right-of-way is acquired. Impacts at the northwestern terminus of the project at the interchange of the proposed bypass and existing US 70 were also discussed. It was noted that several of the median openings along existing US 70 would be closed. However, plans to connect existing service roads along the eastern side of US 70 in the area were also noted. The extended service road will provide adequate access to a nearby school and residential development.

7.2.5 Local Public Officials Informational Meetings

Prior to each of the two Citizens Informational Workshops and two public hearings, a local officials informational meeting was conducted to update the local officials on the project studies and receive their input. The presentations focused on the information being presented at the Citizens Workshops, the study process, and the current project schedule.

7.2.6 Citizens Informational Workshops

Two Citizens Informational Workshops were held during the study process. A brief summary of the workshops is provided as follows:

The first Citizens Informational Workshop was held on January 17, 1995 from 4:00 to 7:00 pm at the Henry S. Whitten Community Center in Havelock. A local officials meeting was conducted prior to the workshop with approximately 20 officials attending.

The mapping and summary findings for Corridors 1 and 2 were presented at this workshop along with the Improve Existing US 70 Alternative. The following are the principal citizen concerns noted by the project officials at this meeting and the responses to the concerns.

- Many attendees desired the Morehead City end of the project to be extended further southward along US 70 to allow future development in this area. This extension was not implemented due to potential impacts to a wetland area in the Croatan National Forest.

- Several attendees noting the proposed bypass corridors provided no direct access to the Cherry Point U.S. Marine Corps Air Station and the base is the major employer generating much of the existing traffic in the area, suggested improved access to the base be included with the project. It was explained that reduced congestion along existing US 70 would improve the access to the base.

- Numerous citizens requested consideration to be given to shifting the northern end of the project closer to the City. This shift was not implemented due to the location of the railroad separation in this area.

- Several residents with property and homes located at the western end of SR 1747 (Sunset Drive) and SR 1791 (Pulley Road), pointed out less wetlands and relocatees would be involved if Corridor 1 was shifted further west along an existing road alignment in this vicinity. This shift was implemented after further studies.

- Several attendees noted Corridor 2 would parallel a proposed Greenfield Heights Boulevard road extension from south of Miller Boulevard to US 70 at McCotter Boulevard. Most felt this extension to US 70 is needed to serve local traffic demands. This facility is included in the area thoroughfare plan.

- Several attendees expressed their belief that moving Corridor 1 further from the business area would promote and better serve future development west of the City.

- Many attendees expressed their support for a bypass noting that existing route improvements would be too damaging to existing development.

- A few business owners opposed any bypass since removing the through traffic would adversely affect their businesses.

A total of 76 attendees signed in at this meeting. However, the actual attendance was estimated to be approximately 100.

The second Citizens Informational Workshop was held on March 17, 1997 from 5:00 to 8:00 pm at the Havelock High School Cafeteria. A local officials meeting was also conducted prior to this workshop with approximately 26 officials attending.

The three bypass corridors were presented, and Corridor 3 was noted as the preferred alternative. Mapping and summary findings for the three bypass corridors were displayed. The following principal citizen concerns were noted at this meeting.

- Most of the interested citizens desired to determine where their homes would be in relation to the various corridors. It was emphasized that the corridors shown were substantially wider than the anticipated right-of-way.

- Most attendees favored Corridor 1 and Corridor 3 over Corridor 2 since they would impact fewer residences.

- Most attendees slightly favored Corridor 1 over Corridor 3 since it would be further from their homes and allow more area for future development.

A total of 73 attendees signed the register at this second citizens workshop meeting. However, the actual attendance was estimated to be approximately 100.

7.2.7 Corridor Public Hearing

In accordance with 23 U.S.C. 128, the North Carolina Department of Transportation certifies that a public hearing for the subject project has been held and the social, economic, and environmental impacts, consistency with local community planning goals and objectives, and comments from individuals have been considered in the selection of the recommended alternative for the project. A transcript of the public hearing was prepared and forwarded to the Federal Highway Administration along with the certification.

After publishing the January 27, 1998 Environmental Assessment (in February 1998) and allowing for sufficient public review time, the first corridor public hearing was conducted for the subject project on Tuesday May 26, 1998 at the Havelock High School. A local officials meeting was conducted prior to the hearing. At the public officials meeting, all endorsed Corridor 3 for the Bypass.

There were approximately 100 attendees at the corridor hearing. One speaker opposed the project but wanted Corridor 1 or 3, if the project is built. Most endorsed the Preferred Alternative and many requested the project be accelerated. A few questioned the northern terminus and requested extending the project northwestward beyond the Carolina Pines entrance. Corridor 2 received no support at either the local officials meeting or the hearing.

After the Local Officials Meeting and Corridor Public Hearing, public input was collected and a Post-Hearing meeting was conducted to review and consider comments on July 20, 1998.

The second Corridor Public Hearing for the subject project was held on December 6, 2011 at the Havelock Tourist and Event Center located at 201 Tourist Center Drive in Havelock. The hearing was preceded by a Local Officials meeting and an informal Pre-Hearing Open House. Maps were available for viewing and staff was available to answer questions. Handouts, including a comment sheet were distributed. Approximately 136 citizens signed-in during the open house and formal presentation. Twenty people spoke at the formal hearing. NCDOT received a total of 37 written comments, letters, emails, and telephone calls about the project during the 30-day comment period following the hearing. The majority of comments were submitted by local residents.

- The majority of written comments received from the Hearing opposed the project as presented and some requested that NCDOT improve existing US 70 through Havelock (54%). Other written comments reflected negative public opinion of the

US 70 median project (ongoing at the time of the public hearing) and the perception that NCDOT plans to construct the bypass regardless of the amount of public opposition. Of the written comments in favor of the project, Alternative 3 was most favored (14%); no support of Alternative 2 was expressed by hearing attendees.

- A total of 21 verbal comments were made at the hearing and recorded in the transcript. The No-Build Alternative and Improve Existing Alternative received the most public preference (52%). Of the verbal comments in favor of the project, two expressed support for Alternative 1 (10%). No verbal support was expressed for Alternative 2 or 3.

A Post-Hearing Meeting on February 2, 2012 to review public comments received during the Corridor Public Hearing for consideration during subsequent design phases.

7.2.8 Design Public Meeting

A Design Public Meeting was held on August 31, 2015 at the Havelock Tourist and Event Center located at 201 Tourist Center Drive in Havelock. The meeting consisted of an informal Pre-Meeting Open House from 4:30 p.m. to 6:30 p.m. followed by a transcribed formal meeting that began at 7:00pm. Maps were available for viewing and staff was available to answer questions. Handouts, including a comment sheet were distributed. Approximately 84 citizens signed-in during the open house and formal meeting. Seven people spoke at the formal meeting. NCDOT received a total of six written comments about the project during the 30-day comment period following the meeting. None of the written or verbal comments expressed opposition to the project. Comment subjects included:

- Support for the project and requests to accelerate the schedule
- Request for an alignment shift to minimize a property (cell tower) impact
- Concern regarding traffic and drainage impacts along the side-roads
- Concern about access (McCotter Blvd. and median breaks) along existing US 70
- Questions about the project schedule and general project information

7.2.9 Newsletters

Five newsletters were prepared during the study (January 1995, March 1997, May 1998, July 2012, and August 2015) and mailed to all persons on the project mailing list. These newsletters contained information about the study process, and included project team contacts, information on upcoming public meetings, and the announcement of the Preferred Alternative. Copies of the newsletters are contained in Appendix H and DEIS Appendix D.

8.0 INDEX

9.0 REFERENCES

References consulted in the preparation of this Final Environmental Impact Statement:

Adams, L.W., Geis, A.D., Effects of Roads on Small Mammals; Journal of Applied Ecology, 20: 403-415, 1983

Alexander, S., Waters, N., Paquet, P. (2005). Traffic Volume and Highway Permeability for a Mammalian Community in the Canadian Rocky Mountains. *The Canadian Geographer* Volume 49 issue 4, pg 321-331

Anderson, Grant, Harris Miller Miller & Hanson Inc. July 2006. *A Very Difficult TNM Quiz*

Anthony P. Clevenger and Nigel Waltho, Factors Influencing the Effectiveness of Wildlife Underpasses in Banff National Park, Alberta, Canada, February 1, 2000,

Bowlby, W, and Wayson, R.L. 2002. Advanced Traffic Noise Modeling [proceedings to TNMn version 2.0 training workshop]. Bowlby & Associates, Inc., Franklin, TN

Case, R.M., 1978, Interstate Highway Road-Killed Animals: A Data Source for Biologists. Wildlife Society Bulletin 6(1): 8-13.

Craven County Economic Development Commission (2010). Creating Economic Development Opportunities in Craven County, NC. December 20, 2010

Deaton, A.S., Chappell, W.S., Hart, K., O'Neal, J., Boutin, B., North Carolina Coastal Habitat Protection Plan, December 2010

Eastern Carolina Council, East Carolina Joint Land Use Study, November 2002

EcoScience Corporation, Axiom Environmental, Inc., Croatan Mitigation Bank Addendum to the NCDOT UMBI, January 2009

Federal Highway Administration (FHWA), Guidance for Preparing and Processing Environmental and Section 4(f) Documents, October 1987
http://environment.fhwa.dot.gov/projdev/impta6640.asp

Federal Highway Administration, (FHWA). 1984. *Analysis of Highway Construction Noise.*

Federal Highway Administration. CFR 23 Part 772 – Procedures for Abatement of Highway Traffic Noise and Construction Noise. [47 FR 29654, July 8, 1982; 47 FR 33956, August 5, 1982; 62 FR 42903, August 11, 1997].

Federal Highway Administration. CFR 23 Part 772 – Procedures for Abatement of Highway Traffic Noise and Construction Noise. [75 FR 39820-39838, July 13, 2010].

Federal Highway Administration. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. 1995.

Federal Highway Administration. *Highway Traffic Noise Analysis: Reasonableness and Feasibility of Abatement*. U.S. Department of Transportation. Washington, D.C. 1992.

Federal Highway Administration. *Highway Traffic Noise Barrier Construction Trends*. Washington, D.C. April 2006.

Federal Highway Administration. *Traffic Monitoring Guide*. 2008.

Florida Department of Transportation (FDOT). 2012. Table 1. Generalized Annual Average Daily Volumes for Florida's Urbanized Areas.

GEL Engineering of NC, Inc. 2013. Determination of Lateral and Vertical Extent of Landfilled Flyash Using Geophysical Methods. Presented by Bergstrom, J., and Eyer, A. April 4-5, 2013.

Getz, L. L., F. R. Cole, and D. L. Gates. 1978. Interstate roadsides as dispersal routes for Microtus pennsylvanicus. Journal of Mammalogy 59: 208-212.

Gillis, William R." Lessons from Eastern Washington: State Route Main Streets, Bypass Routes and Economic Development in Small Towns," Washington State University and Washington State Department of Transportation, 1994.

Goosem, M. W. 1997. Internal fragmentation: the effects of roads, highways and powerline clearings on movements and mortality of rainforest vertebrates. Invited chapter in "Tropical Forest Remnants: Ecology, Management and Conservation of Fragmented Communities". (Eds. Laurance, W. F. and Bierregaard, R. O. Jr.) pp 241-255. University of Chicago Press, Chicago.

Handy, S., S. Kubly, D. Larsen, J. Sralla, S. Vanka, and M. Oden. "Economic Effects of Highway Relief Routes on Small- and Medium-Size Communities: Case Studies." CTR Research Report 1843-3. Center for Transportation Research, University of Texas at Austin, 2001.

Hels, T., Buchwald, E., The effect of road kills on amphibian populations; Biological Conservation, Volume 99, Issue 3: 331-340, June 2001

HSMM, Inc. (2007). Comprehensive Parks and Recreation Master Plan

ITRE, 2014 Economic Contribution of the North Carolina Ports. Institute for Transportation Research and Education (ITRE) North Carolina State University. Swain Center for Business and Economic Services. University of North Carolina Wilmington. Prepared for the North Carolina Ports Authority. November 17, 2014.

Kalcounis-Rueppell, M. and J. Grider. Survey of Threatened Bats in the North Carolina Coastal Plain with Emphasis on State Listed and White Nose Syndrome Positive Species Final Report. Project Number T-14, 2013.

Kauffman, G. Personal Communication. United States Forest Service, Asheville, NC. 2014.

Kimley-Horn and Associates, Inc. US 70 Corridor Access Management Handbook. May 2007.

Kimley-Horn and Associates, Inc., MCAS Cherry Point Transportation Demand Management Plan, June 17, 2011

Kimley-Horn and Associates, Inc., US 70 Access Management Study Clayton to Morehead City, NC, July 2005

Kimley-Horn and Associates, Inc. 2010. US 70 Corridor – Creating Super 70 with One Vision: One Voice.

Lee, Cynthia S.Y. and Fleming, Gregg G. *Measurement of Highway-Related Noise*. U.S. Department of Transportation Research and Special Programs Administration John A. Volpe National Transportation Systems Center Acoustics Facility, DTS-75. Cambridge, MA. May 1996.

Levine, M., Urge-Vorsatz, D., Blok, K., Geng, L., Harvey, D., Land, S., Levermore, G., Mongameli Mehlwana, A., Mirasgedis, S., Novikova, A., Rlling, J., Yoshino, H., 2007, Residential and commercial buildings, Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, U.K. & New York, NY, U.S.A.

Maltby, L., Forrow, D.M., Boxall, A., Calow, P., Betton, C., The effects of motorway runoff on freshwater ecosystems; Environmental Toxicology and Chemistry, Volume 14, Issue 6: 1079-1092, June 1995

Marstel-Day, Regional Growth Management Plan – Military Growth Task Force of North Carolina's Eastern Region, October 2009

Morris, A.D., M.J. Vonhof, D.A. Miller, M.C. Kalcounis-Rueppell, Myotis septentrionalis Trouessart (Northern Long-eared Bat) Records from the Coastal Plain of North Carolina. Southeastern Naturalist 8(2):355-362, 2009.

National Center for Education Statistics (NCES). 2012. Digest of Education Statistics 2011.

Nicholson, J.M., Population and genetic impacts of a 4-lane highway on black bears in eastern North Carolina, August 2009. http://trace.tennessee.edu/cgi/viewcontent.cgi?article=1083&context=utk_gradthes

NOAA, 2010. Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies. US Caribbean. National Marine Fisheries Service. Habitat Conservation Division. 18pp.

North Carolina Department of Transportation. *Traffic Noise Abatement Policy*. July 2011.

North Carolina Department of Transportation. *Traffic Noise Analysis and Abatement Guidance Manual*. August 2011.

North Carolina Department of Transportation (NCDOT). US 70 Corridor. http://www.ncdot.gov/projects/US70corridor/ Accessed 2012.

North Carolina Department of Transportation (NCDOT). 2011. Administrative Action Draft Environmental Impact Statement. US 70, Havelock Bypass, Craven County, North Carolina

North Carolina Department of Transportation (NCDOT). 2012. North Carolina Maritime Strategy Final Report.

North Carolina Department of Transportation (NCDOT) 2002. Roadway Design Manual: General Design Information, Design Criteria and Plan Preparation

North Carolina Department of Transportation (NCDOT), 2000. Wetland Mitigation Plan For Croatan Wetland Mitigation Bank in Craven County, North Carolina (T.I.P. Number R-1015WM). 83pp.

North Carolina Department of Transportation (NCDOT) 2012. Stream Crossing Guidelines for Anadromous Fish Passage.

North Carolina Department of Transportation (NCDOT) 2013. Red-Cockaded Woodpecker Biological Assessment, US Highway 70 Havelock Bypass (R-1015). Craven County, North Carolina.

North Carolina Department of Transportation (NCDOT), 2011. US 70, Havelock Bypass (R-1015); Draft Environmental Impact Statement. Craven County, North Carolina.

North Carolina Department of Transportation (NCDOT), 2008. Final – Phase II Closeout Report, Croatan Wetland Mitigation Bank, Craven County, NC. Ecosystem Enhancement Project No. 103.

North Carolina Department of Transportation (NCDOT), 2007. Phase I – Annual Report, Croatan Wetland Mitigation Bank, Craven County, NC. Ecosystem Enhancement Project No. 103.

North Carolina Department of Transportation (NCDOT). 2014. Carteret County Comprehensive Transportation Plan. Transportation Planning Branch. December 24, 2014.

North Carolina Natural Heritage Program (NCNHP). 2011. Guide to the Natural Communities of North Carolina. Fourth Approximation.

North Carolina Office of State Budget Management, 2011 Revised County Population Estimates http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/demog/countygrowth_2011.html

North Carolina Office of State Budget and Management. 2012. Craven County State of The County's Health (SOTCH) Report 2012

North Carolina Wildlife Resources Commission (NCWRC), 2014a. Red-Cockaded Woodpecker - Species Profile. North Carolina Wildlife Resources Commission. http://www.ncwildlife.org/Learning/Species/Birds/RedcockadedWoodpecker.aspx#35591138-status--distribution

North Carolina Wildlife Resources Commission (NCWRC), 2014b. Eastern Wild Turkey - Species Profile. North Carolina Wildlife Resources Commission. 3 pp. http://www.ncwildlife.org/Portals/0/Learning/documents/Profiles/Wild_Turkey.pdf

North Carolina Wildlife Resources Commission (NCWRC), 2012. North Carolina Black Bear Management Plan 2012-2022, North Carolina Wildlife Resources Commission. 293 pp. http://www.ncwildlife.org/Portals/0/Learning/documents/Species/Bear/Black%20Bear%20Management%20Plan_2012-2022.pdf

North Carolina Wildlife Resources Commission (NCWRC), 2010. Tarheel Wildlife – A Guide for Managing Wildlife on Private Lands in North Carolina. North Carolina Wildlife Resources Commission. 77 pp. http://216.27.39.103/Portals/0/Learning/documents/Publications/Conserving/Tarheel_Wildlife.pdf

Pittaway, L.H., and M.C. Kalcounis-Rueppell. Uwharrie National Forest Bat Transect Data Analysis 2009, 2010, 2012 Project Report for the North Carolina Wildlife Resources Commission, 2014.

Peoples, C. 2014. Personal Communication. Roanoke River Region of Nature Conservancy, Halifax, NC.

Reijnen R, Foppen R, ter Braak C, Thissen J. 1995; The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology 32: 187-202.

Simon, A. and Johnson, P.A., 1999. Relative Roles of Long Term Channel Adjustments Processes and Scour on the Reliability of Bridge Foundations. In: E.V. Richardson and P.F. Lagasse (Editors), Stream Stability and Scour at Highway Bridges. American Society of Civil Engineers, pp. 151-165.

Sivaramakrishnan Srinivasan and Kara Maria Kockelman, The Impacts of Bypasses on Small- and Medium-Sized Communities: An Economic Analysis, 2002

System Metrics Group, California Bypass Study: The Economic Impacts of Bypass Highways, May 2006 < http://www.edrgroup.com/library/highways/california-bypass-study-the-economic-impacts-of-bypasses.html>

Thorpe, G. 2008. NC 119 Relocation from I-85/40 to South of SR 1918 (Mrs. White Lane), Mebane, Alamance County, Federal Aid No. STP-119(1), State Project No. 8.1470901, WBS Element 34900.1.1, TIP Project No. U-3109

University of Kentucky (2001). The Impact of a New Bypass Route on the Local Economy and Quality of Life. Kentucky Transportation Center, College of Engineering

US 70 Corridor Commission. 2012. Access Management Plan Maps Draft

U.S. Environmental Protection Agency. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, D.C. 1971.

U.S. Fish and Wildlife Service. Northern Long-eared Bat Interim Conference and Planning Guidance. USFWS Regions 2,3,4,5, & 6. 2014.

U.S. Fish and Wildlife Service. (2014b) Endangered and Threatened Species and Species of Concern by County for North Carolina. Accessed November 5, 2014. http://www.fws.gov/raleigh/species/cntylist/nc_counties.html

U.S. Forest Service (USFS), 2002. Final Enviromental Impact Statement for the Revised Land and Resource Management Plan Croatan National Forest. United States Department of Agriculture, Forest Service, Southern Region. 531 pp.

Van Hassel, J.H., Ney, J.J., Carling, D.L. (1980). Heavy metals in a stream ecosystem at sites near highways. Trans. Amer. Fish. Soc. 109: 636-643

Von der Lippe, M., Kowarik, I., Long-Distance Dispersal of Plants by Vehicles as a Driver of Plant Invasions, 2007

Wellman, J., Combs, D., Cook, S. Long-term impacts of bridge and culvert construction or replacement on fish communities and sediment characteristics of streams. Journal of Freshwater Ecology 2000, 15 (3), 317-328.

Wisconsin Department of Transportation, The Economic Impacts of Highway Bypasses on Communities, January 1998

References consulted in the preparation of the 2011 Draft Environmental Impact Statement:

American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets (2004 edition)

Beyer, D.E., R. Costa, R.G. Hooper and C.A. Hess. 1996. Habitat quality and reproduction of red-cockaded woodpecker groups in Florida. *Journal of Wildlife Management* 60:826-835.

Burkhead, N.M. and R.E. Jenkins. 1991. Fishes. Pp 321-409 *in:* K. Terwilliger (ed.), Virginia's Endangered Species. The McDonald and Woodward Publishing Company, Blacksburg, Va.

Conner, R.N. and D.C. Rudolph. 1991. Forest habitat loss, fragmentation and red-cockaded woodpecker populations. *Wilson Bulletin* 103:446-457.

Conner, R.N., D. Saenz, R.R. Schaefer, J.R. McCormick, D.C. Rudolph and D.B. Burt. 2004. Group size and nest success in red-cockaded woodpeckers in the West Gulf Coastal Plain: helpers make a difference. *J. Field Ornithol.* 75(1):74-78.

Cowardin, L.M., V. Carter, F.C. Goblet, and E.T. Laroe. Classification of Wetland and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, USFWS/OBS 79/31. U.S. Department of Interior. 1979 131 pp.

Crum, H.A. and L.E. Anderson. 1981. Mosses of Eastern North America. Two volumes. Columbia University Press. New York

DeLotelle, R.S. and R.J. Epting. 1988. Selection of old trees for cavity excavation by red-cockaded woodpeckers. *Wildlife Society Bulletin* 16:48-52.

DeLotelle, R.S. and R.J. Epting. 1992. Reproduction of the red-cockaded woodpecker in central Florida. *Wilson Bulletin* 104:285-294.

[DOA] Department of the Army. 1987. Corps of Engineers Wetlands Delineation Manual. Tech. Report. Y-87-1. Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi. 100 pp plus appendices.

[DEM]Division of Environmental Management, Water Quality Section. 1988. Benthic Macroinvertebrate Ambient Network (BMAN): Water Quality Review 1987. Rpt. 88-04, N.C. Department of Environment and Natural Resources; Raleigh N.C. 63 pp.

[DEM] Division of Environmental Management, Water Quality Section. 1995. Guidance for Rating the Values of Wetlands in North Carolina: Fourth Version. N.C. Department of Environment and Natural Resources, Raleigh, N.C. 56 pp.

[DEM] Division of Environmental Management, Water Quality Section. 2000. Classification and Water Quality Standards Assigned to The Waters of the Neuse River Basin. N.C. Department of Environment and Natural Resources, Raleigh, N.C. 40 pp.

Dr. J.H. Carter III & Associates, Inc., 1995. Unpublished proprietary information on territorial partitioning.

Dr. J.H. Carter III & Associates, Inc., 1996a. Red-cockaded woodpecker assessment for US 70 Bypass (R-1015), Craven County, North Carolina for NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, N.C.,14 pp.

Dr. J.H. Carter III & Associates, Inc., 1996b. Addendum to red-cockaded woodpecker assessment for US 70 Bypass (R-1015), Craven County, North Carolina for NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, N.C., 9 pp.

Dr. J.H. Carter III & Associates, Inc., 2007. Final Biological Alternatives Analysis, for Red-Cockaded Woodpecker and Bald Eagle Impacts, US Highway 70 Bypass (R-1015), Craven County, North Carolina for N.C. Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, N.C., December 11, 2007.

Dr. J.H. Carter III & Associates, Inc., 2008. Final Red-cockaded Woodpecker Mitigation Plan for the Croatan Wetland Mitigation Bank, Craven County, North Carolina for NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, N.C., June 2008.

Dr. J.H. Carter III & Associates, Inc. May 2011 Addendum to the Final Biological Alternatives Analysis, for Red-cockaded Woodpecker and Bald Eagle Impacts, US Highway 70 Bypass (R-1015), Craven County, North Carolina, . for the N,C. Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, N.C.

[DWQ] Division of Water Quality. 2000. Classifications and Water Quality Standards Assigned to Waters of the Neuse River Basin, N.C. Department of Environment and Natural Resources, Raleigh, N.C. (also referenced as [DEM] Division of Environmental Management, Water Quality Section)

[DWQ] Division of Water Quality. 2006a. Neuse River Basinwide Water Quality Plan. N.C. Department of Environment and Natural Resources, Raleigh N.C., 395 pp.

[DWQ] Division of Water Quality. 2006b. Basinwide Information Management System (BIMS): Stream Classification. <http://h2o.enr.state.nc.us/bims/reports/reportsWB.html> accessed September 2006.

[DWQ] Division of Water Quality. 2006c. North Carolina Water Quality Assessment and Impaired Waters 303(d) list – 2006 Draft. <http://h2o.enr.state.nc.us/tmdl/documents/2006303dListPublicReviewDraft.pdf> accessed September 2006.

[DWQ] Division of Water Quality. 2006d. NCIBI Data. <http://www.esb.enr.state.nc.us/> accessed September 2006.

[DWQ] Division of Water Quality. 2006e. Active NPDES Permits. <http://h2o.enr.state.nc.us/NPDES/permits.html#list> accessed September 2006.

Eastern Carolina Council. Down East Rural Planning Organization (RPO) Bicycle Routes Map, May 2005

Environmental Services, Inc., Final Mitigation Plan, Croatan Wetland Mitigation Bank, Craven County, North Carolina, April 2002.

Environmental Services, Inc. 2005. US 70 Havelock Bypass PETS Evaluation, Croatan National Forest, Craven and Carteret Counties, North Carolina. Technical Report Prepared for NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, North Carolina.

Environmental Services, Inc., 2007. Natural Resources Technical Report, US 70 Havelock Bypass DEIS, Craven and Carteret Counties, North Carolina, State Project No. 8.T170701, T.I.P. No R-1015, May, 2007, NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Natural Environment Unit, Raleigh, North Carolina.

Environmental Services, Inc., May 2008 USFS PETS Species Evaluation for the US 70 Havelock Bypass on the Croatan National Forest (CNF).

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations., Federal Register Vol. 59, No. 32, February 16, 1994

Federal Highway Administration, (FHWA). 1988. Manual on Uniform Traffic Control Devices for Streets and Highways.

Federal Highway Administration, (FHWA), USDOT and North Carolina Department of Transportation. US 70, Havelock Bypass, Craven County, NC T.I.P. No. R-1015, Environmental Assessment, January 27, 1998. Division of Highways, Project Development and Environmental Analysis Branch, Raleigh, North Carolina

Forest and Rangeland Renewable Resources Planning Act of 1974, 16-USC-1600 (Public Law 93–378; Approved August 17, 1974) [As Amended Through Public Law 106–580, Dec. 31, 2000]

Franklin, M.A. and J.T. Finnegan. 2008. Natural Heritage Program List of Rare Plant Species of North Carolina. North Carolina Natural Heritage Program, Office of Conservation and Community Affairs; N.C. Department of Environment and Natural Resources; Raleigh.

Godwin, R. A. 1989. Soil Survey of Craven County, North Carolina. USDA Natural Resources Conservation Service (Soil Conservation Service). Washington, DC.

Golder, W.W. and J.F. Parnell. March 1987. The shorebird no one sees. Wildlife in North Carolina 51(3): 22-23.

Handley, C.O., Jr. 1991. Mammals. Pp. 539-616 in: K. Terwilliger (ed.) Virginia's Endangered Species: Proceedings of a Symposium. The McDonald and Woodward Publishing Company, Blacksburg, VA. 672 pp.

Hicks, M.L. 1992. Guide to the Liverworts of North Carolina. Duke University Press. Durham.

HNTB North Carolina, PC, 2008. Community Impact Assessment, STIP Project R-1015, July 15, 2008.

HNTB North Carolina, PC, 2008. Quantitative Indirect and Cumulative Effects, STIP Project R-1015, July 15, 2008.

Holland Consulting Planners, Inc. 2009 CAMA Core Land Use Plan Craven County, Craven County Planning Department, New Bern, N.C.

Hooper, R.G. 1988. Longleaf pines used for cavities by red-cockaded woodpeckers. *Journal of Wildlife Management* 52:392-398.

J.A. Jackson, B.J.S. Jackson 1986. Why do Red-cockaded Woodpeckers need old trees? *Wildlife Society Bulletin* 14: 318–322.

James, F.C., C.A. Hess and D. Kufrin. 1997. Species centered environmental analysis: indirect effects of fire history on red-cockaded woodpecker. *Ecological Applications* 7:118-129.

Kartesz, J.T. 1999. A Synonymized Checklist and Atlas with Biological Attributes for the Vascular Flora of the United States, Canada, and Greenland. First Edition. In: Kartesz, J.T., and C.A. Meacham. Synthesis of the North American Flora Version 1.0. North Carolina Botanical Garden, Chapel Hill, NC.

Kimley-Horn and Associates, Inc. 2007 Draft Havelock Comprehensive Transportation/Land Use Plan, April 9, 2007

Ko & Associates, P.C., Highway Traffic Noise Analysis, US 70 Havelock Bypass North of Pine Grove Road to North of Carteret County Line, Havelock, Craven County, June 2006.

Lee, D.S. 1987. *Felis concolor* True Panther. Endangered, Threatened, and Rare Fauna of North Carolina: Part I. A Re-evaluation of the Mammals. Occasional Papers of the North Carolina Biological Survey 1987-3. 52 pp.

LeGrand, H.E. Jr., S.P. Hall, S.E. McRae, and J.T. Finnegan. 2006. Natural Heritage Program List of the Rare Animal Species of North Carolina. North Carolina Natural Heritage Program, Office of Conservation and Community Affairs; N.C. Department of Environment and Natural Resources; Raleigh. 104 pp.

Lennartz, M.R. and R.F. Harlow. 1979. The role of parent and helper red-cockaded woodpeckers at the nest. *Wilson Bulletin* 91:331-335.

Lennartz, M.R., R.G. Hooper and R.F. Harlow. 1987. Sociality and cooperative breeding of red-cockaded woodpeckers (*Picoides borealis*). *Behavioural Ecology and Sociobiology* 20:77-88.

Leonard, S. W., 1985. Status report on Aeschynomene virginica in North Carolina. Unpublished report to the Nature Conservancy, Boston, MA. 6+ pp.

Ligon, J.D. 1970. Behavior and breeding biology of the red-cockaded woodpecker. *Auk* 87:255-278.

Locke, B.A., R.N. Conner and J.C. Kroll. 1983. Factors influencing colony site selection by red-cockaded woodpeckers. Pp. 46-50 *in* D.A. Wood, ed. Red-cockaded woodpecker symposium II. Florida Game and Fresh Water Commission, Tallahassee, FL.

Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison III. Amphibians and Reptiles of the Carolinas and Virginia. The University of North Carolina Press, Chapel Hill. 1980. 264 pp.

Mattson, Alexander and Associates, An Architectural Resources Survey and Evaluations for the US 70 Proposed Havelock Bypass, Craven County, September, 1993

McQueen, C.B. and R.E. Andrus. 2007. Sphagnaceae Dumortier. In: Flora of North America Editorial Committee. Flora of North America, Volume 27 Bryophytes: Mosses, part 1. Oxford University Press. New York. 712pp.

Menhinick, E.F., The Freshwater Fishes of North Carolina. N.C. Wildlife Resources Commission, Raleigh. 1991, 227 pp.

Mills, L.S. and F.W. Allendorf. 1996. The one-migrant-per-generation rule in conservation and management. *Conservation Biology* 10:1509-1518.

National Forest Management Act (NFMA) of 1976 (P.L. 94-588)

[NMFS] National Marine Fisheries Service and United States Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

[NMFS] National Marine Fisheries Service. 1998a. Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 104 pp.

[NMFS] National Marine Fisheries Service and United States Fish and Wildlife Service. 1998b. Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD.

National Park Service, National Register of Historic Places, Washington, D.C. >http:nps.gov/nr

Neal, J.C., D.A. James, W.G. Montague and J.E. Johnson. 1993. Effects of weather and helpers on survival of nestling red-cockaded woodpeckers. *Wilson Bulletin* 105:666-673.

North Carolina Department of Transportation. Standard Specifications for Roads and Structures (current 2006)

North Carolina Department of Transportation. 1984-1993 Transportation Improvement Program. November, 1983

North Carolina Department of Transportation. 2009-2015 State Transportation Improvement Program. June, 2008

North Carolina Department of Transportation. NCDOT Draft 10-Year Program and Resource Plan (2015-2020), March 2010.

North Carolina Department of Transportation, Transportation Planning Branch. 1993. City of Havelock Thoroughfare Plan. November, 1993

North Carolina Department of Transportation, Division of Highways 1997. Best Management Practices for the Protection of Surface Waters, March 1997

North Carolina Department of Transportation/Department of Environment and Natural Resources, 2001, Volume II : Practitioner's Handbook Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, pp. III-56–III-64, issued November 2001

North Carolina Department of Transportation, Transportation Planning Branch. Strategic Highway Corridors Available:http://www.ncdot.org/doh/preconstruct/tpb/SHC/ Accessed: 09 January 2009

[NCGIA] North Carolina Center for Geographic Information and Analysis 2002. Basin Pro: Significant Aquatic Endangered Species Habitat. Version 3.1.

[NCNHP] North Carolina Natural Heritage Program. 2006. Records review for documented occurrences of federally-listed and state-listed species within 3.0 miles of the project study area. Accessed 11 August 2006.

NC Wildlife Resources Commission. 2006. Holly Shelter Game Land website (http://www.ncwildlife.org/index.htm).

Palmer, W.M. and A.L. Braswell. 1995. Reptiles of North Carolina. The University of North Carolina Press, Chapel Hill, NC for the N.C. State Museum of Natural Sciences. 412 pp.

Potter, E.F., J.F. Parnell, and R.P. Teulings. Birds of the Carolinas. The University of North Carolina Press, Chapel Hill. 1980, 408 pp.

Primack, R.B. 1998. Essentials of Conservation Biology, Second Edition. Sinauer Associates, Sunderland, MA. 659 pp.

Radford, A.E., H.E. Ahles, and C.R. Bell. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill. 1968 1183 pp.

Reed, R.A., J.Johnson-Barnard and W.L. Baker. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. *Conservation Biology* 10: 1098-1107.

Rohde, F.C., R.G. Arndt, D.G. Lindquist, and J.F. Parnell. 1994. Freshwater Fishes of the Carolinas, Virginia, Maryland, and Delaware. The University of North Carolina Press, Chapel Hill. 222 pp.

Rosgen, D., Applied River Morphology. Printed Media Companies. Minneapolis, Mn. 1996, 364 pp.

Rudolph, D.C. and R.N. Conner. 1991. Cavity tree selection by red-cockaded woodpeckers in relation to tree age. *Wilson Bulletin* 103:458-467.

Schafale, M.P. and A.S. Weakley. Classification of the Natural Communities of North Carolina: Third Approximation. N.C. Department of Environment and Natural Resources; Division of Parks and Recreation, North Carolina Natural Heritage Program, Raleigh. 1990 325 pp.

Schonewald-Cox, C.M. and M. Buechner. 1992. Park protection and public roads. *In* P.L. Fiedler and S.K. Jain (eds.), *Conservation Biology: The Theory and Practice of Nature Conservation, Preservation and Management, pp. 373-396.* Chapman and Hall, New York.

Smith, Greg C. 1997 Archaeological Background Report US 70 Havelock Bypass Craven County, North Carolina prepared for NC Department of Transportation, Division of Highways, Project Development and Environmental Analysis Branch, Human Environment Unit, Raleigh, N.C. January 1997

Stacey, P.B. and W.D. Koening, eds. Cooperative breeding in birds. Cambridge University Press, London, UK.

Stucky, J.M. and M. Fleming, 2006. Recommended mitigation plan for *Solidago Verna* in Craven Co., North Carolina; Havelock Bypass, R-1015. Research project conducted for NCDOT, No. HWY-0733.

Thompson, R.L. and W.W. Baker. 1971. A survey of red-cockaded woodpecker habitat requirements. Pp. 170-186 *in* R.L. Thompson, ed. Ecology and management of the red-cockaded woodpecker. U.S. Bureau of Sport Fishing and Wildlife and Tall Timbers Research Station, Tallahassee, FL.

Title VI of the Civil Rights Act of 1964, 42 USC 2000(d)-2000(d)(1) Section 601 to 603, (Pub.L. 88-352, 78 Stat. 241, July 2, 1964

Transportation Research Board, National Research Council. 2000. Highway Capacity Manual 2000. Washington, D.C.

United States Census Bureau, Current Population Reports, P60-231, Income, Poverty, and Health Insurance Coverage in the United States: 2005, U.S. Government Printing Office, Washington, DC

[USDA] U.S. Department of Agriculture, 1987. Soil Survey of Carteret County, North Carolina. Natural Resource Conservation Service

[USDA] U.S. Department of Agriculture, 1989. Soil Survey of Craven County, North Carolina. Natural Resource Conservation Service

[USDA] U.S. Department of Agriculture. 1991. Hydric Soils: Craven County, North Carolina. Soil Conservation Service Technical Guide Section II-A-2. 2 pages.

[USDA] U.S. Department of Agriculture, Important Farmlands in North Carolina http://www.nc.nrcs.usda.gov/programs/soilsurvey/primefarmland.html, accessed June 12, 1998.

[USDA] U.S. Department of Agriculture, U.S. Forest Service. 1996. U.S. Forest Service Analysis of the Alternatives for Proposed U.S. Highway Bypass, Havelock, North Carolina. U.S. Forest Service, National Forests in North Carolina, Asheville, NC.

[USDA] U.S. Department of Agriculture, 2002. 2002 Final Environmental Impact Statement for the Revised Land and Resource Management Plan for the Croatan National Forest, December 2002, U.S. Forest Service Southern Region. Atlanta, GA. December 2002.

U.S. Department of Defense. 2006. Marine Corps Base Camp Lejeune. Camp Lejeune 2006 RCW Recovery Plan. 35 pp.

U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES) Washington www.EDPubs.gov

United States Department of Transportation, Federal Highway Administration. FHWA Technical Advisory T6640.8A: Guidance for Preparing and Processing Environmental and Section 4(f) Documents. October 30, 1987.

United States Department of Transportation, Federal Highway Administration. 1988. Summary of Environmental Legislation Affecting Transportation. December 1998. Available: http://www.fhwa.dot.gov/environment/env_sum.htm#sec6f.

[USFWS] U.S. Fish and Wildlife Service. 1985. Red-cockaded woodpecker recovery plan. U.S. Fish and Wildlife Service, Southeast Region, Atlanta, GA.

[USFWS] U.S. Fish and Wildlife Service. 1987. Habitat Management Guidelines for the Bald Eagle in the Southeast Region. U.S. Department of the Interior, Fish and Wildlife Service. 8 pp.

[USFWS] U.S. Fish and Wildlife Service. National Wetlands Inventory (NWI) maps 1988

[USFWS] U.S. Fish and Wildlife Service.1989. Southeastern states bald eagle recovery plan. U.S. Fish and Wildlife Service, Atlanta, GA. 94 pp.

[USFWS] U.S Fish and Wildlife Service. 1992. Endangered and Threatened Species of Southeastern United States (The Red Book). U.S. Department of the Interior, Southeast Region, Atlanta, GA.

[USFWS] U.S. Fish and Wildlife Service. 1992. Guidelines for management of red-cockaded woodpeckers on private lands . U.S. Fish and Wildlife Service. 35 pp

[USFWS] U.S. Fish and Wildlife Service. 1995a. Sensitive Joint-Vetch (*Aeschynomene virginiana*) Recovery Plan. Hadley, Massachusetts. 55 pp.

[USFWS] U.S.Fish and Wildlife Service. 1995b. Rough-leaved Loosestrife Recovery Plan. Atlanta, Georgia. 32 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996a. "Biological opinion" for the red-cockaded woodpecker assessment for US 70 Bypass (R-1015), Craven County, North Carolina. 13 May 1996. 1 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996b. "Biological opinion" for the Addendum to red-cockaded woodpecker assessment for US 70 Bypass (R-1015), Craven County, North Carolina. 13 November 1996. 2 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996a. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996b. Recovery Plan for Seabeach Amaranth (*Amaranthus pumilius*) Rafinesque. Atlanta, Georgia.

[USFWS] U.S. Fish and Wildlife Service. 1998. Endangered species consultation handbook: procedures for conducting consultation and conference activities under Section 7 of the Endangered Species Act. U.S. Fish and Wildlife Service and National Marine Fisheries Service. Washington D.C. 181 pp.

[USFWS] U.S. Fish and Wildlife Service. 2003. Recovery plan for the red-cockaded woodpecker (*Picoides borealis*): second revision. U.S. Fish and Wildlife Service, Atlanta, GA. 296 pp.

[USFWS] U.S. Fish and Wildlife Service. 2005. Implementation procedures for use of foraging habitat guidelines and analysis of project impacts under the red-cockaded woodpecker (*Picoides borealis*) recovery plan: Second revision. R. Costa, USFWS, unpublished memorandum. 11 pp.

[USFWS] U.S. Fish and Wildlife Service. 2007. Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species: Updated 01-29-2007. <http://www.fws.gov/nc-es/es/cntylist> accessed 14 February 2007.

[USFWS] U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. U.S. Fish and Wildlife Service, May 2007.

[USGS] U.S. Geological Survey. 1974. Hydrologic Unit Map hydrologic unit 03020204.

[USGS] U.S. Geological Survey, 1994a Havelock, North Carolina, 7.5-Minute Topographic Quadrangle Map.

[USGS] U.S. Geological Survey, 1994b Masontown, North Carolina, 7.5-Minute Topographic Quadrangle Map.

Urban Resources Group (URG), City of Havelock 2030 Comprehensive Plan, June 15, 2009. City of Havelock, Planning Department

Van Balen, J.B. and P.D. Doerr. 1978. The relationship of understory vegetation to red-cockaded woodpecker activity. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 32:82-92.

Walters, J.R., P.D. Doerr and J.H. Carter III. 1988. The cooperative breeding system of the red-cockaded woodpecker. *Ethology* 78:275-305.

Walters, J.R. 1990. Red-cockaded woodpecker: a 'primitive' cooperative breeder. pp. 69-101 *in*

Walters, J.R. and W. Starnes. 1992. Croatan National Forest Management Plan.

Walters, J.R., S.J. Daniels, J.H. Carter III and P.D. Doerr. 2002. Defining quality of red-cockaded woodpecker foraging habitat based on habitat use and fitness. *Journal of Wildlife Management* 66(4):1064-1082.

Walters J.R. 2002. Letter to Mr. Derb S. Carter, Jr. Southern Environmental Law Center.

Walters, J.R., K. Sadler, S.J. Daniels, J.H. Carter III, K. Scheigg, G. Pasinelli and P.D. Doerr. 2004. Significant dispersal movements of red-cockaded woodpeckers on Fort Bragg and other areas within the North Carolina Sandhills. Prepared for Fort Bragg Endangered Species Branch. 20 pp.

Weakley, A.S. 2007. Flora of the Carolinas, Virginia, Georgia and surrounding areas. UNC Herbarium, University of North Carolina at Chapel Hill. A working draft. [available at: http://www.herbarium.unc.edu/flora.htm]

Webster, W.D., J.F. Parnell, and W.C. Biggs, Jr., 1985 Mammals of the Carolinas, Virginia, and Maryland. The University of North Carolina Press, Chapel Hill., 255 pp.

Wilcove, D.S., C.H. McLellan and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. *In* M.E. Soulé (ed.), *Conservation Biology: The Science of Scarcity and Diversity,* pp. 237-256. Sinauer Associates, Sunderland, MA.

Following is the complete list of References consulted in the preparation of the approved Environmental Assessment, January 27, 1998. There may be incidences of the same reference cited in the preparation of the individual documents.

References consulted in the preparation of the approved Environmental Assessment (1998):

Adamus, P.R., E.J. Clairain, Jr., R.D. Smith, and R.E. Young. (1987) Wetland Evaluation Technique (WET): Volume II Methodology Operational Draft Technical Report. U.S. Army Engineers Waterways Experiment Station, Vicksburg, Miss.

American Association of State Highways and Transportation Officials, Washington, DC, 1994. Policy on Geometric Design of Highways and Streets.

American Association of State Highways and Transportation Officials, Washington, DC, 1990. Policy on Geometric Design of Highways and Streets.

Bolen, E.G. W.L. Robinson. 1995. Wildlife Ecology and Management. Prentice Hall, Inc. Englewood Cliffs, New Jersey.

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Wetlands Research Program Technical Report WRP-DE-4. U.S. Army Engineers Waterways Experiment Station, Vicksburg, Miss.

Broley, C.L. 1947. Migration and nesting of Florida bald eagles. Wilson Bull. 59:3-20.

Cooper, J E. S.S. Robinson, and J.B. Funderburg. 1977. Endangered and threatened plants and animals of North Carolina. Report to the North Carolina State Museum of Natural History, Raleigh, N.C.

Cowardin, L.M., V. Carter, F.C. Goblet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States, FWS, USDI.

Delotelle, R.S., J.R. Newman, and A.E. Jerauld. 1983. Habitat use by red-cockaded woodpeckers in central Florida. *In* pp.59-67 Proc. Red-cockaded Woodpecker Symp. II. (D.A. Wood, ed.). Fl. Game and Fresh Water Fish Commission and U.S. Fish and Wildlife Service.

Environmental Services, Inc. 1994. Phase I environmental review, U.S. 70 - Havelock Bypass. Environmental Services, Inc., Raleigh, N.C.

Environmental Services, Inc., Raleigh, N.C., September 1995. Natural Systems Report, Proposed U.S. 70 - Havelock Bypass (R-1015), Craven County, N.C .

Environmental Services, Inc., Raleigh, N.C., January 1997. Supplemental Memorandum to the Natural Systems Report, Proposed U.S. 70 - Havelock Bypass (R-1015), Craven County, N.C.

Federal Highway Administration, (FHWA). 1988. Manual on Uniform Traffic Control Devices for Streets and Highways.

Federal Highway Administration, (FHWA). USDOT. Title 23 Code of Federal Regulations (CFR), Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

Federal Highway Administration. March. 1983. Noise Barrier Cost Reduction Procedure Stamina 2.0/Optima-User's Manual, FHWA No. FHWA-DP-58-1.

Fish, F.F. 1968. A catalog of the inland fishing waters of North Carolina. North Carolina Wildlife Resources Commission, Division of Inland Fisheries, Raleigh, N.C.

Goodson, J.M. J.H. Carter. 1996a. Red-Cockaded Woodpecker Assessment For US 70 Bypass (R-1015), Craven County, North Carolina. N.C. Department of Transportation. Raleigh, N.C.

Goodson, J.M. J.H. Carter. 1996b. Addendum to Red-Cockaded Woodpecker Assessment For US 70 Bypass (R-1015), Craven County, North Carolina. N.C. Department of Transportation. Raleigh, N.C.

Hamel, P.B., M.R. LeGrand, Jr., M.R. Lennartz, and S.A. Gauthreaux, Jr. 1982. Bird habitat relationships on Southeastern forest lands. U.S.D.A. Forest Service Gen. Tech. Rep. SE-22.

Harris, L.D. 1984. The Fragmented Forest, Island Biogeography Theory and the Preservation of Biotic Diversity. University of Chicago Press. Chicago, Illinois.

Holland Consulting Planners, Inc. 1996. Craven County, North Carolina 1996 Land Use Plan Update. Wilmington, N.C.

Holland Consulting Planners, Inc. 1996. City of Havelock, 1996 Land Use Plan Update. Wilmington, N.C.

Hooper, R.G., A.F. Robinson, Jr., and J.A. Jackson. 1980. The red-cockaded woodpecker: Notes on life history and management. Gen. Rpt. SA-GR 9. U.S.D.A. Forest Service, Atlanta, GA.

Jackson, J.A. 1977. Red-cockaded woodpeckers and pine red-heart disease. Auk 94:160-163.

Kral, R.A. 1983. A report on some rare, threatened, or endangered forest-related vascular plants of the south. Tech. Pub. R8-TP 2, U.S. Department of Agriculture. Forest Service.

LeGrand, H.E., Jr. 1991. Natural Heritage Program list of rare animal species of North Carolina. North Carolina Dept. of Environment and Natural Resources, Division of Parks and Recreation, Raleigh, N.C.

Ligon, J.D. 1970. Behavior and breeding biology of the red-cockaded woodpecker. Auk 87:255-277.

Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison, Jr. 1980. Amphibians and Reptiles of the Carolinas and Virginia. UNC Press, Chapel Hill, N.C. 264 pp.

Mattson, Ph.D., Richard L. September 1993. An Architectural Resources Survey and Evaluation for the US 70, Proposed Havelock Bypass, Craven County, North Carolina Department of Transportation, TIP Number R-1015, Prepared for TGS Engineers, Raleigh N.C.

McEwan, L.C. and D.H. Hirth. 1979. Southern bald eagle productivity and nest site selection. J. Wildl. Manage. 43(3):585-594.

N.C. Department of Environment and Natural Resources, Division of Parks and Recreation, Raleigh, N.C. Natural Heritage Program

North Carolina Division of Environmental Management. 1989. Benthic macroinvertebrate ambient network (BMAN) water quality review 1983-1987. Report 89-08, North Carolina Department of Environment and Natural Resources, Division of Water Quality, Raleigh, N.C.

North Carolina Division of Environmental Management. 1993a. Classifications and water quality standards assigned to waters of the Neuse River Basin, North Carolina Department of Environment and Natural Resources, Division of Water Quality, Raleigh, N.C.

North Carolina Division of Environmental Management. 1993b. Neuse River basinwide water quality management plan. North Carolina Department of Environment and Natural Resources, Division of Water Quality, Raleigh, N.C.

North Carolina Department of Transportation, Division of Highways, Highway Design Branch, Roadway Design Unit. July 1, 1978. Roadway Standard Drawings.

North Carolina Department of Transportation, Division of Highways, Highway Design Branch, Roadway Design Unit, compiled by Heber C. Eason, Jr. - Special Investigations, Approved January 1, 1978. Design Manual.

North Carolina Department of Transportation, Division of Highways, Program Development Branch, Feasibility Study - Havelock, Lake Road (SR 1756) and Miller Boulevard (SR 1745 & SR 1763) from proposed US 70 Bypass to US 70, Craven County

North Carolina Department of Transportation, Division of Highways, Planning and Environmental Branch compiled by TGS Engineers. 1994. Noise Analysis. US 70, Craven County, Proposed Havelock Bypass, TIP Number R-1015.

North Carolina Department of Transportation, Division of Highways, Planning and Environmental Branch compiled by TGS Engineers. 1995. Air Quality Analysis. US 70, Craven County, Proposed Havelock Bypass, TIP Number R-1015.

North Carolina Department of Transportation, Division of Highways, Planning and Environmental Branch compiled by TGS Engineers. 1994. Traffic Capacity Analysis. US 70, Craven County, Proposed Havelock Bypass, TIP Number R-1015.

North Carolina Department of Transportation, Division of Highways, Statewide Planning Branch. 1993. Thoroughfare Plan for the City of Havelock, N.C.

North Carolina Wildlife Resources Commission (WRC). 1993. Hunting records for 1992-93. Wildlife in North Carolina. Raleigh, N.C.

Parnell, J. F. 1977. Birds. *In* pp. 330-384 Endangered and Threatened Plants and Animals of North Carolina (Cooper, J. E., S. R. Robinson, and J. B. Funderburg, eds.). N.C. State Museum of Natural History. 435pp.

Potter, E.F., J.F. Parnell, and R.P. Teulings. 1980. Birds of the Carolinas. UNC Press, Chapel Hill, N.C.

Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the vascular flora of the Carolinas. UNC Press, Chapel Hill, N.C.

Schafale, M.P., and A.S. Weakley. 1990. Classification of the natural communities of North Carolina: Third Approximation. N.C. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources, Raleigh, N.C.

Smith, Ph.D., Greg C., (Environmental Services, Inc.), January 1997. Archaeological Background Report, US 70 Havelock Bypass.

Transportation Research Board, National Research Council, Washington, D.C. 1985. Highway Capacity Manual, Special Report 209.

Transportation Research Board, National Research Council, Washington, D.C. Updated 1994. Highway Capacity Manual, Special Report 209. Third Edition.

U.S. Department of Agriculture. 1987. Hydric soils of the United States. U.S.D.A. Soil Conservation Service.

U.S. Department of Agriculture. 1989. Soil survey of Craven County, North Carolina. U.S.D.A. Soil Conservation Service.

U.S. Department of the Army. 1987. Corps of Engineers wetland delineation manual. Tech. Report Y-87-1, Waterways Experiment Station, Vicksburg, MS., 100 pp.

U.S. Environmental Protection Agency, May, 1994. User's Guide to MOBILE5A, Mobile Source Emission Factor Model.

U.S. Environmental Protection Agency, November, 1992. User's Guide to CAL3QHC, Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections.

U.S. Fish and Wildlife Service. 1985. Red-cockaded woodpecker recovery plan. U.S. Department of the Interior, Southeast Region. Atlanta, GA. 88 pp.

U.S. Fish and Wildlife Service. 1989. Guidelines for preparation of biological assessments and evaluations for the red-cockaded woodpecker. U.S. Department of the Interior, Southeast Region. Atlanta, Ga.

U.S. Geological Survey, 1949, Photorevised 1983 Havelock, North Carolina, Topographic Quadrangle Map.

U.S. Geological Survey, 1949, Photorevised 1983 Masontown, North Carolina, Topographic Quadrangle Map.

Van Balen, J.B. and P.D. Doerr. 1978. The relationship of understory to red-cockaded woodpecker activity. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Ag.32:82-92.

Weakley, A.S. 1991. Natural Heritage Program list of rare plant species of North Carolina.

Webster, W.D., J.F. Parnell, and W.C. Biggs, Jr. 1985. Mammals of the Carolinas, Virginia, and Maryland. UNC Press, Chapel Hill, N.C. 255 pp.

Wood, P.B. Habitat use, movements, migration patterns, and survival rates of sub-adult bald eagles in north Florida. Ph.D. Diss., Univ. of Florida, Gainesville.

Wood, P.B., T.C. Edwards, and M.W. Collopy. 1989. Characteristics of bald eagle nesting habitat in Florida. J. Wildl. Manage. 53(2):441-449.