STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

LAND USE SCENARIO ASSESSMENT

Cape Fear Crossing
Brunswick and New Hanover Counties
North Carolina

STIP Project No. U-4738

Submitted by: URS Corporation – North Carolina

August 2015

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EXECUTIVE SUMMARY

Project Overview

The North Carolina Department of Transportation (NCDOT) proposes to construct a project known as the Cape Fear Crossing, formerly called the Cape Fear Skyway. The project consists of a limited access road extending from the vicinity of US 17 and I-140 in Brunswick County to US 421 in New Hanover County, including a crossing of the Cape Fear River. The proposed action is listed in the 2016-2025 NCDOT State Transportation Improvement Program (STIP) as Project Number U-4738 (NCDOT 2015). The current STIP defines this project as the "New route (Cape Fear Crossing), Brunswick, New Hanover, US 17 to US 421 (Independence Boulevard-Carolina Beach Road) intersection. Construct a new facility with a structure over the Cape Fear River."

Build alternatives being proposed for study include: upgrading existing US 17, Northern Alternatives, and Southern Alternatives, all of which are located north of Town Creek. Since the completion of the Indirect and Cumulative Effects Screening Report (ICE), new location alternatives south of Town Creek have been removed from consideration. Other highways that are within the project study area are US 17, US 74/76, US 421, NC 87, and NC 133. The project is currently funded for planning and environmental studies, and unfunded for right-of-way acquisitions or construction.

Summary of Future Land Use Study Area

The Future Land Use Study Area (FLUSA) includes approximately 60,260 acres of land. Of this, approximately 24,751 acres (41.1 percent) are considered vacant or underutilized and available for development. The elimination of the new location alternatives south of Town Creek resulted in a reduction in the size of the FLUSA for this Land Use Scenario Assessment (LUSA) and accounts for the differing acreage totals between this report and the previous ICE Screening Report. The time horizon for the study is from 2010 to 2040. The design year for the project is 2040. The Census data and population projections range from 2010 to 2035 and employment projections run to 2040. Adopted local and regional plans relevant to the project have future planning years through 2040. The *Cape Fear Commutes 2035 Transportation Plan* (WMPO, 2010) has been developed for 2035. Traffic forecasts completed for the project extend to 2040. Therefore, a range from 2010 to 2040 encompasses all relevant plans and data.

Notable human environmental features in the FLUSA include potential environmental justice communities in Spring Hill off of Goodman Road, near Leland off of Lansan Lane, and in Wilmington; multiple Voluntary Agricultural Districts (VADs); several historic resources; and numerous parks and recreation facilities. Notable economic resources within the FLUSA include the Port of Wilmington and the Central Business District of Wilmington. Notable natural environmental features include the Cape Fear River, wetlands, floodplains, conservation easements, NCDENR Natural Heritage Program Natural Areas and seven stream segments wholly or partially within the FLUSA that are on the *Final North Carolina Water Quality Assessment and Impaired Waters List (2014 Integrated 305(b) and 303(d) Report* (NC Department of Natural Resources, Division of Water Resources 2014). In addition, the Clarendon Plantation is a 730-acre tract of land held in conservation by the North Carolina Coastal Land Trust (NCCLT) that is located off of NC 133.

The population growth estimates based on data from the North Carolina Office of State Budget and Management (OSBM) show a 2.2 percent and 1.6 percent average annualized growth rate for Brunswick

County and New Hanover County, respectively, through 2034. Employment growth estimates based on data from Woods & Poole show a growth rate of 2.4 percent and 1.4 percent average annualized growth rate for Brunswick County and New Hanover County, respectively.

The majority of development with or without the project is expected to occur in the area along the US 17 corridor between Lanvale Road and US 74/76, the Village Road corridor, the NC 133 corridor, and the US 421 (River Road) corridor. Development regulations in the area address future growth that is anticipated. Brunswick County has a Unified Development Ordinance with several special purpose overlay districts such as Conservation and Protection Districts, Corridor Development Standards, and VADs. New Hanover County's Zoning Ordinance includes a Conservation District Overlay and a Special Highway Overlay District, and also implements a Flood Damage and Protection Ordinance. Brunswick County and New Hanover County are both National Pollutant Discharge Elimination System (NPDES) Phase II designated counties, along with the Town of Leland, the Town of Navassa, and the City of Wilmington. In addition, both counties are Coastal Area Management Act (CAMA) designated counties and require adopted CAMA land use plans and permits for impacts to Areas of Environmental Concern (AEC). Much of the recent infrastructure improvements and expansions have taken place to serve new and planned development.

Probable Development Areas

Six probable development areas have been identified for four build scenarios which include Upgrade Existing US 17 as a freeway, Upgrade Existing US 17 with arterial widening, the Northern Alternatives, and the Southern Alternatives. The probable development areas are located near the US 17/I-140 Interchange, along US 17 from Old Lanvale Road to the US 74 Interchange, US 17/Village Road/NC 133 (River Road) Interchange, NC 133 (River Road) south of Mallory Creek, Downtown Wilmington, and Independence and Shipyard Boulevard via US 421. The six probable development areas examined surround major existing or proposed interchanges. Examination of the areas shows that the Cape Fear Crossing project could encourage growth targeted to highway users in certain areas and/or influence future growth within Brunswick and New Hanover Counties. Construction of the proposed project would likely influence how growth occurs in PDAs 1, 4, and 6. On the other hand, construction of the proposed project would not likely influence growth in PDAs 2, 3, or 5.

Land Use Scenario Assessment Screening Tool Results

Separate indirect screening matrices were created to evaluate the key differences between the Upgrade Existing US 17 Alternatives (freeway and arterial widening options), the Northern Alternatives, and the Southern Alternatives. The results of these matrices showed that:

- Compared with the No-Build Scenario, all four Build Scenarios would put some additional pressures anddemand for higher impact development clustered around interchanges due to increased access. Given the high population and employment growth rates projected for the overall area, increased pressures for commercial development within the FLUSA is likely and local planners indicated that this would be likely to occur regardless of whether the project is built or not.

- As stated above, the FLUSA and the larger metropolitan region is expected to experience a high growth rate through 2040. The No-Build Scenario was rated as Medium-High, given the other infrastructure investments made in the FLUSA for public utilities and other major roadways (e.g. Wilmington Bypass) that have either been completed or are under construction will heavily contribute to the future population shift into this area. Each of the Build Scenarios will further

improve transportation efficiencies in the FLUSA, which will make this area more attractive to residential growth.

- All of the land within the FLUSA is within regulated areas that include natural system regulations, protected habitat areas, and stormwater regulations. Therefore, all four Build Scenarios and the No-Build Scenario were rated as Low.
- All of the land within the FLUSA is within planned areas that fall under the jurisdictions of one of the municipalities or the counties; all of which have land use policies, plans, zoning, and development regulations in place to provide adequate protections to the human environment. Therefore, all four Build Scenarios and the No-Build Scenario were rated as Low.

- The No-Build Scenario and the Upgrade Existing US 17 – Arterial Widening Build Scenario will both likely maintain the current development patterns including strip or sprawling development as highway access will remain partial control of access. These two scenarios were rated as Medium given that local plans and zoning ordinances do encourage higher density development patterns in targeted areas. The other three Build Scenarios (Upgrade Existing US 17 – Full Control of Access, Northern Alternatives, and Southern Alternatives) were ranked as Medium-Low, given that the control of access measures will encourage more clustering of development and higher density development patterns near the proposed interchange locations.

- The Build Scenarios and the No-Build Scenario were all ranked as Low concern for Planned/Managed Land Use Impacts given that the PDAs are consistent with land development and stormwater management goals.

In summary, the LUSA Screening Tool found that there was little divergence between the Build Scenarios and the No-Build Scenario. This suggests that there are few quality of life or resource impacts expected from the project.

Indirect and Cumulative Effects Summary

Examination of the probable development areas shows that the Cape Fear Crossing project could encourage growth targeted to highway users in certain areas and/or influence future growth within the FLUSA. However, local planners indicated that overall, the developable areas of the FLUSA are likely to be developed with or without the project based on other contributing factors and growth trends. Federal, state, and local regulations including zoning ordinances and land use plans provide protections from potential impacts from development on human and natural environmental features within the FLUSA that include historic and cultural resources, protected populations, wetlands, natural systems, and other important features. Indirect land use impacts to these resources should be limited by the regulations in place.

Qualitative analyses of the probable development patterns in the FLUSA suggest that change in land use resulting from the project and subsequent private and public development actions could lead to an increase in impervious surface and could potentially have an effect on future stormwater runoff and water quality in the watersheds encompassed by the project. However, there are adopted ordinances and regulations to help mitigate potential water quality effects due to increased impervious surface coverage and increased water runoff. Water quality concerns should be avoided and/or mitigated through compliance with regulations covering watershed protection, floodplain protection, stream and river buffers and stormwater management.

This project is expected to contribute to indirect and cumulative effects of future changes within the FLUSA. The project is expected to result in travel time savings of varying degrees by alternative, will change property access and exposure and create new land use/transportation nodes.

1.0 PROJECT OVERVIEW

The North Carolina Department of Transportation (NCDOT) proposes to construct a project known as the Cape Fear Crossing, which would be a limited access road extending from the vicinity of US 17 and I-140 in Brunswick County to US 421 in New Hanover County, including a crossing of the Cape Fear River. See Figure 1 for the project location. Other highways that are within the project study area are US 17, US 74/76, US 421, NC 87, and NC 133.

The proposed action is listed in the 2016-2025 NCDOT State Transportation Improvement Program (STIP) as Project Number U-4738 (NCDOT 2015). The current STIP defines this project as the "New route (Cape Fear Crossing), Brunswick, New Hanover, US 17 to US 421 (Independence Boulevard-Carolina Beach Road) intersection. Construct a new facility with a structure over the Cape Fear River." The project is currently funded for planning and environmental studies, and unfunded for right of way and construction.

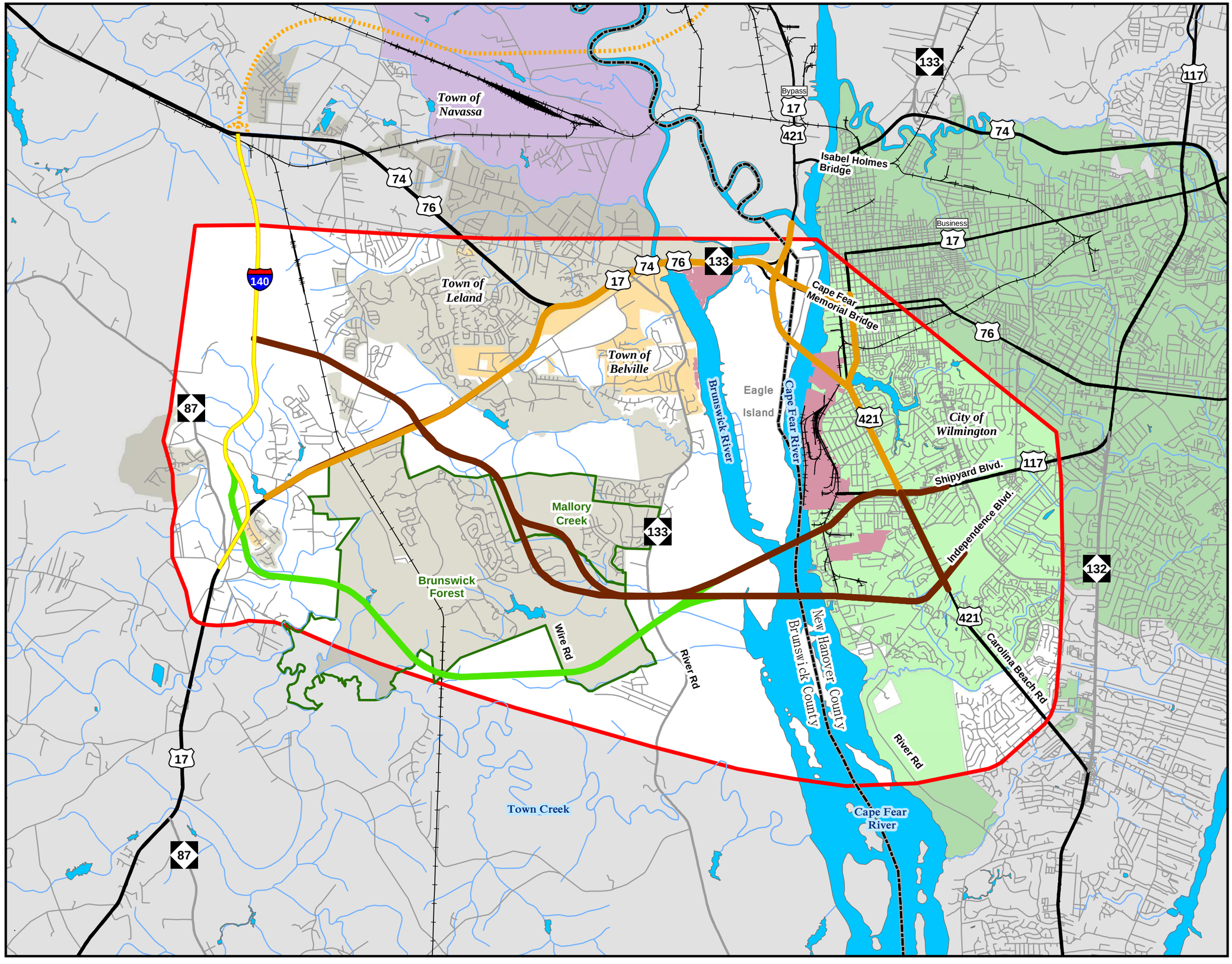
According to the *Final Traffic Forecast for STIP Project U-4738, Cape Fear Skyway*, traffic on US 17 crossing the Cape Fear River (existing Cape Fear Memorial Bridge) had an Annual Average Daily Traffic (AADT) of 49,800 vehicles in 2013 (HNTB 2014). It is projected that this same segment will carry between 79,600 AADT to 91,300 AADT in the year 2040, depending on which alternative is selected.

Build alternatives being proposed for study include: Upgrading Existing US 17, Northern Alternatives, which transect US 17 and Brunswick Forest, and Southern Alternatives, which travel south of Brunswick Forest and avoid major impacts to the developments. A detailed description of each alternative group is located in Section 1.3.

1.1 ENVIRONMENTAL DOCUMENTATION

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, an Environmental Impact Statement (EIS) is being prepared for the proposed Cape Fear Crossing project. The EIS is intended for use as an informational document by the decision-makers and the public. As such, it represents a disclosure of relevant environmental information concerning the proposed action.

The content of this document will conform to the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), which provide direction regarding implementation of the procedural provisions of NEPA, and FHWA's Guidance for Preparing and Processing Environmental and Section 4(f) Documents (Technical Advisory T 6640.8A, 1987).



CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 1: Project Location

Legend

- Project Study
- Upgrade Existing Alternative Group
- Northern Alternative
- Southern Alternative
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- Brunswick Forest and Mallory Creek Plantation Development
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

1.2 PURPOSE AND NEED

The purpose of the proposed action is to improve traffic flow and enhance freight movements beginning in the vicinity of US 17 and I-140 in Brunswick County across the Cape Fear River to US 421 near the Port of Wilmington in southern New Hanover County. Primary needs for the project include traffic capacity deficiencies and access to North Carolina ports.

Traffic Capacity Deficiencies

Without improvements to the existing network, US 17, from south of the proposed Wilmington Bypass interchange to Front Street in Wilmington (over a 10-mile long segment), will be over capacity and function at level of service (LOS) F in 2035. From the west, this roadway, including the Cape Fear Memorial Bridge, serves as one of the main entry points into the City of Wilmington and the Port of Wilmington. The Cape Fear Memorial Bridge was not designed to support the area's current and projected future population. Inadequate shoulder widths, median widths, and lane widths hinder its traffic carrying capacity. From the east, the opening of the lift-span bridge creates additional delay along the Dawson Street and Wooster Street corridors, creating additional, periodic congestion on US 17. It is also likely that future population growth and development in the area will increase travel demand from areas in eastern Brunswick County to southern New Hanover County.

North Carolina Port Access

Port of Wilmington officials state that the proposed action is necessary to accommodate growth, and the Cape Fear Crossing has been identified by the North Carolina State Ports Authority (NCSPA) as a freight corridor priority. Without improvements to the existing transportation and distribution network, the Port of Wilmington may not be able to capitalize on the opportunity for increased shipping and cargo volumes. Goals outlined in the Wilmington Urban Area Metropolitan Planning Organization's (WMPO's) current Long Range Transportation Plan (LRTP), titled the *Cape Fear Commutes 2035 Transportation Plan* (WMPO, 2010), support enhanced efficiency of the area's freight movement transportation system.

Secondary Benefits

A secondary benefit of the project would be to meet the goals of the transportation visions in the North Carolina Strategic Highways Corridor (SHC) Initiative and the WMPO's LRTP. The proposed Cape Fear Skyway (now called the Cape Fear Crossing) is included as a part of the NCDOT's SHC Vision Plan (2004) for North Carolina. It was included as part of Corridor 06.D, which was one of 55 corridors included in the SHC Vision Plan. In 2013, the SHC was updated and resulted in the creation of the North Carolina Transportation Network (NCTN) and the Strategic Transportation Corridors (STC) Policy, adopted March 4, 2015. The STC identify a network of 25 critical multimodal transportation corridors that move most of North Carolina's freight and people, link critical centers of economic activity to international air and sea ports, and support interstate commerce (NC Department of Transportation 2015). The US 17 corridor has been identified as a STC.

The project is also listed as a priority project in the current WMPO LRTP, citing the project as an important intermodal connector to improving freight movements in the Wilmington area and accommodating anticipated growth at the Port of Wilmington. The plan also cites the project as the highest profile project that is not funded through the LRTP, and is anticipated to provide a comprehensive transportation network connection, linking Brunswick County to New Hanover County.

Another benefit of the project would be the potential reduction in clearance time for residents and visitors who use the area thoroughfares during hurricane evacuation, as well as aid in emergency evacuation from areas surrounding Duke Energy's Brunswick Nuclear Plant in Southport, North Carolina.

1.3 PROPOSED MODIFICATIONS

The Inter-agency Team, which consists of local, state and federal agency representatives, has selected 12 Detailed Study Alternatives (Study Alternatives). These alternatives include alternatives that would involve upgrading existing US 17, new location alternatives, and hybrid alternatives that include upgrades of US 17 and new location. These alternatives were selected for their potential to fulfill the purpose and need of the project while minimizing impacts to human and natural environment resources.

For the purposes of discussion in this report, the alternatives are grouped into Study Alternatives and will be referred to as "Upgrade Existing US 17" alternatives (those alternatives that involve upgrading US 17), "Northern Alternatives" (those that begin on I-140 or at the I-140/US 17 interchange and transect the Brunswick Forest development), and the "Southern Alternatives" (those that begin at the I-140/US 17 interchange and travel south of the Brunswick Forest development). The Study Alternatives are shown on Figures 2a, 2b, and 2c and described in the following sections.

Functional designs for major project elements, including the location of interchanges with highways and other major roadways, are currently being developed. Design criteria developed for the Study Alternatives are shown in Table 1. The typical section is proposed as a four-lane, median-divided facility with full control of access.

Table 1: Build Alternative Design Criteria

Factor	Classification
Facility Type/Functional Classification	Freeway
Terrain Type	Level
Design Speed	70 mph
Posted Speed	65 mph
Right of Way Width	Varies 250' – 300'
Control of Access	Full (new location)/ Varies (Upgrade Existing)
Rumble Strips (Y/N)	N
Ultimate Typical Section Type	4-Lane Divided Shoulder
Lane Width	12'
Sidewalks (Y/N)	N
Bicycle Lanes (Y/N)	N
Median Width	46'
Shoulder Width	12'
Horizontal Alignment	8%
Cross Slopes	2.5%

The following subsections provide a more detailed description of each of the Study Alternatives.

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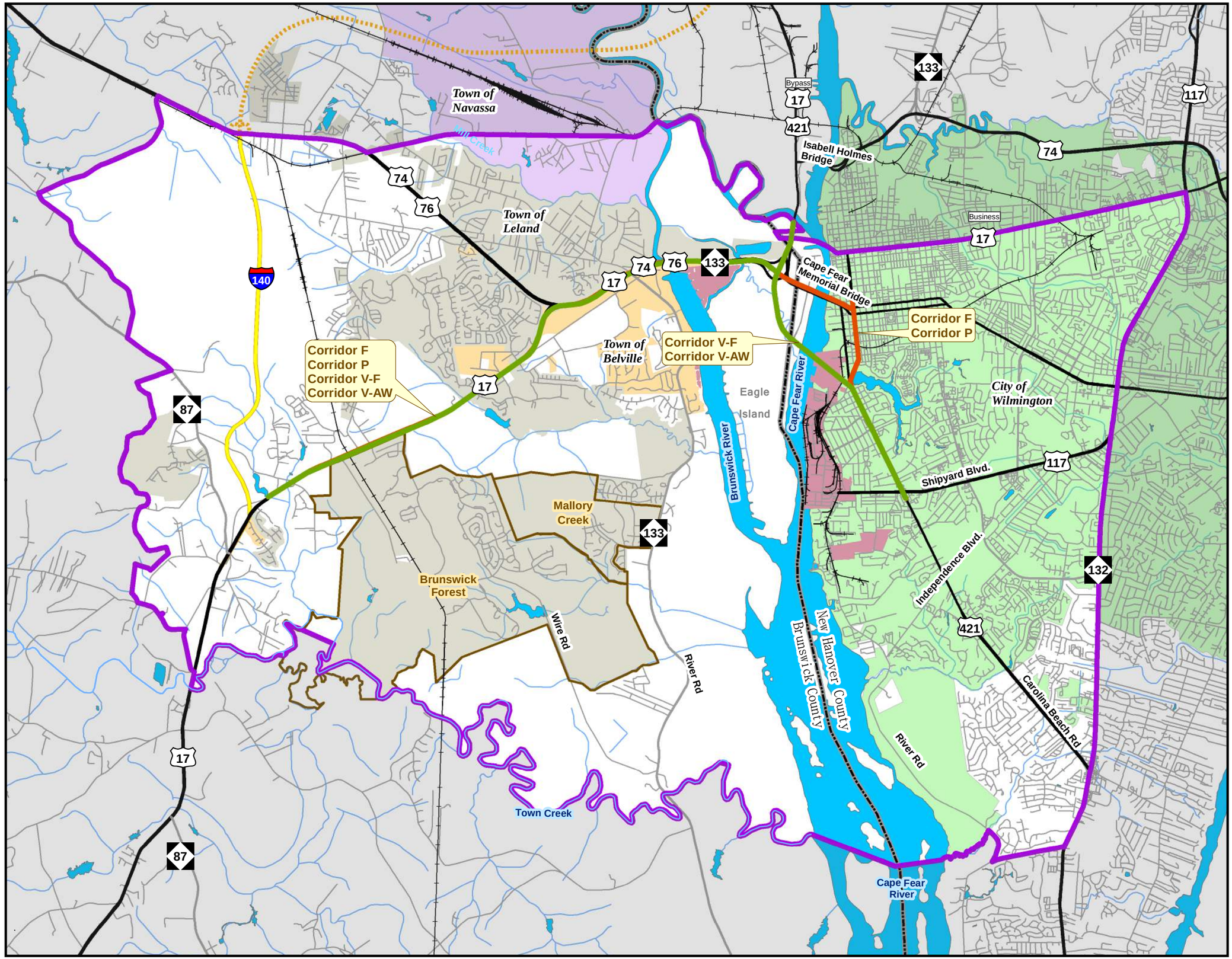
State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 2a: Upgrade Existing Alternative Group



Legend

- FLUSA
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Neighborhood Boundary
- Water
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Miles

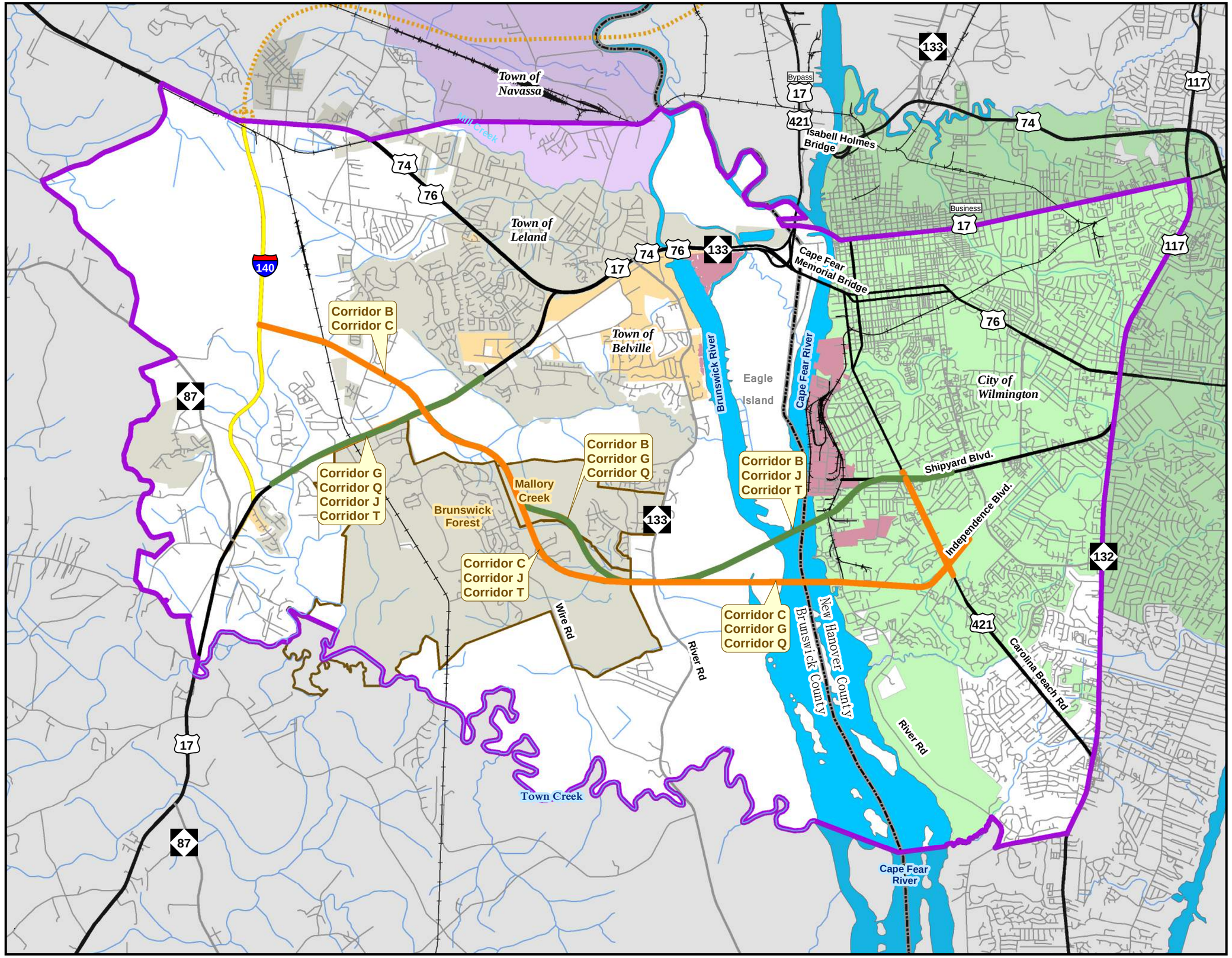
Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 2b: Northern Alternative Group



Legend

- FLUSA
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Miles

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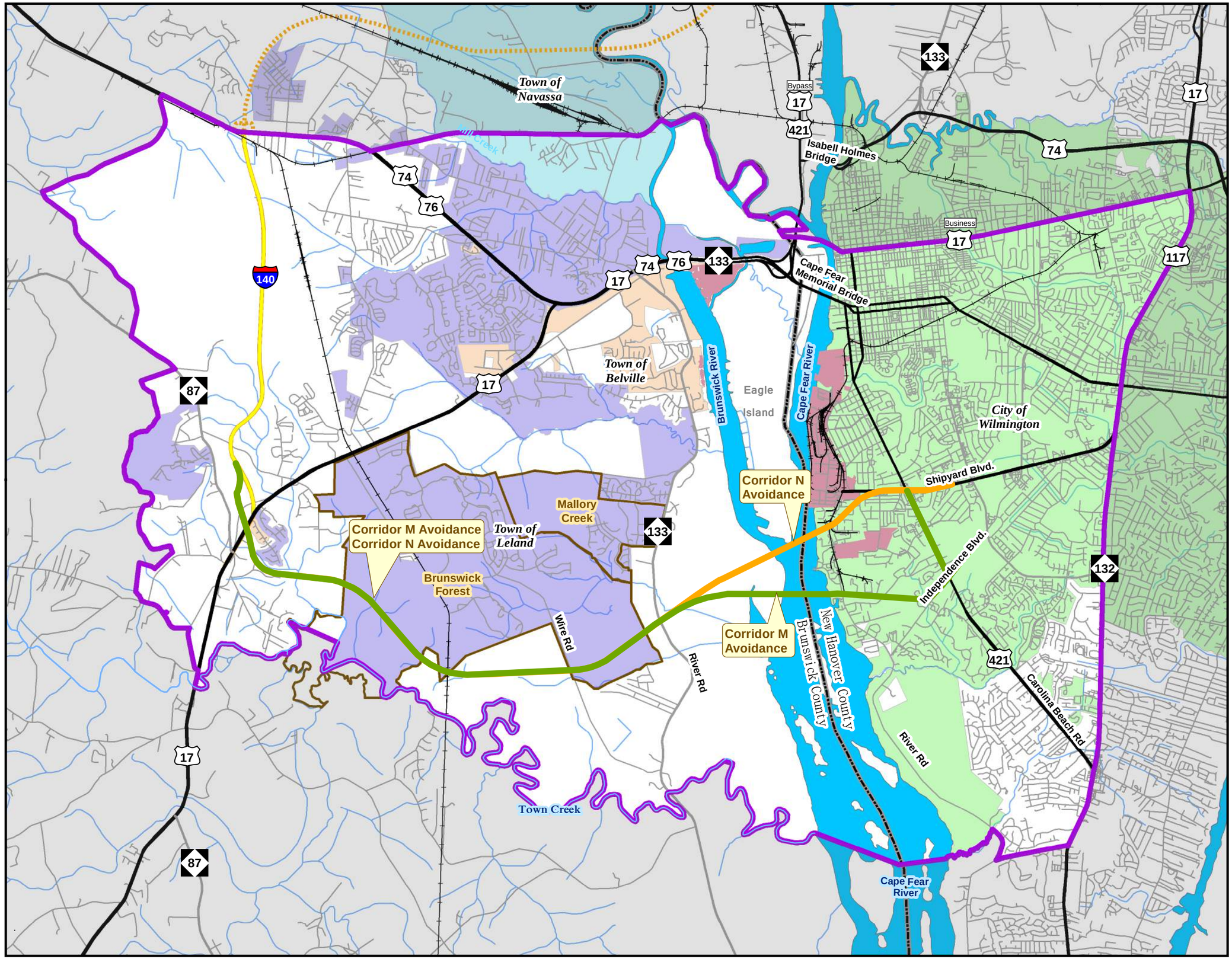
CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 2c: Southern Alternative Group



Legend

- FLUSA
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Neighborhood Boundary
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

1.3.1 UPGRADE EXISTING US 17 ALTERNATIVES

There are four separate alternatives which include extensive modifications to US 17.

- Alternatives F and P include modifications to US 17, which would begin at the terminus of I-140 on US 17 and continue to US 421 at US 117 (Shipyard Boulevard) in the City of Wilmington. Alternative F would be designed as a freeway and Alternative P would be designed as a standard arterial widening (AW). Both alternatives would include replacement of the existing Cape Fear Memorial Bridge.

- Alternative V-AW and V-F include upgrades to existing US 17 and portions on new location with a new fixed-span bridge. These alternatives would both begin at the terminus of I-140 on US 17, upgrade US 17 to the US 17/421 interchange, then traverse south along Eagle Island on new location and terminate on US 421 just north of the Port of Wilmington. Alternative V-AW would upgrade existing US 17 as a standard widening and Alternative V-F would upgrade existing US 17 as a freeway. The portion located on Eagle Island would be designed as a freeway for both options. Both options would also include a new bridge crossing over the Cape Fear River.

1.3.2 NORTHERN ALTERNATIVES

There are six alternatives included as the Northern Alternatives, two new location alternatives and four hybrid alternatives.

- Alternative B would begin at a new interchange on I-140, intersect US 17 and travel between the Brunswick Forest and Mallory Creek developments. This alternative would terminate at US 117 (Shipyard Boulevard).

- Alternative C would begin at a new interchange at I-140, intersect US 17 and travel parallel to Wire Road. This alternative would connect to Independence Boulevard and upgrade US 421 to Shipyard Boulevard. Both alternatives would include a new bridge crossing over the Cape Fear River.

- Alternatives G and Q would begin at the terminus of I-140 on US 17, upgrade existing US 17 for approximately two miles, then continue southeast on new location between the Brunswick Forest and Mallory Creek developments. Both alternatives would connect to Independence Boulevard and upgrade US 421 to Shipyard Boulevard. Alternative G would be designed as a freeway for the entire length. Alternative Q would be designed as a standard widening along US 17 and a freeway on new location. Both alternatives would include a new bridge crossing over the Cape Fear River.

- Alternatives J and T would begin at the terminus of I-140 on US 17, upgrade existing US 17 for approximately two miles, then continue on new location parallel to Wire Road. Both alternatives would terminate at US 117 (Shipyard Boulevard). Alternative J would be designed as a freeway for the entire length, while Alternative T would be designed as a standard widening along US 17 and a freeway on new location. Both alternatives would include a new bridge crossing over the Cape Fear River.

1.3.3 SOUTHERN ALTERNATIVES

There are two alternatives included as the Southern Alternatives, M Avoidance and N Avoidance. Both alternatives would begin at the interchange of I-140 and US 17 and continue on new location just north of Town Creek. These alternatives avoid impacts to the Brunswick Forest development. Both would be designed as a freeway for their entire length and include new bridge crossings over the Cape Fear River.

- Alternative M Avoidance would connect to Independence Boulevard and upgrade US 421 to Shipyard Boulevard

- Alternative N Avoidance would terminate at Shipyard Boulevard

2.0 FUTURE LAND USE STUDY AREA (FLUSA)

The FLUSA is the area surrounding a construction project that could possibly be indirectly affected by the actions of others as a result of the completion of the project and other combined projects. The FLUSA encompasses all of the areas examined for potential increases in development pressure as a result of project construction (Figure 3). The FLUSA boundary shown on Figure 2 represents a revision from the FLUSA shown in the Screening ICE Report completed in August 2013. This is because alternatives being considered south of Town Creek were eliminated from further consideration after finalization of the Screening ICE Report. The FLUSA boundary includes planned and potential future development areas around the City of Wilmington, Brunswick County, and the Towns of Leland, Navassa, and Belville; residential neighborhoods west and north of the proposed project; and environmental features. The FLUSA was approved by the NCDOT Human Environment Section at a meeting held on October 16, 2014.

To the north, the FLUSA boundary generally follows the boundaries of the 2010 Census block groups encompassing the northern boundary of the Town of Leland and a portion of the Town of Navassa. To the east, it runs along NC 132 until it intersects with US 421, then it follows US 421 for approximately one mile and then continues west along the 2010 Census Block Group 2, Census Tract 121.01 until it reaches Town Creek, then follows Town Creek west until reaching NC 87 and again follows 2010 Census block groups for the rest of the western portion of the study area.

The western side of the FLUSA is located in Brunswick County and includes unincorporated rural areas along the recently completed I-140 project, as well as the Towns of Belville, Leland, and Navassa where the land development patterns are suburban and contain relatively low-density development. A large (5,000 to 6,000 acres) mixed-use development, known as Brunswick Forest, with approximately 12,000 home sites and 300 acres of commercial land is under construction within the study area. This development is roughly bounded by US 17, NC 133, and Town Creek.

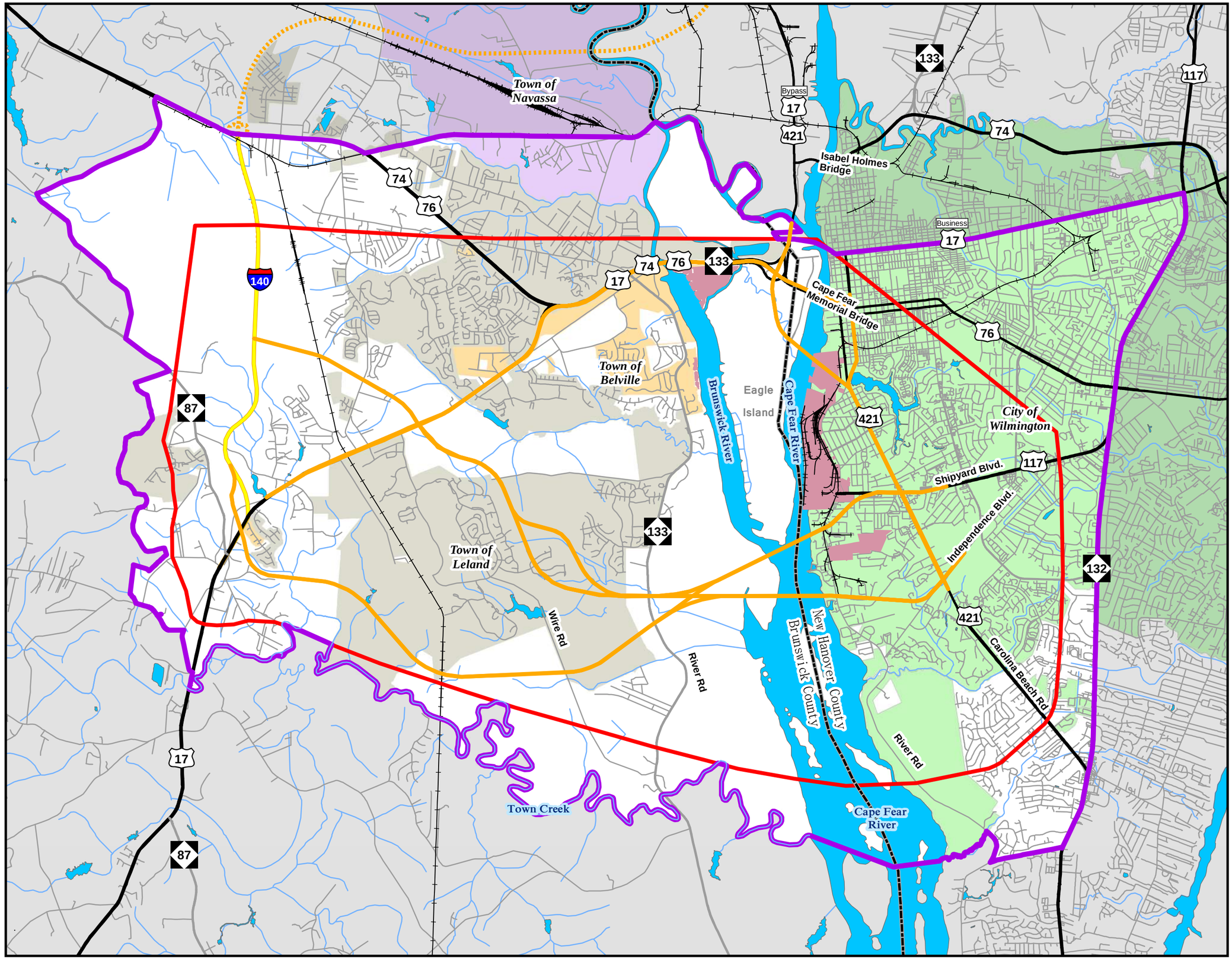
The eastern side of the FLUSA, east of the Cape Fear River in New Hanover County, is a mostly urbanized area that is within the City of Wilmington. This includes the central business district in Wilmington, residential areas, and the Port of Wilmington.

CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 3: Future Land Use Study Area (FLUSA)



Legend

- Project Study Area
- FLUSA
- Project Alternatives
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

N

0 0.5 1 2
Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

3.0 TIME HORIZON

The time horizon for this analysis is between 2010 and the year 2040. The design year for the project is 2040. The Census data and population projections range from 2010 to 2034. Adopted local and regional plans relevant to the project have future planning years through 2040. The *Cape Fear Commutes 2035 Transportation Plan* (WMPO, 2010) has been developed for 2035. Traffic forecasts completed for the project extend to 2040. Therefore, a range from 2010 to 2040 encompasses all relevant plans and data.

4.0 OTHER TRANSPORTATION AND INFRASTRUCTURE PROJECTS

Other transportation projects in and around the vicinity of the proposed project may cause indirect and cumulative effects related to land use, transportation, socio-economics, and the environment. The current STIP (June 2015) was reviewed to identify other transportation and infrastructure projects, which are listed in Table 2 and shown on Figure 4.

Table 2: Other Transportation Improvement Projects in the Vicinity of the Study Area

ID No.	County	Description	Schedule (Fiscal Years)
R-2633	Brunswick/New Hanover	I-140/US 17 (Wilmington Bypass), US 17 South of NC 87 in Brunswick County to I-40 in New Hanover County. Four-lane divided freeway on new location. Length: 20.2 miles.	AA: NC 87 South of Bishop to US 74/76 East of Malmo in Brunswick County – Complete AB: NC 87 South of Bishop to US 74/76 East of Malmo in Brunswick County – Complete BA: US 74/76 east of Malmo in Brunswick County to SR 1430 (Cedar Hill Road) – Under construction BB: SR 1430 (Cedar Hill Road) to west of US 421 north of Wilmington – Under construction BC: US 74/76 east of Malmo in Brunswick County to west of US 421 north of Wilmington CA: West of US 421 north of Wilmington to west of NC 133 – complete CB: West of NC 133 to US 117 – complete CC: US 117 to east of I-40 south of Castle Hayne – complete D: Implementation of Intelligent Transportation Systems (ITS) – Construction 2018
R-3601	Brunswick/New Hanover	US 17/US 74/76, NC 133/SR 1472 (Village Road) interchange to the US 421/NC 133 interchange. Add	Under construction

ID No.	County	Description	Schedule (Fiscal Years)
		additional lanes on north and southbound lanes and widen bridge 090107 and bridge 090108. Length: 1.5 miles.	
U-5869	New Hanover	US 17 Business, US 17 (South 17th Street) to Covil Avenue in Wilmington. Construct a road diet. Length: 1.3 miles.	ROW – 2024 Construction - 2025
U-4902	New Hanover	US 17 Business (Market Street), Colonial Drive to SR 1402 (Porters Neck Road). Access Management Improvements. Length: 8.6 miles.	A: SR 1272 (New Centre Drive) to Martin Luther King, Jr. Parkway – Complete. B: Colonial Drive to Martin Luther King, Jr. Boulevard to Station Road – ROW 2018, Construction 2020 C: Martin Luther King, Jr. Boulevard to Station Road - – ROW 2018, Construction 2020 D: Lendire Road to SR 2734 (Marsh Oaks Drive) – ROW 2018, Construction 2020
U-5731	New Hanover	US 74, US 17/US 421 in Wilmington. Construct a fly-over and free flow ramp at interchange.	ROW – 2022 Construction - 2024
U-5710	New Hanover	US 74 (Eastwood Road), SR 1409 (Military Cutoff Road) intersection in Wilmington. Convert at-grade intersection to an interchange. Length: 2.0 miles.	ROW – 2020 Construction - 2022
U-5792	New Hanover	US 74 (Martin Luther King, Jr. Parkway), US 117/NC 132 (College Road) in Wilmington. Convert at-grade intersection to interchange.	ROW – 2020 Construction – 2022
U-5729	New Hanover	US 421 (Carolina Beach Road), US 421 (Burnett Avenue) to US 117 (Shipyard Boulevard) in Wilmington. Upgrade roadway. Length: 1.6 miles.	ROW – 2019 Construction - 2020
U-5734	New Hanover	US 421 (South Front Street), US 17 Business/US 76/US 421 (Cape Fear Memorial Bridge) to US 421 (Burnett Boulevard) in Wilmington. Widen to multi-lanes. Length: 1.0 mile.	ROW – 2021 Construction - 2023
U-5790	New Hanover	US 421 (Carolina Beach Road), NC 132 (South College Road) to Sanders Road in Wilmington. Widen existing roadway and	ROW – 2020 Construction - 2020

ID No.	County	Description	Schedule (Fiscal Years)
		construct flyovers at US 421 and NC 132. Length: 1.1 miles.	
U-5702	New Hanover	NC 132 (College Road), SR 2048 (Gordon Road) to US 421 (Carolina Beach Road) in Wilmington. Access management and travel time improvements. Length: 9.7 miles.	ROW – 2023 Construction - 2025
U-5704	New Hanover	NC 132 (College Road), Wilshire Boulevard to US 117 (Shipyard Boulevard) in Wilmington. Access management and travel time improvements including interchange with US 76 (Oleander Drive).	ROW – 2023 Construction – 2025
U-5863	New Hanover	NC 133 (Castle Hayne Road), I-140/US 17 (Wilmington Bypass) to SR 1310 (Division Drive) in Wilmington. Widen to multi-lanes. Length 3.1 miles.	ROW – 2022 Construction - 2024
U-3338	New Hanover	SR 1175 (Kerr Avenue), Randall Parkway to US 74 (Martin Luther King, Jr. Parkway) in Wilmington. Widen to multi-lanes. Length: 3.2 miles.	B: Randall Parkway to US 74 (Martin Luther King, Jr. Parkway/Eastwood Road) – under construction C: SR 1175 (Kerr Avenue) interchange at US 74 (Martin Luther King, Jr. Parkway) – ROW 2018, Construction 2020
U-4434	New Hanover	SR 1209 (Independence Boulevard Extension), Randall Parkway to US 74 (Martin Luther King, Jr. Parkway). Multi-lanes on new location. Length: 1.7 miles.	Planning/Design – in progress ROW – unfunded Construction – unfunded
U-4751	New Hanover	SR 1409 (Military Cutoff Road Extension), SR 1409 (Military Road) to US 17 in Wilmington. Multi-lanes on new location. Length: 4.0 miles.	ROW – in progress Construction - 2018
U-3831	New Hanover	SR 2048 (Gordon Road), NC 132 interchange ramp to west of US 17 Business (Market Street) in Wilmington. Widen to multi-lanes. Length: 2.4 miles.	ROW – 2022 Construction - 2024
U-5871	New Hanover	New route, SR 2432 (Raleigh Street) to River Road in Wilmington. Construct two-lane road on new location. Length: 0.7 mile.	Under construction

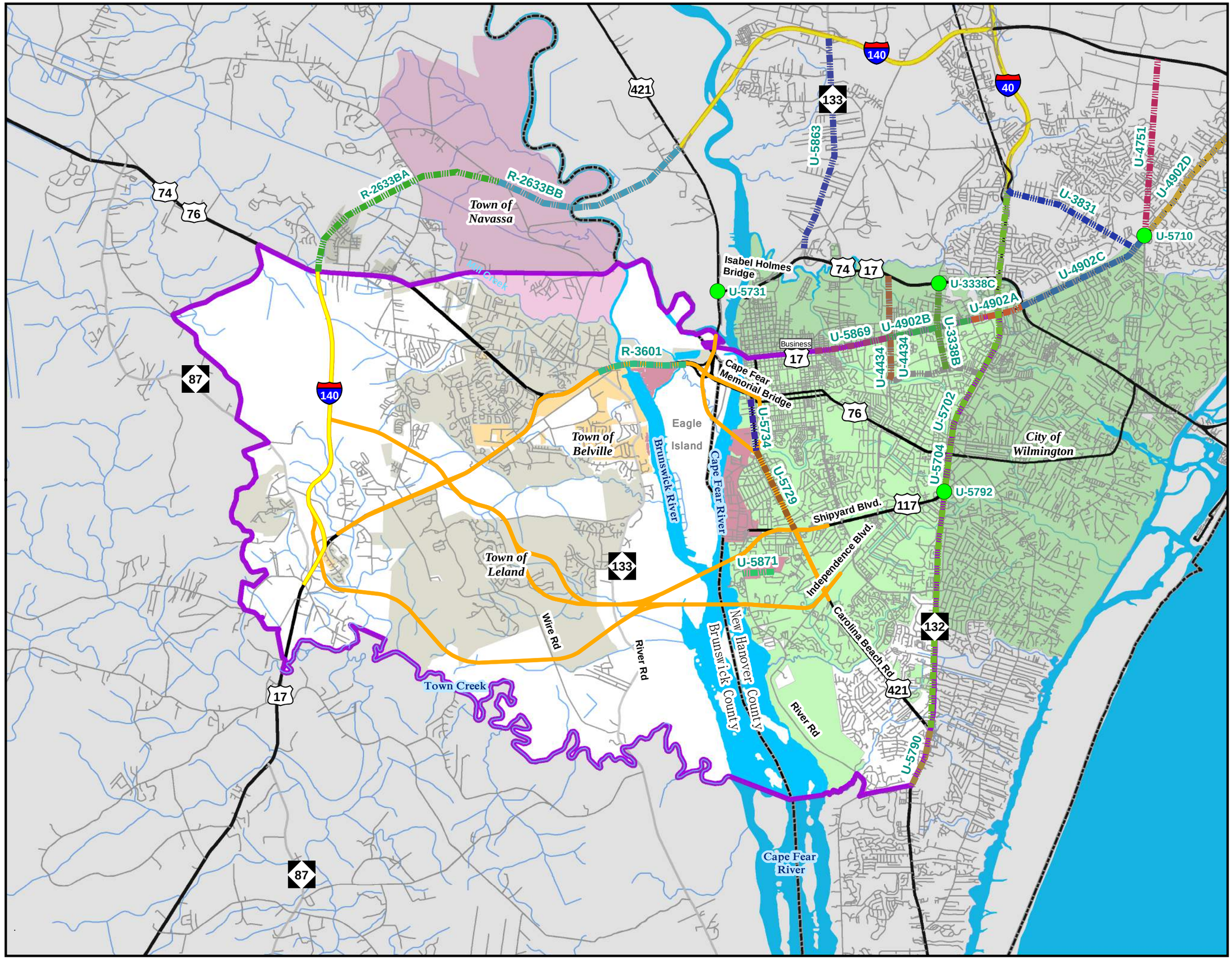
Sources: North Carolina Department of Transportation 2016-2025 State Transportation Improvement Program.
Website: https://connect.ncdot.gov/projects/planning/Planning%20Document%20Library/LIVE_STIP.pdf.
R – Rural Projects. U – Urban Projects. ROW – Right of Way

CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 4: Project Area STIP Projects



Legend

- FLUSA
- STIP Roadway Project
- STIP Interchange Project
- Project Corridors
- Interstate
- US Route
- NC Route
- Road
- Water
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

The WMPO *Cape Fear Commutes 2035 Transportation Plan* identified over 200 bicycle improvement projects which included striping lanes on new and/or existing roadways, developing bicycle boulevards, and constructing multi-use paths. After prioritizing the projects, the top ten were noted; six within the FLUSA. These include:

- Shipyard Boulevard (on-road bicycle lanes – new pavement)
- South 17th Street (off-road multi-use path)
- Carolina Beach Road (on-road bicycle lanes – restriping)
- South Front Street/South 3rd Street (off-road multi-use path)
- South Front Street (on-road bicycle lanes – restriping)
- North & South 5th Avenue (on-road bicycle lanes – restriping)

The Plan also makes a series of recommendations for transit system improvements, including local bus, express bus, bus rapid transit, and other regional transit priorities. Within the FLUSA, this includes local bus routes along College Road, South Front Street, and River Road. Express bus routes proposed include routes along US 17, US 421, 17th Street, and US 74/76.

4.1 PORT OF WILMINGTON

The NCSPA owns and operates the Ports of Wilmington. The Port of Wilmington is situated on the eastern bank of the Cape Fear River and utilizes a 42-foot deep navigation channel to provide access from the Atlantic Ocean. The Port of Wilmington is equipped to handle containerized, bulk, breakbulk and specialized cargos. The Port is a Customs-Trade Partnership Against Terrorism (C-TPAT) certified location, designated as a foreign trade zone, and is one of the nation's strategic seaports. The Port of Wilmington is one of the few South Atlantic ports with readily available berths and storage for containers and cargo. CSX Transportation provides daily service for boxcar, tanker and general cargo services.

The *Feasibility Study for the Wilmington Southern Bridge from US 17 Bypass near Bishop to US 421* recommended a route for the Cape Fear Crossing that would tie into Bryan Road, providing better access to the Port of Wilmington's southern entrance (NCDOT 2003). Port officials indicated in July 2006 that the relocation of River Road had been discussed, as it would create more direct access to the Port of Wilmington from the Cape Fear Crossing in an effort to improve accessibility and mobility of freight services. Port officials indicated that the proposed action is necessary to accommodate growth, and the Cape Fear Crossing has been identified by the NCSPA as a freight corridor priority, because it is key to the continued growth and expansion of the Port (*Presentation to 21st Century Transportation Intermodal Committee*, NCSPA, February 2008).

In 2014, the NCSPA commissioned the Institute for Transportation Research and Education (ITRE) to produce the *Economic Contribution of the North Carolina Ports* report. This is a 25-year transportation vision to map the economic future of North Carolina's state ports and determine how to best leverage North Carolina's infrastructure to catalyze economic growth. Capital needs for the terminal are categorized by infrastructure asset groups (i.e., cranes, dock/berth complexes, open storage areas, warehouses, gates, other/infrastructure) on the terminal. Infrastructure investment will be required to provide the needed equipment and facilities to support the projected growth; $113 million in the first five years. Seventy-five million dollars will be used to continue the container berth expansion and

modernization project. In the subsequent five years, an additional $135 million will be required to maintain existing facilities and support planned growth (ITRE 2014).

5.0 TRANSPORTATION IMPACT CAUSING ACTIVITIES

The proposed project will affect travel patterns, travel time, property access and property exposure within the FLUSA. In addition, the project is expected to create new transportation/land use nodes at existing or planned interchanges. The following table summarizes these potential effects. The location and extent of changes will vary, depending on which project alternative is ultimately selected and built.

Table 3: Summary of Transportation Impact Causing Activities

Activity	Potential Effects
Travel Time	The project will provide either an upgraded existing facility (widening or freeway) or a new location controlled access freeway, which will reduce delays and increase capacity. Travel time for through-traffic will be reduced. This will improve connectivity for travelers between New Hanover and Brunswick Counties, users of the Port of Wilmington, and improve access to I-140 and I-40. A Draft Traffic Simulation Report (URS, 2015) was prepared using the WMPO Travel Demand Model to calculate travel time savings for US 17 for each alternative. Travel time savings ranged from between approximately 7 to 17 minutes, depending on alternative, time of day, and direction of travel. Travel time data were extracted from the model between the origin and destination points of the I-140/US 17 interchange and the US 421/Shipyard Boulevard intersection.
Property Access	Property access will be altered for those properties that are along or adjacent to the project. Properties bisected by or near the project will have a new barrier that may limit their access. Other properties will experience improved access to the highway system if they are located near interchanges.
Travel Patterns	Traffic patterns will be altered by a new location controlled access freeway. Through traffic may use the proposed project instead of existing US 17. Traffic that may currently avoid existing US 17 due to capacity deficiencies, may now use the new roadway or choose the existing roadway over their current alternative. Other changes in travel patterns could occur on local roads due to barrier effects or reductions in connectivity on local streets.
Property Exposure	Property exposure will increase, especially for properties located at proposed interchanges or those along the new location roadway. Properties along existing US 17 will have a decrease in exposure from through-traffic if a new location roadway is built.
Transportation/Land Use Nodes	New transportation/land use nodes will be created at the interchanges with existing roadways and the proposed project. These nodes will most likely experience land use changes and support denser clusters of highway-oriented commercial development (e.g. gas stations, restaurants, and lodging).

6.0 POPULATION TRENDS / PROJECTIONS

According to the 2010 United States Census, between 2000 and 2010 the population of Brunswick and New Hanover Counties grew significantly, with a change of 46.9 and 26.4 percent, respectively.

Table 4 below compares population forecasts for the state and counties between 2010 and 2035, in increments. The projected population growth in the two counties, coupled with physical indicators of recent growth observed within the FLUSA, indicate notable growth and development in the vicinity of the project.

Table 4: Population Forecasts

Area	Population		Growth		
	2010	**2020**	**Difference**	**Percent Change**	**Annualized Growth**
Brunswick County	108,085	137,036	28,951	26.8	2.4
New Hanover County	203,325	235,831	32,506	16.0	1.5
North Carolina	9,574,917	10,573,611	998,694	10.4	1.0
	2020	**2035**	**Difference**	**Percent Change**	**Annualized Growth**
Brunswick County	137,036	183,410	46,374	33.8	2.0
New Hanover County	235,831	283,028	47,197	20.0	1.2
North Carolina	10,573,611	12,119,680	1,546,069	14.6	0.9

Source: North Carolina Office of State Budget and Management, State Demographics Unit (2014); Annual County Population Totals

7.0 JOB TRENDS / PROJECTIONS

According to employment data from Woods & Poole Economics, The 2040 projected employment for Brunswick County is 91,193 persons and 195,782 persons in New Hanover County. By 2040, there are projected to be 91,193 persons employed in Brunswick County and 195,782 persons employed in New Hanover County (Woods & Poole Economics, Inc. 2014). This represents an average annualized employment growth rate of 2.4 percent for Brunswick County and 1.4 percent for New Hanover County.

According to the North Carolina Department of Commerce Labor and Economic Analysis Division (LEAD) within the Division of Employment Security (DES), the largest employers in New Hanover County (1,000+ employees) are New Hanover Regional Medical Center, New Hanover County School System, the University of North Carolina, PPD, New Hanover County, Cellco Partnership, Cape Fear Community College, Wal-Mart Associates Inc., and the City of Wilmington. The largest industries are ambulatory health care services; specialty trade contractors; professional, scientific and technical services; motor vehicle and parts dealers; and nursing and residential care facilities.Brunswick County is known as a “bedroom community” to the City of Wilmington and has few major employers aside from the service industry within the county. The largest employers in Brunswick County (1,000+ employees) are Brunswick County Board of Education and Brunswick County (NC Department of Commerce 2015).

The Port of Wilmington is expanding, and is projected to grow in both container cargo, and break-bulk cargo volumes over the next five years. The Port of Wilmington has a large impact on both the local and state economies, contributing an estimated $299 million in local and state tax revenues (AECOM 2011). Tourism in both New Hanover and Brunswick Counties has a large economic impact. More than 5,030

jobs in Brunswick County were directly related to tourism and travel, while 5,460 jobs in New Hanover were in the same category. Domestic tourism generated an economic impact of $470.58 million in Brunswick County, and $477.68 million in New Hanover County in 2013, according to the NC Dept. of Commerce, Tourism Services (NC Department of Commerce 2013).

The historical unemployment trends for the Wilmington Metropolitan Statistical Area (MSA) and North Carolina are shown in Table 5. The Wilmington MSA encompasses the entire FLUSA. As you can see, the unemployment rate of the Wilmington MSA mirrors the unemployment rate of North Carolina.

Table 5: Historical Unemployment Statistics

Date	Wilmington MSA*	North Carolina
March 2000	3.7	3.4
March 2005	4.4	5.4
March 2010	10.6	11.3
March 2015	5.2	5.4

Source: U.S. Department of Labor, Bureau of Labor Statistics. "Local Area Unemployment Statistics." http://www.bls.gov/lau (June 2015)

*The Wilmington MSA includes the area encompassed by the FLUSA, including the City of Wilmington and the Town of Leland.

8.0 MUNICIPAL UTILITIES

8.1 WATER SERVICE

All of the area within the FLUSA has water service (Figure 5). The Cape Fear Public Utility Authority (CFPUA) provides water and sewer services to the residents of the City of Wilmington and New Hanover County. Wilmington and New Hanover County residents living within the FLUSA are served by CFPUA's largest system, the Sweeney Water Treatment Plant. This plant treats surface water from the Cape Fear River and has a capacity of 35 million gallons per day (MGD) and is currently treating approximately 15 MGD. There are three public utility providers servicing the study area in Brunswick County: Brunswick County Public Utilities, Leland Public Utilities, and H2GO (formerly Brunswick Regional Water and Sewer). Brunswick County Public Utilities services the unincorporated areas of the county within the FLUSA, as well as Snee Farm and Stoney Creek. The Town of Leland Public Utilities services Brunswick Forest. H2GO services Belville and the Town of Leland not serviced by the aforementioned providers. Brunswick County owns the Northwest Water Treatment Plant, located outside of the FLUSA in the City of Northwest. It has a treatment capacity of 24 MGD and on-site storage of 9 MGD. Currently, the plant treats approximately 18 MGD. The Town of Leland Public Utilities and H2GO are purchase water system and have contracts with Brunswick County (Strickland 2015) (Nickels 2015) (Lane 2015).

8.2 SEWER SERVICE

In Wilmington and New Hanover County, the Cape Fear Public Utility Authority (CFPUA) operates two main wastewater treatment plants: James A. Loughlin (Northside) Wastewater Treatment Plant (WWTP) and M'Kean Maffitt (Southside) WWTP (see Figure 5). The Northside WWTP has capacity to treat 10 MGD. The Southside plant has a capacity to treat 12 MGD and currently treats approximately 8.4 MGD. CFPUA also operates the Walnut Hills WWTP, which has a capacity of 100,000 gallons per day (gpd) and currently treats 50,000 gpd.

The Town of Leland has sewer service through the Northeast Brunswick Regional Wastewater Treatment Plant located in the Town of Navassa, and owned and operated by Brunswick County. The plant began operation in 2003 with a capacity of 1.65 MGD and increased capacity to 2.475 MGD in 2013. It is currently treating approximately 2.475 MGD. The Town of Belville's wastewater is handled by H2GO and is treated by the Belville Wastewater Treatment Plant. This plant has a capacity of 400,000 gpd. The unincorporated areas of Brunswick County rely on septic tanks for wastewater treatment. It is anticipated that as land outside local jurisdictions develops, sewer service will be made available to serve the properties (Strickland 2015).

CAPE FEAR CROSSING

State Transportation Improvement Program
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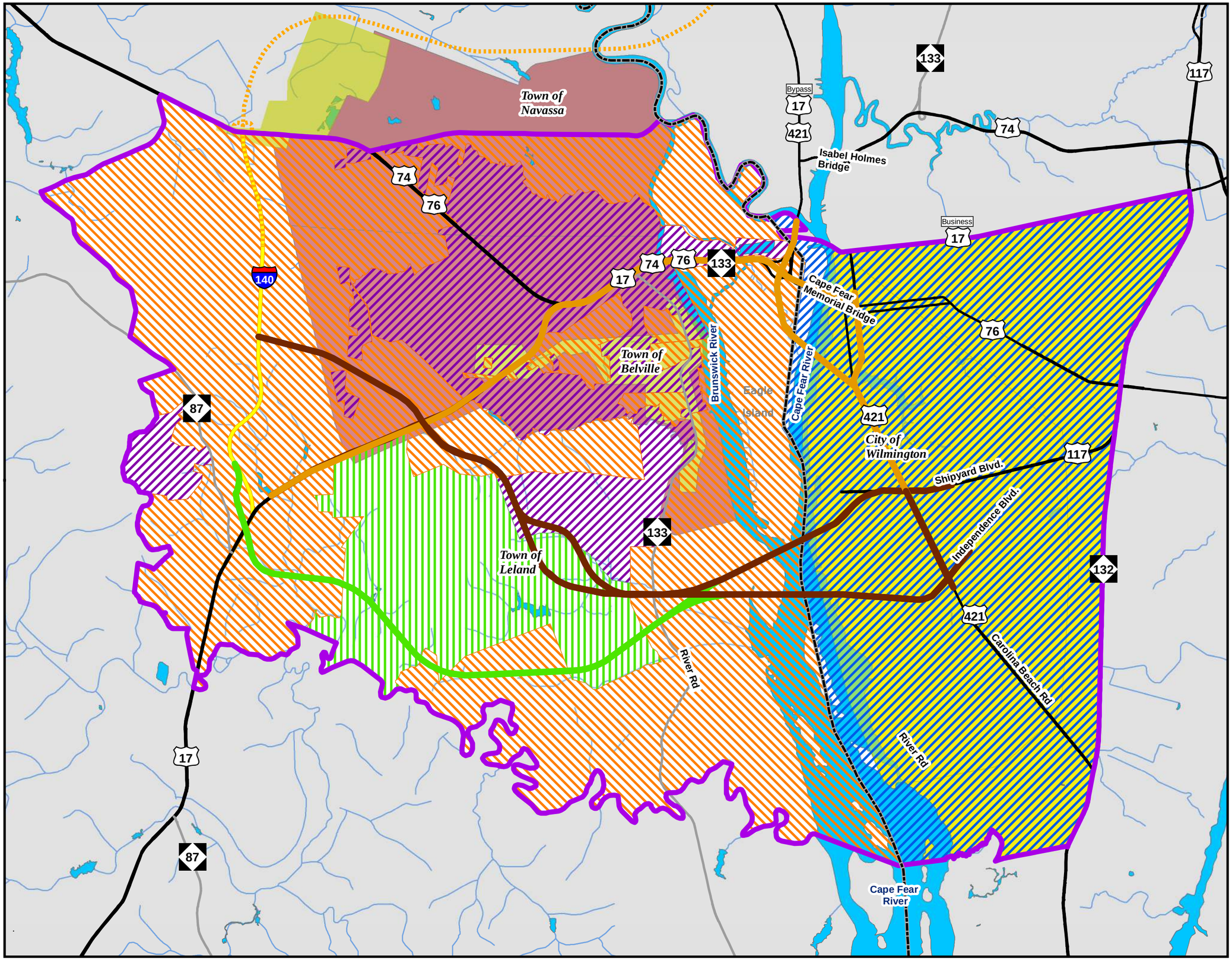
Figure 5: Water and Sewer Service Areas



Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- CFPUA Water Service Area
- CFPUA Sewer Service Area
- Brunswick County Water Service Area
- Brunswick County Sewer Service Area
- H2GO Water Service Area
- H2GO Sewer Service Area
- Town of Leland Water Service Area
- Interstate
- US Highway
- NC Highway
- Future Wilmington Bypass (I-140)
- Water

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0 0.5 1 2
Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

9.0 NOTABLE FEATURES

9.1 HUMAN ENVIRONMENT

The FLUSA boundary encompasses Leland, Navassa, and Belville in Brunswick County and the City of Wilmington in New Hanover County. This area is home to a number of historical, educational, and recreational venues, including Legion Sports Complex and USS North Carolina Battleship. Figure 6 displays the human environmental features within the FLUSA.

9.1.1 ENVIRONMENTAL JUSTICE

Spring Hill, a historic African-American community, is located near US 17 and Goodman Road in an unincorporated area of Brunswick County. Other potential environmental justice populations were noted in the area near Shipyard Boulevard and River Road (behind Port property along Worth Drive) and near 3rd Street and Wooster and Dawson Streets in the City of Wilmington by local planners. A Limited English Proficiency (LEP) population was noted, and later confirmed by local planners, along Cape Fear Boulevard and Bell Avenue in Wilmington.

9.1.2 LAND USE

A large (5,000 to 6,000 acres) mixed-use development, known as Brunswick Forest, with approximately 12,000 home sites and 300 acres of commercial land is under construction in phases within the study area. This development is roughly bounded by US 17, NC 133, and Town Creek. In addition, local planners indicated that the area along NC 133 is experiencing rapid residential development, which includes Mallory Creek Plantation. Mallory Creek Plantation is located along NC 133 approximately five miles south of US 17/74/76. The development includes multi-family homes and various sized single family homes. There is a sidewalk system in place throughout the development. There are also paved shoulders dedicated for bikes along the main entrance road. It covers approximately 370 acres of residential land.

9.1.3 PARKS AND RECREATION

There is no state or national parks or forests in the FLUSA. There are several local parks within the FLUSA. Other recreational facilities include the Wilmington River Walk along the Cape Fear River, the Gary Shell Cross City Trail which is primarily an off-road multi-use trail, several designated local bicycle routes, and the Cape Fear National Golf Course at Brunswick Forest.

9.1.4 VOLUNTARY AGRICULTURAL DISTRICTS (VAD)

There are five parcels designated as Voluntary Agricultural Districts (VADs) that represent four farms located in Brunswick County within the FLUSA that account for approximately 850 acres of land (see Figure 6). Five of the VADs are located near the intersection of I-140 and US 17 and the remaining VAD is near NC 133 and the Cape Fear River. Lands under VAD protection have a conservation agreement between the landowner and the county that prohibits non-farm use or development. However, if the property owner decides to remove the land from the program or if the land is no longer eligible for the program, it becomes available for development.

9.1.5 COMMUNITY RESOURCES

USS North Carolina Battleship and Memorial Park is located on Eagle Island between New Hanover and Brunswick counties. The USS North Carolina was listed in the National Register and as a National Historic

Landmark in 1981. It was the first modern battleship built by the United Sates after the Washington Armament Conference of 1922 and the first in the American fleet to incorporate new ship-building technology. It was moved to Wilmington in 1961 and restored as a memorial honoring the 10,000 North Carolinians of all branches of the military service that gave their lives in World War II. Today it is open to the public for tours and has over 200,000 annual visitors.

9.1.6 CHURCHES AND SCHOOLS

There are nine churches within the FLUSA, one of which is located in Brunswick County and the remaining are in New Hanover County. There are 19 schools within the FLUSA boundary. Sunset Park Elementary School is within close proximity to US 421 (Carolina Beach Road).

9.1.7 PORT OF WILMINGTON

The Port of Wilmington is situated on the eastern bank of the Cape Fear River with a 42-foot deep navigational channel to provide access from the Atlantic Ocean (NC State Ports Authority 2012).

9.1.8 RAIL

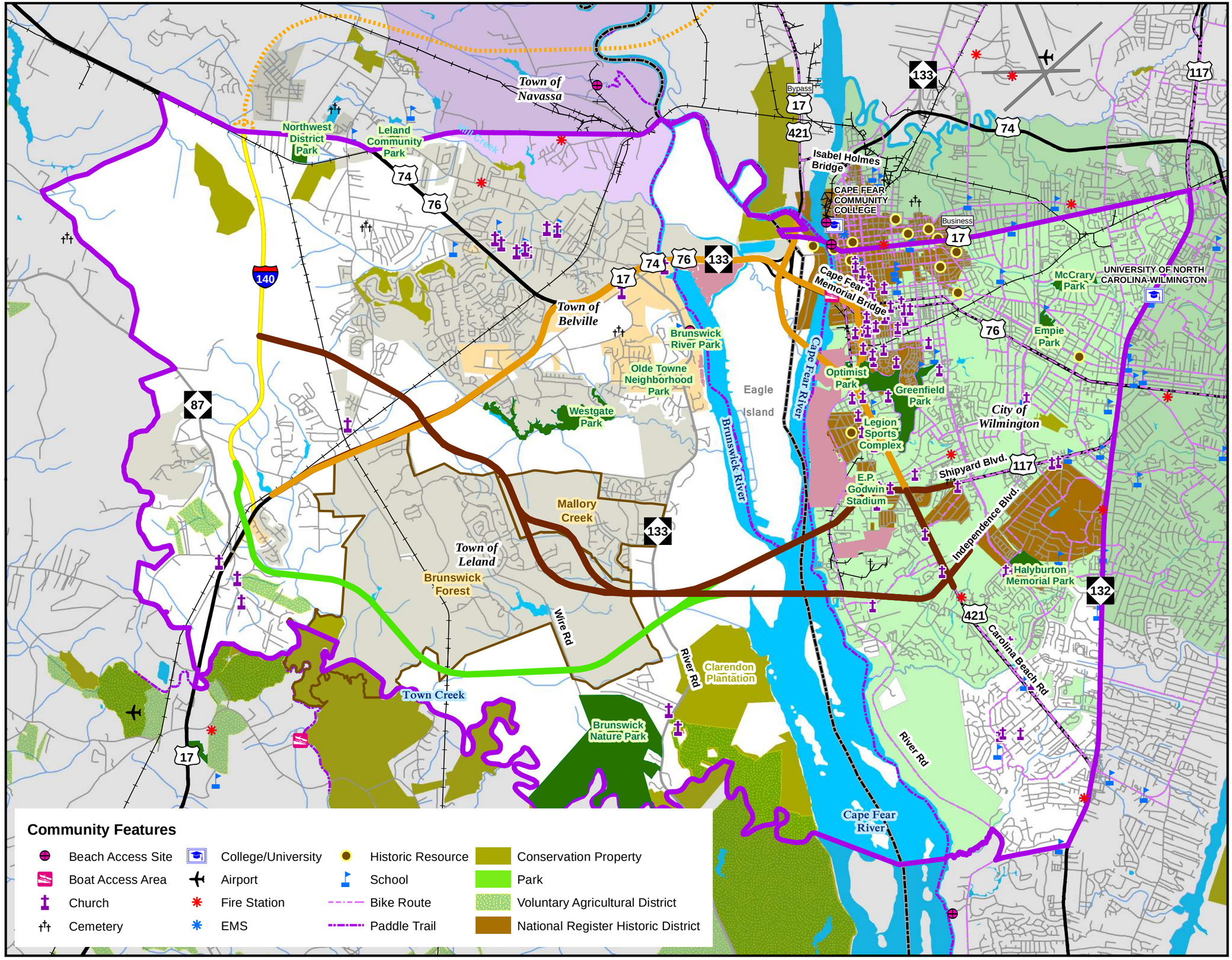
CSX operates a rail line within the FLUSA. The Wilmington switching yard, known as Davis Yard, is located in Leland and processes approximately 90,000 to 98,000 rail cars per year. CSX also has interchanges with the Wilmington Terminal Railroad (with connections to the Port of Wilmington) and short lines to the US Army's Military Ocean Terminal at Sunny Point just south of the FLUSA.

CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 6: Human Environmental Features



Legend

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- Northern Alternative Group
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- Future Wilmington Bypass (I-140)
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- Neighborhood Boundary
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary

Community Features

- Beach Access Site
- Boat Access Area
- Church
- Cemetery
- College/University
- Airport
- Fire Station
- EMS
- Historic Resource
- School
- Bike Route
- Paddle Trail
- Conservation Property
- Park
- Voluntary Agricultural District
- National Register Historic District

N

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Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

9.2 NATURAL ENVIRONMENT

The study area lies in the coastal plain physiographic province of North Carolina. Topography in the project vicinity is characterized as nearly level, with wide upland surfaces. Elevations in the FLUSA range from sea level to 75 feet above mean sea level. Water resources in the FLUSA are a part of the Cape Fear River Basin.

9.2.1 NATURAL HERITAGE PROGRAM NATURAL AREAS

There are 13 Natural Heritage Program Natural Areas (NHPNA) located within the FLUSA (NC Department of Natural Resources 2015):

- Battle Royal Bay
- Little Green Swamp
- Town Creek Marshes and Swamp
- CPF/Town Creek Aquatic Habitat
- Clarendon Plantation Limesinks
- Pleasant Oaks/Goose Landing Plantations
- CPF/Lower Cape Fear River Aquatic Habitat
- Brunswick River/Cape Fear River marshes
- Sturgeon Creek Tidal Wetlands
- Greenfield Lake
- South Wilmington Sandhills
- Barnards Creek Natural Area
- Mott Creek Natural Area

9.2.2 STREAMS

The Cape Fear River, Brunswick River, and Alligator Creek have been designated by the United States Army Corps of Engineers (USACE) as Navigable Waters under Section 10 of the Rivers and Harbors Act.

There are no trout waters within the study area. The NC Division of Marine Fisheries (NCDMF) maps indicate the Cape Fear River as a coastal anadromous fish spawning area (AFSA) within the study area. The Brunswick River and Northeast Cape Fear River are listed as joint AFSA water between NCDMF and the North Carolina Wildlife Resources Commission (NCWRC) in the study area. Alligator Creek, Jackey's Creek, Mallory Creek, and Town Creek are also listed as inland AFSA water under jurisdiction of NCWRC (NC Department of Environment and Natural Resources 2015).

The entire lengths of the Cape Fear, Northeast Cape Fear, and Brunswick Rivers within the FLUSA are designated as Primary (Fishery) Nursery Areas (PNA). The dredged portion of the navigational channel (used for Port of Wilmington access) is not included (NCDENR 2011). These areas represent important areas for numerous species including finfish and crustaceans, which are of commercial and recreational importance. Penaeid Shrimp, Snapper, and Grouper are listed as Essential Fish Habitat (EFH) Habitat

Areas of Particular Concern (HAPC) in the Cape Fear, Brunswick River, and their adjacent estuarine wetlands (National Oceanic and Atmospheric Administration 2010).

The FLUSA contains numerous unnamed tributaries (UT) as well as 24 named streams (Figure 7). The Cape Fear River (SC) separates Brunswick and New Hanover Counties. The Brunswick River (SC) parallels the Cape Fear River before their confluence below Eagle Island. Town Creek (C;Sw) is the southern boundary of the FLUSA in Brunswick County. Alligator Creek and Greenfield Creek are classified as SC;Sw. The rest of the streams within the FLUSA are classified as C;Sw, with the exception of Hewletts Creek and Whisky Creek in the City of Wilmington. These two streams are classified as SA;HQW because they are protected shellfishing waters.

There are seven stream/river segments wholly or partially within the FLUSA that are on the *Final North Carolina Water Quality Assessment and Impaired Waters List (2014 Integrated 305(b) and 303(d) Report* (NC Department of Natural Resources, Division of Water Resources 2014). The streams and a brief description of the impairment are listed in Table 6 and shown on Figure 7. No Outstanding Resource Waters, or Wild and Scenic Rivers exist within or within one mile of the FLUSA.

Table 6: Streams listed as 303(d)

DWR Stream Index Number	Stream Name	Description	Reason for Rating
18-74-(61)	Northeast Cape Fear River	From mouth of Ness Creek to Cape Fear River	Fish tissue mercury
18-77	Brunswick River	From source to Cape Fear River	Dissolved Oxygen; Fish tissue mercury
18-(71)a2	Cape Fear River	From Railroad bridge at Navassa to Greenfield Creek	Dissolved oxygen; pH; fish tissue mercury
18-(71)a3	Cape Fear River	From Greenfield Creek to Barnards Creek	Copper; Dissolved Oxygen; fish tissue mercury
18-(71)a4	Cape Fear River	From Barnards Creek to 0.6 mile downstream of Barnards Creek	Dissolved Oxygen; pH; fish tissue mercury
18-(71)a5	Cape Fear River	From 0.6 miles downstream of Barnards Creek to 1.9 miles downstream of Mott Creek	Copper; Dissolved Oxygen; fish tissue mercury
18-76-1	Greenfield Lake	Entire Lake	Chlorophyll a; fish tissue mercury
18-87-26a	Hewletts Creek	From source to 0.5 miles inland of Intracoastal Waterway	Shellfish growing area-prohibited; fish tissue mercury
18-87-28	Whiskey Creek	From source to Intracoastal Waterway	Shellfish Growing area-prohibited
18-74-63-2	Burnt Mill Creek	From source to Smith Creek	Benthos poor; Chlorophyll a

Source: (NC Department of Natural Resources, Division of Water Resources 2014)

9.2.3 TARGETED LOCAL WATERSHEDS

The project lies in the eastern portion of the Cape Fear River Basin within the Coastal Plain. Seven watersheds are included in the FLUSA. Six of the seven are designated as "Targeted Local Watershed" (HUCODE 03030005040010, 03030007140010, 03030005050010, 03030001040020, 03030005070010, and 03030005060010) by the North Carolina Division of Mitigation Services (NCDMS) (NC Department of Natural Resources 2015). Targeted Local Watersheds are those that have a high need for improvement

and a high potential to benefit from restoration efforts, many of which occur in the form of mitigation by the NCDOT.

9.2.4 WETLANDS AND FLOODPLAINS

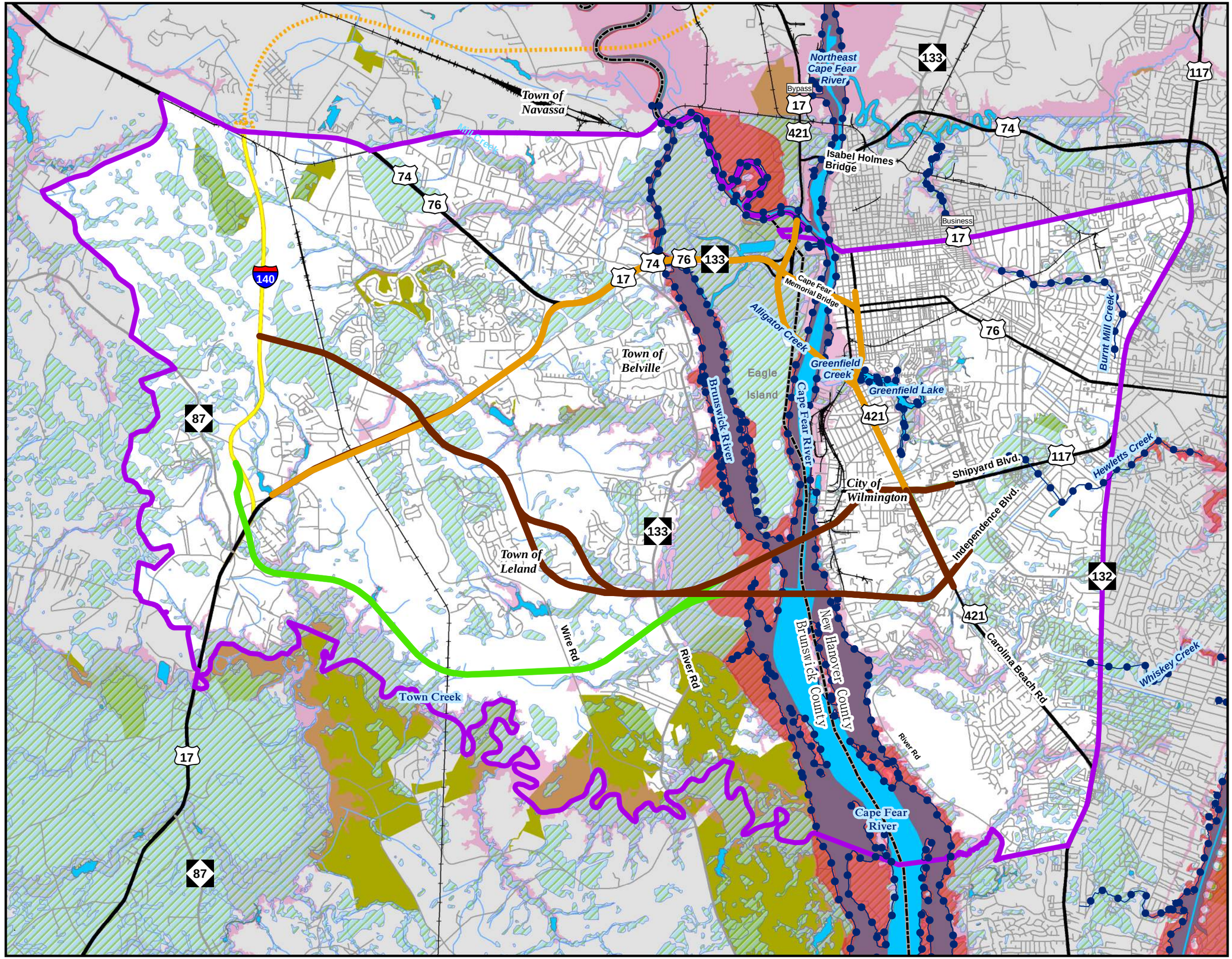
Wetland communities present within the FLUSA are located along the floodplains of the Cape Fear, Northeast Cape Fear, and Brunswick Rivers and Riverine Swamp Forest associated with the extensive stream network (Barnards Creek, Town Creek, Mallory Creek, Jackey's Creek, Sturgeon Creek, and Mill Creek.

9.2.5 SPECIAL RESOURCES

Several conservation areas are located within the FLUSA. The Clarendon Plantation is a 730-acre tract of land held in conservation by the North Carolina Coastal Land Trust (NCCLT). Features on the land include extensive longleaf pine (*Pinus palustris*) and mixed pine hardwood forests, bluffs along the Cape Fear River, and marshes. Funds for the land were provided by the North Carolina Clean Water Management Trust Fund (CWMTF), the federal Forest Legacy program, the U.S. Fish and Wildlife Service (USFWS), and private donations from Fred and Alice Stanback. The Clarendon Plantation is considered to be the "keystone" tract of the NCCLT's Cape Fear Corridor Conservation Initiative because it is the northernmost of a series of properties in eastern Brunswick County that have been conserved since 1995. The land is also considered a potential historic resource due to its history as one of almost 30 plantations along the Cape Fear River where rice was once cultivated (NC Coastal Land Trust 2015). Several other tracts of land held in conservation by the NCCLT are located within the FLUSA along Town Creek (Figure 7).

9.2.6 THREATENED AND ENDANGERED SPECIES

As of January 24, 2014, the U.S. Fish and Wildlife Service (USFW) lists 14 federally protected species for Brunswick County and 13 federally protected species for New Hanover County.



CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 7: Natural Environmental Features

Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Primary Nursery Area (PNA)
- Floodplain
- 303(d) Impaired Stream
- Wetlands
- Conservation Property
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- County Boundary

Purple areas include Primary Nursery Areas and Wetlands

N

0 0.5 1 2
Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

10.0 DEVELOPMENT REGULATIONS

10.1 BRUNSWICK COUNTY

The *Brunswick County Unified Development Ordinance* (UDO) (May 2013 (revised and readopted March 2015)) applies to areas of the FLUSA that are in Brunswick County and outside municipal limits. The UDO implements the policies and goals contained in the *Brunswick Tomorrow Comprehensive Plan*, the *Coastal Area Management Act (CAMA) Land Use Plan*, and other adopted plans. The UDO zoning districts include: residential, commercial, industrial, special purpose base districts and overlay districts. There are sub-categories of the residential and commercial zoning districts that establish varying densities and intensities for these uses. The special purpose districts apply to military installations and conservation protection areas. The overlay district standards address conditional zoning, economic development, planned development, transitional office, and water quality projection. Planned Unit Developments (PUD) and conditional zoning are optional overlay districts.

The Conservation and Protection District (CP) is intended to provide permanent protection and preservation of environmentally sensitive lands, and historical, cultural, and archeological areas of Brunswick County. Activities within a CP district are limited to very low intensity uses, agricultural and silvicultural activities, parks, open space and natural habitat preservation, and very limited residential uses. Setbacks of 100 feet are required in the CP district for the 100 year floodway, USCOE and DWR jurisdictional wetlands, CAMA shoreline buffers, slopes steeper than 25 percent, and lands located below the high water line of ponds, lakes and streams. In addition, development guidelines, including the use of Low Impact Development apply to all development within the CP district. It is important to note, the CP district is a part of the UDO and applies to the project and/or future development surrounding the project.

Corridor Development Standards (CDS 1 and CDS 2) Overlay Districts are intended to ensure that lands adjoining major transportation corridors maintain the scenic natural beauty along the corridor, and reduce or eliminate commercial strip development, excessive driveway cuts, visual clutter and poor site layout. This district applies to the major thoroughfares within the FLUSA including, but not limited to, US 17, US 74/76, and NC 133.

The Viewshed Protection Overlay District is intended to protect the scenic character of water courses, including, waterways, marshes, Carolina Bays, pocosins, and other water bodies that contribute to the scenic character and history. The ordinance designates the following waterways as part of the Viewshed Protection Overlay District:

- The Intracoastal Waterway (IWW)
- Lockwood Folly River – Genoe's Point to Mullet Creek
- Town Creek – US Hwy 17 – NC 133
- Shallotte River

Setbacks from the property line are required for structures exceeding 50 feet in height. For each additional one foot in height above 50 feet, two additional feet of setback is required. The Planning Director has the authority to determine which portions of a structure are considered to be "facing" the protected watercourse for the purposes of these regulations.

The VAD Program is contained in the UDO, but it is not established as a zoning district. The purpose of the VAD Program is to promote agriculture in the county and increase protection from development. To

establish a VAD a farm must be ten acres or include two or more farms that are within one mile of each other and total ten or more acres. The Agreement is reviewed and approved by the Agricultural Advisory Board. Lands under VAD protection have a conservation agreement between the landowner and the county that prohibits non-farm use or development.

Article 7 of the UDO is the *Flood Damage and Protection Ordinance* (2006) that is intended to minimize both public and private losses due to flood conditions. The ordinance includes standards for development in the floodway or floodway fringe. Major provisions of the ordinance include the following:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or floor heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of flood waters;
- Control filling, grading, dredging, and other development which may increase erosion or flood damage; and
- Prevent or regulate the construction of flood barriers which would unnaturally divert flood waters or which may increase flood hazards to other lands.

10.2 TOWN OF BELVILLE

Belville uses a Zoning Ordinance to regulate land development. This ordinance applies to all areas within the municipal limits of the town. The zoning ordinance establishes several categories of land uses: residential, multi-family, manufactured homes, business residential, business highway, central business, industrial and public institutional. Residential districts have subcategories that provide for variable densities. There are two overlay districts, the Downtown District and the Blackwell Road Overlay. The Downtown District implements both the Vision 2020 Plan and the Renaissance Plan (2007) which address smart growth principles, a mix of retail, office and residential uses focused around a planned public waterfront park area (urbanSMARTgrowth 2007). The Blackwell Road Overlay District also implements the Vision 2020 Plan and establishes design standards for the roadway corridor and is intended to improve the bicycle, pedestrian and vehicular network along this corridor.

New development proposed within the Town is required to obtain stormwater permits from Brunswick County, as described in the previous section.

10.3 TOWN OF LELAND

The Town of Leland uses it Code of Ordinances and Master Plan to guide land development. It has developed a zoning plan map identifying current and future allowable land use types. The zoning ordinance includes several categories of land use: residential, commercial, office/institutional, conservation, manufactured homes, multi-family and Planned Unit Development. Residential and Commercial Districts have several subcategories that provide for medium to low densities, and standards for intensities of commercial uses. The objectives of the zoning are to guide appropriate use and development of parcels that will promote the health, safety and general welfare of its citizens, and promote environmental protection.

The Town of Leland developed a *Master Plan* (2009) that uses sectors to regulate land use and type of development. There are six sectors: S1 Preserved Open Sector, S2 Reserved Open Sector, S3 Restricted Growth Sector, S4 Controlled Growth Sector, S5 Intended Growth Sector, and S6 Infill Growth Sector. The Master Plan provides the framework for the recently drafted a Flex Code. The Flex Code is commonly referred to as a Form Based Code intended to implement its the Master Plan in a phased manner over the next 15 to 20 years, according to the Leland Planning Director.

New development activity within the Town of Leland is required to obtain a floodplain development permit to minimize public and private losses within flood prone areas. The Town's Floodplain Manager implements the Flood Damage Prevention Ordinance.

10.4 TOWN OF NAVASSA

The Town of Navassa uses a Zoning Ordinance to regulate land use and development within the municipal town limits. The Ordinance establishes zoning districts including conservation and recreation areas, residential, business and industrial and planned unit development areas. Residential and commercial districts have several subcategories that provide for medium to low densities, and standards for intensities of commercial uses (i.e. light, heavy) (Town of Navassa 2010).

10.5 NEW HANOVER COUNTY

New Hanover County's Zoning Ordinance applies to unincorporated areas of the County. The ordinance implements the planning policies expressed in the comprehensive plan. The code establishes zoning districts: residential, commercial, industrial, mixed use, and overlay districts. There are multiple subcategories of each category, with standards for the intensity and density of land uses.

The Conservation District Overlay is intended to protect important environmental and cultural resources in the county. Single family homes and residential duplexes and commercial and industrial development on lots involving less than one acre of land disturbance are exempt. The Overlay standards identify the resources to be protected including:

- Swamp forest
- Pocosin
- Savannah
- Natural ponds
- Freshwater marsh
- Brackish marsh
- Primary nursery areas
- Barrier island-beach complex
- Maritime shrub thickets
- Salt Marsh
- Animal and plant natural areas of special significance
- Archaeological/Historical Resources and cemeteries

The District standards establish required amounts of conservation space to be protected based on the size of the parcel and the acreage of conservation area. Each resource has a ratio of conservation area required along with a total aggregate minimum acreage established for protection. Protected areas are required to be permanently protected and preserved by conservation easements, protective covenants,

or similar restrictions and all have a vegetated buffer that extends thirty-five (35) feet measured horizontally from the edge of the conservation resource.

A Water Supply Watershed Overlay District establishes standards to protect water quality from new construction and existing development and to meet state requirements under 15ANCA C 02H.1000. Standards require open space, 100 foot setbacks for development, and density and intensity standards for residential and nonresidential development within the watershed and rural zoning districts, and limitations of 24 percent imperious surfaces for both residential and non-residential development. All development is required to have 35-foot vegetative buffers along all perennial streams and wetlands. There are no Water Supply Watersheds located directly within the Brunswick or New Hanover County portion of the FLUSA. There is, however, one Class WS-IV watershed located just north of the FLUSA along Toomer's Creek in Brunswick County.

It is important to note that these districts are a part of the UDO and apply to the project and/or future development surrounding the project.

A SHOD is intended to protect the natural and scenic beauty along interstates and other designated roadways that serve as major access points and gateways into New Hanover County. The SHOD addresses setbacks from the roadway, landscape and streetscape standards, parking and signage requirements.

The County implements a *Flood Damage and Protection Ordinance* that is intended to minimize both public and private losses due to flood conditions. The ordinance includes standards for development in the floodway or floodway fringe. Major provisions of the ordinance include the following:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or floor heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of flood waters;
- Control filling, grading, dredging, and other development which may increase erosion or flood damage; and
- Prevent or regulate the construction of flood barriers which would unnaturally divert flood waters or which may increase flood hazards to other lands.

10.6 CITY OF WILMINGTON

The City of Wilmington's *Land Development Code* (LDC) (March 2013) applies to areas of the FLUSA within the City's municipal limits. The ordinance implements the planning policies expressed in the *Wilmington-New Hanover County CAMA Land Use Plan Update Comprehensive Plan* and the *Future Land Use Plan*, as well as corridor plans and special area plan as adopted by the City Council. The code establishes numerous zoning districts: residential, commercial, office/institutional, mixed use, historic, industrial, manufactured homes, and multi-family. There are multiple sub-categories of residential, business, commercial and mixed use districts with standards for neighborhood, community, regional and central business district scaled development. The LDC is a unified code that includes subdivision, floodplain management, conservation resource protection, and landscape/tree protection and design standards.

The Resource Protection provisions are intended to maintain the city's ecologically important natural systems; preserve estuarine systems important for fin fishing and shell fishing; preserve natural open space; and protect the resources critical to the city's economic development and tourism industry. The conservation resource regulations define conservation resources as wetlands based on the North Carolina Coastal Region Evaluation of Wetland Significance (NC CREWS):

- Headwater swamp/swamp forest wetlands
- Pocosin wetlands
- Savannah wetlands
- Natural or naturalized ponds
- Freshwater marsh
- Salt/brackish marsh
- Primary nursery areas

Conservation resources are required to be permanently protected and preserved by conservation easements, protective covenants, or similar restrictions or by any of the procedures for the dedication of park, recreation, and open space areas set forth in section 18-383I of the LDC. In addition, all conservation resources are protected by a vegetated buffer that extend thirty-five (35) feet measured horizontally from the edge of the conservation resource.

The standards and provisions of the ordinances described in the above-discussed sections will help moderate environmental impacts of the proposed project.

10.7 WATER QUALITY

Streams within the study area are part of the Cape Fear River Basin. Therefore, no North Carolina River Basin Buffer Rules apply to the project streams. All stream or wetland impacts will require a Clean Water Act, Section 401/404 Permit.

10.8 COASTAL AREA MANAGEMENT ACT

The North Carolina Coastal Area Management Act of 1974 (CAMA) established a cooperative program of coastal land management between local governments and the State for preparing, adopting, and enforcing land use plans to manage and protect sensitive coastal and estuarine resources within 20 coastal counties, including Brunswick and New Hanover.

Brunswick County adopted its CAMA Core Land Use Plan (LUP) in 2007, and it was certified by the Coastal Resources Commission in 2007. The Town of Belville participated in the development of the Brunswick County CAMA, and its policies apply to the Town.

The Navassa Town Council adopted the CAMA Future Land Use Plan 2011 Update in August 2012 and is awaiting certification of the plan from the Division of Coastal Management. The horizon year for the plan is 2030. This plan evaluated land use growth and development trends and identified impacts to quality of life, property values, public safety, environment, and infrastructure. The Future Land Use Plan also discusses the Town's adopted goals and policies to be implemented over the planning period of the document (Town of Navassa 2011).

The City of Wilmington LDC provides a density bonus for Exceptionally Designed Projects, and applies to development within areas classified as Watershed Resource Protection or Conservation Areas in the CAMA Land Classification Map. Density bonuses are intended to be an incentive for developers to

incorporate environmentally preferred design techniques into their projects. The LDC sets out baseline requirements which must be met in order for any development to be considered as an exceptionally designed project. A set of scaled development practices criteria is used to determine if a development may qualify to be considered as an exceptionally designed project for the purpose of awarding density bonuses.

10.9 STORMWATER REGULATIONS

Both Brunswick County and New Hanover County are Phase II designated counties with a National Pollutant Discharge Elimination System (NPDES) permit for stormwater. The Phase II applies to smaller (< 100,000 population) communities and public entities that own or operate a municipal separate stormwater system. The Towns of Leland and Navassa and the City of Wilmington currently have Phase II stormwater permits. If the following two conditions are met by communities and public entities that own or operate a separate storm sewer (MS4), they are required to obtain a NPDES Phase II stormwater permit:

1. The MS4 is located in an urbanized area as determined by the latest Decennial Census of the Bureau of the Census. If the MS4 is not located entirely within an urbanized area, only the portion that is within the urbanized area is regulated.

2. The community or public entity is designated by the NPDES permitting authority. In the state of North Carolina, the NPDES permitting authority is the Environmental Management Commission (EMC).

In addition, coastal counties are required to minimize the post-construction effects of stormwater runoff from development activities. The State Stormwater Rules require all twenty coastal counties to provide the following for all development:

1. A minimum 30 feet vegetative riparian buffer requirement for redevelopment projects and 50 feet for new development projects (measured from the mean high water line).

2. The use of vegetated swales to convey stormwater runoff for low-density projects, defined as projects with an impervious surface area of 24% of the total site or less.

3. The use of a stormwater control system for high-density development projects (impervious surface area greater than 24% of the total site) designed to store, control and treat stormwater runoff from all surfaces generated by a 1.5 inch rainfall event.

The Brunswick County Stormwater Ordinance became effective September 16, 2002 and applies to unincorporated areas of the county. The county also has agreements in place to administer the Stormwater Ordinance in Belville. Brunswick County's Stormwater Management Manual outlines how stormwater runoff must be addressed for all new development and redevelopment in the county (Brunswick County 2002).

The New Hanover County Stormwater Ordinance applies to unincorporated areas of the county. The ordinance imposes conditions and requirements upon existing and proposed development activities and outlines how stormwater runoff must be addressed for new development and redevelopment (New Hanover County 2015).

The Town of Leland implements a Phase II Stormwater Ordinance under the State Stormwater Guidelines (15A NCAC 02H .1005). A 50-foot wide undisturbed vegetative buffer is required for new development, and a 30-foot wide undisturbed vegetative buffer is required for redevelopment activities. According to the stormwater guidelines, the width of the buffer is measured horizontally from the normal pool elevation of impounded structures, from the bank of each side of streams or rivers, and from the mean high waterline of tidal waters, perpendicular to the shoreline. The town may, on a case by case basis, grant a minor variance for vegetative buffers pursuant to 15A NCAC 02B.0233 (9)(b). Low-density development is required to utilize vegetated stormwater conveyances to transport stormwater runoff from the development, and be set back 30 feet landward of all perennial and intermittent surface waters. High-Density development standards require measures that control and treat runoff from all surfaces generated by one and one-half inches of rain. In addition, projects that are located within one-half mile and draining to SA waters are required to control and treat the difference in stormwater runoff from the pre- and post-development conditions for the one-year, 24-hour storm.

The Town of Navassa became subject to Phase II Stormwater Rules in 2007 and received a permit in 2012 from the State of North Carolina to discharge stormwater from its municipal separate storm sewer system (MS4). As part of this permit, it imposes certain requirements on the Town in order for it to remain in compliance with Phase II stormwater rules (Town of Navassa 2012).

The City of Wilmington is a National Pollution Discharge Elimination System (NPDES) Phase II community. Federal Law requires that the City of Wilmington implement a Stormwater Ordinance that includes Post Construction Controls. This permitting process is required by the Clean Water Act and applies to urbanizing areas. The City of Wilmington's *Stormwater Ordinance* applies to all new development, redevelopment and expansion or modification of existing development. It regulates both water quality and water quantity with respect to run-off generated by development activities. For many projects, it replaces the State Stormwater Permit process currently administered by the NCDENR – Division of Water Quality. All activities within the Storm Sewer System must comply with this permit and Wilmington's associated *Stormwater Management Plan*.

11.0 AVAILABLE LAND

The FLUSA includes approximately 60,260 acres of land. Of this, approximately 24,751 acres (41.1 percent) are considered vacant or underutilized and available for development.

Developable land includes undeveloped parcels of land (those without building structures). Developable land does not include protected lands such as public parks, lands managed for conservation and open space, land owned by the NCSPA, and military land. Other land not considered developable includes transportation right of way, waterways, and floodways. Lands such as wetlands and VADs exist within the FLUSA and may be more difficult to develop; however, they were not excluded from the land considered developable. In addition, underutilized parcels were identified by selecting parcels in which the total value of improvements (i.e. buildings/structures) is less than the value of the parcel without improvements.

Table 7 provides the approximate acreage of the undeveloped and underutilized parcels. Figure 8 shows the land available for potential development.

Table 7: Available Land

Land Type	Brunswick County (acres)	New Hanover County (acres)	Total Acreage	Percent of FLUSA
Vacant & Developable	15,386	3,373	18,759	31
Underutilized	4,676.6	1,316	5,992	10
Total Available Land	**20,062.6**	**4,689**	**24,751**	**41**
FLUSA	**-**	**-**	**60,260**	**-**

The FLUSA was also screened and evaluated for environmental sensitivity. This was completed using NC DENR's Biodiversity and Wildlife Habitat Assessment tool, which combines different GIS data layers representing wildlife habitats and places with biological diversity. The index scores land based on its relative conservation value on a scale from 1-10, with areas rated 10 having the maximum conservation value and areas rated 1 having a moderate conservation value. Other values shown on this scale include (-1) for impervious surfaces and 0 for unrated areas. This assessment helps determine areas of high conservation value. Figure 9 shows the environmental sensitivity screening that was completed for the FLUSA.

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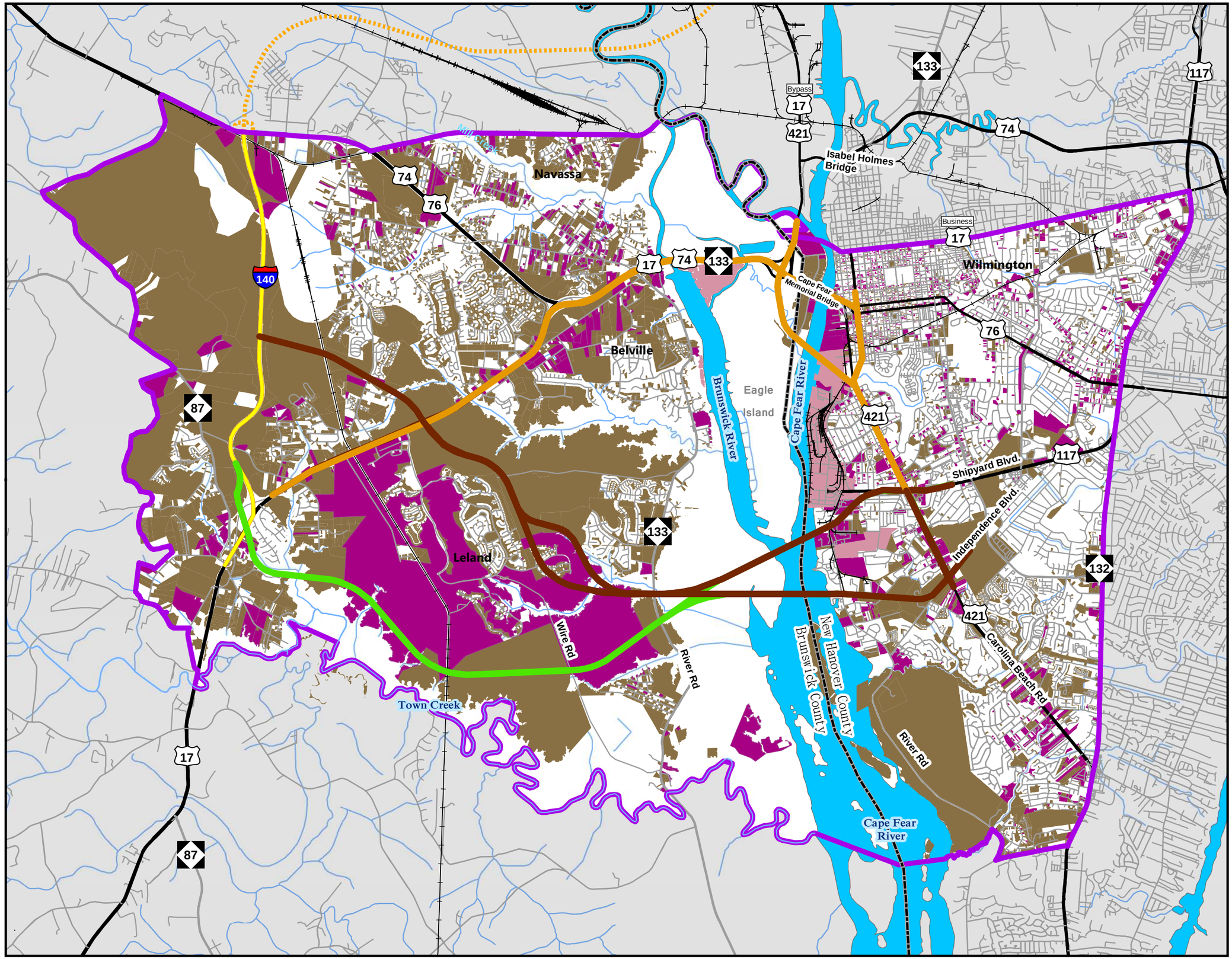
Figure 8: Vacant and Underutilized Land



Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- County Boundary
- Port of Wilmington

N

0 0.5 1 2
Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

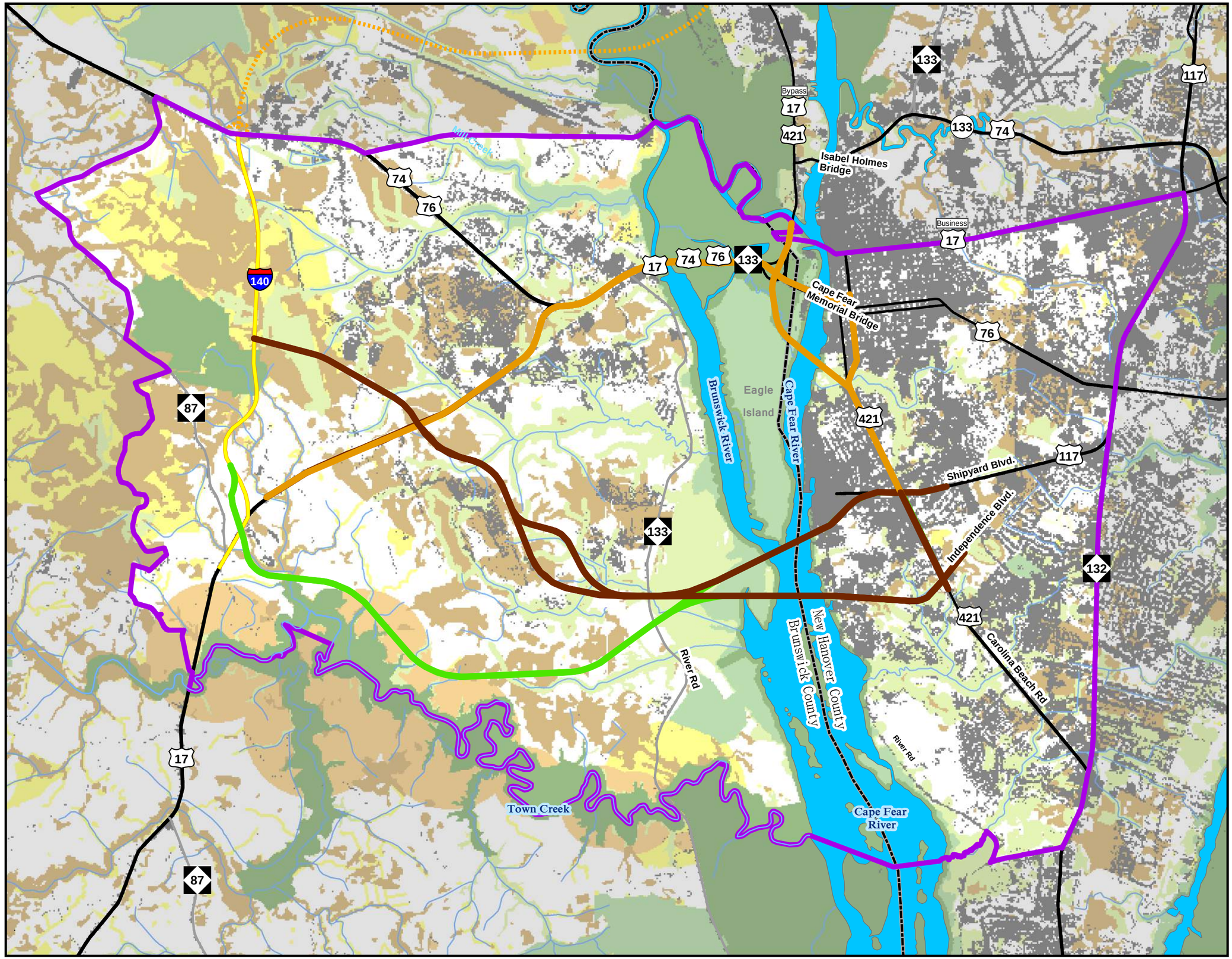


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Figure 9: Environmental Sensitivity Screening

Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Interstate
- US Highway
- NC Highway
- Future Wilmington Bypass (I-140)
- Water
- County Boundary

Relative Conservation Value

- Score: 9-10 (Maximum)
- Score: 8
- Score: 7
- Score: 6
- Score: 5
- Score: 2-4
- Score: 1 (Moderate)
- Score: 0 (Unrated)
- Score: -1 (Impervious Surface)

N

0 0.5 1 2
Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

12.0 MARKET FOR DEVELOPMENT

12.1 CURRENT DEVELOPMENT PRESSURES

The portion of the FLUSA in New Hanover County is composed mostly of a built-out Central Business District of the City of Wilmington as well as higher density residential and industrial development surrounding the Port of Wilmington.

Between March 2013 and September 2014, Wilmington Business Development announced the creation of 835 new jobs and more than $200 million in annual payroll (Wilmington Business Development 2014). In addition, Vertex Rail Technologies recently announced the creation of 1,342 manufacturing jobs in the City of Wilmington expected to yield $1.1 billion in annual economic impact on the City of Wilmington and the greater region (Wilmington Business Development 2014). According to the American Community Survey (2009-2013) the job growth rate in Brunswick and New Hanover Counties remained relatively constant from 2010 through 2013 at approximately 1.5 percent increase per year in the labor force employment. Total the employment increase for Brunswick and New Hanover, from 2010 through 2013, was 4.8 percent and 4.2 percent, respectively.

In fiscal year 2014, the Port of Wilmington handled more than 250,000 twenty foot equivalent units (TEUs) with a forecast of nearly 270,000 TEUs in 2015. The Port's addressable market for containers is nearly two million TEUs; however, the Port of Wilmington currently serves only 13 percent of that addressable market. There is demand for the container facilities at the Port by companies wanting to import and export in the region. By 2020, the Port expects to grow at a compounded annual growth rate of 13.4 percent and handle in excess of 530,000 TEUs (per year) (ITRE 2014). Using the current reach-stacker based operations; the capacity of the Port of Wilmington is 540,000 TEUs per year. This can be increased to 750,000 TEUs per year by expanding storage area and realigning the gate. If rubber tired gantries are used instead of the reach-stacker based operations, the maximum capacity increases to 1.3 TEUs per year (AECOM 2011).

Port officials indicate that the number of trucks entering and exiting the Port of Wilmington is expected to grow based on projected cargo forecasts. In 2014, the yearly total of truck movements was 350,911. This included 269,671 container trucks with an average of 1,078 container trucks per day (NC State Ports Authority 2015).Development in the Brunswick County portion of the FLUSA has previously followed a traditional pattern of corridors with strip malls and less dense development throughout the area. Future plans focus on "in-fill" development that will increase density throughout the FLUSA. New resort and golf course communities are under construction along the US 17 Corridor. A large mixed-use development, Brunswick Forest, illustrates a development trend of rapid residential development with 12,000 planned home sites and 300 acres of commercial land in the FLUSA.

According to the *Town of Leland Master Plan (2009)*, the Town of Leland benefits from its proximity to the City of Wilmington. Its coastal location within the Wilmington region, proximity to historical and cultural attractions, together with accessibility via air, waterways, rail and major transportation corridors makes Leland attractive for investment. Wilmington is a very desirable metropolitan area that focuses on education (UNC-W and Cape Fear Community College) and tourism. Given the socio-economic, quality of life, political factors, and its coastal location, the development trend in Leland is expected to grow, particularly as the aging population begins to make lifestyle choices for retirement.

The Town of Leland recently adopted a Flex Code plan (see Section 10.0 for more detail) that breaks down areas around Village Road (NC 133 north of US 17) into walkable "zones" to help create a more walkable and traditional downtown. The main focus of this new plan is the Town's "Gateway District", just north of the intersection of Village Road (NC 133) and US 17. As discussed in *Connecting Northern Brunswick County*, this district is one of the main focuses of future urban development, residential infill, and job growth in the area (Kimley-Horn and Associates, Inc. 2013)

According to the *Town of Leland's Master Plan* there has been extensive residential growth on either side of US 17 between 1990 and 2005, with large areas of undeveloped land south of the highway proving to be particularly attractive for future residential development. Large scale new development in Leland began when the areas of Magnolia Greens, Waterford and Westgate developments were de-annexed from Belville. Together, these communities added 5,400 new housing units with approximately 12,150 residents. The *US 17/NC 133 Area Collector Street Plan* identified 7,000 acres of developable land around US 17 and NC 133 outside affected wetland areas, with a potential development yield of up to another 22,000 homes based on recent development patterns. This potential development may add an additional 49,500 new residents over the next twenty to thirty years.

Representatives from the Town of Leland and the City of Wilmington have indicated that most residential and commercial growth in the FLUSA will occur along the US 17 corridor between Lanvale Road and US 74/76, the Village Road corridor, the NC 133 corridor and the US 421 (River Road) corridor. Representatives also discussed areas on potential development that may emerge as a result of the project (See Appendix). The surrounding area includes business and industrial land uses, as well as a mix of agricultural and residential land uses. According to *Connecting Northern Brunswick County*, the draft collector street plan for the County, the Mallory Creek and Brunswick Forest developments currently under construction have approved expansion phases. Another neighborhood in the western portion of the FLUSA, Grayson Park, is expanding as well. A 500-acre mixed-use development with approximately 2,290 residential units called River Lights is being planned for the area along River Road in the City of Wilmington in the southeast portion of the FLUSA. Barclay West, a 300-acre planned development which will eventually consist of office and institutional buildings, regional business, multi-family housing, and community business is currently under construction south 17th Street at Independence Boulevard in New Hanover County.

According the *Town of Leland Master Plan*, the demand for retail space would grow commensurate with the residential growth previously noted. Highway access and land availability within the Town provide opportunities to create a mixed-use, lifestyle center format in the Village Road area (Gateway District).

Figure 10 depicts the existing and approved development areas within the FLUSA.

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Project No. U-4738

Land Use Scenario Assessment

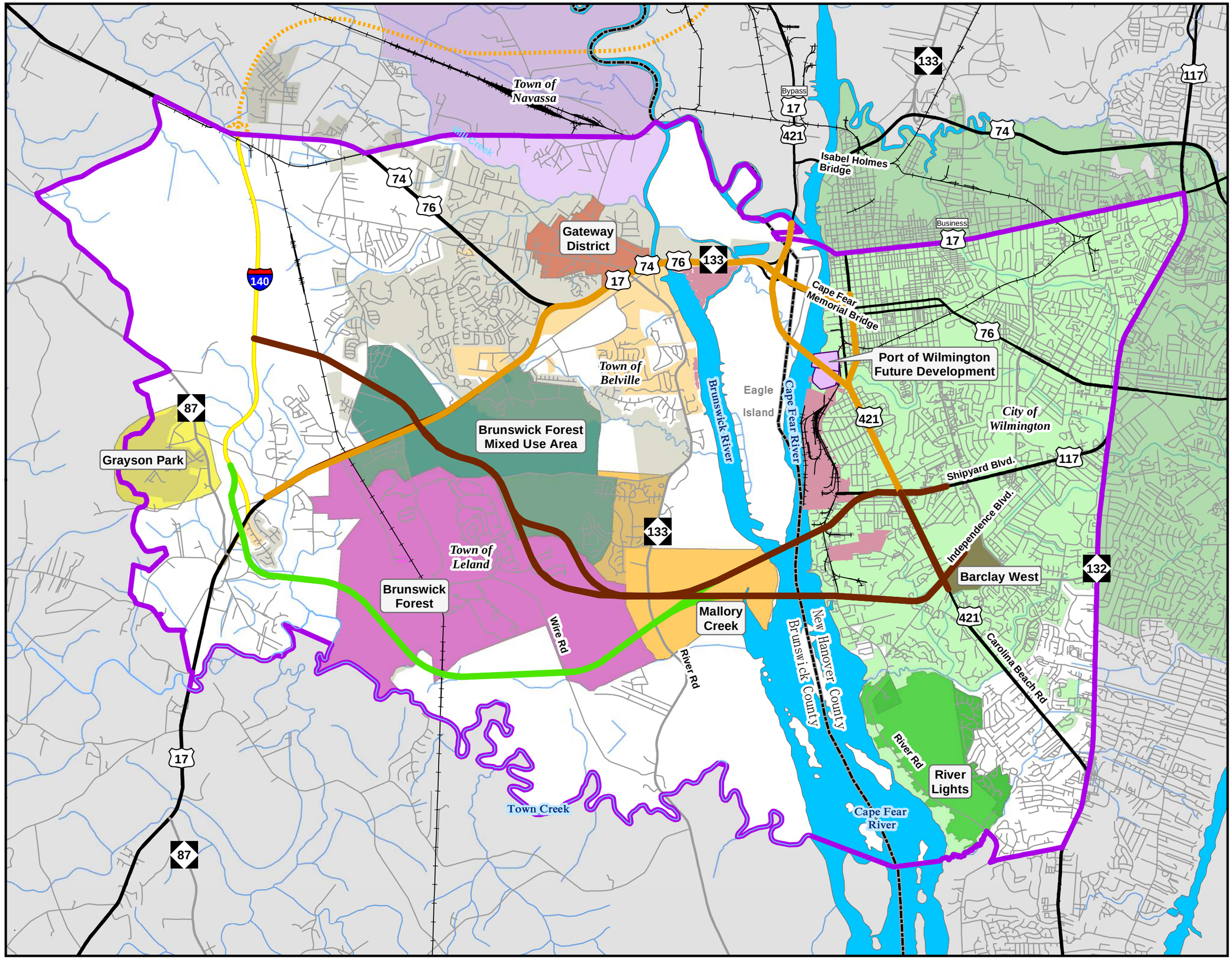

Figure 10: Existing and Approved Development Areas

Legend

- FLUSA
- Upgrade Existing Alternative
- Northern Alternative
- Southern Alternative
- Future Planned Industrial
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

12.2 DEVELOPMENT MARKET ASSUMPTIONS

As previously discussed, Brunswick and New Hanover Counties are expected to see notable population and employment growth through 2040. In the near-term, growth in the two counties is likely to occur near transportation and utility infrastructure. This is particularly true for businesses and industry that depend on the logistical hubof the Port of Wilmington and Interstate 40.

Growth and development in Brunswick County is likely due to the large amount of available land. Improved access to the area would help spur and/or accelerate growth, especially near transportation nodes. Improvements to the transportation network will help facilitate these changes; therefore the project could encourage growth targeted to highway users in certain areas and/or influence future growth and make this area more attractive to residential growth. The New Hanover County portion of the FLUSA is nearly built out; therefore, more in-fill and redevelopment would occur compared to Brunswick County.

13.0 PROBABLE DEVELOPMENT SCENARIOS

To determine the type of development that could occur in the FLUSA, with and without the project, six probable development areas (PDA) will be examined, which are located near the US 17/I-140 Interchange, along US 17 from Old Lanvale Road to the US 74 Interchange, US 17/Village Road/NC 133 (River Road) Interchange, NC 133 (River Road) south of Mallory Creek, Downtown Wilmington, and Independence and Shipyard Boulevard via US 421. Development pressures and regulations, proposed future land use, infrastructure, proximity to proposed economic centers, and will influence how areas within the FLUSA will develop. Predictions of the type of development within recognized PDAs will determine the amount of impacts to notable features that may occur with and without the project. Figure 11 depicts the PDAs and their locations within the FLUSA. The PDAs were determined in a meeting with the NCDOT Human Environment Section held on October 16, 2014.

13.1 PROPOSED CHANGES

This report analyzes how the Study Alternatives could change or influence development patterns within each PDA. As discussed in Section 1.3, the Study Alternatives group a variety of design options that include widening existing US 17 and developing roadways on new locations. The freeways will have full control of access and the widening will have either partial or no control of access. Table 8 summarizes the Study Alternatives that are located in each PDA, as well as whether the Study Alternative is proposed as a freeway or arterial widening.

Table 8: Study Alternatives within each PDA

Study Alternative	Probable Development Area (PDA)					
	1	2	3	4	5	6
Upgrade Existing US 17 Alternatives						
Alternative F	F	F	F		AW	
Alternative P	AW	AW	AW		AW	
Alternative V-AW	AW	AW	AW		AW	
Alternative V-F	F	F	F		AW	
Northern Alternatives						
Alternative B		F		F		AW
Alternative C		F		F		AW
Alternative G		F		F		AW
Alternative J	F	F		F		AW
Alternative Q		AW		F		AW
Alternative T		AW		F		AW
Southern Alternatives						
Alternative M Avoidance	F			F		AW
Alternative N Avoidance	F			F		AW

Notes: F = Freeway; AW = Arterial Widening

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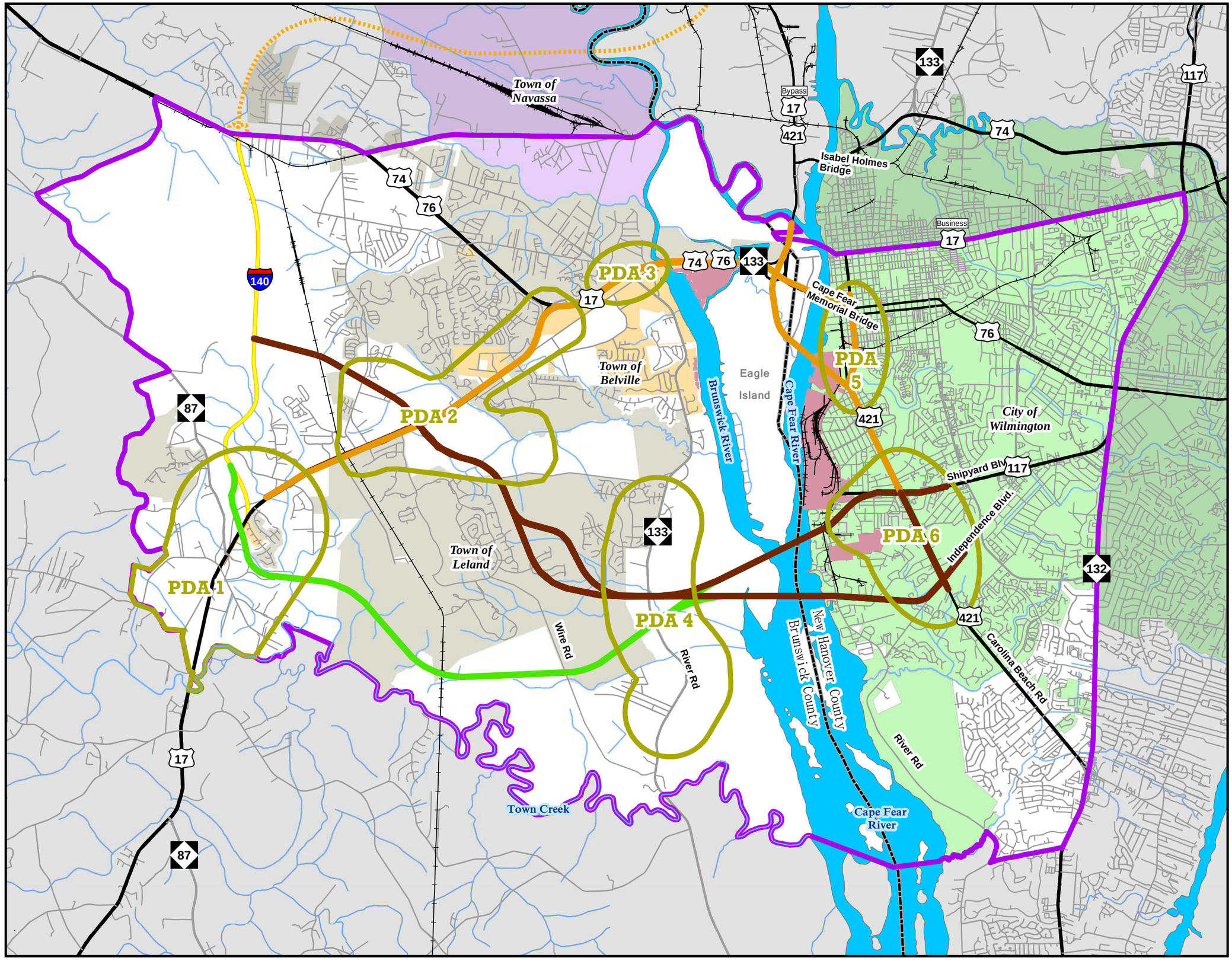
Figure 11: Probable Development Areas



Legend

- FLUSA
- Upgrade Existing US 17 Alternatives
- Northern Alternatives
- Southern Alternatives
- Probable Development Areas
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Future Wilmington Bypass (I-140)
- Water
- Belville
- Leland
- Navassa
- Wilmington
- County Boundary
- Port of Wilmington

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Miles

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

13.2 PDA 1: US 17/I-140 INTERCHANGE

Existing Conditions

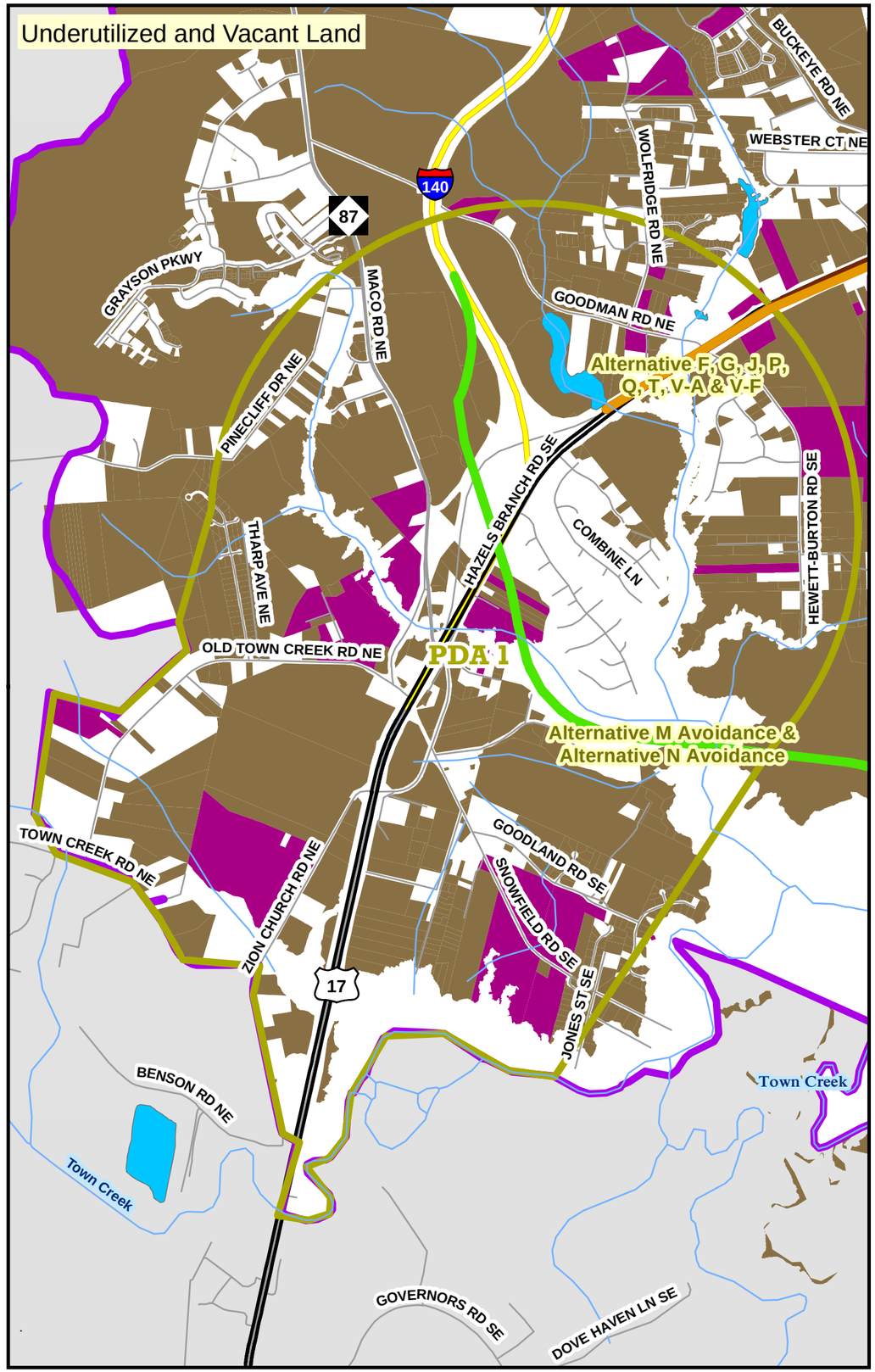
PDA 1 is located at the existing interchange of US 17 and I-140 (Figure 12). The PDA is in a rural area of Brunswick County. Neighborhoods in the Town of Leland and Belville are located southwest of the existing intersection of I-140 and US 17. Much of the remainder of the land within the PDA is designated as developable land, either vacant or underutilized.

Neighborhoods in the PDA include Snee Farm, Stoney Creek, and a portion of Grayson Park. In addition, Spring Hill is located in this PDA, which is a historic African-American community. Strong community cohesion has been noted in the Spring Hill community located along Goodman Road. This community is home to a tight-knit group of families who were originally sharecroppers following the Civil War. Grayson Park is a new development with several lots under construction. Snee Farm and Stoney Creek neighborhoods were recently impacted by the I-140 Wilmington Bypass project and no longer have direct access to US 17, but instead use a frontage road for access. An abandoned subdivision with paved streets and sidewalks is located in the southwest portion of the PDA. The area surrounding this is mostly undeveloped and wooded with scattered single family and modular homes.

Water service is available for the entire PDA. Sewer service is only available for the annexed area of Leland.

Areas within the town limits of Leland in PDA 1 are zoned residential, rural residential or low density commercial. In the *Leland Master Plan*, which includes areas outside of Leland's town limits, the area in this PDA is designated as a *Regional Center*. According to the plan, *Regional Centers* are mixed-use activity centers with employment and commercial uses that attract people from beyond the immediate neighborhoods and from surrounding communities. These centers are appropriate for commercial and employment development, as well as high density residential uses. Discussions with Brunswick County planners indicate there were no plans to develop the area in PDA 1.

Overall, PDA 1 is comprised of 2,837 acres, of which 76.2 percent is considered vacant and developable, while 7.8 percent of the built area is considered underutilized.



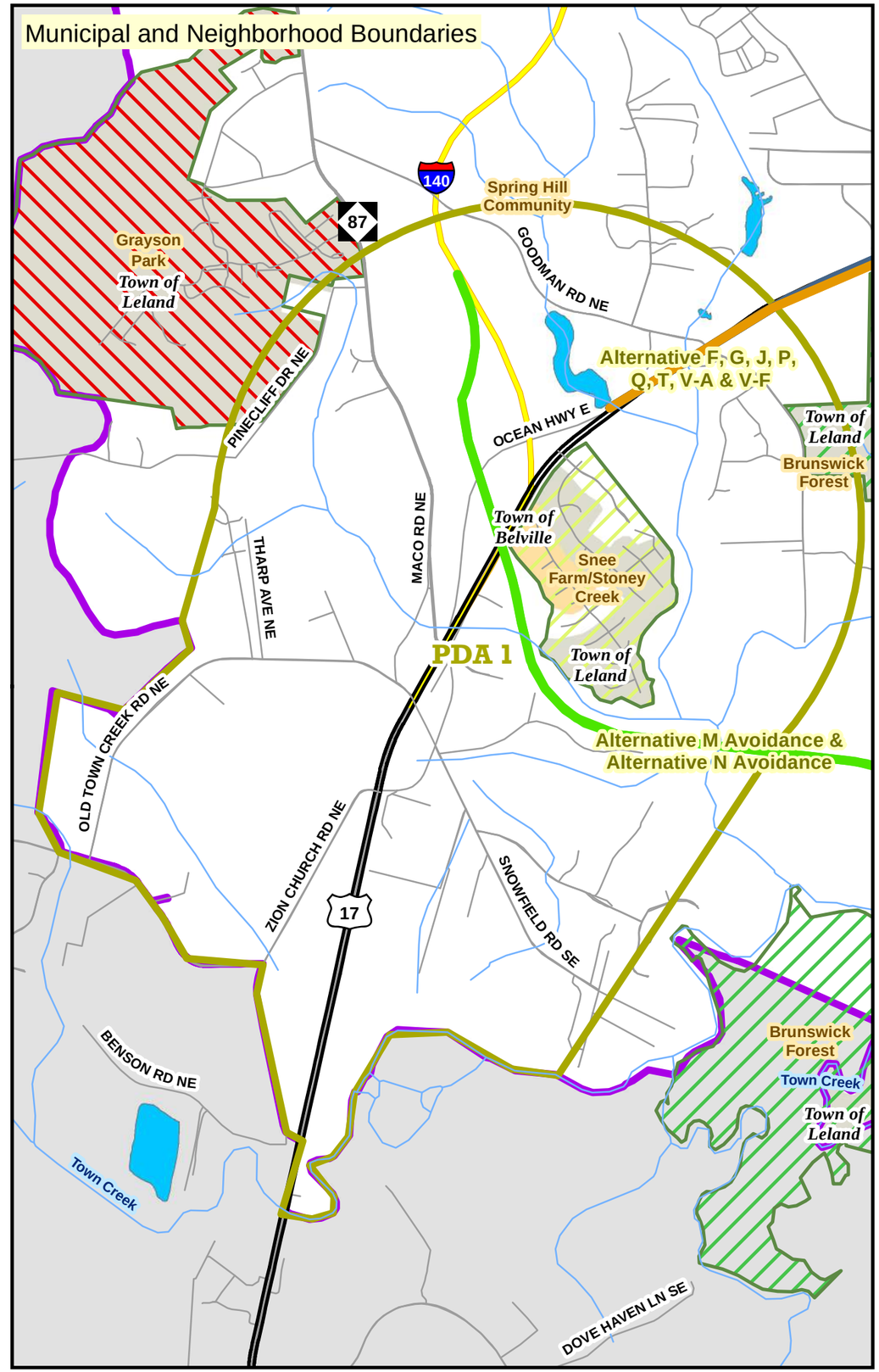


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Figure 12: Probable Development Area 1 - US 17/I-140 Interchange

Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Areas
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Local Roads
- Railroad
- Water
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

N

0 0.125 0.25 0.5
Mile

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

Proposed Changes

PDA 1 encompasses the western terminus for the Upgrade Existing US 17 Alternatives (F, P, V-AW, and V-F), the Southern Alternatives (M Avoidance and N Avoidance), and four of the Northern Alternatives (J, T, G, and Q). Alternatives designed with full control of access along US 17 will be limited and eliminate several direct access points, utilizing service roads. Alternatives F, V-F, G, and J would extend Hazels Branch Road and Goodman Road along US 17 as service roads. Direct access to Hewett-Burton Road and Goodman Road from US 17 will be closed. Zion Church Road and Sloan Road, where they intersect with US 17, will likely be cul-de-sac'd from Alternatives M Avoidance and N Avoidance.

Proposed widening alternatives are not likely to close any access locations in PDA 1. Alternatives B and C do not traverse PDA 1.

No Build: Rural residential development in this area would likely remain similar to its present condition. Construction of the I-140/US 17 interchange in the area has not spurred any new development in the area. While the *Connecting Northern Brunswick* and *Brunswick Tomorrow* plans do not indicate any proposed changes for the area, the *Leland Master Plan* designated this area as a *Regional Center*. As a *Regional* Center, higher intensity land uses are expected, should this land be annexed into the Town of Leland.

Build: The Build Alternatives have the potential to increase development pressure in this area, as the project will improve mobility between this PDA and New Hanover County. In particular, if the land is annexed into the Town of Leland and becomes a *Regional Center*, higher density development that includes commercial, business, and high-density residential development is probable. Zion Church Road and Old Towne Road are likely to incur more development due to the proximity to proposed interchanges and the vacant/underutilized nature of the area. The Town of Leland expressed interest in annexing areas within PDA 1, using alternatives M Avoidance and N Avoidance as town limits.

13.3 PDA 2: US 17 FROM OLD LANVALE ROAD TO US 74 INTERCHANGE

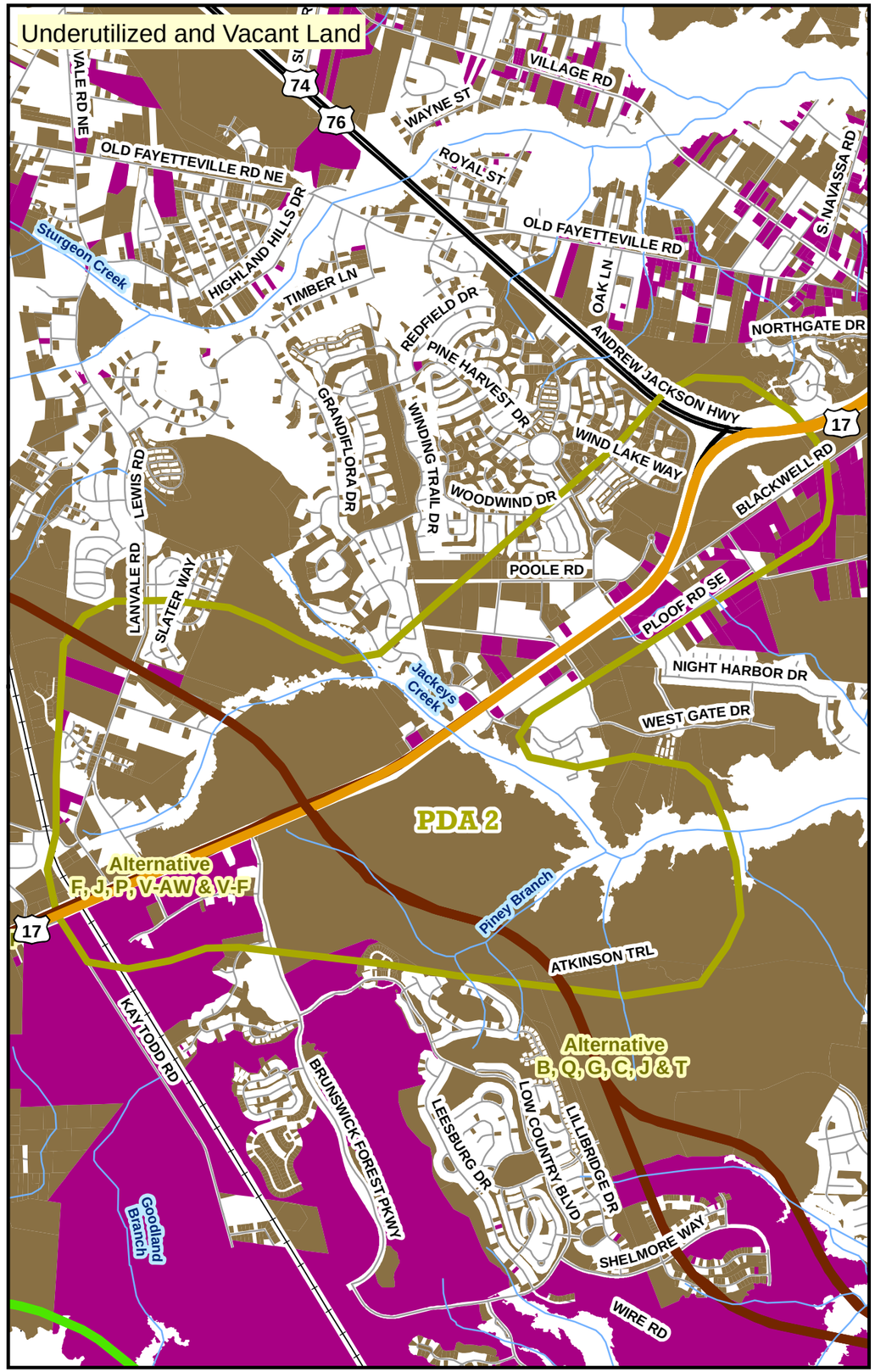
Existing Conditions

PDA 2 is located along US 17 between US 74 and Old Lanvale Road (Figure 13). The northeastern linear portion of the PDA follows US 17, which has several access points to the adjacent commercial and residential developments. Walmart and Harris Teeter are the major anchors for the commercial development including gas stations, banks, various restaurants, medical offices, and other office complexes. Zoning in the area includes planned unit developments, regular commercial businesses, and medium density residential development.

The southern lateral portion of the PDA includes the wooded, unincorporated land between the town limits of Leland. The area abutting US 17 is currently zoned for low density commercial. The area west of US 17 is zoned for general industrial use and east of US 17 is zoned for medium density residential.

Water service is available for the entire PDA. Sewer service is available within the town limits of Leland and Belville and to the north of US 17. The vacant area between Westgate and Brunswick Forest subdivision, which is not a part of the Town of Leland, does not have sewer service. Based on aerial images this area is heavily wooded and includes Jackeys Creek and Piney Branch.

Overall, PDA 2 is comprised of 2,748 acres, of which 85 percent is considered vacant and developable, while 4.9 percent of the built area is considered underutilized.



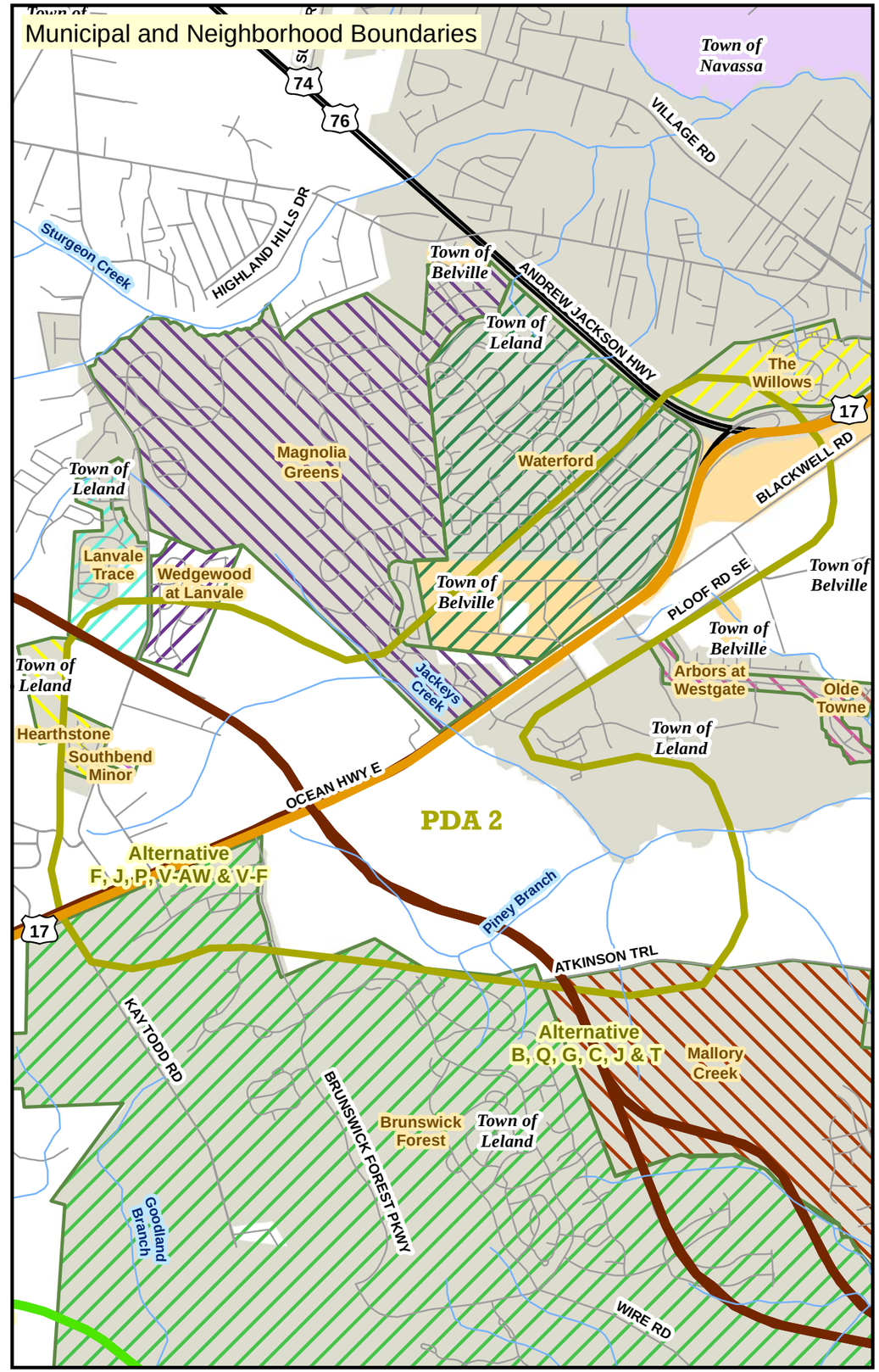


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Figure 13: Probable Development Area 2 - US 17 from Old Lanvale Road to US 74 Interchange

Legend

- FLUSA
- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Area
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

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Mile

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

The *Leland Master Plan* designates two areas along US 17 as *Regional Centers.* The first is near the entrance to Brunswick Forest (Brunswick Forest Parkway). The second is south of the US 17 and US 74/76 split. Along the US 17 Corridor, the Master Plan defines the area between Leland town limits south of US 17 as primarily sector S-5 zones incorporating S-2 zones to provide a greater mix of land uses. To the north, between Lanvale Road and US 17, the Plan calls for lower density housing combined with large areas of preserved open space. Other general recommendations for US 17 listed in the Master Plan include: develop elevated bike/pedestrian connections across the corridor, establish parallel frontage roads, enhance landscape requirements, and develop design guidelines.

Proposed Changes

Alternatives M Avoidance and N Avoidance are the only alternatives which do not traverse portions of PDA 2. Full control of access options will likely close direct access to Carol Lynn Road and Kay Todd Road; however the extended service roads from Goodman Road and Hazels Branch Road, described in PDA 1, will allow access to the area. There will likely be a new interchange connecting Lanvale Road and Provision Parkway to US 17. Direct access to Brunswick Forest Parkway will be closed. Alternatives B, C, G, Q, J, and T will utilize a new interchange in the wooded unincorporated area between the Leland town limits. Alternatives F and V-F will likely utilize a new interchange to allow access to service roads for the commercial and residential developments including Harris Teeter, Wal-Mart, Magnolia Greens, and Waterford. Bridges will span the freeway to allow easier access across US 17.

Widening options will not likely eliminate direct access to US 17, but may reduce property size for parcels abutting US 17.

No-Build: Commercial and/or residential development in this area would likely remain similar to present conditions. Commercial development along US 17 has been strong over the recent years and local planners indicated that it is likely to continue with or without this project.

Build: Businesses reliant on drive-by customers (e.g. gas stations, fast food) will likely be impacted from full control of access options. Property owners along US 17 may experience some loss of land from overpasses to connect to US 17. Commercial development will likely occur surrounding the proposed US 17 interchange for Alternatives B, C, J, T, G, and Q; however, this area is currently zoned for residential development to the south and low density commercial development to the north of US 17. Development pressures could alter the zoning directly abutting US 17 to include more mixed use development, as suggested by the *Regional Center* designation in the *Leland Master Plan*.

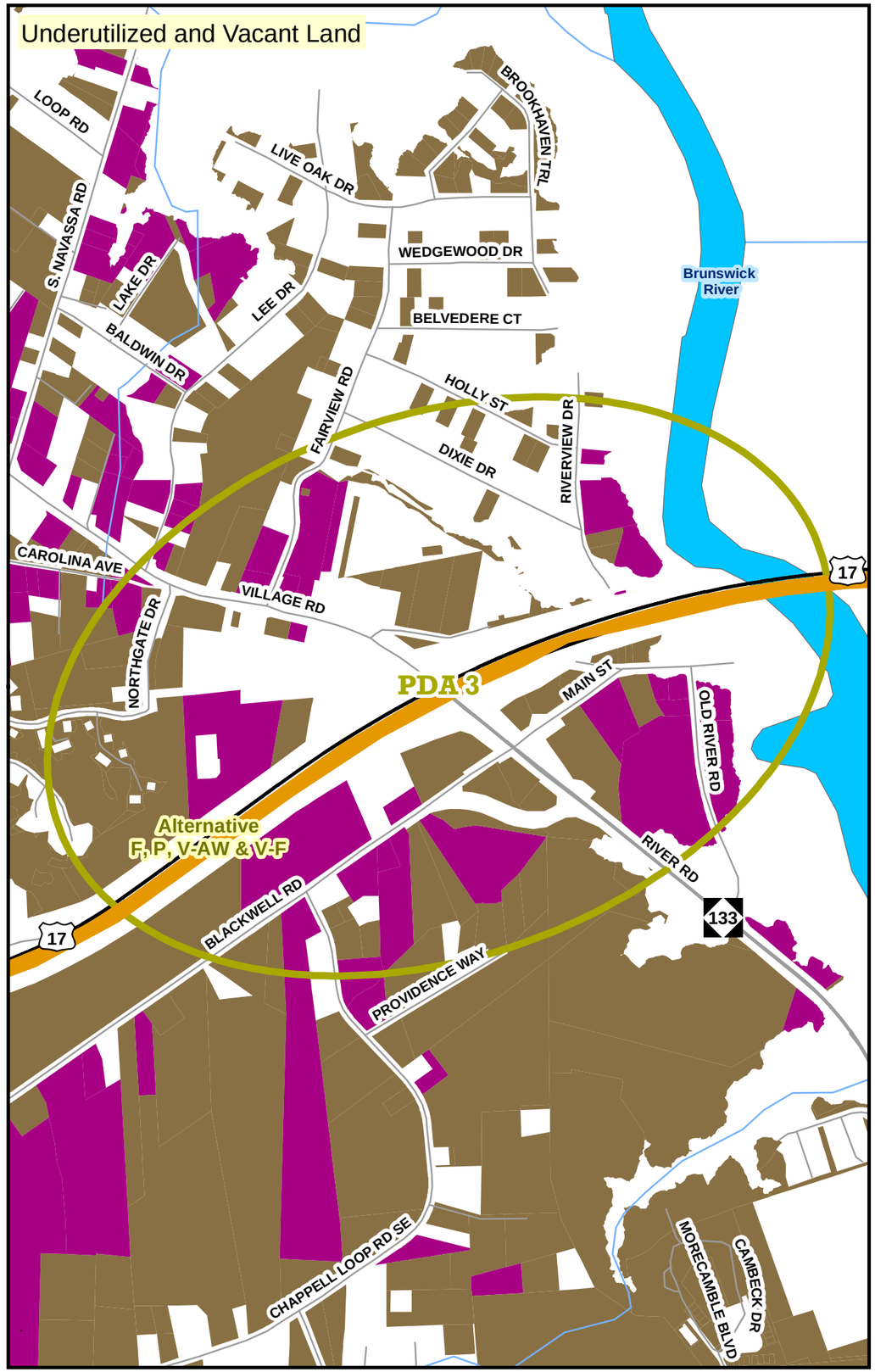
Zoning for the remainder of the developed PDA will likely remain the same regardless of the project.

13.4 PDA 3: US 17 AT VILLAGE ROAD/NC 133 (RIVER ROAD) BELVILLE AND LELAND

Existing Conditions

PDA 3 includes the Town of Leland to the north of US 17 and the Town of Belville to the south (Figure 14). The major intersection in PDA 3 is at US 17 and Village Road/NC 133 (River Road). Development in both Leland and Belville includes older strip malls.

In the *Leland Master Plan*, the area in this PDA is designated as a *Regional Center* and is considered to be a part of Downtown Leland. Northwest of the interchange with US 17/74/76 and NC 133 (River Road/Village Road), the plan defines the area as a *Mixed-Use Town Center,* and suggests redeveloping the existing properties along Village Road for retail, office centers, and high density residential uses.



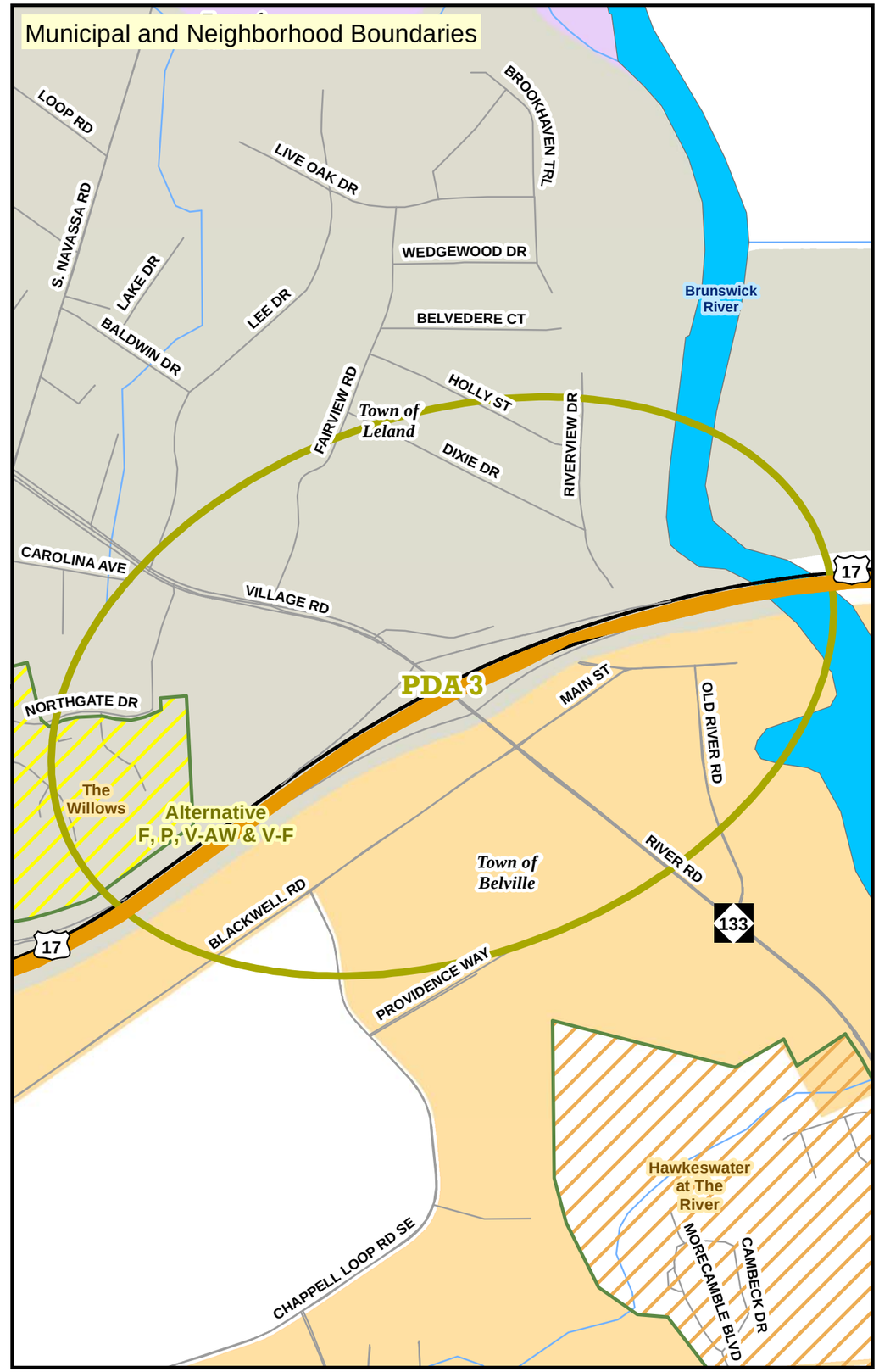


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Figure 14: Probable Development Area 3 - US 17 at Village Road/ NC 133 (River Road) Belville and Leland

Legend

- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Areas
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

N

0 500 1,000 2,000
Feet

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

Belville's *Vision 2020 Plan* discusses redeveloping the downtown area, located south of US 17/74/76 at Blackwell Road and NC 133, as a mixed use area and opening the riverfront for public use through development of a riverwalk and other bicycle and pedestrian facilities.

Water service and sewer service are both available for the entire area.

Overall, PDA 3 is comprised of 383 acres, of which 51.9 percent is considered vacant and developable, while 24.0 percent of the built area is considered underutilized.

Proposed Changes

Alternatives F, P, V-AW, and V-F traverse PDA 3. The existing interchange configuration will likely remain similar since the area already has full control of access.

No-Build: Given that the Town of Leland has targeted this area as a *Regional Center* and as a *Mixed-Use Town Center,* the area is likely to see redevelopment into higher-density land uses that will include a mix of business, commercial, and residential developments. These changes in development are expected to occur with or without the project, as the area surrounding the existing intersection of US 17 and Village Road/NC 133 (River Road) is not likely to experience access changes from the project. New residential development is also possible along the riverfront and parallel NC 133 (River Road). The proximity to the river makes this area a very desirable location, making it attractive for development.

Build: Development patterns will likely be very similar to the No-Build Scenario. Properties outside of the interchange are not likely to experience a change in access. Increased traffic volumes may prompt more drive-by development catering to highway traffic along Village Road or NC 133 (River Road). Given the geographic location and demographic profile of the area, Belville will likely remain a predominately residential "bedroom" community.

13.5 PDA 4: NC 133 (RIVER ROAD)

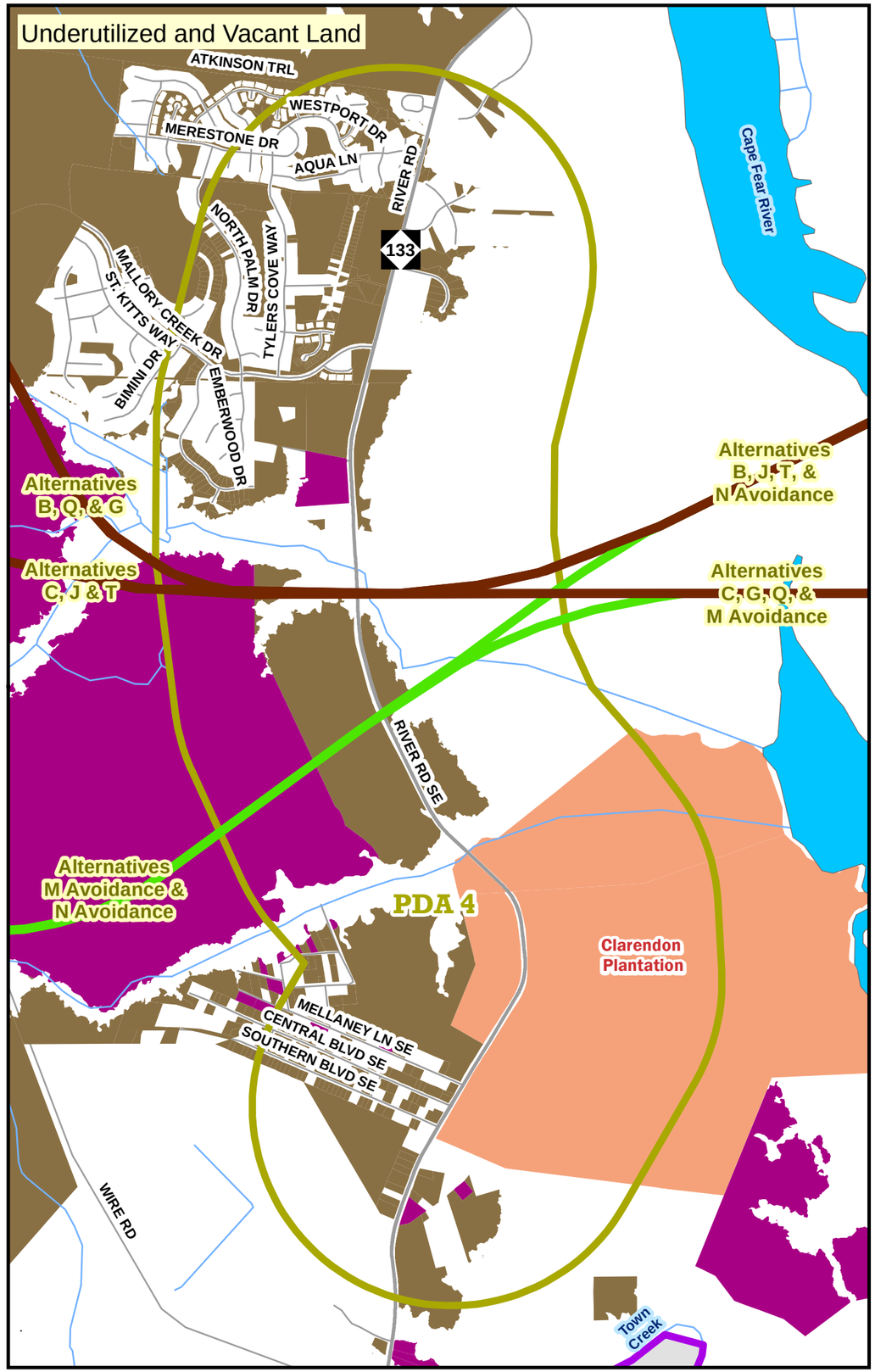
Existing Conditions

PDA 4 is centered on NC 133 with the Mallory Creek and Brunswick Forest developments to the west and scattered developments and wetlands to the east (Figure 15). Development to the east includes single family homes, a daycare facility and Brunswick Cove nursing home. The vacant land just south of Mallory Creek is zoned by Brunswick County as residential. Within the town limits of Leland, the area is zoned as Planned Unit Development. The Clarendon Plantation, which is a part of the NC Coastal Land Trust, is included in the southern area of the PDA. This area is an unincorporated part of Brunswick County zoned as Conservation and Protection.

The *Leland Master Plan* designates the majority of the land within this PDA as preserved open space (S-1) for the portion east of NC 133, while the land west of NC 133 is designated as either reserved open space (S-2) or controlled growth sector (S-4).

Water service is available for the entire PDA. Sewer service is available for areas within the Town limits.

PDA 4 is comprised of 2,531 acres, of which 14.4 percent is considered vacant and developable, while 79.8 percent of the build area is considered underutilized. Note that much of the underutilized land is part of a large parcel that is only partially within the PDA, but is part of undeveloped property in the Brunswick Forest development.



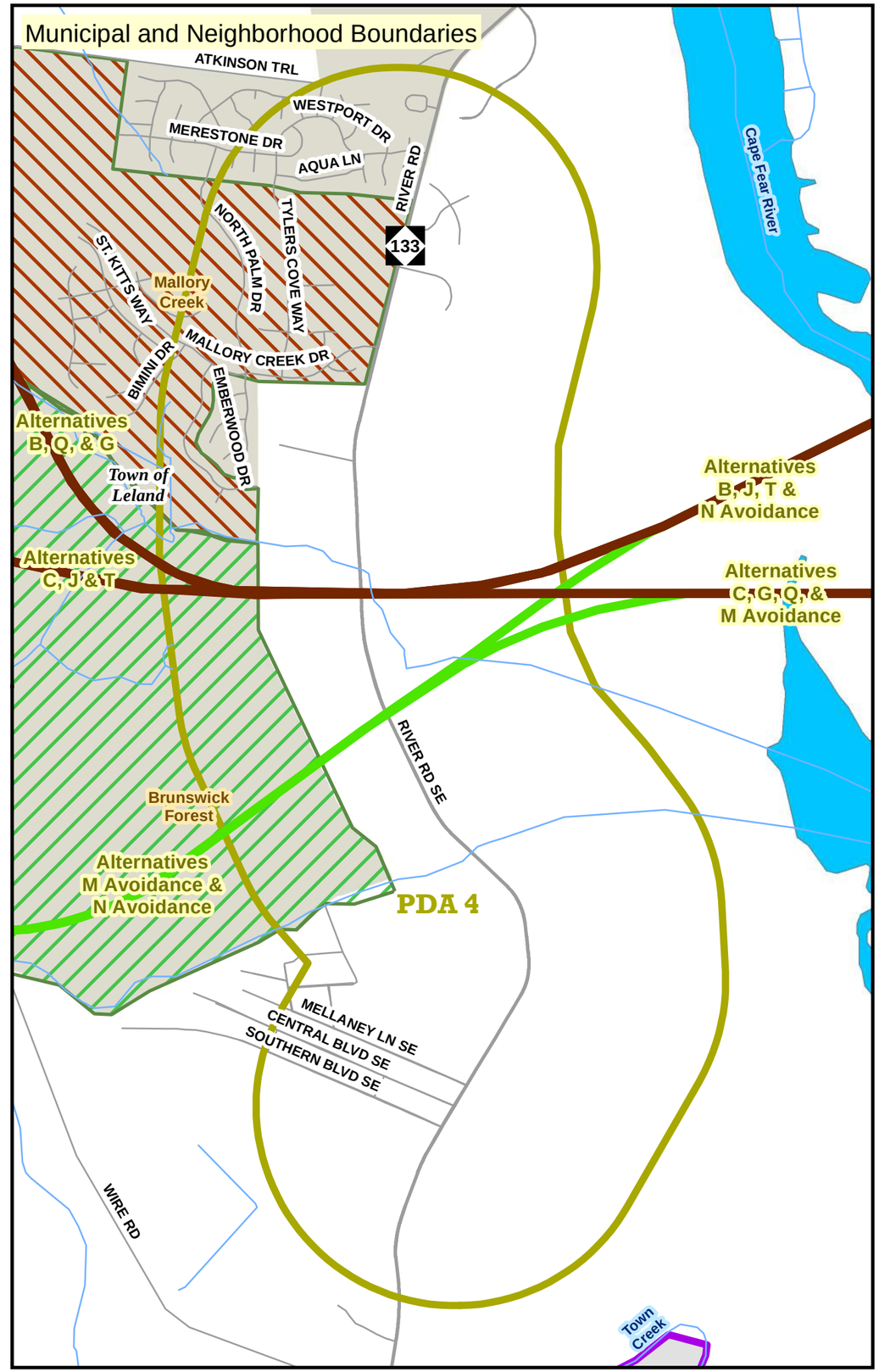


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Figure 15: Probable Development Area 4 - NC 133 (River Road)

Legend

- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Areas
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

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Mile

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

Proposed Changes

Alternatives B, C, G, J, T, Q, M Avoidance, and N Avoidance traverse PDA 4. Each alternative proposes a new interchange at NC 133 within the vacant undeveloped land south of Mallory Creek. Access along NC 133 (River Road) will likely remain the same. The alternatives will have full control of access and be designed with full control of access.

No Build: Development patterns in this area would likely remain similar to the present condition. Further expansion of Brunswick Forest and Mallory Creek is likely and development of vacant land for residential uses is expected. It is expected that land within the Clarendon Plantation will remain in conservation and will not be developed.

Build: PDA 4 will likely experience development pressures from the proposed interchange. However, based on current zoning regulations, the area will continue to develop residentially, especially with convenient access across the Cape Fear River into Wilmington. Development pressures, such as increased traffic volumes, may induce more commercial or mixed use development. Development to the east and south of the PDA would not likely occur due to the presence of wetlands and conservation areas.

13.6 PDA 5: US 421 DOWNTOWN WILMINGTON

Existing Conditions

PDA 5 mostly encompasses the historic district of downtown Wilmington and the Port of Wilmington (Figure 16). The PDA begins north of Church Street and extends south to Alabama Avenue. It extends to the west along the Cape Fear River and to the east near 8th Street. Land use in the area is primarily multi-use and urban residential. Along the riverfront to the west of US 421 and south of the Cape Fear Memorial Bridge, the land use is primarily industrial and serves the Port of Wilmington. Several major thoroughfares exist in the area including US 421, US 74/76, US 17 and a CSX rail line. The Port of Wilmington is a major anchor in this area. Infill development or revitalization is the primary tool for growth in the area since little area is vacant or undeveloped.

The entire PDA falls under the planning jurisdiction of the City of Wilmington. The *Create Wilmington Comprehensive Plan* discusses goals to develop *Creative Districts* which include housing, employment opportunities, and strong ties to local businesses to revitalize the area. The WMPO is currently developing Cape Fear Transportation 2040, a long-term transportation plan that will steer transportation projects in the region.

Throughout the PDA, US 421 has partial control of access. The main transportation node in the PDA is US 74/76, which becomes full control of access at the Cape Fear Memorial Bridge. Prior to the ramp, US 74/76 is also partial control of access.

Water service and sewer is available for the entire PDA.

Overall, PDA 5 is comprised of 701 acres, of which 13.1 percent is considered vacant and developable, while 21.5 percent of the built area is considered underutilized.

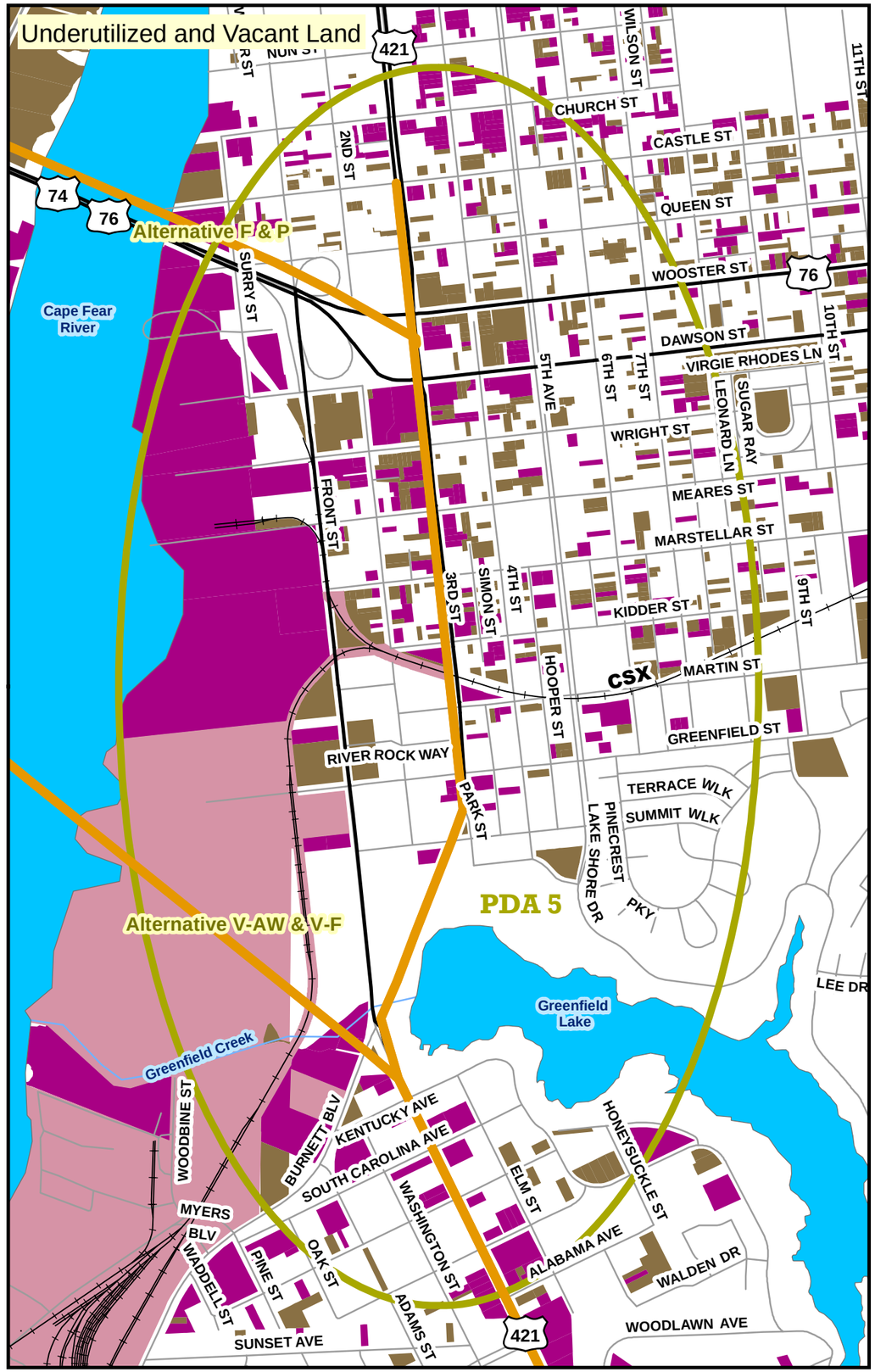

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Figure 16: Probable Development Area 5 - US 421 Downtown Wilmington

Legend

- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Areas
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Port of Wilmington
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

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Feet

Date: July 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

Proposed Changes

Alternatives F and P will upgrade the Cape Fear Memorial Bridge and terminate at US 76 West (Wooster Street) and US 76 East (Dawson Street). Currently, the interchanges are located between Front Street and 2nd Street. The proposed interchanges will likely be located further east between 2nd Street and 3rd Street. Queen Street will serve as a collector street for US 76W and US 421S will serve as the distributer for traffic on the bridge. Alternatives F and P will upgrade US 421 from Church Street to Parkway Boulevard. Alternatives V-AW and V-F terminate further south on US 421. Access to Burnett Boulevard will connect directly to US 421, closing access from Kentucky Avenue. Both alternatives will have full control of access at the interchanges. Alternatives V-AW and V-F will upgrade US 421 from Greenfield Street to Parkway Boulevard.

No Build: New development is expected to continue the trend of taking into account context sensitive solutions; and will likely remain the same in the No-Build Scenario. The City of Wilmington officials indicated efforts in forming mixed use live/work developments in the area, known as *Emerging Arts Clusters*. Currently, the Cape Fear Memorial Bridge acts as a barrier in the community. The NC State Ports Authority has indicated that the Port of Wilmington is expected to see continued growth in the near future that will primarily include expansion of existing facilities on existing port property and cause an increase in cargo movement in and out of the port, including both rail and trucks.

Build: Commercial and/or industrial development in this area would likely remain similar to the No-Build Scenario. Redevelopment of vacant commercial structures and/or the development of parcels is likely from the additional access across the Cape Fear River. Improved mobility will aid in development of the Port of Wilmington. Commercial development abutting US 421 will likely be impacted from widening activities.

13.7 PDA 6: INDEPENDENCE AND SHIPYARD BOULEVARD VIA US 421

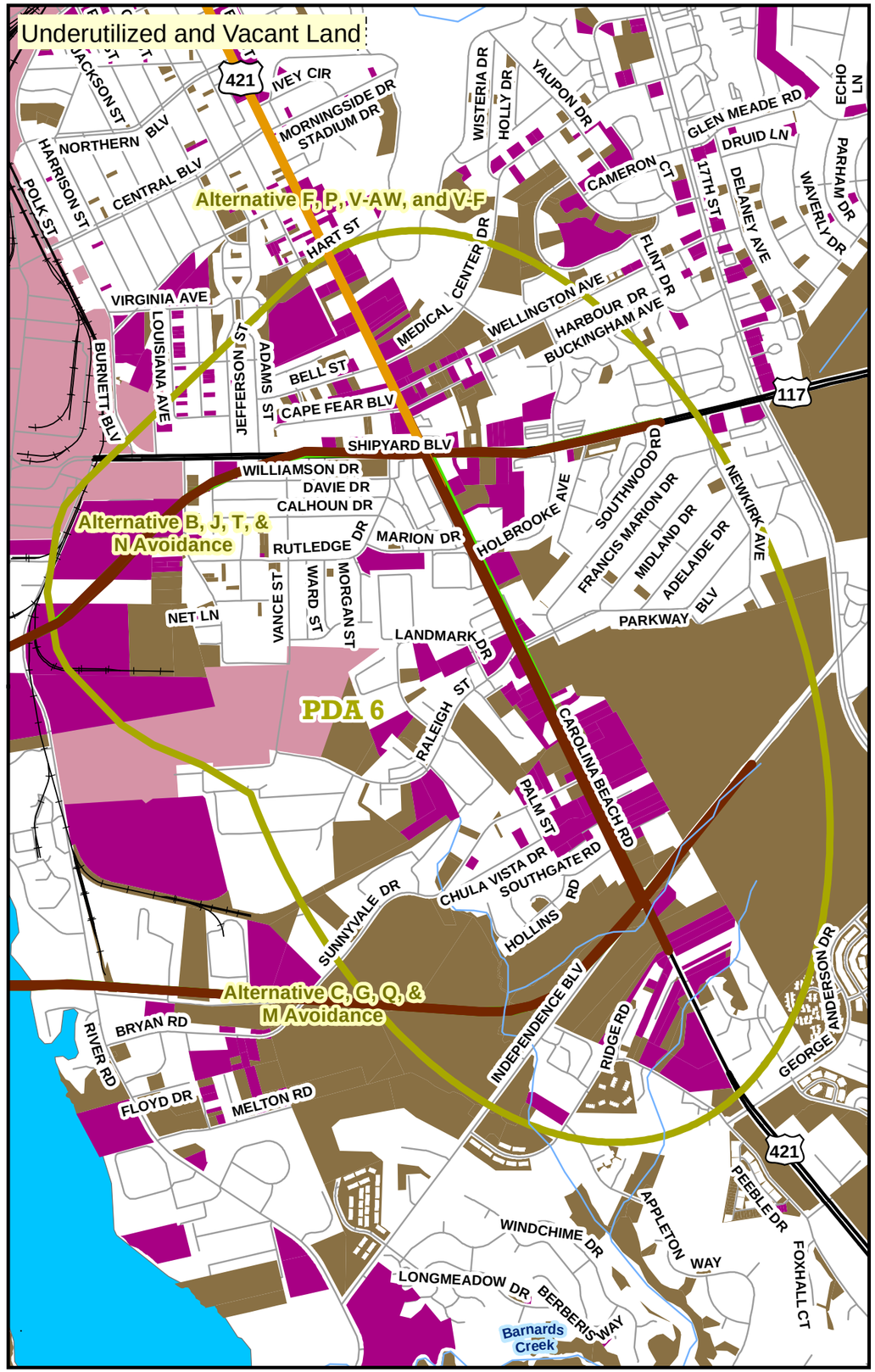
Existing Conditions

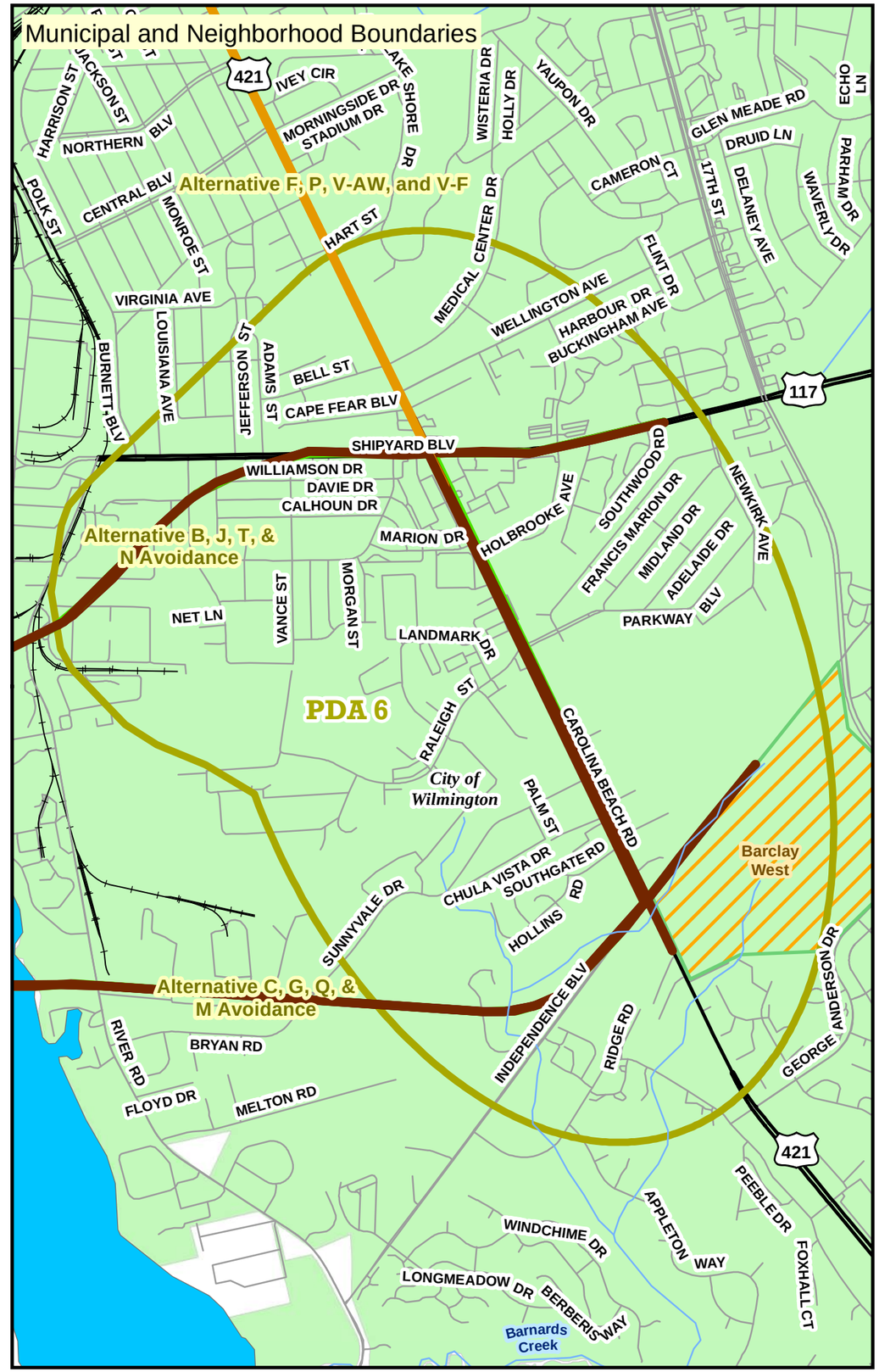
PDA 6 encompasses US 421 (Carolina Beach Road) and the intersections with US 117 (Shipyard Boulevard) and Independence Boulevard (see Figure 17). Throughout the PDA, US 421 has partial control of access. The main transportation nodes in the PDA are US 117 (Shipyard Boulevard) and Independence Boulevard. Both roadways are also partial control of access. The area is very urban, including high volume highways, commercial development, and scattered residential areas. US 117 (Shipyard Boulevard) terminates at the Port of Wilmington. The Port of Wilmington is a major anchor in this area. River Road parallels the Cape Fear River, beginning at the terminus of US 117 (Shipyard Boulevard).

The City of Wilmington is the planning jurisdiction for PDA 6. The area surrounding the intersection at US 421/US 117 includes several commercial services and business offices. Outside of the commercial developments, the area is zoned for residential uses. Commercial zoning continues alongside US 421 south to the intersection at Independence Boulevard. Single family and multi-family residential areas make up the majority of the land use south of Independence Boulevard. Local officials from the City of Wilmington stated there are plans to convert US 421 between US 117 and Independence Boulevard to a grassed median superstreet (STIP Project U-5729).

Water service and sewer service lines are in place for the entire PDA.

Overall, PDA 6 is comprised of 1,836 acres, of which 38.3 percent is considered vacant and developable, while 16.2 percent of the built area is considered underutilized.





CAPE FEAR CROSSING

State Transportation Improvement Program
Project No. U-4738

Land Use Scenario Assessment

Figure 17: Probable Development Area 6 - Independence Boulevard and Shipyard Boulevard via US 421

Legend

- Upgrade Existing Alternative Group
- Northern Alternative Group
- Southern Alternative Group
- Probable Development Areas
- Underutilized and Developable Land
- Vacant and Developable Land
- Interstate
- US Highway
- NC Highway
- Road
- Railroad
- Water
- Port of Wilmington
- Neighborhood (Color and hatching vary by neighborhood)
- Belville
- Leland
- Navassa
- Wilmington

N

0 0.125 0.25 0.5
Mile

Date: August 2015
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

Proposed Changes

PDA 6 serves as the eastern terminus for all of the project alternatives. Alternatives B, J, T, and N Avoidance terminate on US 117 (Shipyard Boulevard). Alternatives C, G, Q, and M Avoidance connect to Independence Boulevard and upgrade US 421 to Shipyard Boulevard. Alternative F, P, V-AW, and V-F upgrade US 421 to Shipyard Boulevard. Access to Shipyard Boulevard from Vance Street and Rutledge Street will be closed. Access to US 421 from Wellington Avenue and Cape Fear Boulevard will also be closed. Primary access to the proposed bridge crossing will be from US 117 (Shipyard Boulevard). Other access points are located on Worth Drive. US 421 will be upgraded in the vicinity of the project.

No Build: In the No-Build Scenario, commercial and residential development in this area would likely remain similar to its present condition. City of Wilmington officials indicated plans to upgrade US 421 between Shipyard Boulevard and Independence Boulevard to a grassed median superstreet. The project is a city funded project, which was part of a city bond referendum in 2014. Construction is expected to take place next year. The goal of the project is to improve this gateway into the city and to help make the area more attractive for development. They also indicated that there are several development projects in the works or underway within or near the PDA that would happen with or without the project. Nearby, there are several large-scale developments underway including River Lights, a residential development south of the PDA and Barclay West, a multi-use development immediately east of the PDA along Independence Boulevard. These developments are examples of how the area is rapidly transforming without the project. Local planners expect this area to continue to develop with or without the project. NC State Ports Authority has indicated that the Port of Wilmington is expected to see continued growth in the near future that will primarily include expansion of existing facilities on existing port property and cause an increase in cargo movement in and out of the port, including both rail and trucks.

Build: In the Build Scenario, commercial and residential development will likely increase within the PDA due to the new access point across the Cape Fear River. Improved mobility will aid in development at the Port of Wilmington. In Brunswick County, this allows for easier access to the southern areas in New Hanover County, and vice versa, it allows residents of New Hanover County access to US 17 South without traveling through Leland.

13.8 PDA RESULTS SUMMARY

Examination of the probable development areas shows that the Cape Fear Crossing project could encourage growth targeted to highway users in certain areas and/or influence future growth within Brunswick and New Hanover Counties. Six probable development areas have been identified. Construction of the proposed project would likely influence growth in PDAs 1, 4, and 6. Conversely, construction of the proposed project would not likely influence growth in PDAs 2, 3, or 5.

Table 9: Summary of PDA Build and No-Build Scenarios

PDA	No-Build	Build
1	Rural residential development in this area would likely remain similar to its present condition. Potential development as a Town of Leland *Regional Center*, higher intensity land use is expected.	The project will create more development pressure, which would likely result in higher density land uses that would create demand for this area to fully develop into a *Regional Center*.
2	Commercial and/or residential development in this area would likely remain similar to present conditions. Development of remaining vacant parcels is likely to occur and to follow similar land use patterns as the existing development.	Businesses reliant on drive-by customers (e.g. gas stations, fast food) will likely be impacted from full control of access options. Commercial development will likely occur surrounding the proposed US 17 interchange for Alternatives B, C, J, T, G, and Q. Mixed-use development near US 17 is recommended by the *Regional Center* designation in the *Leland Master Plan*.
3	The Town of Leland has targeted this area as a *Regional Center* and as a *Mixed-Use Town Center*, thus the area is likely to see redevelopment into higher-density land uses that will include a mix of business, commercial, and residential developments.	As in the No-Build, redevelopment into higher-density land uses that will include a mix of business, commercial, and residential developments is likely, given that the Town of Leland has targeted this area a *Regional Center* and as a *Mixed-Use Town Center.*
4	Development patterns in this area would likely remain similar to its present condition. Further expansion of Brunswick Forest and Mallory Creek is likely and development of vacant land for residential uses is expected. Land within the Clarendon Plantation will likely remain in conservation and will not be developed.	This area will likely experience development pressures from the proposed interchange. Current zoning regulations include conservation areas and residential land uses. However, pressure for commercial uses may occur to induce more commercial or mixed-use development. Development to the east and south of the PDA would not likely occur due to the presence of wetlands and conservation areas.
5	Development trends will likely remain the same. The City of Wilmington indicated efforts in forming mixed-use developments in the area, known as Emerging Arts Clusters, are a big goal of the community.	Redevelopment of vacant commercial structures and/or the development of parcels is likely from the additional access across the Cape Fear River. Commercial development abutting US 421 will likely be impacted from widening activities.
6	This is a growing area of the community that has new multi-use developments being planned or under construction. This type of activity is expected to continue with or without the project.	Commercial and residential development will likely increase within the PDA due to the new access point across the Cape Fear River.

14.0 LAND USE SCENARIO ASSESSMENT SCREENING TOOL

Each of the alternative groups – Upgrade Existing US 17 Alternatives, North Alternatives, and Southern Alternatives – was evaluated using the LUSA Screening Tool. The categories listed on the LUSA Screening Tool have been shown to have a direct relationship to future quality of life and resource impacts. The measures in the Tool are rated from high to low concern for the likelihood of the alternatives to impact the resource. Each measure is assessed individually, for the Build Scenarios and the No-Build Scenario, and the results of the table represent a comprehensive determination of the severity of impacts that may occur as a result of the Build Scenario. In general, the more the Build Scenario and the No-Build Scenario diverge, the greater the potential for future quality of life or resource impacts from the project.

14.1 UPGRADE EXISTING US 17 ALTERNATIVE – ARTERIAL WIDENING

Pressure/Demand for Typically Higher Impact Development

Commercial and residential growth is expected along the US 17 corridor in Brunswick County and along US 421 (Carolina Beach Road) in New Hanover County, in both the Build and No-Build Scenario given the high growth rates projected for the region as well as existing and projected development trends. In this Build Scenario, the improved mobility between Brunswick County and New Hanover County may encourage additional growth in Brunswick County. Pressure for development in New Hanover County is not expected to differ between the No-Build Scenario and the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as MODERATELY HIGH.**

Future Shift of Regional Population Growth to the Project Area

Population projections for Brunswick and New Hanover Counties are relatively high, with average annualized growth rates of 2.7 percent and 1.8 percent, respectively. Within the Brunswick County portion of the FLUSA, there has recently been a large amount of population growth along the US 17 corridor. Local planners indicated that this is likely to continue both with and without the proposed project. In the New Hanover County portion of the FLUSA, the area near Independence Boulevard is an area targeted for development; however, local planners indicated that it would likely be developed prior to this project being constructed. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Pressure for Land Development outside Regulated Areas

All land within the FLUSA falls under a combination of regulations which include the NPDES Phase II Stormwater Permits, a Flood Damage and Protection Ordinance, and CAMA permits. No new access will be provided in the Build Scenario and the existing regulations provide protections to the environment for the PDAs. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Pressure for Land Development outside of Planned Areas

All land within the FLUSA fall within planned areas. No new access to areas outside of planned areas will be provided in the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Development Patterns

The Build Scenario will maintain partial control of access for much of the project corridor, similar to the No-Build Scenario, it will likely encourage further strip or sprawling development patterns in the suburban areas of Brunswick County. In New Hanover County, the Build Scenario will also maintain the

existing partial control of access or no control of access conditions that already exist along the current roadway network. **Both the No-Build Scenario and the Build Scenario are rated as MEDIUM.**

Planned/Managed Land Use and Impacts

Growth areas are generally consistent with land development and storm water management goals for both the Build Scenario and the No-Build Scenario. Local planners indicated that growth in the PDAs was consistent with community development plans. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Table 10: Indirect Scenario Assessment Tool – U-4738 – Upgrade Existing US 17 Alternatives – Arterial Widening

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 Landuse 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
⬆		Build Scenario				
↑	No-Build Scenario Build Scenario	No-Build Scenario				
↔					No-Build Scenario Build Scenario	
↓						
⬇			No-Build Scenario Build Scenario	No-Build Scenario Build Scenario		No-Build Scenario 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 Goals

14.2 UPGRADE EXISTING US 17 ALTERNATIVE – FREEWAY

Pressure/Demand for Typically Higher Impact Development

Commercial and residential growth is expected along the US 17 corridor in Brunswick County and along US 421 (Carolina Beach Road) in New Hanover County in both the No-Build Scenario and the Build Scenario given the high growth rates projected for the region. In this Build Scenario, the improved mobility between Brunswick County and New Hanover County may encourage additional growth in Brunswick County. Pressure for development in New Hanover County is expected to be high, but is not expected to differ between the No-Build Scenario and the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as MODERATELY HIGH.**

Future Shift of Regional Population Growth to the Project Area

Population projections for Brunswick and New Hanover Counties are relatively high, with average annualized growth rates of 2.7 percent and 1.8 percent, respectively. Within the Brunswick County portion of the FLUSA, there has recently been a large amount of population growth along the US 17 corridor. Local planners indicated that this is likely to continue both with and without the proposed project; however, the proposed project could help attract larger-scale mixed-use development projects by decreasing the travel time from the area south of Leland along US 17 into Wilmington. In the New Hanover County portion of the FLUSA, the area near Independence Boulevard is an area targeted for development; however, local planners indicated that it would likely be developed prior to this project being constructed. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Pressure for Land Development outside Regulated Areas

All land within the FLUSA fall under a combination of regulations which include the NPDES Phase II Stormwater Permits, a Flood Damage and Protection Ordinance, and CAMA permits. No new access will be provided in the Build Scenario and the existing regulations provide protections to the environment for the PDAs. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Pressure for Land Development outside of Planned Areas

All land within the FLUSA fall within planned areas. No new access to areas outside of planned areas will be provided in the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Development Patterns

The Build Scenario will include full control of access along the existing US 17 corridor in the Brunswick County. It will likely encourage high density development patterns, clustered around the proposed interchange areas. However, in New Hanover County, the Build Alternatives will remain either partial control of access or no control of access, which would not create a discernable difference in land use patterns between the Build Scenario and the No-Build Scenario. **The No-Build Scenario is rated as MEDIUM and the Build Scenario is rated as MEDIUM-LOW.**

Planned/Managed Land Use and Impacts

Growth areas are generally consistent with land development and storm water management goals for both the Build Scenario and the No-Build Scenario. Local planners indicated that growth in the PDAs was consistent with community development plans. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Table 11: Indirect Scenario Assessment Tool – U-4738 – Upgrade Existing US 17 Alternatives – Full Control of Access

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 Landuse 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
⬆		Build Scenario				
↑	No-Build Scenario Build Scenario	No-Build Scenario				
↔					No-Build Scenario	
↓					Build Scenario	
⬇			No-Build Scenario Build Scenario	No-Build Scenario Build Scenario		No-Build Scenario 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 Goals

14.3 NORTHERN ALTERNATIVES

Pressure/Demand for Typically Higher Impact Development

New location portions of this Build Scenario in Brunswick County will be full control of access, so new access from the roadway will not be allowed. However, pressure for development near interchange locations along existing roadways without control of access, namely US 17 and NC 133 in Brunswick County and US 421 in New Hanover County, could put additional pressures for development near these interchanges. However, these areas are already experiencing relatively high growth rates, which are expected to continue in both the No-Build Scenario and the Build Scenario. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Future Shift of Regional Population Growth to the Project Area

Population projections for Brunswick and New Hanover Counties are relatively high, with average annualized growth rates of 2.7 percent and 1.8 percent, respectively. Within the Brunswick County portion of the FLUSA, there has recently been a large amount of population growth along the US 17 corridor. Local planners indicated that this is likely to continue both with and without the proposed project; however, the proposed project could help attract larger-scale mixed-use development projects by decreasing the travel time from the area south of Leland along US 17 into Wilmington. In the New Hanover County portion of the FLUSA, the area near Independence Boulevard is an area targeted for development; however, local planners indicated that it would likely be developed prior to this project being constructed. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Pressure for Land Development outside Regulated Areas

All land within the FLUSA fall under a combination of regulations which include the NPDES Phase II Stormwater Permits, a Flood Damage and Protection Ordinance, and CAMA permits. No new access will be provided in the Build Scenario and the existing regulations provide protections to the environment for the PDAs. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Pressure for Land Development outside of Planned Areas

All land within the FLUSA fall within planned areas. No new access to areas outside of planned areas will be provided in the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Development Patterns

The Build Scenario will maintain the full control of access for the new location portions of the project corridor. It will likely encourage higher density development patterns near the interchange locations. In New Hanover County, relatively dense development patterns are expected to be maintained near the Port of Wilmington. **The No-Build Scenario is rated as MEDIUM and the Build Scenario is rated as MEDIUM-LOW.**

Planned/Managed Land Use and Impacts

Growth areas are generally consistent with land development and storm water management goals for both the Build Scenario and the No-Build Scenario. Local planners indicated that growth in the PDAs was consistent with community development plans. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Table 12: Indirect Scenario Assessment Tool – U-4738 – Northern Alternatives

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 Landuse 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
⬆	Build Scenario	Build Scenario				
↑	No-Build Scenario	No-Build Scenario				
↔					No-Build Scenario	
↓					Build Scenario	
⬇			No-Build Scenario Build Scenario	No-Build Scenario Build Scenario		No-Build Scenario 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 Goals

14.4 SOUTHERN ALTERNATIVES

Pressure/Demand for Typically Higher Impact Development

New location portions of this Build Scenario in Brunswick County will be full control of access, so new access from the roadway will not be allowed. However, pressure for development near interchange locations along existing roadways without control of access, namely US 17 and NC 133 in Brunswick County and US 421 in New Hanover County, could put additional pressures for development near these interchanges. However, these areas are already experiencing relatively high growth rates, which are expected to continue in both the No-Build Scenario and the Build Scenario. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Future Shift of Regional Population Growth to the Project Area

Population projections for Brunswick and New Hanover Counties are relatively high, with average annualized growth rates of 2.7 percent and 1.8 percent, respectively. Within the Brunswick County portion of the FLUSA, there has recently been a large amount of growth along the US 17 corridor. Local planners indicated that this is likely to continue both with and without the proposed project; however, the proposed project could help attract larger-scale mixed-use development projects by decreasing the travel time from the area south of Leland along US 17 into Wilmington. In particular, this Build Alternative will likely shift growth near the interchange with US 17/I-140. In the New Hanover County portion of the FLUSA, the area near Independence Boulevard is already targeted for development; however, local planners indicated that it would likely be developed prior to this project being constructed. **The No-Build Scenario is rated as MEDIUM-HIGH and the Build Scenario is rated as HIGH.**

Pressure for Land Development outside Regulated Areas

All land within the FLUSA fall under a combination of regulations which include the NPDES Phase II Stormwater Permits, a Flood Damage and Protection Ordinance, and CAMA permits. No new access will be provided in the Build Scenario and the existing regulations provide protections to the environment for the PDAs. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Pressure for Land Development outside of Planned Areas

All land within the FLUSA fall within planned areas. No new access to areas outside of planned areas will be provided in the Build Scenario. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Development Patterns

The Build Scenario will maintain the full control of access for the new location portions of the project corridor; it will likely encourage higher density development patterns near the interchange locations. In particular, this Build Alternative will likely influence higher density development near the interchange with US 17/I-140. In New Hanover County, relatively dense development patterns are expected to be maintained near the Port of Wilmington. **The No-Build Scenario is rated as MEDIUM and the Build Scenario is rated as MEDIUM-LOW.**

Planned/Managed Land Use and Impacts

Growth areas are generally consistent with land development and storm water management goals for both the Build Scenario and the No-Build Scenario. Local planners indicated that growth in the PDAs was consistent with community development plans. **Both the No-Build Scenario and the Build Scenario are rated as LOW.**

Table 13: Indirect Scenario Assessment Tool – U-4738 – Southern Alternatives

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 Landuse 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
⬆	Build Scenario	Build Scenario				
↑	No-Build Scenario	No-Build Scenario				
↔					No-Build Scenario	
↓					Build Scenario	
⬇			No-Build Scenario Build Scenario	No-Build Scenario Build Scenario		No-Build Scenario 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 Goals

14.5 RESULTS OF LAND USE SCENARIO ASSESSMENT SCREENING TOOL

Separate indirect screening matrices were created to evaluate the key differences between Upgrade Existing US 17 Alternatives (freeway and arterial widening options), Northern Alternatives, and Southern Alternatives. The results of these matrices show that:

- Compared with the No-Build Scenario, all four Build Scenarios would put some additional pressures and demand for higher impact development due to increased access. Given the high population and employment growth rates projected for the overall area, increased pressures for commercial development within the FLUSA is likely and local planners indicated that this to likely to occur regardless of whether the project is built or not.

- As stated above, the FLUSA and the larger metropolitan region are expected to experience an overall high growth rate through 2040. The No-Build Scenario was rated as Medium-High, given the other infrastructure investments made in the FLUSA that are expected to contribute to the future population shift. Each of the Build Scenarios will further improve transportation efficiencies in the FLUSA, making this area more attractive to residential growth.

- Lands within the FLUSA already have regulations for natural systems and stormwater in place. Therefore, all four Build Scenarios and the No-Build Scenario were rated as Low.

- All of the land within the FLUSA is within planned areas that fall under the jurisdictions of one of the municipalities or counties; all of which have land use policies, plans, and zoning regulations in place to adequately guide and regulate future development. Therefore, all four Build Scenarios and the No-Build Scenario were rated as Low.

- The No-Build Scenario and the Upgrade Existing US 17 – Arterial Widening Build Scenario will both likely maintain the status quo of development patterns that includes strip or sprawling development as highway access will remain partial control of access. These two scenarios were rated as Medium given that local plans and zoning ordinances do encourage higher density development patterns in targeted areas. The other three Build Scenarios (Upgrade Existing US 17 – Full Control of Access, Northern Alternatives, and Southern Alternatives) were ranked as Medium-Low, given that the control of access measures will encourage more clustering of development and higher density development patterns near the proposed interchange locations.

- The Build Scenarios and the No-Build Scenario were all ranked as Low concern for Planned/Managed Land Use Impacts given that the PDAs are consistent with land development and stormwater management goals.

In summary, the results of the LUSA Screening Tool found little divergence between the Build Scenarios and the No-Build Scenario. This suggests that there are few quality of life or resource impacts expected from the project.

15.0 INDIRECT AND CUMULATIVE EFFECTS SUMMARY

The time horizon for indirect and cumulative effects is 2040. The following sections summarize the potential indirect and cumulative effects.

15.1 INDIRECT LAND USE SUMMARY STATEMENT

Examination of the probable development areas shows that the Cape Fear Crossing project may encourage growth targeted to highway users in certain areas and/or influence future growth within the FLUSA. However, local planners indicated that overall, the developable areas of the FLUSA are likely to be developed with or without the project based on other contributing factors and growth trends. Federal, state, and local regulations provide protections from development to both the human and natural environments within the FLUSA. Indirect land use impacts to these resources should be limited by the regulations in place.

15.2 WATER QUALITY STATEMENT

Qualitative analyses of the probable development patterns in the FLUSA suggest that change in land use resulting from the project and subsequent private and public development actions could lead to an increase in impervious surface and could potentially have an effect on future stormwater runoff and water quality in the watersheds within the project area.

However, there are adopted ordinances and regulations to help mitigate potential water quality effects due to increased impervious surface coverage and increased water runoff. The Town of Leland, City of Wilmington, Brunswick County, and New Hanover County each have floodplain protection ordinances that include standards for development in the floodway and floodway fringe. Other stormwater permitting programs exist within the FLUSA. The Towns of Leland and Navassa and the City of Wilmington are currently NPDES Phase II entities and require stormwater permits. Both Brunswick County and New Hanover County are CAMA designated counties, and require permits for development projects that impact coastal wetlands and other areas of environmental concern.

Water quality concerns should be avoided and/or mitigated through compliance with regulations covering watershed protection, floodplain protection, stream and river buffers, and stormwater management.

Direct natural environmental impacts by the project would be addressed by avoidance, minimization, and mitigation, consistent with programmatic agreements with environmental resource and regulatory agencies during the permitting processes. Future development would be required to follow federal, state and local regulations for the protection of water quality.

15.3 CUMULATIVE EFFECTS

The cumulative effects analysis includes an assessment of past, current, and future projects that are reasonably foreseeable to determine potential cumulative effects.

15.3.1 PAST PROJECTS

The following table provides a list and brief description of the major past projects that have influenced growth and development in the FLUSA.

Table 14: Summary of Past Projects

Past Projects	Description of Action
Wilmington Bypass – Section A	Wilmington Bypass from US 17 to US 74/76 in Brunswick County.
Wilmington Bypass – Section C	Wilmington Bypass from US 421 to I-40 in Brunswick and New Hanover Counties.
Randall Parkway Widening	Randall Parkway, widened to multi-lanes from Independence Boulevard/Covil Avenue to South College Road in Wilmington.
Village Road (SR 1472) Widening	Village Road, widened to multi-lanes from west of SR 1437 (Old Fayetteville Road) to east of US 17 interchange ramps with dual left turn lanes on north ramp to US 17 in Leland.
Market Street – Section A (U-4902)	Market Street, provided access management improvements from SR 1272 (New Centre Drive) to Martin Luther King, Jr. Parkway.
Brunswick Forest Subdivision and multi-use area	A portion of the commercial and residential area of the Brunswick Forest development has occurred between US 17, Town Creek, and NC 133 in Brunswick County.
Mallory Creek Development	A portion of the commercial and residential area of the Mallory Creek development has occurred along NC 133 in Brunswick County.
Commercial development along US 17	Large-scale retailers, general commercial strip development, and gas stations have developed along the US 17 corridor over the last 15 years. This has mostly occurred west of the US 74/76 interchange to Lanvale Road in Brunswick County.
USACE Navigational Channel dredging project	In 2004, the Cape Fear River navigational channel in the vicinity of the Port of Wilmington was dredged to 42 feet. This allowed larger vessels to call the Port.

15.3.2 CURRENT PROJECTS

The following table provides a brief description of current projects that are likely to influence growth within the FLUSA.

Table 15: Summary of Current Projects

Current Projects	Description of Action
Barclay West	A multi-use development with residential and commercial development immediately located near the intersection of Independence Boulevard and S. 17th Street.
River Lights	Large scale residential development along River Road, south of Wilmington.
Brunswick Forest Subdivision and multi-use area	A portion of the commercial and residential area of the Brunswick Forest development is currently being developed just south of US 17.
Commercial development along US 17	Large-scale retailers, general commercial strip development, and gas stations have developed along the US 17 corridor over the last 15 years. This has mostly occurred west of the US 74/76 interchange to Lanvale Road in Brunswick County.

15.3.3 FUTURE PROJECTS

The following table provides a list and brief description of future projects that are likely to influence growth and development within the FLUSA.

Table 16: Summary of Future Projects

Future Projects	Description of Action
Wilmington Bypass – Section B (R-2633)	Wilmington Bypass from US 74/76 to US 421 in Brunswick County.
Independence Boulevard Extension (U-4434)	Extend Independence Boulevard from Randall Parkway to US 74 (Martin Luther King, Jr. Boulevard).
Village Road (R-3601)	From US 17/US 74/76, NC 133/SR 1472 (Village Road) interchange to the US 421/NC 133 interchange, add additional lanes on north and southbound lanes and widen bridge No. 107 and bridge No. 108.
US 17 Business (U-5869)	US 17 Business, US 17 (South 17th Street) to Covil Avenue in Wilmington. Construct a road diet.
Market Street (U-4902)	Provide access management improvements along Market Street from Colonial Drive to SR 1402 (Porters Neck Road)
US 74, US 17/US 421 (U-5731)	Construct a fly-over and free flow ramp at interchange.
Eastwood Road/Military Cutoff Road (U-5710)	Convert at-grade intersection to an interchange.
Martin Luther King, Jr. Parkway/College Road (U-5792)	Convert at-grade intersection to an interchange.
Carolina Beach Road (U-5729)	Upgrade roadway from US 421 (Burnett Avenue) to US 117 (Shipyard Boulevard) in Wilmington.
South Front Street (U-5734)	Widen to multi-lanes from US 17 Business/US 76/US 421 (Cape Fear Memorial Bridge) to US 421 (Burnett Boulevard) in Wilmington.
Carolina Beach Road (U-5790)	Widen existing roadway from NC 132 (South College Road) to Sanders Road and construct flyovers at US 421 and NC 132.
College Road (U-5702)	Provide access management and travel time improvements from SR 2048 (Gordon Road) to US 421 (Carolina Beach Road).
College Road (U-5704)	Provide access management and travel time improvements from Wilshire Boulevard to US 117 (Shipyard Boulevard). Includes the construction of a grade separated interchange at with US 76 (Oleander Drive).
Castle Hayne Road (U-5863)	Widen to multi-lanes from I-140/US 17 (Wilmington Bypass) to SR 1310 (Division Drive) in Wilmington.
Kerr Avenue (U-3338)	Widen to multi-lanes from Randall Parkway to US 74 (Martin Luther King, Jr. Parkway) in Wilmington.
Military Cutoff Rd Extension (U-4751)	Multi-lanes on new location from SR 1409 (Military Road) to US 17 in Wilmington.
Gordon Road (U-3831)	Widen to multi-lanes from NC 132 interchange ramp to west of US 17 Business (Market Street) in Wilmington.
New Route (U-5871)	Construct two-lane road on new location from SR 2432 (Raleigh Street) to River Road in Wilmington.
Brunswick Forest Subdivision and multi-use area	A future portion of the residential area of the Brunswick Forest development is to be developed along Town Creek.
Mallory Creek Development	A portion of the commercial and residential area of the Mallory Creek development is proposed in between Wire Road and the current residential development of Mallory Creek along NC 133.

Future Projects	Description of Action
Port of Wilmington Expansion	The NC Ports Authority has a proposed container yard improvement plan as well as a north-south transportation corridor internal to the Port.

15.3.4 CUMULATIVE EFFECTS SUMMARY STATEMENT

This project is expected to contribute to indirect and cumulative effects of future changes within the FLUSA. The project is expected to result in travel time savings to varying degrees depending on alternative. Depending on the chosen alternative, it will also change property access and exposure and create new land use and transportation nodes to varying degrees. Table 17 provides a summary of impaired and/or protected notable environmental features that are within the FLUSA and highlights likely foreseeable cumulative impacts from the proposed project.

Direct environmental impacts by NCDOT projects are addressed by avoidance, minimization or mitigation, consistent with programmatic agreements with the natural resource agencies during permitting. All development will be required to follow local, state and federal guidelines and permitting requirements.

Table 17: Summary of Notable Environmental Resources and Foreseeable Impacts

Notable Environmental Resources	Description	Foreseeable Impacts
Section 4(f) Resources	The following Section 4(f) Resources exist in the FLUSA:	
-Public parks and recreation lands	Several parks and recreation facilities are located within the project study area.	Direct impacts to park and recreational facilities are not anticipated.
Voluntary Agricultural Districts (VADs)	Six farms in Brunswick County are protected as VADs, which have a conservation agreement between the landowner and the county prohibiting non-farm use or development for a period of at least ten years.	If the VADs are not renewed and conversion to residential or other land uses takes place productive farmland will be reduced. These VADs are all located within PDAs.
Coastal Zone	Brunswick County and New Hanover County are designated as CAMA counties and applicable CAMA land use regulations are in place.	Under CAMA regulations, any development within an AEC will require a CAMA permit. CAMA mitigation or minimization of impacts is expected.

Notable Environmental Resources	Description	Foreseeable Impacts
Conservation Easements	Several areas of land have been purchased as conservation easements within the FLUSA including wetlands and croplands. These lands carry deed restrictions that prohibit development activity. This includes the Clarendon Plantation.	No direct impacts are expected, as deed restrictions are in place that will prohibit changes in land use. However, habitats on adjacent properties that are unprotected could be destroyed or impaired and effect biological diversity on the conservation easements. These wetlands help absorb stormwater runoff and negate water quality impacts.
Environmental Justice (EJ)	Populations, including the Spring Hill community in Brunswick County and several neighborhoods in New Hanover County near US 76 that surpass thresholds for environmental justice.	Indirect and cumulative effects may include gentrification or being priced out of the community due to increased development pressures. The project may increase air pollution or create a barrier effect on the EJ communities.
Primary [Fishery] Nursery Areas (PNA)	The entire lengths of the Cape Fear, Northeast Cape Fear, and Brunswick Rivers within the FLUSA have been designated as PNAs, except for the dredged navigational channel. These areas represent critical areas for numerous species including finfish and crustaceans, which are of commercial and recreational importance.	Induced growth and development would increase stormwater runoff and turbidity which would negatively impact habitat.
Prime and Unique Farmland Soils	Prime and Unique Farmland soils exist within the FLUSA in Brunswick County. Potential direct impacts to prime and unique farmland soils will be assessed in the Community Impact Assessment.	Induced growth from the project will likely reduce active farmland within the FLUSA.
Natural Heritage Program Natural Areas (NHPNA)	Several NHPNAs exist within the FLUSA. NHPNAs contain one or more high-quality or rare natural communities, rare species, and/or special animal habitats. The Clarendon Plantation is the most notable NHPNA property within the FLUSA and is owned by the NC Coastal Land Trust.	Induced growth could create pressure to develop neighboring parcels that are currently undeveloped or in open space active land uses. This would contribute to habitat fragmentation and impair water quality, limiting the integrity of the NHPNA. Induced growth from the Northern and Southern Build Alternatives is probable for the area near the Clarendon Plantation.

Notable Environmental Resources	Description	Foreseeable Impacts
Targeted Local Watersheds	Six watersheds in the FLUSA are designated as Targeted Local Watersheds by the NC Division of Mitigation Services. Targeted Local Watersheds have a high need for improvement and a high potential to benefit from restoration efforts, many of which occur in form of mitigation from the NCDOT.	Increased surface water runoff from induced growth could further contribute to the degradation of the targeted local watersheds.
303(d) Streams	Seven streams within the FLUSA are listed as impaired for one or more of the various reasons: dissolved oxygen, dissolved ph, copper, chlorophyll a, and shellfish growing area-prohibited.	Increased surface water runoff from induced growth could further contribute poor water quality.
Stream Buffers	No buffer rules exist for the Cape Fear River Basin within the FLUSA. Protection of stream buffers is limited to applicable regulations from CAMA and local floodplain and zoning regulations.	Built areas within buffers are prone to flooding and contribute to flood events downstream.
Water Quality	Wetlands are located throughout the FLUSA and are protected under Section 401 and 404 of the Clean Water Act.	Induced development will eliminate wetlands, which may lead to a cumulative aggregate loss of wetlands.

16.0 CONCLUSIONS AND NEXT STEPS

The results of the LUSA show little divergence between the Build Scenarios and the No-Build Scenario for the project; however, the impacts from indirect and cumulative effects on the natural and cultural resources are still important considerations. Key takeaways from the analysis show that:

- Each of the Build Scenarios will further improve transportation efficiencies in the FLUSA, making this area more attractive to residential and commercial growth.
- NCDOT should consider what level of access management is proposed for each alternative during the alternative selection process given the findings that the alternatives that will remain partial control of access (No-Build and Upgrade Existing US 17 – Arterial Widening) are expected to encourage lower-density and sprawling development patterns. Conversely, The Upgrade Existing US 17 – Full Control of Access, Northern Alternatives, and Southern Alternatives will provide control of access measures that will encourage more clustering of development and higher density development patterns near the proposed interchange locations.
- Preservation of land through conservation easements and/or acquisition by an organization or group can help protect natural areas from future development.

17.0 SOURCES

AECOM. *North Carolina Maritime Strategy.* Report, Raleigh: NCDOT, 2011.

Brunswick County. "Brunswick County Unified Development Ordinance." 2015.

Brunswick County. "Brunswick Tomorrow Comprehensive Plan." 2004.

Brunswick County. "Coastal Area Management Act (CAMA) Core Land Use Plan." 2011.

—. "Stormwater Ordinance." *Brunswick County, NC.* September 16, 2002. http://www.brunswickcountync.gov/engineering/files/2015/02/Storm_Water_Manual.pdf (accessed July 2015).

HNTB. *Final Traffic Forecast for STIP U-4738, Cape Fear Skyway.* Technical Memorandum, Raleigh: NCDOT, 2014.

ITRE. *Economic Contribution of the North Carolina Ports.* Raleigh: ITRE, 2014.

Kimley-Horn and Associates, Inc. "Connecting Northern Brunswick County." Plan, 2013.

Lane, Russ, interview by Celia Foushee. *H2GO Utilities Director* (July 22, 2015).

Lawrence Group. *Town of Leland Master Plan.* Plan, Leland: Town of Leland, 2009.

Lawrence, David and Warren Jake Wicker. *Municipal Governments in North Carolina, Second Edition.* Chapel Hill: Institute of Government, 1996.

Louis Berger Group, Inc. *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Volume II.* Practitioner's Handbook, Raleigh: NCDOT, 2001.

National Oceanic and Atmospheric Administration. "Essential Fish Habitat Mapper v3.0." *National Marine Fisheries Service.* 2010. http://www.habitat.noaa.gov/protection/efh/habitatmapper.html (accessed 2015 July).

NC Coastal Land Trust. *NC Coastal Land Trust.* 2015. www.coastallandtrust.org (accessed June 1, 2015).

NC Department of Commerce. *Largest Employers.* 2015. http://esesc23.esc.state.nc.us/d4/QCEWLargestEmployers.aspx (accessed 2015).

—. *Tourism Services.* 2013. http://www.nccommerce.com/tourism/research/economic-impact/teim (accessed May 2015).

NC Department of Environment and Natural Resources. "Anadromous Fish Spawning Areas Maps." *Division of Marine Fisheries.* May 1, 2015. http://portal.ncdenr.org/web/mf/afsa-maps (accessed July 2015).

NC Department of Natural Resources. *EEP Watershed Priority Map.* 2012. http://portal.ncdenr.org/web/eep/priorities-map (accessed June 1, 2015).

—. *EEP Watershed Priority Map.* 2015. http://portal.ncdenr.org/web/eep/priorities-map (accessed June 10, 2015).

—. "Natural Heritgage Program." *Heritage Data Search.* April 13, 2015. http://www.ncnhp.org/web/nhp/database-search (accessed June 1, 2015).

—. "Natural Heritgage Program." *Heritage Data Search.* April 13, 2015. http://www.ncnhp.org/web/nhp/database-search (accessed June 10, 2015).

NC Department of Natural Resources, Division of Water Resources. *303(d) Impaired Waterbodies List.* 2014. http://portal.ncdenr.org/web/wq/ps/csu/swstandards/303d (accessed June 1, 2015).

—. *Surface Water Classifications.* 2015. http://portal.ncdenr.org/web/wq/ps/csu/classifications (accessed June 1, 2015).

NC Department of Transportation. "Natural Resources Technical Report." Report, 2014.

—. "Strategic Transportation Corridors." *Connect NCDOT .* March 4, 2015. https://connect.ncdot.gov/projects/planning/Pages/NCTransportationNetwork.aspx (accessed June 2015).

NC Office of State Budget and Management. *State Demographics Unit.* 2014. http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/county_projections.shtm (accessed June 17, 2015).

NC State Ports Authority. *2015 Cargo and Truck Rail Movement.* 2015.

—. *Port of Wilmington.* 2012. http://www.ncports.com/port-of-wilmington/ (accessed June 1, 2015).

NCDENR, Division of Marine Fisheries. *Fishing Nursery Areas, Map 27.* March 2011. http://portal.ncdenr.org/web/mf/primary-nursery-areas (accessed June 10, 2015).

NCDOT. "Feasibility Study for the Wilmington Southern Bridge from US 17 Bypass near Bishop to US 421." Raleigh, 2003.

—. "NCDOT State Transportation Improvement Program." *STIP.* June 2015. https://connect.ncdot.gov/projects/planning/Planning%20Document%20Library/LIVE_STIP.pdf (accessed July 17, 2015).

NerdWallet. *Best Places to Start A Business.* April 27, 2015. http://www.nerdwallet.com/blog/small-business/best-places-to-start-business-2015/ (accessed June 8, 2015).

Nickels, John, interview by Celia Foushee. *Brunswick County Public Utilities Assistant Director* (July 21, 2015).

South Atlantic Fishery Management Council. "Shrimp, Red Drum, Snapper and Grouper, and Coastal Migratory Pelagics Management Plants." 1998. http://www.safmc.net/resource-library/fishery-management-plans-amendments.

Strickland, Jimmy, interview by Celia Foushee. *Town of Leland - Public Utilities Director* (03 04, 2015).

Town of Navassa. *Future Land Use Plan.* Navassa, NC: Town of Navassa, 2011.

Town of Navassa. *Zoning Ordinance.* Ordinance, Navassa, NC: Town of Navassa, 2010.

U.S. Department of Labor Statistics. *Local Area Unemployment Statistics.* March 2015. http://www.bls.gov/lau/ (accessed June 1, 2015).

urbanSMARTgrowth. "Town of Belville Renaissance Plan." Plan, Belville, 2007.

Wilmington Business Development. *Economic Impact Data Affirms WBD Results.* December 18, 2014. http://www.wilmingtonbusinessdevelopment.com/economic-impact-data-affirms-wbd-results/ (accessed June 8, 2015).

WMPO. "Cape Fear Commutes 2035 Transportation Plan." Plan, Wilmington, 2010.

Woods & Poole Economics, Inc. *North Carolina 2014 State Profile.* Data, Washington D.C.: Woods & Poole Economics, 2014.