North Carolina Department Of Transportation

US 17 / US 258 Compendium to the I-40/I-95 Flood Resilience Feasibility Study

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Table of Contents

Figures

Tables

Appendices

1. Summary and Purpose

Hurricane Matthew and Hurricane Florence catastrophically impacted North Carolina in 2016 and 2018, respectively. Extensive riverine flooding inundated Interstate 95 (I-95) and Interstate 40 (I-40) for up to a week or more following both storms. In 2019, to address the vulnerability of the State's infrastructure to natural flooding disasters and to initiate strategies to mitigate against future flooding disasters, the Secretary of Transportation commissioned the I-95/I-40 Flood Resilience Feasibility Study which identifies improvement options and estimated costs to increase flood resilience on I-95 from Benson to South Carolina, I-40 from Benson to Wilmington, and NC 24 Connector from I-95 to I-40.

During this process, vulnerabilities were also identified on US 17 and US 258, which also experienced significant flooding during Hurricane Florence. These two routes are important connectors for evacuation of Wilmington, Jacksonville, and surrounding communities. To increase the resilience of these key evacuation routes during future hurricane flooding events, this Compendium was developed to expand the I-95/I-40 Flood Resilience Feasibility Study to evaluate three flooding locations identified by NCDOT Division 3 along US 17 from Wilmington to Jacksonville and US 258 from Jacksonville to the US 258 and NC 24 split.

This compendium to the I-95/I-40 Flood Resilience Feasibility Study applies the same approach to assess vulnerability, define resilience criteria, and identify improvement options for US 17 and US 258. The improvement options identified are intended to decrease the potential for flooding and minimize disruption to transportation during extreme weather events.

2. Limitations of Study

As with the I-95/I-40 Flood Resilience Feasibility Study, this US 17/US 258 Compendium is not intended to satisfy National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA) requirements for a project, nor be an exhaustive investigation of design and environmental issues. Specifically, the following items were not considered during the development of this study:

- NEPA/SEPA documentation
- Hydraulics design-level analyses, including potential flood impacts on upstream areas
- Detailed planning or design
- Detailed cost estimation. While right-of-way, construction and utility costs were included, they were not based on detailed planning or design.

The findings within this Compendium are not intended to be used as final design and cost estimates.

3. Flood Resilience Feasibility Study Approach

The study approach utilized for the I-95/I-40 Flood Resilience Feasibility Study was applied for this US 17/US 258 Compendium. The approach was structured into three interdependent work elements as shown in the graphic below. The initial element, Assess Vulnerability, identified the areas of US 17 and US 258 that were subject to flooding during Hurricane Florence. Once these vulnerable areas were identified, the resilience criteria were defined which in turn drove the identification of improvement options in the vulnerable areas.

The interdependent work elements comprising the study approach are discussed in further detail in the subsections that follow. See the I-95/I-40 Flood Resilience Feasibility Study for more details on this approach.

3.1 Assess Vulnerability

For the purposes of this study, vulnerability is defined as susceptibility to flooding during large hurricane events. Specifically, the assessment identified sections of US 17 and US 258 that flooded during Hurricane Florence. The primary sources of data utilized for the assessment include the following:

- NCDOT Division Coordination
- Light Imaging, Detection and Ranging (LiDAR) Analysis
- Flood Study Analyses
- Conveyance Analyses
- High Water Mark Analyses

Multiple data sources were used to document the levels of flooding experienced during Hurricane Matthew and Hurricane Florence, including flooding summary reports developed by the North Carolina Emergency Management (NCEM) and the North Carolina Department of Transportation (NCDOT), United States Geological Survey (USGS) gage records, high water marks collected by the USGS and the NCEM, and observations recorded by NCDOT Division staff during the flooding events.

Figure 3.1 below indicates the general location by mile marker where flooding was recorded on US 17 and US 258 during Hurricane Florence.

The following subsections detail the data sources bulleted above and their use in defining resilience criteria and identifying improvement options.

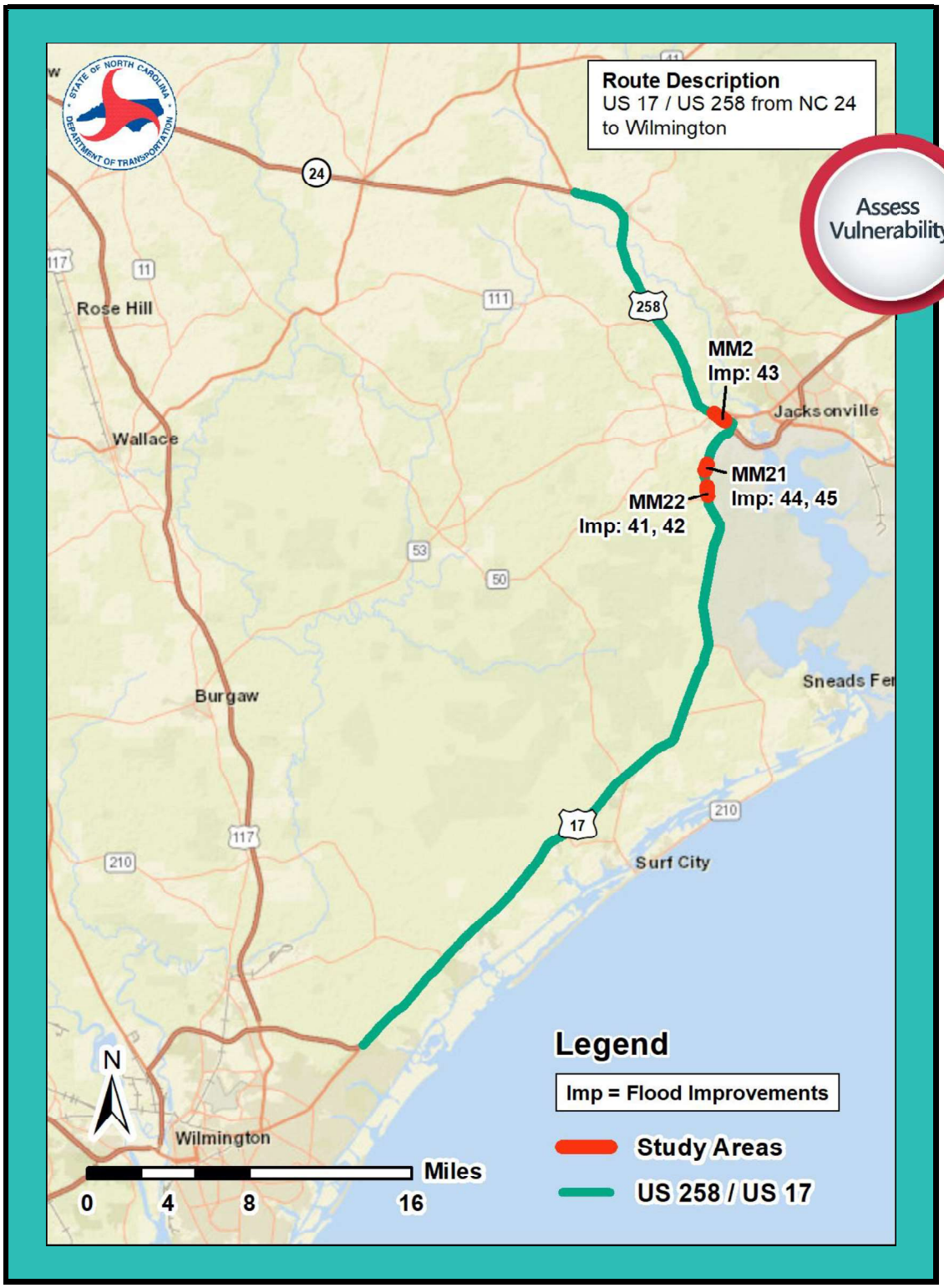


Figure 3.1 – US 17 and US 258 Flooded Areas During Hurricane Florence

3.1.1 NCDOT Division Coordination

The NCDOT Hydraulics Unit met with the NCDOT Divisions 3, 4, and 6, and the NCDOT Project Management Unit (PMU) to discuss the objectives of the I-95/I-40 feasibility study as well as to discuss flooding and damage observed during Hurricane Florence. The NCDOT Division 3, 4 and 6 staff documented the flooding during response activities and following the hurricanes, including flooding locations, extents, depths, durations, and photographs.

The results of Division discussions identified that US 17 was flooded in at least two locations and US 258 was flooded in at least one location during Hurricane Florence. Flood observations from Hurricane Matthew were not available for these locations. Photographs of the flooding during Hurricane Florence were not available from NCDOT.

Table 3.1 provides a summary of the flooding depths, flooding durations, and lanes flooded on US 17 and US 258.

Table 3.1 – Flood Elevations Experienced During Hurricane Florence, US 17 and US 258

Location	Minimum LiDAR Elevation (NAVD 88 feet)	Florence Flooding Elevation (NAVD 88 feet)	Depth of Florence Flooding (feet)	Duration of Florence Flooding	Lanes Impacted
US 17 MM 21	20.57	22.57	2	10 hours	SB
US 17 MM 22	11.94[1]	12.44	0.5[2]	3 tide cycles	SB, NB
US 258 MM 2	12.28	13.78	1.5	12 hours	EB, WB

[1]This is the lowest elevation of the road in the area, not the low elevation on the bridge.

[2]The bridge was not overtopped. Sags adjacent to the bridge were overtopped.

MM = Mile Marker; SB = South Bound; NB = North Bound; EB = East Bound; WB = West Bound; NAVD = North American Vertical Datum.

3.1.2 LiDAR Analysis

To aid in the elevation determination for flooding described in Section 3.1.1, the North Carolina Floodplain Mapping Program's (NCFMP's) LiDAR data was used to estimate the roadway grade elevation at each of these flooding locations. The roadway grade derived from the LiDAR was combined with the flooding depth estimates collected by the NCDOT Divisions to estimate the flooding elevation, as shown in Table 3.1.

3.1.3 Flood Study Analyses

The NCFMP's Flood Risk Information System (FRIS) was utilized to identify the 100-year water surface elevations as well as review the latest United State Army Corps of Engineers (USACE) Hydrologic Engineering Center River Analysis System (HEC-RAS and HEC2) hydraulic models at each of the identified study areas. To confirm the 100-year water surface elevations at each study area, the 100-year water surface elevations were extracted from the Federal Emergency Management Agency (FEMA) Effective models on the upstream side of each of the US 17 and US 258 stream crossings. A summary of the 100-year base flood elevations is provided in Table 3.2.

Table 3.2 – 100-Year Water Surface Elevations, US 17 and US 258

Location	100-Year Flood Elevation (NAVD 88 feet)
US 17 MM 21	N/A[1]
US 17 MM 22	10.82
US 258 MM 2	9.3

[1]FEMA models do not exist for the flooding source at US 17 MM 21.

3.1.4 Conveyance Analyses

The Flood Resilience Feasibility Study included conveyance analyses at US 17 at Southwest Creek and US 258 at Blue Creek. Stream crossings with undersized openings are more likely to create backwater effects on the upstream side of the culvert or bridge. The water surface elevation difference between upstream and downstream of the roadway crossings was analysed to identify potential conveyance improvements.

The existing FEMA flood study for the bridges at US 17 at Southwest Creek was reviewed. The 100-year water surface elevation is at the minimum low chord more than one mile downstream of the bridge. The head loss through the bridge is approximately 0.4 feet. Based on the backwater conditions and relatively small head loss through the bridge, it is assumed increasing the bridge opening would not significantly improve the potential for overtopping.

No conveyance improvements are needed at US 258 at Blue Creek for the 100-year flood as the roadway meets a 1.5' freeboard for the 100-year flood event. The discharge across the roadway during Hurricane Florence was estimated based on the NCDOT observed flood depth and the corresponding estimated overtopping width. The existing structure is a 3 barrel 10' x 8' box culvert. Using the estimated Hurricane Florence weir flows for several assumed average flood depths, it appears 3 or more additional barrels would be needed to convey the roadway weir flow discharge from Hurricane Florence. Expanding the culvert to six barrels or replacing the existing culvert with a bridge structure is deemed to be infeasible given cost constraints.

3.1.5 High Water Mark Analysis

The USGS collected high water marks (HWMs) in the flooded areas post-storm for both Hurricane Matthew and Hurricane Florence. The HWMs are available in Environmental Systems Research Institute (ESRI) shapefile format and on-line at the websites below.

Hurricane Matthew: https://stn.wim.usgs.gov/FEV/#MatthewOctober2016

Hurricane Florence: https://stn.wim.usgs.gov/FEV/#FlorenceSep2018

Following Hurricane Florence, a HWM on US 17 at Southwest Creek was measured 6 feet above ground level on a large pine tree in the clearing just downstream of the left bridge end.

In addition to USGS data listed above, review of the NCDOT design plans for US 17 from South of SR 1526 at Dixon to the Four Lane Section South of Jacksonville dated August 22, 1985 indicated a high-water mark of 15.1' from September 20, 1955 (Hurricane Diane).

High water marks are not available for Hurricane Matthew on US 17 and US 258.

3.2 Define Resilience Criteria

Resilience is defined as the capacity of a system to recover quickly from an event. For the purposes of this study, resilience is defined as the ability of US 17 and US 258 to remain open during a hurricane event. To achieve resilience along US 17 and US 258, this study defined two resilience criteria as follows:

- Level of Service 1: Greater of the Hurricane Diane, Matthew, or Florence Elevations[1]
- Level of Service 2: 100-year Design Criteria

Hydraulic Level of Service 1 is defined as providing resilience to the greater of historic hurricane flood levels. Hydraulic Level of Service 2 is defined to be an increase in the existing interstate 50-year hydraulic design criteria to the 100-year hydraulic design criteria. When preparing the improvement options for each study area, water surface elevations for Level of Service 1 and 2 were compared, and the higher of the two elevations was used.

3.2.1 Hurricane Resilience Level of Service 1

For Level of Service 1, water surface elevation estimates for Hurricane Diane and Hurricane Florence were collected from two sources: 1) HWMs from the USGS and the NCEM; and 2) elevations derived from flood depths observed by the NCDOT Divisions as part of the hurricane response activities. Additionally, for the flooded area at US 17 MM 22, the HWM from Hurricane Diane (1955), recorded on NCDOT design plans for US 17 from South of SR 1526 at Dixon to the Four Lane Section South of Jacksonville dated August 22, 1985, was evaluated.

It should be noted that while historic flood levels for Hurricane Matthew were available for the I-40/I-95 Flood Resilience Feasibility Study, Hurricane Matthew flood levels were not available for US 17/ US 258 and could not be used to evaluate Level of Service 1.

3.2.2 Hydraulic Design Storm Level of Service 2

The NCDOT Hydraulics Unit established the 100-year design criteria for this study to be the 100-year base flood elevation plus 1.5 feet of freeboard. As described in Section 3.1.3, the 100-year base flood elevations were compiled from the NCFMP's FRIS which are based on hydraulic models developed as part of FEMA Flood Insurance Study (FIS). FEMA models do not exist for the flooding source at US 17 MM 21.

3.2.3 Design Elevations Used for the Improvement Options

For locations where the 100-year design criteria is greater than the flooding elevation experienced during both hurricanes, only the 100-year design criteria option was analyzed, as improvements would protect to both the 100-year design criteria and the flooding elevations of Hurricane Diane and Hurricane Florence. Table 3.3 summarizes the maximum elevations experienced during both hurricanes, the 100-year design flood elevation, and which elevations were used for the feasibility designs.

Table 3.3 – Design Elevations at Flooded Locations, US 17 and US 258

Location	Hurricane Florence Design Elevation (NAVD 88 feet)	Hurricane Diane Design Elevation (NAVD 88 feet)	100-year Design Elevation (NAVD 88 feet)	Design Elevations Used
US 17 MM 21	22.57	N/A	N/A	Hurricane Florence
US 17 MM 22	12.44	15.1	12.32	Hurricane Florence, Hurricane Diane
US 258 MM 2	13.78	N/A	10.8	Hurricane Florence

[1] Hurricane Matthew high water marks were not available for these flooded areas.

3.3 Identify Improvement Options

For US 17 and US 258, improvement alternatives were identified to maintain connectivity, which was defined as providing flood resilient roadway access without maintaining interstate traffic capacity. See the I-40/I-95 Flood Resilience Feasibility Study for more details on the two broad categories of improvement alternatives: connectivity and mobility.

Improvement options were developed using the resilience criteria defined above to meet the objectives of connectivity and to provide a range of options and costs. Improvement options considered included the following:

- Elevate the Roadway
- Develop a Traffic Plan

Each of the improvements were designed for the design elevations listed in subsection 3.2.3. Table 3.4 provides the detailed list of improvement options considered.

Table 3.4 – Improvement Options Considered

Improvement ID	Improvements Considered
41	Elevate four lanes with depressed median to the Hurricane Florence flood elevation
42	Elevate four lanes with depressed median to the Hurricane Diane flood elevation
43	Elevate four lanes with two-way left turn lane to the Hurricane Florence flood elevation
44	Elevate two southbound lanes to the Hurricane Florence flood elevation
45	Create a four-lane traffic plan

Elevated Road and Bridge Design

The list below provides specific roadway design considerations used for the Flood Resilience Feasibility Study:

- US 17 improvements were designed to be a four-lane section;
- US 258 improvements were designed to be a four-lane section with a two-way left turn lane;
- The vertical design elevations were maintained throughout the flooded area extents;
- Existing design speeds were followed;
- A minimum 0.3% grade was maintained in the improvement area, with a target maximum of 2 feet of elevation rise above the design elevation;
- Bridges were designed with the girders to maintain either 1.5 feet of freeboard above the 100-year design elevation or to maintain clearance above the hurricane design elevation;
- The US 17 bridges at Southwest Creek were designed with span lengths ranging from 155 feet to 165 feet; and
- The bridge superstructure depth was designed as 7 feet and 7 inches (Roadway Design Manual – 6-5, F-2).

The typical designs for the roadway sections are included in Appendix A.

Traffic Plans

A traffic plan to restrict travel on flood prone portions of the roadway was considered for one location.

4. Flood Resilience Feasibility Study Results

The following sections contain descriptions of the connectivity options considered for US 17 and US 258, along with supporting figures and cost summary tables. The primary flood improvement options focused on increasing roadway elevations. Additionally, an option was included for implementing a traffic plan to direct traffic around flooded lanes.

4.1 US 17

The vulnerability assessment discussed in Section 3 identified two flooded areas along US 17. Flood resilience improvements were developed for each flooded area, as listed in Table 4.1 and shown in Figure 4.1. The flood improvement alternatives include two connectivity options for each flooded area.

Table 4.1 – Improvements Evaluated by Mile Marker, US 17

US 17 Mile Marker	Improvement ID	Improvements Considered
22	41	Elevate four lanes with depressed median to the Hurricane Florence flood elevation
	42	Elevate four lanes with depressed median to the Hurricane Diane flood elevation
21	44	Elevate two southbound lanes to the Hurricane Florence flood elevation
	45	Create a four-lane traffic plan

The four connectivity improvement options identified for US 17 focused on maintaining connectivity to Wilmington, defined for this study as providing flood resilient roadway access to Wilmington without increasing the traffic carrying capacity of US 17. The US 17 Connectivity options are described below.

- US 17 at MM 22 – Improvement 41: Elevate four lanes with depressed median to the Hurricane Florence flood elevation. This alternative proposes improvements to Onslow County bridges 660012 and 660251 over Southwest Creek and the adjacent roadway. The total flood improvement cost is $9.8 million, shown in Table 4.2.
- US 17 at MM 22 – Improvement 42: Elevate four lanes with depressed median to the Hurricane Diane flood elevation (1955). This alternative proposes improvements to Onslow County bridges 660012 and 660251 over Southwest Creek and the adjacent roadway. The total flood improvement cost is $14.9 million, shown in Table 4.3.
- US 17 at MM 21 – Improvement 44: Elevate two southbound lanes to the Hurricane Florence flood elevation. This alternative proposes improvements to US 17 near Douglass Road. The total flood improvement cost is $903,000, shown in Table 4.4.
- US 17 at MM 21 – Improvement 45: Create a traffic plan for four lanes. This alternative proposes a plan routing traffic away from the area on the southbound lanes near Douglass Road that flooded during Hurricane Florence. The total flood improvement cost is $350,000, shown in Table 4.5.

Subsections for each connectivity option follow to provide a general description of each improvement. Figure 4.1 shows the location of each improvement alternative. Additionally, Table 4.2 through Table 4.4 provide summary costs for each alternative.

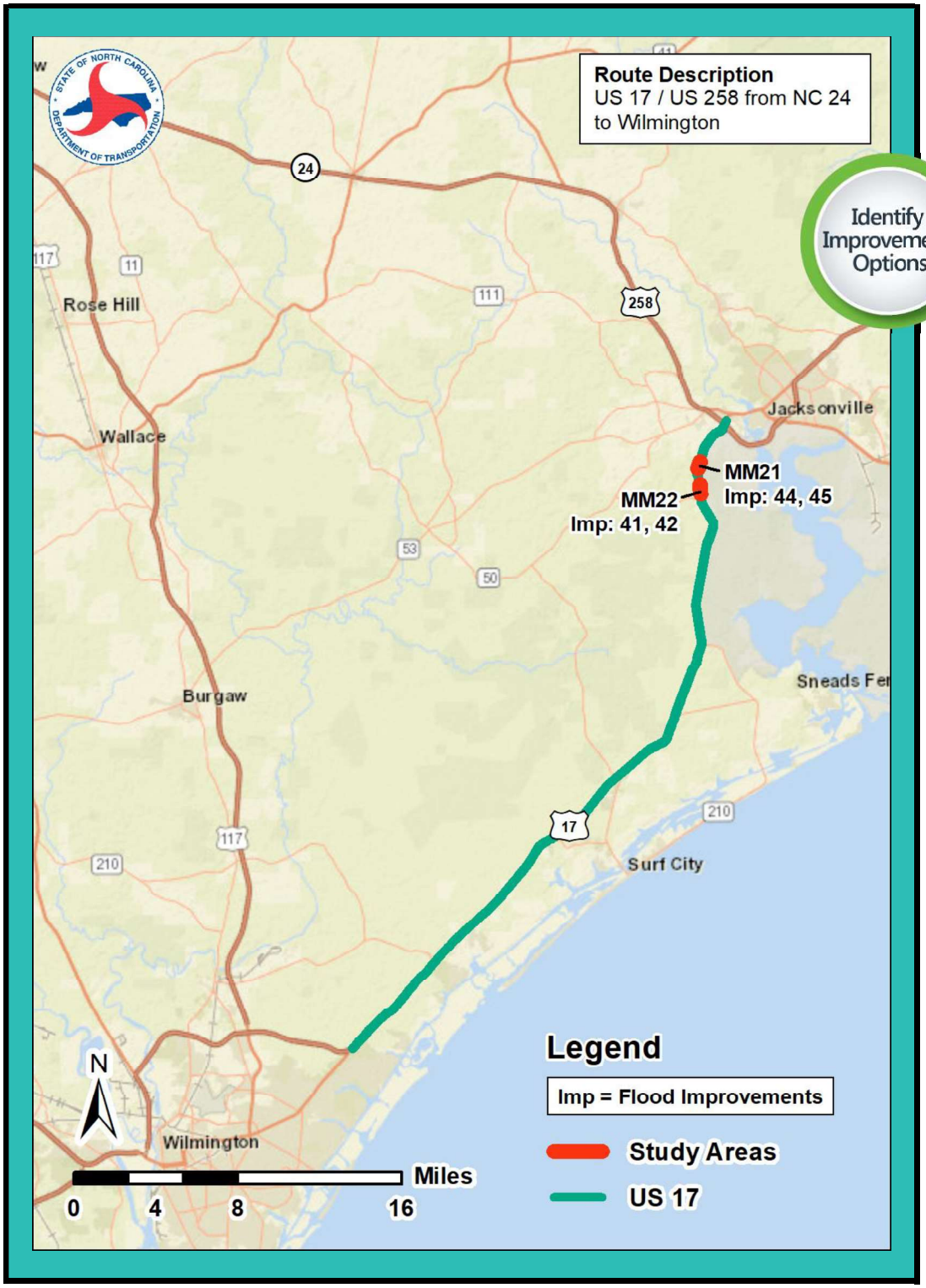


Figure 4.1 – Study Areas and Improvements on US 17

Note: Improvement numbers identified in Figure 4.1 above are explained in Table 4.1.

US 17 at MM 22 – Improvement 41

The flooded section of US 17 at Southwest Creek is proposed to be improved by elevating four lanes with a depressed median to the Hurricane Florence flood elevation. The proposed improvements begin approximately 950 feet north of Stoney Creek Drive and terminate approximately 300 feet north of Murrill Hill Road. Proposed improvements include:

- Elevating Onslow County Bridges 660012 and 660251 approximately five (5) feet to Hurricane Florence flood elevations; and
- Elevating the adjacent US 17 southbound and northbound grade elevation for 2,430 feet by a maximum amount of approximately five (5) feet.

Table 4.2 below provides the US 17 at MM 22 – Improvement 41 summary costs.

Table 4.2 – Summary Costs for US 17 at MM 22 – Improvement 41

	Cost in Thousands
Flood Improvement	**Independent Flood Improvement Cost**
Elevate Bridges Elevate Road Adjacent to Elevated Bridges	$9,798

US 17 at MM 22 – Improvement 42

The flooded section of US 17 at Southwest Creek is proposed to be improved by elevating four lanes with a depressed median to the Hurricane Diane flood elevation. The proposed improvements begin approximately 950 feet north of Stoney Creek Drive and terminate approximately 300 feet north of Murrill Hill Road. Proposed improvements include:

- Elevating Onslow County Bridges 660012 and 660251 approximately 6.5 feet to Hurricane Diane flood elevations; and
- Elevating the adjacent US 17 southbound and northbound grade elevation for 4,080 feet by a maximum amount of approximately 6.5 feet.

Table 4.3 below provides the US 17 at MM 22 – Improvement 42 summary costs.

Table 4.3 – Summary Costs for US 17 at MM 22 – Improvement 42

	Cost in Thousands
Flood Improvement	**Independent Flood Improvement Cost**
Elevate Bridges Elevate Road Adjacent to Elevated Bridges	$14,904

US 17 at MM 21 – Improvement 44

The flooded section of US 17 at MM 21 is proposed to be improved beginning approximately 200 feet south of SR 1116 (Onslow Pines Road) and terminating approximately 500 feet north of SR 1143 (Bailey Drive). Proposed

improvements include elevating the US 17 southbound grade elevation for 621 feet by a maximum amount of approximately 2.5 feet to Hurricane Florence flood elevations.

Table 4.4 below provides the US 17 at MM 21 – Improvement 44 summary costs.

Table 4.4 – Summary Costs for US 17 at MM 21 – Improvement 44

	Cost in Thousands
Flood Improvement	**Independent Flood Improvement Cost**
Elevate two southbound lanes	$903

It should be noted two Transportation Improvement Project (TIP) projects have been developed for this location:

- U5735A includes roadway improvements to the US 17 and Douglass Road intersection. These improvements were not considered for Improvement 44 as there is little overlap in the roadway improvements.
- US5735 includes increasing the conveyance of Onslow County cross pipe E2266 by increasing the pipe size to 8' x 6' concrete box culvert (buried one foot). Improvement 44 did not include the increased conveyance so the elevation of the roadway would provide an alternate solution to the conveyance improvement.

US 17 at MM 21 – Improvement 45

The flooded section of US 17 at MM 21 is proposed to be improved by implementing a traffic control plan. The proposed traffic control plan would detour traffic away from flooded southbound lanes into one of the existing northbound lanes, and northbound traffic would detour into the other existing northbound lane. Also, the US 17 turn lanes for Douglass Road would be closed temporarily while traffic is detoured. The proposed improvements begin approximately 200 feet south of SR 1116 (Onslow Pines Road) and terminate approximately 500 feet north of SR 1143 (Bailey Drive). Proposed improvements include:

- Widening US 17 turn lanes for SR 1129 and SR 1116 for trucks entering the detour; and
- Implement traffic control plan

Table 4.5 below provides the US 17 at MM 21 – Improvement 45 summary costs.

Table 4.5 – Summary Costs for US 17 at MM 21 – Improvement 45

	Cost in Thousands
Flood Improvement	**Independent Flood Improvement Cost**
Widen US 17 turn lanes Add traffic control for SB detour into NB lane	$350

4.2 US 258 at MM 2 – Improvement 43

The vulnerability assessment discussed in Section 3 identified one flooded area along US 258, as shown in Figure 4.2. To maintain connectivity to Wilmington via Jacksonville, defined for this study as providing flood resilient roadway access without increasing traffic carrying capacity of US 258, one connectivity alternative was developed. The flood improvement connectivity option for US 258 is summarized in Table 4.6 and detailed below.

Table 4.6 – Improvements Evaluated by Mile Marker, US 258

US 258 Mile Marker	Improvement ID	Improvements Considered
2	43	Elevate four lanes with two-way left turn lane to the Hurricane Florence flood elevation

The flooded section of US 258 at MM2 is proposed to be improved by elevating four lanes with a two-way left turn lane to the Hurricane Florence flood elevation. The proposed improvements begin approximately 1,000 feet south of the US 258 intersection with Blue Creek Road/Ridge Road and terminate approximately 380 feet north of the US 258 intersection with Blue Creek Road/Ridge Road. Proposed improvements include:

- Increasing the US 258 westbound and eastbound grade elevation for 2,080 feet by a maximum amount of approximately 2.75 feet; and
- Elevating Blue Creek Road Y Line and Ridge Road Y line to meet the new US 17 grade elevation.

Table 4.7 below provides the US 258 at MM 2 – Improvement 43 summary costs.

Table 4.7 – Summary Costs for US 258 at MM 2 – Improvement 43

	Cost in Thousands
Flood Improvement	Independent Flood Improvement Cost
Elevate Roadway	$3,562

It should be noted a Transportation Improvement Project (TIP) has been developed for this location:

- U5739 includes roadway and conveyance improvements to US 258, including improvements at or near Blue Creek. These improvements were not considered for Improvement 43. The level of service for resilient design will be considered during the design phase of the TIP.

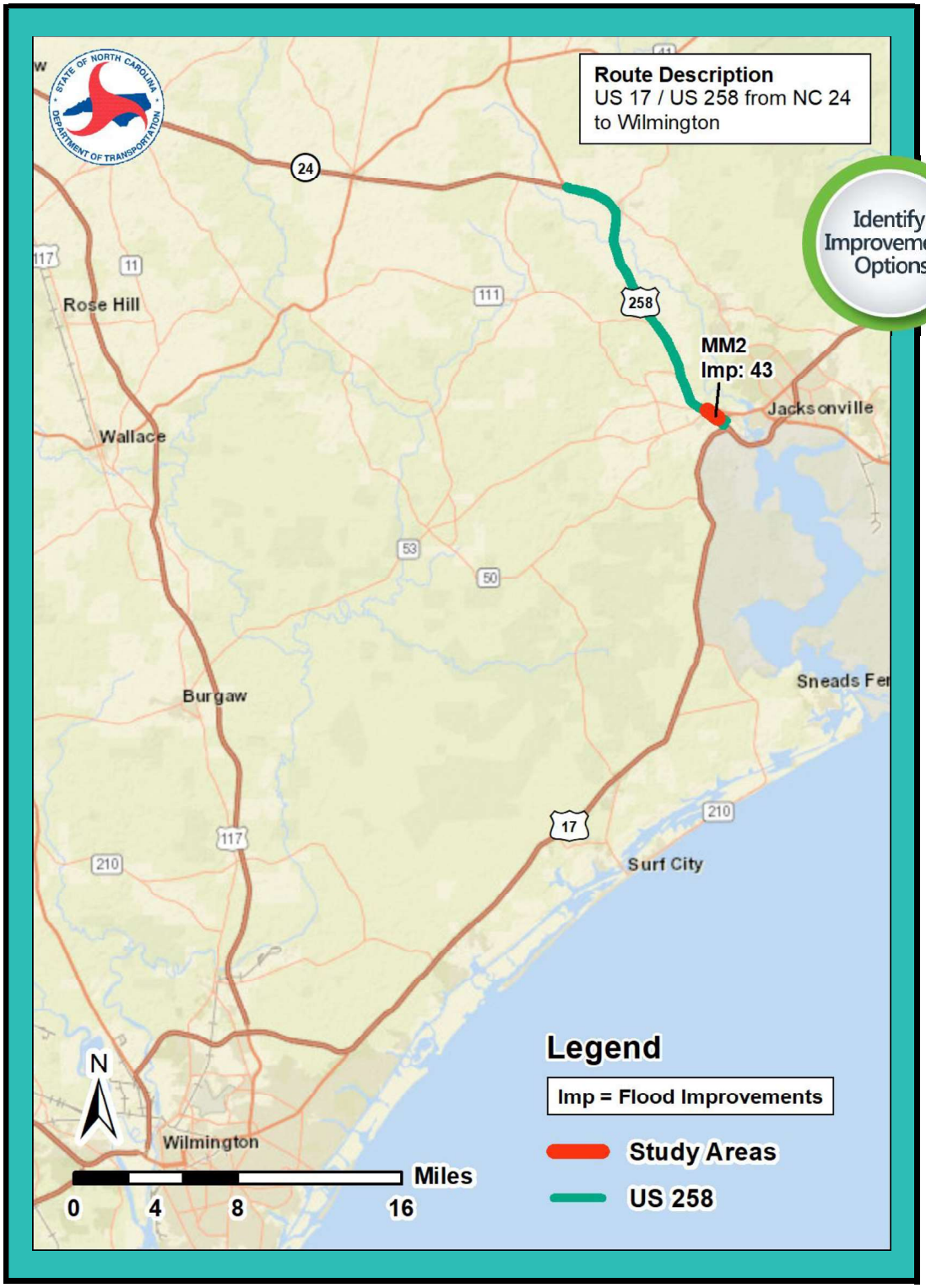
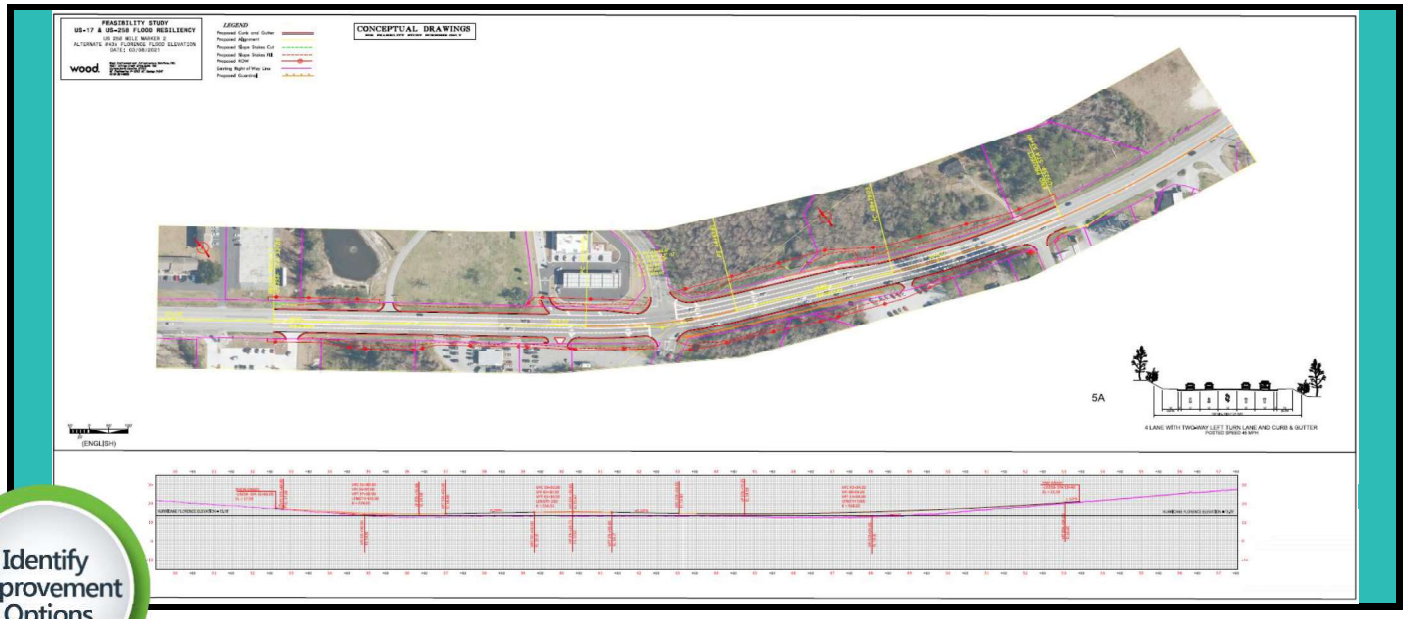


Figure 4.2 – Study Areas and Improvements on US 258

Note: Improvement numbers identified in Figure 4.2 above are explained in Table 4.6.

A summary table of all improvements considered is provided in Appendix D. The table structure provides for a quick comparison of improvement options based on location, flooding experienced, cost, and other considerations.

For each of the flood improvements, feasibility drawings and preliminary estimates for construction were also developed. Feasibility drawings for roadway design improvements, example shown in Figure 4.3 below, are provided in Appendix B. Preliminary cost estimates (construction only) are provided in Appendix C.



Identify Improvement Options

Figure 4.3 – US 258 Feasibility Drawing Example

5. Summary of Findings

The US 17/US 258 Compendium to the I-40/I-95 Flood Resilience Feasibility Study identifies improvement options and estimated costs to increase flood resilience on US 17 from Wilmington to Jacksonville and US 258 from Jacksonville to the US 258 and NC 24 split.

Five improvements options were identified to maintain connectivity. The specific improvement options included:

- Elevating the roadway
- Implementing a traffic plan

The improvement options identified by this study include four connectivity improvement options for US 17 and one connectivity improvement option for US 258. The findings for US 17 and US 258 are summarized below.

- Two study areas were identified for flood resilience improvements along US 17. The improvements include four connectivity options, which have independent estimated flood improvement costs ranging from approximately $350,000 to $14.9 million. These options maintain flood resilient access from Wilmington to Jacksonville. Table 5.1 on the following page summarizes the costs for the identified flood improvement options for US 17. Figure 4.1 shows the locations of the flood improvements.
- One study area was identified for flood resilience improvements on US 258. One connectivity option was identified. This option has an independent estimated flood improvement cost of approximately $3.6 million. This option maintains flood resilient access from Jacksonville to the US 258 and NC 24 split. Table 5.2 on the following page summarizes the cost for the identified flood improvement option for US 258. Figure 4.2 shows the location of the flood improvement.

Table 5.1 – Summary of US 17 Flood Improvement Costs

			Cost in Thousands
Alternative	**Description**	**Flood Improvement**	**Total Cost of Alternative**
US 17 at MM 22 – Improvement 41	US 17	Elevate US 17 for 2,430 feet and Elevate bridges 660012 and 660251 5 feet	**$9,798**
US 17 at MM 22 – Improvement 42	US 17	Elevate US 17 for 4,080 feet and Elevate bridges 660012 and 660251 6.5 feet	**$14,904**
US 17 at MM 21 – Improvement 44	US 17	Elevate SB US 17 for 621 feet	**$903**
US 17 at MM 21 – Improvement 45	US 17	Widen US 17 turn lane for SR 1116, Widen US 17 turn lane for SR 1129, and Implement Traffic Control Plan	**$350**

Table 5.2 – Summary of US 258 Flood Improvement Costs

			Cost in Thousands
Alternative	**Description**	**Flood Improvement**	**Total Cost of Alternative**
US 258 at MM 2 – Improvement 43	US 258	Elevate US 258 for 2,080 feet	**$3,562**

Note: Appendices are available through the NCDOT Resilience Program.