

# FEASIBILITY STUDY

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Widening of NC 241  
from NC 24 North to SR 1151 (Bob Stroud Road)

Duplin and Lenoir Counties

Divisions 2 and 3

FS-1202A



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# **Widening of NC 241 From NC 24 North to SR 1151 (Bob Stroud Road)**

## **Duplin and Lenoir Counties**

### **FS-1202A**

#### **I. INTRODUCTION**

This feasibility study provides an initial review of the proposed widening of NC 241 in Beulaville from NC 24 in Duplin County north to SR 1151 (Bob Stroud Road) in Pink Hill, Lenoir County, a distance of approximately seven miles not including the proposed bypasses of Beulaville and Pink Hill. The feasibility study is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. The purpose of this study is to describe the proposed project, including cost, and to identify potential issues that may require consideration in the planning and design phases and help to determine the feasibility of the project.

For this report, a study area was developed to delineate the limits of the environmental constraints that may have a potential impact to the project. This study area or “feasibility study area” includes the limits of the design concepts and varies in width from approximately 10,775 feet near Kennedy Lane/Church Road, widening to 29,880 feet and 15,250 feet near Beulaville (along NC 24) and Pink Hill, respectively. **Figure 1** shows the general project location and feasibility study area.

#### **II. PURPOSE AND NEED**

The primary need of the proposed project includes the following:

- Lack of connectivity in Eastern North Carolina:

##### Camp Lejeune and I-95:

Marine Corps Base Camp Lejeune is a 246 square mile United States military training facility in Jacksonville, NC. The base’s 14 miles of beaches make it a major area for amphibious assault training and its location between two deep water ports (Wilmington and Morehead City) allows for fast deployments. Duplin County is centrally located among seven major military bases in eastern North Carolina, including Camp Lejeune Marine Corps Base, New River Marine Corps Air Station, Cherry Point Marine Corps Air Station and Naval Aviation Depot, Ft. Bragg, and Seymour Johnson Air Force Base, which comprise approximately 10 percent of the area’s economy. Road improvements are badly needed in eastern North Carolina and strategic planning efforts are underway by the military. Facility traffic is expected to increase with shared training requirements between Ft. Bragg and Camp Lejeune, especially as troops return to North Carolina. A

more direct north-south route is needed to provide improved movement of troops, both on and off duty.

- Lack of direct highway access between the Global TransPark and the Port of Wilmington which is vital to economic development in the region.

Global TransPark and the Port of Wilmington (via I-40):

The North Carolina Global TransPark (GTP) is a 2,500-acre industrial/airport site situated strategically in Eastern North Carolina, between the Raleigh-Durham area and the coastal region. The GTP includes an airport with an 11,500 x 150 foot runway, the longest commercial runway in the State, and is located near several major military installations, as well as two deep water ports. The GTP includes 5,775 acres environmentally permitted for development and industrial sites that are shovel ready with electric, natural gas, water, and sewer utilities. The GTP is designated by the United States Transportation Command (USTRANSCOM) as an alternate point of aerial embarkation/debarkation for the U.S. Marine Corps. The mission of USTRANSCOM is to provide air, land, and sea transportation for the Department of Defense (DoD), both in times of peace and times of war. Additionally, the GTP is a designated Inland Port, servicing both Wilmington and Morehead City, and there is a 25-year agreement with the DoD to use the GTP runway for training. Road improvements between the GTP and I-40 are needed as the State of North Carolina and the North Carolina Global TransPark Authority are committed to recruitment and growth of business and industry at the GTP. An efficient transportation link between the GTP and the Port of Wilmington via I-40 is needed to provide interstate connectivity to take advantage of the State's access to a viable port and enhance the attractiveness of GTP to potential business development and potential employment opportunities at the Global TransPark, as well as in the region.

The primary purpose of the proposed project includes the following:

- Improve access to Eastern North Carolina.

Connectivity among the traveled routes - NC 241, NC 24, and NC 41 - in close proximity to Beulaville, Pink Hill, and EastPark (an industrial center located west of Beulaville) is lacking. Local use mixing with through traffic, including military traffic, on NC 241 and NC 24 causes motorists to experience delays, specifically through the Towns of Beulaville and Pink Hill. Access in eastern North Carolina between Camp Lejeune and I-95 is limited, which has the potential to delay the movement of troops especially in a time of mass mobilization.

Additionally, Pink Hill sits strategically on the southern corner of Lenoir County and the northern corner of Duplin County with portions of its Town in both counties. Lack of a multi-lane facility into Pink Hill limits Duplin County residents from accessing the services in Pink Hill, a shared community between the two counties.

- Improve interstate connectivity and mobility in Eastern North Carolina for hurricane evacuation.

Currently, there is one route, NC 24, which serves as a hurricane evacuation route out of Onslow County into Duplin County. Hurricane Evaluation Routes are selected because they can accommodate heavy traffic volumes and have higher speed limits. They also provide a direct path to areas not usually affected by hurricanes. While NC 24 varies between a five-lane and four-lane divided facility between Jacksonville and Beulaville, in downtown Beulaville NC 24 has traffic signals and numerous driveways which present delays for traffic evacuating the coast of North Carolina. Lack of an access-managed facility impedes mobility through Beulaville which in turn is expected to delay vehicles during hurricane evacuations.

- Improve mobility between the Global TransPark and the Port of Wilmington via I-40.

The port is an invaluable asset for the transport of goods and commerce and better connectivity to eastern North Carolina and the port is expected to improve commerce and employment in an area of the State that typically experiences higher unemployment than other areas of the State. As an alternate point of aerial embarkation/debarkation and a designated Inland Port, GTP is a key component for the military, serving as an alternate departure or return site for military contingencies or emergencies, which requires appropriate access to/from the military bases to GTP. Access between the Global TransPark and I-40, as well as to the deep water port located in Wilmington (via I-40), is limited. Duplin County is served by I-40, US 117, NC 11, NC 24, NC 50, NC 403, and NC 903; however, the County lacks full control of access routes that access the I-40 and I-95 corridors. Lack of a supporting link to both I-40 and I-95 west of Beulaville hinders the movement of goods and services in the area.

### **III. EXISTING CONDITIONS**

NC 241 within the feasibility study area is generally two lanes with grassed shoulders. Existing land uses along NC 241 are rural in nature, and include predominantly residential, agricultural, and undeveloped forested land uses. NC 241 serves residential properties and connects NC 24 and NC 11. NC 241 through Pink Hill includes residential and commercial development.

NC 24 within the feasibility study area west of NC 241 is a four-lane divided roadway with a grassed median. East of Miller Road, NC 24 transitions to five-lanes with a center turn lane and paved shoulders. NC 24 has numerous driveways through the Town of Beulaville serving commercial, residential, and retail properties. Development to the west and north of Beulaville is limited by Limestone Creek.

NC 11 within the feasibility study area west of NC 241 is generally two lanes with grassed shoulders. Land use along existing NC 11 north of Pink Hill varies from scattered residential and undeveloped forested land uses to more dense linear residential development and agricultural

use with scattered commercial development. NC 11 has several driveway connections and connects NC 241 and US 258.

NC 24 is included by the State as Strategic Highway Corridor 47 serving as an expressway (connecting Fayetteville to Morehead City, via NC 24 and US 70). NC 11 through the feasibility study area is included by the State as Strategic Highway Corridor 53 serving as a freeway (connecting Wilmington to Norfolk, VA, via I-40, NC 24, NC 11, and US 13). The primary purpose of the Strategic Highway Corridors initiative is to provide a network of high-speed, safe, reliable highways throughout North Carolina (NCDOT, 2012).

Both NC 11/NC 903 and US 258 in the project area are included by the State as Strategic Highway Corridors. NC 11/NC 903 is proposed to be a freeway in the vicinity of the feasibility study area from Kenansville to Pink Hill and US 258 is proposed as an expressway to be widened to multi-lanes from Jacksonville, through Richlands, to Kinston. As an option to upgrading NC 11/NC 903 and US 258, Duplin and Lenoir County officials recommend widening NC 241 between Beulaville and Pink Hill. The local officials and Rural Planning Organization suggest designating NC 241 as a Strategic Highway Corridor, serving as a freeway facility rather than NC 11/NC 903 (freeway) and US 258 (expressway).

#### **Other Planned Transportation Projects**

There are two projects in the Draft 2015-2025 State Transportation Improvement Program (STIP) near the study area. These include:

- B-4502 Replace Bridge No. 144 on SR 1704 (Kitty Noecker Road) over Panther Creek
- B-5534 Replace Bridge No. 82 on NC 111 over Burnt Coat Creek

#### **Commuting Patterns**

Both Duplin and Lenoir Counties have substantial commuting populations. Based on 2010 Census data, a total of 7,815, or 42 percent of workers who resided in Duplin County also worked within Duplin County. Another 9,341 workers commuted into Duplin County from other counties, while 10,595 workers residing in Duplin County commuted to other counties. Of those residents who commute out of Duplin County, 910 commute to Lenoir County and likely use the routes being studied: NC 241 and NC 11. In Lenoir County, 9,955 or 46 percent of workers who resided in Lenoir County also worked within Lenoir County. Another 12,508 workers commuted into Lenoir County from other counties and 11,794 workers commuted from Lenoir County to other counties to get to work. Of those residents who commute out of Lenoir County, 613 commute to Duplin County and likely use NC 241 and NC 11.

### **IV. DESCRIPTION OF ALTERNATIVES**

NC 241 is proposed to be widened in Beulaville from NC 24 in Duplin County north to SR 1151 (Bob Stroud Road) in Pink Hill, Lenoir County. The proposed design concepts for this project consist of widening NC 241 from a two-lane arterial roadway to a four-lane divided shoulder

section between Pink Hill and Beulaville and bypasses of Pink Hill and Beulaville. **Figure 2** presents the typical mainline cross section for the four-lane divided section. For evaluation purposes, the project was divided into segments.

One design concept proposes a freeway typical section for NC 241 that includes full control of access with a 46-foot wide grass median with 12-foot travel lanes in a 300-foot right-of-way and service roads in an additional 150-foot right-of-way. Under the freeway option, all intersecting roads must be converted to overpasses, underpasses, interchanges, or reconfigured to not intersect NC 241. The proposed freeway design concept includes some realignment of intersecting roads, such as Sarecta Road and Kennedy Lane/Church Road, proposed to bridge over NC 241. No private driveway connections would be allowed. A control of access fence would be placed along the roadway (with the exception of ramp entrances and exits) at a minimum of 1,000 feet beyond the ramp intersections on the cross-streets (Y lines), if possible.

The second design concept proposes widening NC 241 from a two-lane arterial roadway to a four-lane divided expressway that includes partial control of access with a 46-foot wide grass median and with 12-foot travel lanes. Under the expressway option, the right-of-way to accommodate the interchange footprint would be purchased although the connections are proposed as at-grade intersections with the potential to be converted to interchanges at a later date. The expressway option may include some minor realignment of intersecting roads as at-grade intersections with NC 241 and parcels would be allowed one access point per parcel.

### ***Description of Segment Alternatives***

Initially, the design concepts developed included a bypass of Beulaville on the north side of town between NC 24 and NC 241, north of Limestone Creek. The design concepts in Pink Hill included a bypass on the west side of town and a widening scenario through Pink Hill. These design concepts were presented to local officials at a scoping meeting on August 16, 2012. After review and discussion, the following changes were made to the design concepts:

- Two full northern bypasses of Beulaville are being studied – one closer to town (inner loop) and one further away from town (outer loop);
- Eastern and western bypasses of Pink Hill are being studied; and
- Widening NC 241 to freeway standards, including interchanges, overpasses, and service roads is being studied and NC 241 as a four-lane arterial was eliminated.

The design concepts were revised to reflect the design changes discussed at the scoping meeting held on August 16, 2012 (summary included in **Appendix A**) and functional designs were prepared. **Figure 3A** depicts the functional design concepts for the freeway option including the revisions outlined above. A description of each freeway option is discussed below.

**Beulaville Inner Loop** (freeway option) - The Beulaville Inner Loop is located on the north side of NC 24 between Limestone Creek and the Town of Beulaville. It runs from NC 24 in a northeastern direction parallel to and north of Turkey Branch Road, crossing NC 241, and runs parallel to and south of Penny Road back to NC 24. The inner loop includes trumpet



interchanges at both locations along NC 24 and includes interchanges with NC 241 and NC 41. The provision of the inner loop would include a realignment of and interchange with Sarecta Road, as well as grade separation of NC 111. The inner loop does not include a crossing of Limestone Creek, but may cross tributaries of Limestone Creek. The relocations estimated to occur within this segment include 116 residences, 25 businesses, one church, one cemetery, and one cell tower (**Table 12**). One of the business relocations is a hog farm with an open pit lagoon and surrounding spray field. This segment may also require the relocation of a pump station.

Beulaville Outer Loop (freeway option) - The Beulaville Outer Loop is also located on the north side of NC 24; however, it is located north and west of Limestone Creek. It runs from NC 24 in a northerly direction parallel to and west of Miller Road, crossing NC 111, NC 241, and NC 41, also running parallel to and south of Penny Road back to NC 24. The outer loop includes trumpet interchanges at both locations along NC 24 and includes an interchange with NC 111, NC 241, and NC 41. The provision of the outer loop would also include a realignment of Sarecta Road which would bridge NC 241, as well as grade separations with Ottis Miller Road and Miller Road. The outer loop includes a major crossing of Limestone Creek, as well as crossings of tributaries of Limestone Creek. The relocations estimated to occur within this segment include 77 residences, 19 businesses, one church, and one cemetery (**Table 12**). One of the business relocations is a hog farm with an open pit lagoon and surrounding spray field. Additional hog farms, lagoons, and spray fields, as well as turkey houses may be acquired.

Mainline and Service Roads (freeway option) - NC 241 would be widened to a four-lane median divided facility beginning north of Beulaville at the Beulaville loops to south of Pink Hill at the Pink Hill Bypass. NC 241 will have a trumpet interchange at the Pink Hill Bypass and a fully directional interchange at the Beulaville loops. Widening NC 241 to freeway standards would include providing an overpass for Sumner Road over NC 241 and realigning Kennedy Lane/Church Road to provide an interchange with NC 241. In addition, W. Pleasant Hill Road would be realigned to tie into Howard Family Road. The relocations estimated to occur along the mainline (NC 241) include 108 residences, 14 businesses, three churches, and one cemetery (**Table 12**). This segment would also include impacts to a golf course.

Service roads would be provided along both sides of existing NC 241 beginning at the realigned Sarecta Road. The service road along the west side of NC 241 would parallel NC 241 to the west until it crosses Parker Heath Road where it turns west tying into Tapp Farm Road. The service road along the east side of NC 241 would parallel NC 241 and tie into Sumner Road. The east side service road was not extended for the length of the project because there are existing roadways in the feasibility study area that provide connectivity north of Sumner Road. These service roads would provide access from the improved NC 241 to properties located along and off of existing NC 241 from north of Beulaville to south of Pink Hill. The relocations estimated to occur with construction of the service roads include 6 residences and one business (**Table 12**).

Pink Hill Western Bypass (freeway option) - The Pink Hill Western Bypass extends west from NC 241 at Howard Family Road, crosses over Tapp Farm Road where it turns north as it crosses Kitty Noecker Road and NC 11. The Western Bypass then turns east, crosses Bill Sutton Road, and continues around the north side of Pink Hill, tying in to NC 11 north of Pink Hill. The Western Bypass includes trumpet interchanges at NC 241 south of Pink Hill and NC 11 north of Pink Hill and includes an interchange with NC 11 west of Pink Hill. The provision of the western bypass would also include grade separations with Tapp Farm Road, Kitty Noecker Road, Lester Turner Road, Bill Sutton Road, and Old Pink Hill Road. The relocations estimated to occur within this segment include 16 residences, 6 businesses, and one cemetery (**Table 12**).

It should be noted that after additional meetings with the stakeholders, the northern terminus of this design concept was revised to terminate at the same location along NC 11 as the Pink Hill Eastern Bypass, in the vicinity of SR 1151 (Bob Stroud Road), which is slightly north of its original termination location. Estimated relocations associated with this design concept remain unchanged from those identified above.

Pink Hill Eastern Bypass (freeway option) - The Pink Hill Eastern Bypass extends east from NC 241 beginning south of W. Pleasant Hill Road and parallels W. Pleasant Hill Road for a short time before it turns north. The Eastern Bypass crosses Howard Family Road, Potters Hill Road, W. Pleasant Hill Road, and Earl Howard Road, tying into NC 11 north of Pink Hill. The Eastern Bypass includes trumpet interchanges at NC 241 south of Pink Hill and NC 11 north of Pink Hill, and includes an interchange with W. Pleasant Hill Road. The provision of the eastern bypass would also include grade separations to carry Howard Family Road, Potters Hill Road, and Earl Howard Road over the bypass. This alternative also includes the realignment of several intersecting roads, including Howard Family Road, Earl Howard Road, and W. Pleasant Hill Road.

Based upon discussions with the stakeholders at a project update meeting held on July 15, 2013, the Pink Hill Eastern Bypass was eliminated from further study. The stakeholders prefer the Pink Hill Western Bypass as it includes improved access to NC 11 which is the predominant traffic flow. The relocations estimated to occur within the Pink Hill Eastern Bypass include 98 residences, 15 businesses, and 1 cemetery. This 5.5 mile segment is estimated to cost \$84 million for construction and \$52.2 million for right-of-way.

### ***Segment Alternatives Added for Further Study***

Through the analysis process and based upon discussions with the stakeholders at a project update meeting held on July 15, 2013 (summary included in **Appendix A**), it was agreed that the design concepts would be revised and an expressway option on freeway right-of-way would be developed and presented to the stakeholders. **Figure 3B** depicts the functional design concepts for the expressway option. A description of each expressway option is discussed below.

Beulaville Inner Loop (expressway option) - The Beulaville Inner Loop is located on the north side of NC 24 between Limestone Creek and the Town of Beulaville. It runs from NC 24 in a northeastern direction parallel to and north of Turkey Branch Road, crossing NC 241, and runs parallel to and south of Penny Road back to NC 24. The inner loop includes intersections at

both locations along NC 24, as well as with NC 241. The provision of the inner loop would include a minor realignment of and intersection with Sarecta Road, as well as intersections with NC 111 and NC 41. The inner loop does not include a crossing of Limestone Creek, but may cross tributaries of Limestone Creek. The relocations estimated to occur within this segment include 81 residences, 22 businesses, one cemetery, and two cell towers (**Table 12**). One of the business relocations is a hog farm with an open pit lagoon and surrounding spray field. This segment may also require the relocation of a pump station.

Beulaville Outer Loop (expressway option) - The Beulaville Outer Loop is also located on the north side of NC 24; however, it is located north and west of Limestone Creek. It runs from NC 24 in a northerly direction parallel to and west of Miller Road, crossing NC 111, NC 241, and NC 41, also running parallel to and south of Penny Road back to NC 24. The outer loop includes intersections at both locations along NC 24 and includes an intersection with NC 111, NC 241, and NC 41. The provision of the outer loop would also include an intersection with Sarecta Road, as well as an intersection with Miller Road and an overpass of Ottis Miller Road. The outer loop includes a major crossing of Limestone Creek, as well as crossings of tributaries of Limestone Creek. The relocations estimated to occur within this segment include 64 residences, 12 businesses, one cemetery, and one cell tower (**Table 12**). One of the business relocations is a hog farm with an open pit lagoon and surrounding spray field. Additional hog farms, lagoons, and spray fields, as well as turkey houses may be acquired.

Mainline (expressway option) - NC 241 would be widened to a four-lane median divided facility beginning north of Beulaville at the Beulaville Bypasses (Inner or Outer) to south of Pink Hill at the Pink Hill Bypass. NC 241 will have an intersection at the Pink Hill Western Bypass, as well as the Beulaville Bypasses. Widening NC 241 to expressway standards would include intersections and minor realignments at Baker Road and Sumner Road, as well as realigning Kennedy Lane/Church Road to provide an intersection with NC 241. In addition, Country Club Road would be slightly realigned to intersect NC 241 and W. Pleasant Hill Road would be realigned to tie into Parker Heath Road. The relocations estimated to occur along the mainline (NC 241) include 92 residences, 14 businesses, two churches, and one cemetery (**Table 12**). This segment would also include impacts to a golf course.

Under the expressway option, service roads would not be needed along both sides of NC 241. Access from the improved NC 241 to properties located along and off of existing NC 241 from north of Beulaville to south of Pink Hill would be provided under the expressway option.

Pink Hill Western Bypass (expressway option) - The Pink Hill Western Bypass extends west from NC 241 at Howard Family Road, crosses over Tapp Farm Road where it turns north as it crosses Kitty Noecker Road and NC 11. The Western Bypass then turns east, crosses Bill Sutton Road, and continues around the north side of Pink Hill, tying in to NC 11 north of Pink Hill. The Western Bypass includes intersections at NC 241 south of Pink Hill and NC 11 north of Pink Hill and includes an intersection with NC 11 west of Pink Hill. The provision of the western bypass would also include intersections with Tapp Farm Road, Kitty Noecker Road, Lester Turner Road,

Bill Sutton Road, and Old Pink Hill Road. The relocations estimated to occur within this segment include 17 residences, 5 businesses, one church, and one cemetery (**Table 12**).

**Table 1** includes a summary of the freeway and expressway design concepts selected for further study.

**Table 1**  
**Design Concepts Identified for Further Study**

Segment	Location	Description
Beulaville Inner Loop	Between Limestone Creek and the Town of Beulaville	Freeway with interchanges
		Expressway with intersections
Beulaville Outer Loop	North of NC 24 and north and west of Limestone Creek.	Freeway with interchanges
		Expressway with intersections
NC 241 Mainline	North of Beulaville from the Inner/Outer Loops to south of Pink Hill at the Pink Hill Western Bypass	Four-lane median divided facility with interchanges
		Four-lane median divided facility with intersections
Service Roads (East & West)	Along both sides of existing NC 241	Two-lane roads with intersections for access
Pink Hill Western Bypass	Extends from NC 241 at Howard Family Road west and north of Pink Hill to NC 11	Freeway with interchanges
		Expressway with intersections

At this stage, the design alternatives presented in this study do not depict the exact location of the project, but provide a reasonable location with which to provide a cost estimate and evaluate environmental constraints. The widening of NC 241 as part of this project is depicted as symmetrical widening; however, a best-fit alternative should be studied in the environmental document to minimize impacts to the human and natural environment. Additionally, Division 2 recommends that all fill slopes for the proposed design alternatives are 3:1 or flatter.

### Access Management

For the freeway option, access management is not a component of the design because it is inherently covered in the controlled access of freeway facilities. For the expressway option, access management is a key component of the design. The bypass facilities are new and therefore undeveloped while NC 241 is not heavily developed in this area and is more rural and residential in land use. All of the expressway facilities as part of this project are four-lane median divided facilities. The median typical section in and of itself assists in access management by concentrating movements and providing a means to adequately space full movement median openings. For this effort, NCDOT's Median Crossover Guidelines were utilized to determine full movement intersection locations. It is imperative to maintain the integrity of the new Pink Hill and Beulaville Bypasses and the improved NC 241 that access management techniques be utilized as development occurs in the area. This includes but is not

limited to proper median opening spacing, cross connectivity, internal circulation, and access off side streets in lieu of the mainlines.

## V. TRAFFIC AND SAFETY

### Traffic Analysis

Level of service (LOS) is the standard measure of effectiveness used to determine the quality of service provided by transportation facilities and is represented by a letter designation of A to F (**Table 2**). LOS A represents the best operating conditions and LOS F represents a breakdown in traffic flow. Synchro 7 was used for all intersection analyses while the Highway Capacity Manual 2010 methodologies using the Highway Capacity Software (HCS 2010) was used to perform freeway and multilane highway analyses.

**Table 2**  
**Level of Service Classifications and Conditions**

Level of Service (LOS)	Traffic Flow Conditions
A	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The general level of physical and psychological comfort provided to the driver is still high.
B	Reasonably free flow operations. The ability to maneuver within the traffic stream is only slightly restricted and the general level of physical and psychological comfort provided to the driver is still high.
C	Flow with speeds at or near free flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension because of the additional vigilance required for safe operation.
D	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is more noticeably limited. The driver experiences reduced physical and psychological comfort levels.
E	At lower boundary, the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.
F	Breakdowns in traffic flow. The number of vehicles entering the highway section exceeds the capacity or ability of the highway to accommodate that number of vehicles. There is little or no room to maneuver. The driver experiences poor levels of physical and psychological comfort.

Source: Transportation Research Board, 2000

The 2012 Annual Average Daily Traffic (AADT) along NC 241 ranges from approximately 4,300 vehicles per day south of NC 11 in Pink Hill to 11,100 vehicles per day north of NC 24 in

Beulaville. The 2012 AADT along routes within the feasibility study area are listed in **Table 3**. Project AADT data was taken from the project level traffic forecast included in **Appendix B**.

**Table 3**  
**2012 No-Build Average Daily Traffic Volumes**

Route	Location	No-Build
<b>NC 241</b>	North of NC 24	11,100
	South of Sarecta Road	4,300
	North of Church Road	3,900
	North of Parker Heath Road	3,800
	North of Howard Family Road	3,900
	South of NC 11	4,300
<b>NC 24</b>	West of NC 241	14,200
	East of NC 241	12,600
<b>NC 11</b>	West of Pink Hill	2,800
	West of NC 241	4,300
	East of NC 241	7,300
	North of Rosewood Drive	7,100
<b>NC 11</b>	North of Pink Hill / HC Turner Road	6,900

The 2035 AADT along NC 241 for the No-Build scenario ranges from approximately 5,800 vehicles per day near Parker Heath Road south of Pink Hill to 15,500 vehicles per day north of NC 24 in Beulaville. The 2035 AADT along routes within the feasibility study area for the No-Build scenario, as well as the Build scenarios, is listed in **Table 4**.

**Table 4**  
**2035 Average Daily Traffic Volumes**

Route	Location	No-Build	Pink Hill Western Bypass	Pink Hill Western Bypass (Freeway)
<b>NC 241</b>	North of NC 24	15,500	10,100	10,100
	South of Sarecta Road	6,100	6,100	6,100
	North of Church Road	5,800	5,800	5,800
	North of Parker Heath Road	5,800	5,800	5,800
	North of Howard Family Road	6,000	4,100	4,100
	South of NC 11	6,600	4,700	4,700
<b>NC 24</b>	West of NC 241	23,200	16,000	16,000
	East of NC 241	20,800	17,400	17,400
<b>NC 11</b>	West of Pink Hill	3,900	2,300	3,100
	West of NC 241	6,400	4,400	4,400

Route	Location	No-Build	Pink Hill Western Bypass	Pink Hill Western Bypass (Freeway)
	East of NC 241	11,000	7,500	7,500
	North of Rosewood Drive	10,600	10,600	10,600
	North of Pink Hill / HC Turner Road	9,900	9,900	9,900

Since congestion mitigation was not part of the purpose and need for this project, a No-Build analysis was not performed. The forecasted traffic volumes along NC 241 between the proposed bypasses are essentially the same in the Build and No-Build conditions. In addition, the traffic forecast includes only the outer bypass of Beulaville which allows for an additional interchange located on NC 111. Since it is represented by the traffic forecast, the Beulaville Outer Loop was analyzed.

Under the freeway scenario, the typical section for the two bypasses and NC 241 is a four-lane freeway with acceleration and deceleration lanes as appropriate. For the freeway analyses, the analysis results represent the worst-case peak period for the analyzed location, hence no specific peak hour is specified. Under the expressway scenario, the typical section for the two bypasses and NC 241 is a four-lane median divided expressway with left-turn lanes at all intersections where left-turns from the mainline are allowed. Mainline right-turn lanes are provided at each intersection as well.

As a four-lane freeway facility, and as a four-lane median divided expressway, the Beulaville Bypass, NC 241, and the Pink Hill Western Bypass are anticipated to operate at LOS A in the year 2035. The analysis results for this scenario are presented in **Appendix B**.

Based on the traffic forecast volumes and coordination with NCDOT, intersections with heavier projected traffic volumes during the peak period were analyzed to represent worse case operations. **Table 5** presents the analysis results for the intersections along the Beulaville Outer Loop and **Appendix B** includes the analyses.

**Table 5**  
**Intersection Analyses along Beulaville Outer Loop (2035 Build)**

Intersection	Movement	AM	PM
		LOS / Delay (sec)	LOS / Delay (sec)
Unsignalized			
NC 24 (Western Intersection)/ Beulaville Outer Loop	EB L	A 9.4	A 8.6
	SB L	D 31.3	C 24.3
	SB R	B 11.2	B 11.1

Intersection	Movement	AM	PM
		LOS / Delay (sec)	LOS / Delay (sec)
NC 111/Beulaville Outer Loop	EB L	A 7.8	A 8.0
	WB L	A 7.8	A 7.6
	NB LTR	D 25.1	C 17.9
	SB LT	C 23.2	D 27.7
	SB R	C 23.2	D 27.7
NC 241/Beulaville Outer Loop	EB L	A 7.9	A 8.1
	WB L	A 7.8	A 7.6
	NB L	C 19.4	C 19.0
	NB T	C 18.3	C 16.3
	NB R	C 15.9	B 14.8
	SB L	C 24.9	C 19.6
	SB T	C 15.3	C 15.0
	SB R	B 11.6	B 11.5
<b>Signalized</b>			
NC 24 (Eastern Intersection)/ Beulaville Outer Loop	N/A	A 9.3	A 7.6

As shown in the table, all but one of the evaluated intersections along the Beulaville Outer Loop was analyzed under stop control. Based on this analysis, all of the unsignalized intersection movements are anticipated to operate at LOS D or better in the year 2035. Based on projected volumes, the eastern intersection of NC 24 and the Beulaville Outer Loop was analyzed under signal control in the design year. Under signal control, this intersection is anticipated to operate at LOS A in the year 2035. The intersection of the Beulaville Outer Loop and NC 241 is anticipated to work well unsignalized based upon the analysis; however, it should be noted that both roadways are four-lane divided facilities with turn lanes. With those cross-sections, this intersection may operate under signal control in the future due to intersection crossing distance. If this intersection does function under signal control, it is anticipated to operate at LOS A.



**Table 6** presents the analysis results for the intersections along NC 241 and the Pink Hill Western Bypass and **Appendix B** includes the analyses.

**Table 6**  
**Intersection Analyses along NC 241 and Pink Hill Western Bypass (2035 Build)**

Intersection	Movement	AM	PM
		LOS / Delay (sec)	LOS / Delay (sec)
Unsignalized			
NC 241/Sarecta Road	EB LTR	B 12.9	B 13.0
	WB LTR	B 12.7	B 13.2
	NB L	A 7.8	A 8.0
	SB L	A 7.9	A 7.8
NC 241/Pink Hill Western Bypass/Howard Family Rd	EB LT	C 16.5	C 15.1
	EB R	A 9.2	A 9.5
	WB LTR	B 12.6	B 12.7
	NB L	A 8.0	A 8.0
	SB L	A 7.7	A 7.6
NC 11/Pink Hill Western Bypass	EB LT	C 15.2	B 14.2
	EB R	C 15.2	B 14.2
	WB LTR	B 13.4	B 14.1
	NB L	A 7.6	A 7.8
	SB L	A 7.6	A 7.5
NC 11/Pink Hill Western Bypass/Rosewood Drive	EB L	C 15.9	C 16.8
	EB TR	B 10.5	B 10.9
	WB LTR	B 11.7	B 11.6
	NB L	A 8.0	A 8.2
	SB L	A 8.1	A 7.8

The NC 241/Sarecta Road intersection was selected as a representative intersection along NC 241 and was analyzed under stop control. All movements are anticipated to operate at LOS B or better in the year 2035. All evaluated intersections along the Pink Hill Western Bypass expressway concept were analyzed under stop control and are anticipated to operate at LOS C or better in the year 2035.

### Safety

Crash data was obtained from the NCDOT for portions of NC 24, NC 241, and NC 11 within the feasibility study area for the years 2008 – 2013. **Table 7** summarizes the number of crashes and rates for the major roadways in the feasibility study area compared with the statewide average crash rates for similar rural routes.

**Table 7**  
**Crash Data**

Crash Type	Number of Crashes	Percent of Total	Crashes per 100 MVM <sup>1</sup>	Statewide Average Crash Rate per 100 MVM
<b>NC 24 from SR 1702 (Blizzard Town Road) to SR 1720 (Penny Road) <sup>2</sup></b>				
Total	163	100.00%	161.50	139.34
Fatal	1	0.61%	0.99	0.66
Non-Fatal Injury	34	20.86%	33.69	44.71
Night	51	31.29%	50.53	41.47
Wet	21	12.88%	20.81	20.72
<b>NC 241 from NC 24 in Beulaville to the Duplin/Lenoir County Line <sup>3</sup></b>				
Total	157	100.00%	246.86	194.56
Fatal	0	0.00%	0.00	1.90
Non-Fatal Injury	27	17.20%	42.45	60.43
Night	65	41.40%	102.20	73.20
Wet	27	17.20%	42.45	29.94
<b>NC 241 from the Duplin/Lenoir County Line to NC 11 <sup>3</sup></b>				
Total	13	100.00%	115.31	194.56
Fatal	0	0.00%	0.00	1.90
Non-Fatal Injury	5	38.46%	44.35	60.43
Night	7	53.85%	62.09	73.20
Wet	1	7.69%	8.87	29.94
<b>NC 11 from Short Cut Lane west of Pink Hill to the Duplin/Lenoir County Line <sup>3</sup></b>				
Total	7	100.00%	282.46	194.56
Fatal	0	0.00%	0.00	1.90
Non-Fatal Injury	2	28.57%	80.70	60.43
Night	3	42.86%	121.05	73.20
Wet	1	14.29%	40.35	29.94

<b>NC 11 from the Duplin/Lenoir County Line to SR 1113 (Ash Davis Rd) <sup>3</sup></b>				
Total	29	100.00%	124.55	194.56
Fatal	0	0.00%	0.00	1.90
Non-Fatal Injury	10	34.48%	42.95	60.43
Night	4	13.79%	17.18	73.20
Wet	1	3.45%	4.29	29.94

Notes: Report period is October 1, 2008 to September 30, 2013.

<sup>1</sup> Crash rates are expressed in crashes per 100 million vehicle miles (MVM) of travel.

<sup>2</sup> The Statewide Average is for rural NC four or more lanes divided with no control of access routes for the period 2009-2011.

<sup>3</sup> The Statewide Average is for rural NC two-lane undivided routes for the period 2009 – 2011.

Source: NCDOT, 2013

The total crash rates for NC 24, NC 241 from NC 24 in Beulaville to the Duplin/Lenoir County Line, and NC 11 from Short Cut Lane to the Duplin/Lenoir County Line are all higher than the statewide average crash rate. Additionally, several of the other crash rates for these same sections of roadway within the feasibility study area are also higher than the statewide average crash rates.

## **VI. ENVIRONMENTAL SCREENING**

The following is a preliminary review of environmental constraints that may have a potential effect on the project. The information obtained for the environmental screening is from readily available sources. No survey work other than a field inspection was performed for this study. The environmental screening is not a substitute for the project planning / environmental documentation process. The purpose of environmental screening is to identify potential environmental constraints early in the process. For the purpose of this study, potential environmental constraints were identified within the feasibility study area.

### **Rivers and Streams**

There are several streams and unnamed tributaries to streams located within the feasibility study area, including Limestone Creek, Cabin Creek, Persimmon Branch, Gum Swamp, Little Limestone Creek, Panther Creek, Beaverdam Creek, Tuckahoe Swamp, and Cherrytree Branch (**Figures 4A and 4B**). All of these streams are classified as Class C Swamp Waters (Sw), with the exception of Cabin Creek which is classified as Class B Swamp Waters (Sw). In addition, Beaverdam Creek, Tuckahoe Swamp, and Cherrytree Branch are classified as nutrient sensitive waters. (NCDENR, 2012)

### **Wetlands and Floodplains**

Wetland data was downloaded from the NCDENR Division of Coastal Management and reviewed to determine whether the proposed project impacts any wetlands. There are wetlands associated with Limestone Creek and Tuckahoe Swamp; however, numerous wetlands are scattered throughout the feasibility study area, as well. The wetlands are shown on **Figures 4A and 4B**. No delineation of jurisdictional resources or agency coordination was conducted as

part of this study. During the preparation of any environmental documentation, it is recommended that these wetlands be surveyed and delineated.

Duplin and Lenoir Counties are participants in the National Flood Insurance Program. Digital Federal Emergency Management Agency (FEMA) floodplain maps were obtained from the North Carolina Floodplain Mapping Program and reviewed to determine whether the proposed project would cross the 100-year floodplain. The crossings at Limestone Creek, Cabin Creek, Little Limestone Creek, Panther Creek, and Tuckahoe Swamp are designated as special flood hazard areas within the 100-year floodplain (Zone AE, meaning that base flood elevations have been determined for these streams). In addition, Tuckahoe Swamp has a floodway area in Zone AE. The largest floodplain area will be associated with Limestone Creek, located in the southern portion of the feasibility study area. **Figures 5A and 5B** show the floodplains and floodways in the feasibility study area for the freeway and expressway options, respectively. If this project is constructed, local and State regulations regarding the 100-year floodplain should be followed.

#### **Prime and Important Farmland**

Soils in the project study area considered to be Prime or of Statewide Importance are listed in **Appendix C**. There are no soils designated Unique Farmland in the project study area. Additional coordination with the NRCS would take place during the project planning process to determine the farmland impacts of each project alternative.

#### **FEMA Issues**

There are no known Federal Emergency Management Agency (FEMA) buyout properties located within the feasibility study area. According to the Duplin County Planner / Section Manager and former FEMA Buyout Staff Project Manager for Duplin County, there are no FEMA buyout properties located within the feasibility study area in Duplin County. (Tyndall, 2012)

#### **Historic Properties and Archaeology**

As part of the environmental screening process, existing GIS and the NC State Historic Preservation Office webpage were reviewed for the presence of any known historic properties within the project area. **Table 8** lists the properties in the vicinity of the proposed project that are listed on the National Register of Historic Places (NRHP), determined eligible for listing on the NRHP, or on the State Study List. These resources are shown on **Figures 5A and 5B**. None of the following properties are within the proposed corridors. Should this project be programmed into the STIP, it is recommended that a survey of the corridor be conducted by an architectural historian to identify other potentially eligible properties.

**TABLE 8**  
**Historic Resources**

Property	Location	County
<b>Listed in the NRHP</b>		
Hebron Presbyterian Church and cemetery	West of feasibility study area; north of NC 11 along Burncoat Road	Duplin
<b>Eligible for Listing in the NRHP</b>		
Beulaville Elementary School	Within feasibility study area; Downtown Beulaville	Duplin
John Maxwell House	West of feasibility study area; north of and along NC 11	Duplin
<b>Eligible for Listing in the NRHP and State Study List</b>		
Pink Hill Historic District	Within feasibility study area; Downtown Pink Hill	Lenoir
James Maxwell House	Along western edge of feasibility study area; north of NC 11 along Mill Branch	Duplin
<b>State Study List</b>		
Melvin Jones House (Gone)	Within feasibility study area; east of NC 241 along W. Pleasant Hill Road	Lenoir
Leary-Stroud House	Along northern edge of feasibility study area; along Jonestown Road	Lenoir

Source: NC State Historic Preservation Office, 2014

Mapping was reviewed at the North Carolina Office of State Archaeology (OSA) on December 1, 2012 to determine if any archaeology sites were located within the project area. According to the OSA mapping, ten known archaeological sites were initially identified within the feasibility study area. After further review of the OSA files, additional test excavations were recommended at one known archaeology site. Site 31DP86 is a woodland and early archaic site located west of Beulaville along NC 24 in the vicinity of where the Beulaville Outer Loop intersects NC 24. Should this project be programmed into the STIP, it is recommended that a survey of the corridors be conducted by an archaeologist to assess this site and identify other potential sites.

### **Threatened and Endangered Species**

A review of the US Fish and Wildlife Service (USFWS) lists species under federal protection for Duplin (2 species) and Lenoir (3 species) counties as of May 13, 2015. These species are listed in **Table 9**.

**TABLE 9**  
**Species under Federal Protection**

Scientific Name	Common Name	County	Status <sup>1</sup>
<b>Vertebrates</b>			
<i>Alligator mississippiensis</i>	American alligator	Duplin	T (S/A)
<i>Picoides borealis</i>	Red-cockaded woodpecker	Duplin / Lenoir	E
<i>Haliaeetus leucocephalus</i>	Bald eagle	Lenoir	BGPA
<b>Vascular Plant</b>			
<i>Aeschynomene virginica</i>	Sensitive joint-vetch	Lenoir	T

Notes:

- <sup>1</sup> E Endangered denotes a species in danger of extinction throughout all or a significant portion of its range.
- T Threatened denotes a species likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
- S/A Similarity of appearance denotes a species that closely resembles in appearance to an endangered or threatened species that enforcement personnel would have substantial difficulty in differentiating between the listed and unlisted species.
- BGPA The bald eagle was declared recovered and removed (de-listed) from the federal List of Threatened and Endangered wildlife in the July 9, 2007 Federal Register. After de-listing, the Bald and Golden Eagle Protection Act becomes the primary law protecting bald eagles.

Source: United States Fish and Wildlife Service, 2015 (Last updated September 22, 2010 [Duplin] and December 26, 2012 [Lenoir])

The North Carolina Natural Heritage Program (NHP) database was queried to determine the presence of protected species within the feasibility study area. The most recent search of the NHP database of rare species and unique habitats, conducted on May 13, 2015, did not list occurrences of federally-protected species within two miles of the feasibility study area. However, surveys for federally protected and FSC species may need to be completed during preparation of any environmental documentation.

### Hazardous Materials

There are eleven registered underground storage tanks (UST) located within or adjacent to the feasibility study area based upon the NCDENR Division of Waste Management databases. These properties are listed in **Table 10** and shown on **Figures 6A and 6B** for the freeway and expressway options, respectively. (NCDENR, 2014)

**TABLE 10**  
**Underground Storage Tank Registered Tanks**

Facility ID	Property Name	Property Address	County
0-035279	Beulaville Elementary School	183 Lyman Road, Beulaville	Duplin
0-035256	Trade – Wilco 1844	110 S. Jackson Street, Beulaville	Duplin
0-015396	Speedy Mart	105 East Main Street	Duplin
0-024587	E-Z Shop #18	201 Jackson Street, Beulaville	Duplin
0-034124	Mom & Pops Country Store	2168 E. Hwy 24, Beulaville	Duplin

Facility ID	Property Name	Property Address	County
0-030263	East Duplin High School	394 North NC 111, Beulaville	Duplin
0-029317	Pink Hill Elementary School	202 South Central Avenue, Pink Hill	Lenoir
0-013698	Short Stop 20	Highway 241, Pink Hill	Lenoir
0-026628	C-Mart 13	Front Street, Pink Hill	Lenoir
0-034894	Jarmans Service Center	107 Kinston Blvd, Pink Hill	Lenoir
0-035945	Woodrow Sumner Garage Service	100 South Kinston Blvd, Pink Hill	Lenoir

Source: NCDENR DWM - GIS Maps, 2014

After a review of the US Environmental Protection Agency Superfund Site Information, the East Duplin High School Mercury Spill (EPA ID NCN000410841) was identified as a removal only site where no site assessment work was needed. This site is anticipated to be included on the National Priorities List (NPL) upon completion of Hazard Ranking System screening, public solicitation of comments about the proposed site, and after all comments have been addressed. The East Duplin High School Mercury Spill is not included on the NPL. This is the only known Superfund site located in close proximity to the feasibility study area. (USEPA, 2014)

### Other Significant Findings

Agriculture in Duplin County is an important local industry providing nearly \$1.2 billion in sales for the County's 1,159 farms. (Duplin County Agricultural Protection Plan, 2010) Duplin County is an important producer of commodity crops ranking in the top ten counties in the United States in hogs/pigs and poultry and in the top ten in the State in small grains, tobacco, vegetables, fruits, hay, poultry, cattle, and hogs/pigs. Of the \$1.2 billion in sales, 94 percent was generated from livestock sales demonstrating the significant influence of this sector which is driven by pigs and hogs which represent 65 percent of farm output. There are numerous swine farms located within or adjacent to the feasibility study area, predominantly on the west side of NC 241. However, there are a few swine farms also located on the north side of NC 24 in the vicinity of Beulaville. (NCDENR, 2012)

Due to the nature of the area (i.e. low elevation, significant water features and extensive wetlands), it is anticipated that there will be significant hydraulic design challenges with this project. Bridges have been proposed in the design concepts when crossing major water features. Additional study and design of hydraulic structures are needed should this project be programmed.

## VII. SOCIAL AND ECONOMIC EFFECTS

### Relocations

Potential residential and business relocation impacts associated with each of the design concepts are presented in **Table 11**. These estimates were appended from the right-of-way cost estimate and are based on functional designs.

**Table 11**  
**Estimated Relocations**  
**(Freeway / Expressway)**

<b>Segment</b>	<b>Residential Relocations</b>	<b>Business Relocations</b>	<b>Church Displaced</b>	<b>Cemetery Displaced</b>	<b>Transmission/Pump Station/Cell Tower</b>
Beulaville Inner Loop	116 / 81	25 / 22	1 / 0	1 / 1	2 / 3
Beulaville Outer Loop	77 / 64	19 / 18	1 / 0	1 / 1	0 / 1
NC 241 Mainline	108 / 92	14 / 14	3 / 2	1 / 1	0 / 0
Service Roads (East & West)	6 /---	1 /---	0 /---	0 /---	0 /---
Pink Hill Western Bypass	16 / 17 <sup>1</sup>	6 / 5	0 / 1 <sup>2</sup>	1 / 1	0 / 0

Notes: <sup>1</sup> The expressway design concept right-of-way extends along Lester Turner Road and includes an additional residential relocation, which is not included in the freeway design concept.

<sup>2</sup> The expressway design concept includes the acquisition of right-of-way along Bill Sutton Road resulting in the taking of an additional church as compared to the freeway design concept.

### **Environmental Justice**

The Census 2000 demographic data were reviewed at the block group level for high percentages of minority and low-income populations. Based on available census data, no potential environmental justice (EJ) concerns were noted within the feasibility study area. However, the area located along and to the south of NC 24 between SR 1962 (Sandlin Road) and SR 1702 (Blizzardtown Road) in Duplin County contains a larger concentration of minority populations compared to the County average. This is the area where the proposed Beulaville Inner Loop and Beulaville Outer Loop tie-in to existing NC 24, west of Beulaville. A review of available census data may need to be completed during preparation of any environmental documentation. Also based on the field review to estimate right-of-way costs, there appears to be a minority area in Pink Hill affected by the design. The design should be reviewed during the next stages for methods to minimize or remove impacts to this area, such as reducing right-of-way.

### **Public Facilities and Services**

#### ***Churches and Cemeteries***

The churches and cemeteries identified in the vicinity of the feasibility study area based on a review of existing GIS data, Google Earth, and NCGENWEB website are listed in **Appendix D** and shown on **Figures 7A and 7B** for the freeway and expressway options, respectively.

#### ***Community Centers***

There are no known community centers located in Beulaville or Pink Hill. However, the former Beulaville Elementary School, located adjacent to the existing Beulaville Elementary School along NC 24, is being partially renovated to accommodate a 109-seat assembly room, including



a kitchen area and restrooms. Future planned phases for the former Beulaville Elementary School will include a Beulaville Town Hall, Police Department, and general office space. The former Pink Hill Elementary School is now utilized as a multi-purpose facility that includes the former gymnasium utilized as an events and local discussion venue. Additionally, East Duplin High School in Beulaville has a 600-seat Fine Arts Building that is used for meetings and events, including theatrical events.

### ***Public Schools***

Beulaville Elementary School is located at the intersection of NC 24 and Lyman Road in Beulaville and serves grades kindergarten - 8. East Duplin High School is located immediately north of Beulaville, along NC 111 and serves grades 9 - 12. Pink Hill Elementary School is located north of Pink Hill off of H.C. Turner Road near Bob Stroud Road in Lenoir County and serves grades kindergarten - 5. The former Pink Hill Elementary School is located in downtown Pink Hill along S. Central Avenue and is utilized as a multi-purpose facility housing a health, wellness, and fitness facility, providing classroom extensions for Lenoir Community College, and the former gymnasium is used as an events and local discussion venue. South Lenoir High School is located north of Pink Hill on Old Highway 11 off of NC 11 in Lenoir County and serves grades 9 - 12. East Duplin High School is located in close proximity to where the Beulaville Inner Loop crosses NC 111 and Pink Hill Elementary School is located in close proximity to where the Pink Hill Eastern Bypass intersects NC 11, north of Pink Hill.

### ***Public Safety***

The Duplin County Sheriff's Office, located in Kenansville, provides service to all of the citizens of Duplin County. Beulaville is served by volunteer fire and rescue departments, as well as the Beulaville Police Department. (Duplin County, 2012) The Lenoir County Sheriff's Office, located in Kinston, provides law enforcement within Lenoir County. (Lenoir County, 2012)

The Duplin County volunteer fire departments (VFD) located near the project area include Sarecta VFD, Beulaville VFD, Albertson VFD, Potters Hill VFD, and Lyman VFD. The Lenoir County VFD's located near the project area include Deep Run VFD and Pink Hill VFD.

The Duplin County Emergency Medical Services (DCEMS) operates eight paramedic ambulances that provide coverage 24-hours a day every day. DCEMS has a primary response district in Beulaville. Lenoir County is divided into several response districts. The nearest EMS station to Pink Hill is located off NC 11 in Deep Run.

### ***Health Services***

Duplin General Hospital and Duplin County Health Department are located in Kenansville, approximately 12 miles west of the feasibility study area. Goshen Medical Center, Inc. is a community health center in Beulaville. In addition, the Senior Center in Beulaville provides food and health advice to senior citizens. The Lenoir County Health Department is located in Kinston, approximately 18 miles northeast of Pink Hill. Of the health services mentioned above, the Goshen Medical Center, located north of Beulaville near the Beulaville Inner Loop terminus along NC 41, appears to be the only known health service located near the proposed project.

## VIII. EVALUATION OF ALTERNATIVES

Estimated environmental impacts and costs associated with the design alternatives are summarized in **Table 12**.

**TABLE 12**  
**Summary of Estimated Impacts**

	Segment Alternative (Freeway / Expressway)				
	Beulaville Inner Loop	Beulaville Outer Loop	NC 241 Mainline	Service Roads (East & West)	Pink Hill Western Bypass
Length (miles)	3.9	6.6	5.8	10.2/---	4.3
Construction Cost (in millions) <sup>1</sup>	\$88/\$60.7	\$128/\$79.3	\$59/\$50.3	\$19/---	\$61.7/\$35.7
Right-of-Way Cost (in millions) <sup>2</sup>	\$38/35.35	\$27.2/26.35	\$30.0/20.575	\$3.7/---	\$41.4/14.35
Residential Relocations	116/81	77/64	108/92	6/---	16/17 <sup>3</sup>
Businesses Relocations	25/22	19/18	14/14	1/---	6/5
Parks Impacted	---	---	---	---	---
Schools Impacted	---	---	---	---	---
Churches Displaced	1/0	1/0	3/2	0/---	0/1 <sup>4</sup>
Cemeteries Impacted	1/1	1/1	1/1	0/---	1/1
Transmission/Pump Station/Cell Tower Impacted	2/3	0/1	0/0	0/---	0/0
Known Archaeological Sites in Vicinity	0/0	1/1	0/0	0/---	0/0
Historic Architecture in Vicinity	0/0	1/1	0/0	0/---	0/0
Stream Crossings	1/1	4/4	1/1	2/---	5/5
Length of Impacted Streams (linear feet)	0/0	0/0	249/249	3101/---	1924/1757
Wetland Impacts (acres)	43/24	70/59	60/38	57/---	29/14
Floodplain Area Impacted (acres)	38/20	103/49	1/1	0/---	0/0

Notes: <sup>1</sup> Utility construction cost has been added; however, right-of-way utility cost has not been included.

<sup>2</sup> The right-of-way to accommodate the interchange footprint would be purchased under the expressway option.

<sup>3</sup> The expressway design concept right-of-way extends along Lester Turner Road and includes an additional residential relocation, which is not included in the freeway design concept.

<sup>4</sup> The expressway design concept includes the acquisition of right-of-way along Bill Sutton Road resulting in the taking of an additional church as compared to the freeway design concept.

## Cost Estimates

Feasibility level construction and functional right-of-way cost estimates for each of the design concepts under the freeway and expressway scenarios are presented in **Table 12**. The primary differences between the construction costs are length, number of interchanges, and provision of grade separations to accommodate freeway standards. The right-of-way to accommodate the interchange footprint would be purchased under the expressway option although the connections are proposed as at-grade intersections with the potential to be converted to interchanges at a later date.

The segments with more than one construction alternative combine to form four alternatives, Alternatives 1, 2, 3, and 4, presented in **Table 13**:

**Table 13**  
**Combined Design Concepts**

Alternative	Segments	Length (miles)	Combined Cost
<b>Freeway Option</b>			
1	Beulaville Inner Loop/NC 241 Mainline/ Service Roads/Pink Hill Western Bypass	24.2	\$ 340,800,000
2	Beulaville Outer Loop/NC 241 Mainline/ Service Roads/Pink Hill Western Bypass	26.9	\$ 370,000,000
<b>Expressway Option</b>			
3	Beulaville Inner Loop/NC 241 Mainline/ Pink Hill Western Bypass	14.0	\$ 216,975,000
4	Beulaville Outer Loop/NC 241 Mainline/ Pink Hill Western Bypass	16.7	\$ 226,575,000

## IX. USER BENEFIT

In an effort to evaluate the user and non-user benefits for the various segment improvements studied, benefit cost analyses were performed. These analyses were based on the *User and Non-User Benefit Analysis for Highways* by AASHTO, September 2010, known as the Red Book. NCDOT provided a spreadsheet that incorporates the Red Book methodologies for use in these analyses. Standards provided by NCDOT were also used with the provided spreadsheet to develop costs and estimates of benefits for each studied segment. This procedure calculates benefits based on user value of time, user operating cost, and from construction and capital costs. From this information, a benefit-cost ratio is computed. The benefit-cost ratios per segment for the freeway and expressway options are essentially negligible, all hovering around zero. These low benefit-cost ratios are due to the extra distance traveled with the enhancements and lack of congestion anticipated along existing routes in the design year compared to the estimated cost of the project.

## **X. CONCLUSIONS**

All of the design concepts studied will provide more than adequate capacity for the projected traffic beyond the design year. Additionally, these design concepts will increase the mobility and connectivity between Duplin and Lenoir Counties and improve access between Camp Lejeune, the Port of Wilmington, Global TransPark, and eastern North Carolina as a whole. As an access-managed facility, the design concepts should help to provide an improved hurricane evacuation route.

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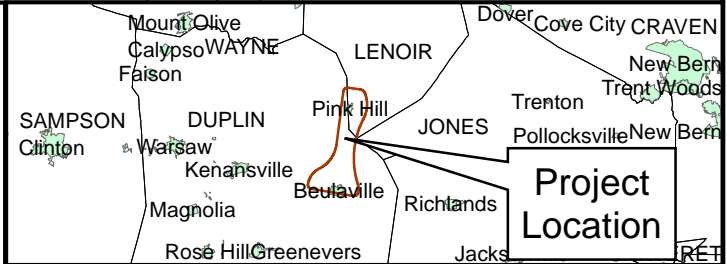
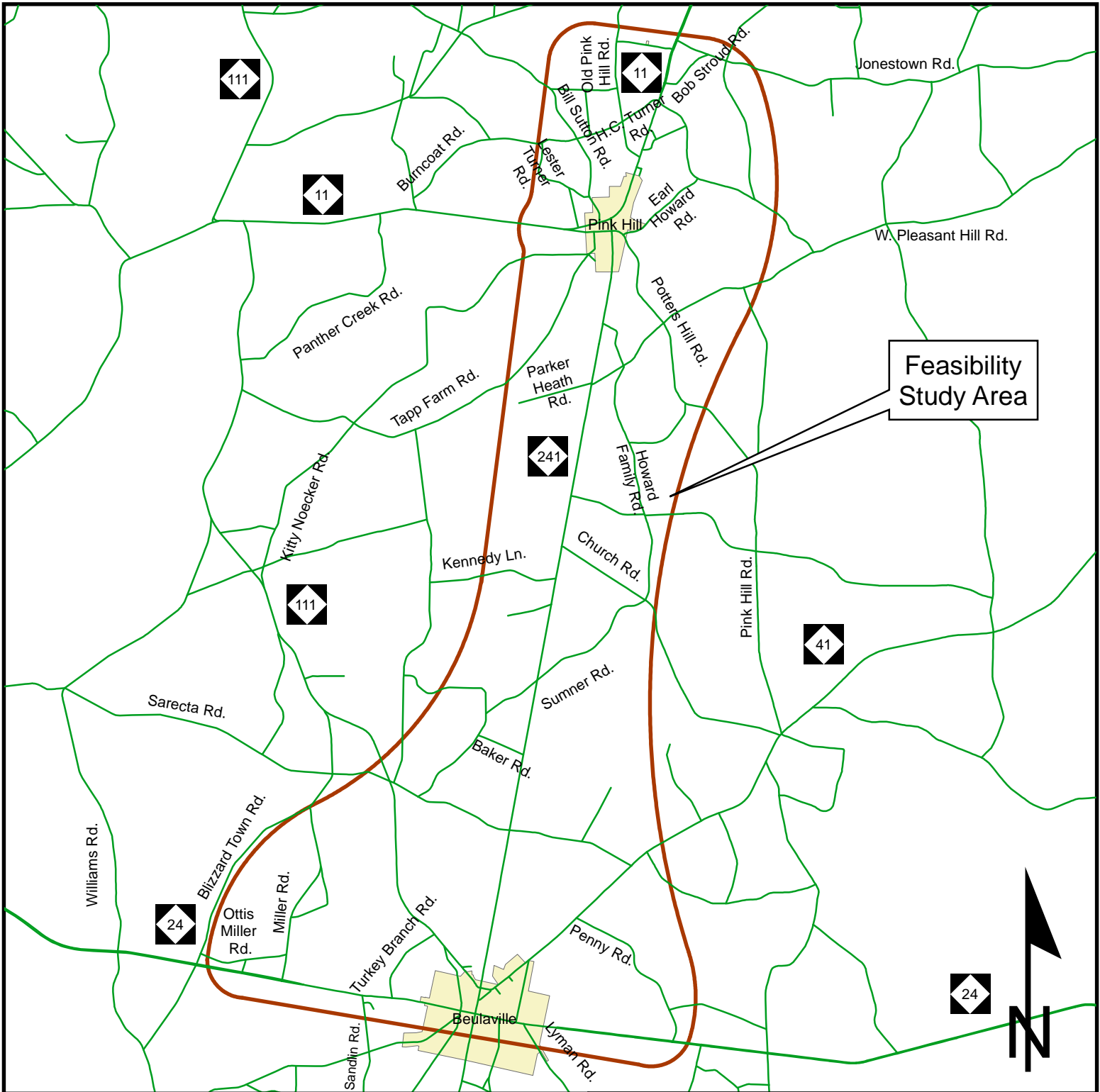
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# FIGURES



**Hatch Mott  
MacDonald**



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
PROGRAM DEVELOPMENT BRANCH  
FEASIBILITY STUDIES UNIT

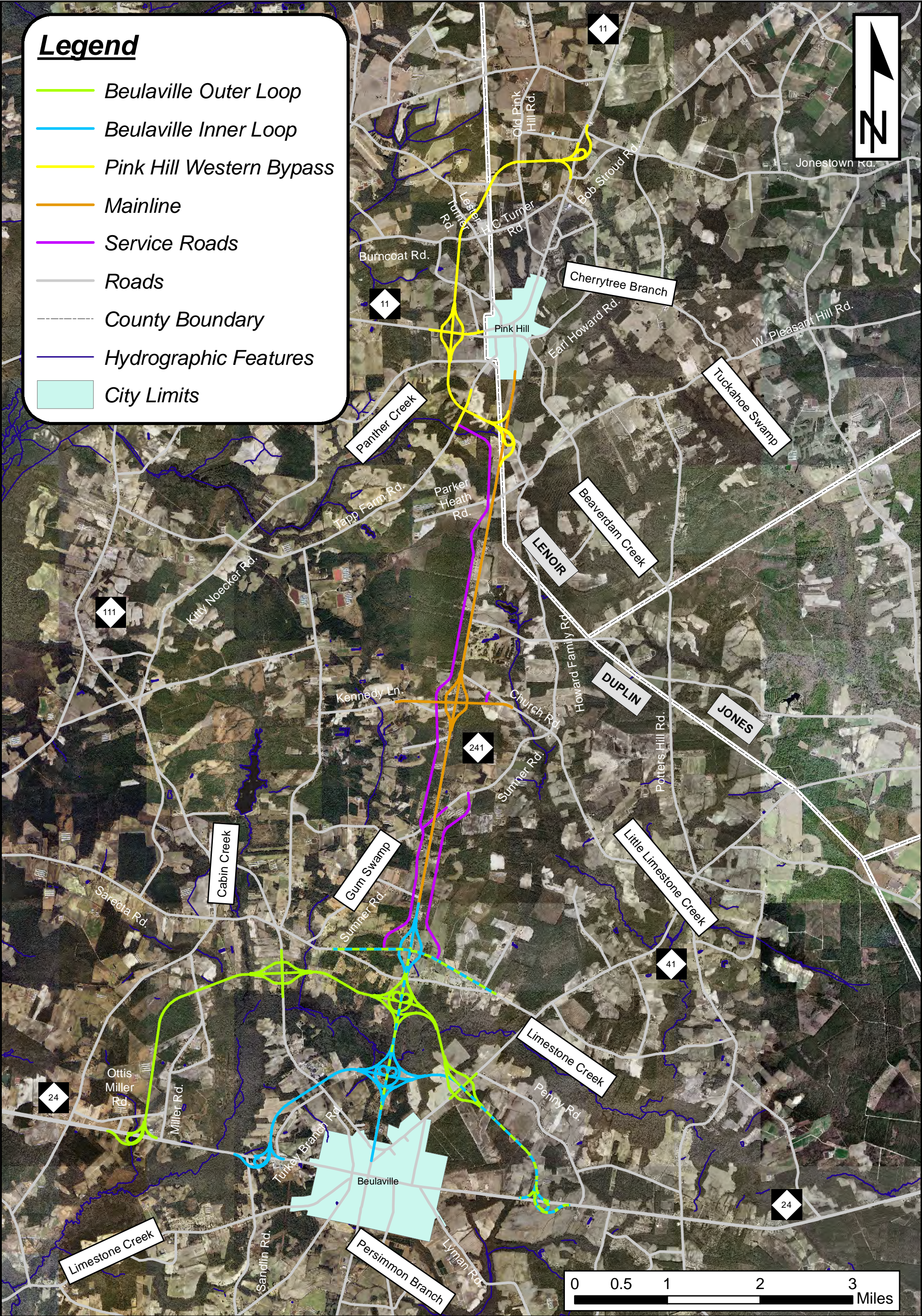
Widening NC 241 From NC 24  
In Duplin County To NC 11  
In Lenoir County  
FS-1202A

## Project Location Map

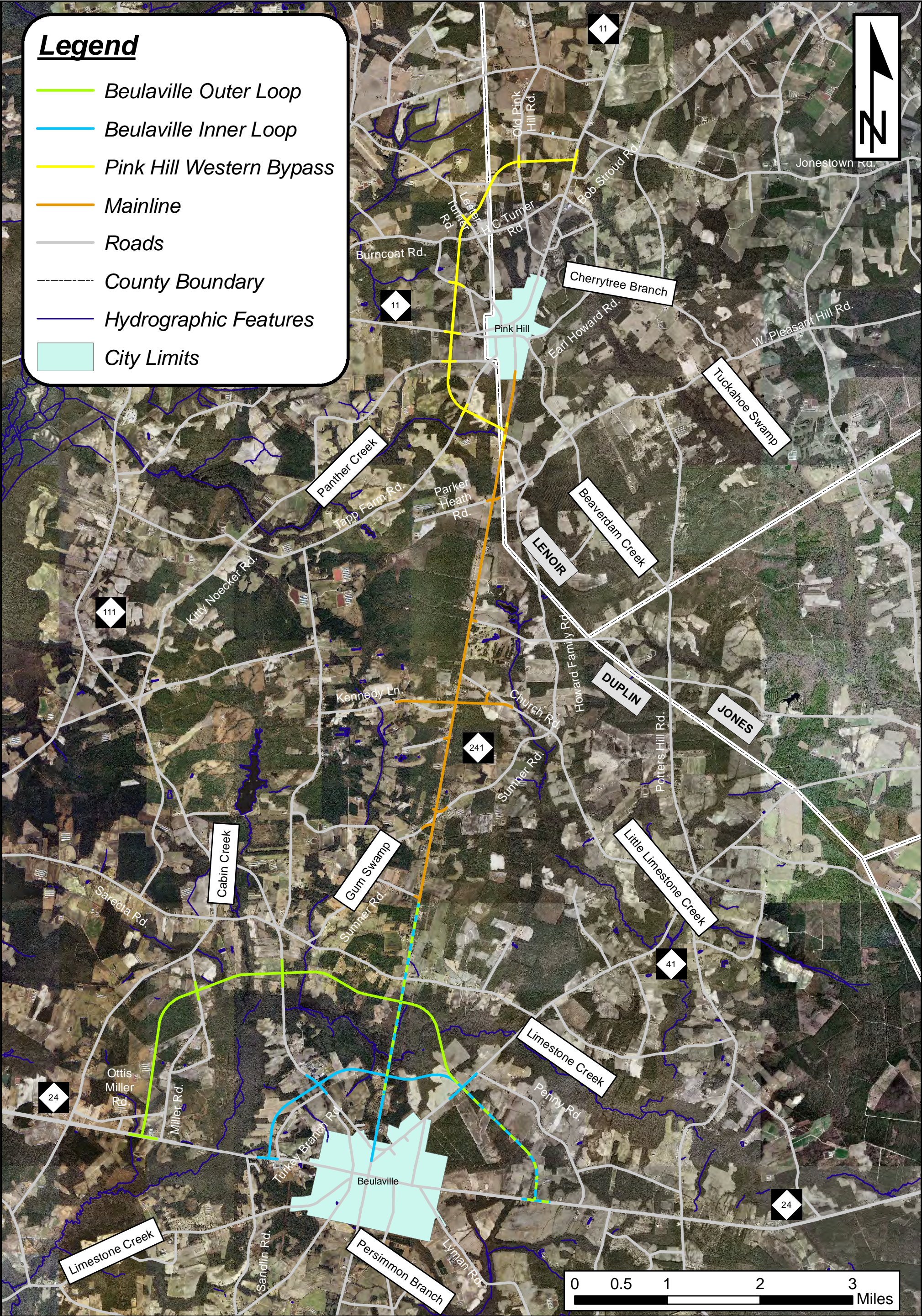
**Figure 1**

## Figure 2

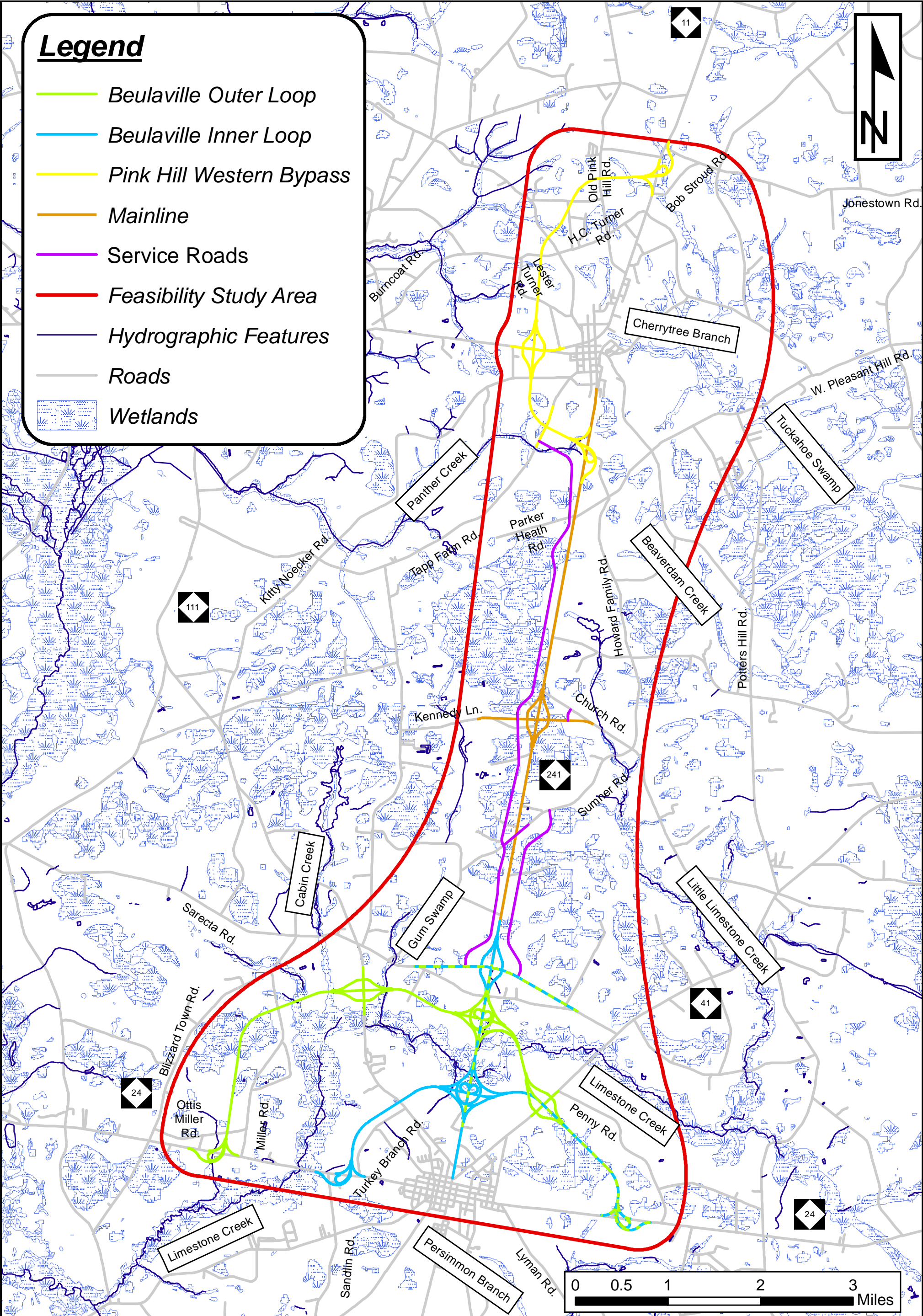












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## Water Resources (Freeway)

Figure 4A



