# F

# Appendix F - Bridge Replacement Scoping Trip Risk Assessment Form & Preliminary Stormwater Management Design Study

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# BRIDGE SCOPE AND RISK ASSESSMENT FORM

COUNTY: Beaufort

DATE: 06/28/2016

ROAD #: US 21

STREAM CROSSING: Harbor River

Purpose & Need for the Project:

The existing US Highway 21 Bridge over Harbor River located in Beaufort County, SC is to be replaced by a bridge on new alignment. The existing bridge is classified as structurally and functionally obsolete.

## I. FEMA Acknowledgement

Is this project located in a regulated FEMA Floodway? [X] Yes [ ] No

Panel Number: 450025 0135 E
450025 0162 E

Effective Date: 11/04/1992 (See Attached)

## II. FEMA Floodmap Investigation

FEMA Flood Profile Sheet Number N/A illustrates the existing 100 year flood:

- [ ] Passes under the existing low chord elevation.
- [ ] Is in contact with the existing low chord elevation.
- [ ] Overtops the existing bridge finished grade elevation.

## III. No Rise/CLOMR Preliminary Determination

[✔] Preliminary assessment indicates this project may be constructed to meet the "No-Rise" requirements. A detailed hydraulic analysis will be performed to verify this assessment.

Justification: The proposed bridge will be longer than the existing bridge and maintain the existing bridge low chord at a minimum, providing a larger hydraulic opening. This will increase the floodplain limits under the bridge and, therefore, there should be no increase in the flood profile.

[ ] Preliminary assessmnet indicates this project may require a CLOMR/LOMR. Impacts will be determined by a detailed hydraulic analysis.

Justification:

# BRIDGE SCOPE AND RISK ASSESSMENT FORM

## IV. Preliminary Bridge Assessment

A. Locate Existing Plans

a. Bridge Plans ☑ Yes ☐ No File No. 7.629 Sheet No. 42-76 (See Attached)

b. Road Plans ☑ Yes ☐ No File No. 7.223/7.23 Sheet No. ______ (See Attached)

B. Historical Highwater Data

a. USGS Gage ☐ Yes ☐ No Gage No. ____________ Results: ________________

b. SCDOT/USGS Documented Highwater Elevations ☐ Yes ☐ No Results: ______________________

c. Existing Plans ☑ Yes ☐ No See Above

## V. Field Review

A. Existing Bridge

Length: 2,851 ft. Width: 47 ft. Max. span Length: 85.2 ft.

Alignment: ☑ Tangent ☐ Curved

Bridge Skewed: ☐ Yes ☑ No Angle: ____________

End Abutment Type: Concrete Cap

Riprap on End Fills: ☑ Yes ☐ No Condition: Little riprap on west end.

Superstructure Type: Concrete deck.

Substructure Type: Steel girders on concrete caps and piles.

Utilities Present: ☑ Yes ☐ No

Describe: DIP connected to north and south side of bridge, as well as electrical conduit on south side. Power lines run parallel to bridge on south side.

Debris Accumulation on Bridge: Percent Blocked Horizontally: 0 %

Percent Blocked Vertically: 0 %

Hydraulic Problems: ☐ Yes ☑ No

Describe: Shellfish (oysters/barnicles) are growing on bridge piles, slightly reducing the hydraulic opening under the bridge.

# BRIDGE SCOPE AND RISK ASSESSMENT FORM

V. Field Review (cont.)

B. Hydraulic Features

a. Scour Present: ☐ Yes ☑ No Location: No scour observed on banks.

b. Distance from F.G. to Normal Water Elevation: 11.76 ft.

c. Distance from Low Steel to Normal Water Elev.: 9.76 ft.

d. Distance from F.G. to High Water Elevation: 8.72 ft.

e. Distance from Low Steel to High Water Elev.: 6.72 ft.

Mean Tide Level: -0.46'
Mean High Water: +2.58'

F.G. and Low Steel elevs. are minimum elevs. on ex. bridge.

f. Channel Banks Stable: ☑ Yes ☐ No

Describe: Channel banks consist of march grass and oyster beds.

g. Soil Type: Muddy, fine sands.

h. Exposed Rock: ☐ Yes ☑ No Location: ______

i. Give Description and Location of any structures or other property that could be damaged due to additional backwater.

Due to the vast floodplains of the surroundings marshlands, backwater from the bridge should not affect any property of structures. However, nearby Saint Helena Island and Harbor Island contain structures located in flood zones. Power lines on concrete piles are present south of the existing bridge.

C. Existing Roadway Geometry

a. Can the existing roadway be closed for an On-Alignment Bridge Replacement

☐ Yes ☑ No

Describe:

Existing bridge is only means of vehicular transportation to and from islands south east of Saint Helena Island.

If "yes", does the existing vertical and horizontal curves meet the proposed design speed criteria?

N/A

If "No", will the proposed bridge be:

☐ Staged Constructed

☑ Replaced on New Alignment

# BRIDGE SCOPE AND RISK ASSESSMENT FORM

VI. Field Review (cont.)

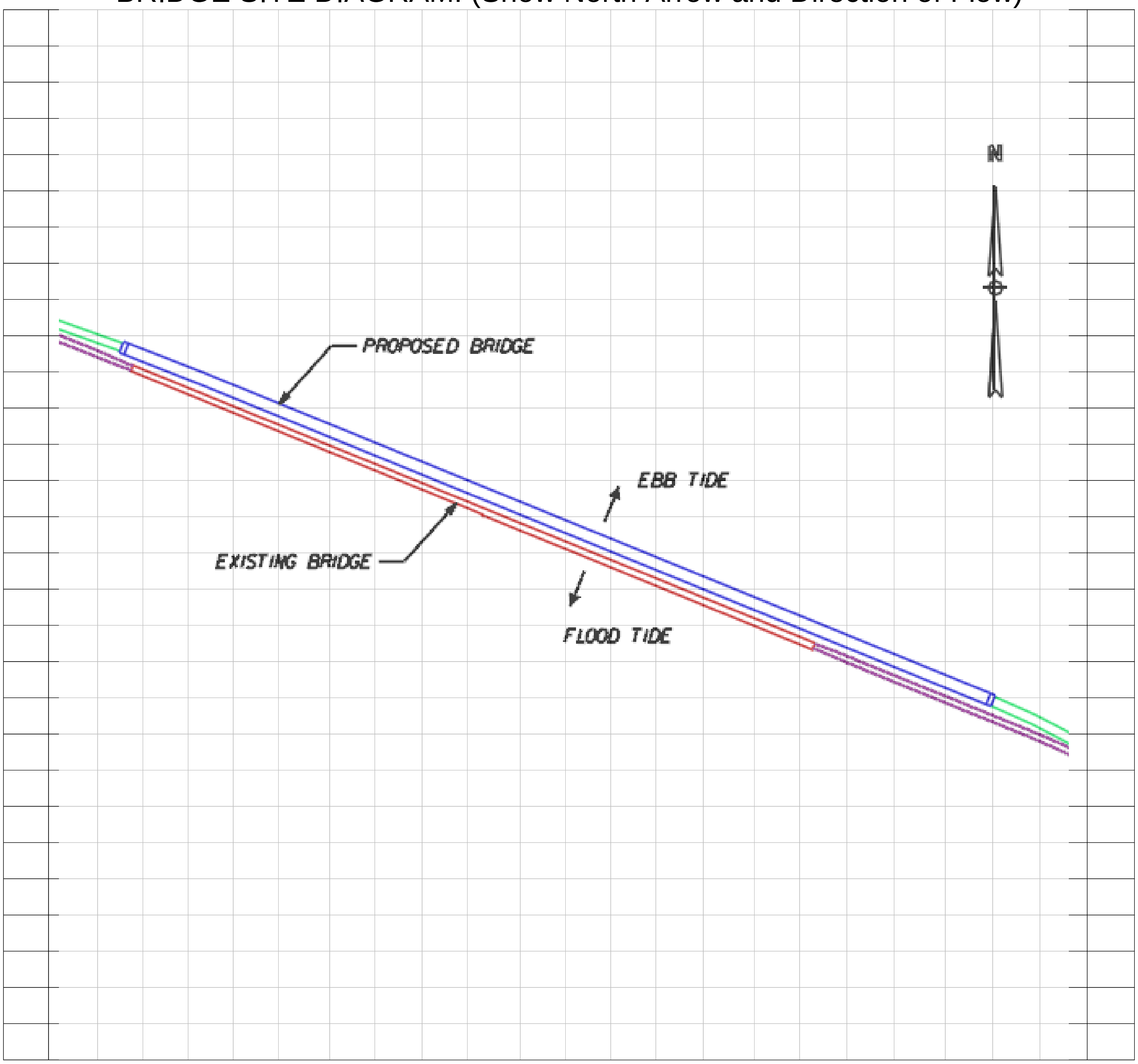
A. Proposed Bridge Recommendation:

Length: 3,602 ft. Width: 47 ft. Elevation: 89.00 ft. Max.
21.85 ft. Min.

Span Arangement: 16 @ 126'-0" / 13 @ 122'-0"

Notes:

BRIDGE SITE DIAGRAM: (Show North Arrow and Direction of Flow)




Performed By: Brandon Stokes

# Preliminary Stormwater Management Design Study

US 21 (Sea Island Parkway) Harbor River Bridge Replacement

Project # P026862

*Beaufort County, South Carolina*

June 28, 2016

# Contents



# Tables



# Figures

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# 1 Introduction/Existing Conditions

The South Carolina Department of Transportation proposes to replace the existing US Highway 21 Bridge over the Harbor River in Beaufort County, South Carolina. The existing bridge to be replaced is 0.54 miles long and spans a navigable waterway, the Harbor River, to connect Saint Helena Island and Harbor Island. The proposed project involves replacement of the existing swing-span bridge with a proposed fixed, high level bridge on new alignment and tying back in to the existing road. The project site is located in a rural area and the roadway corridor consists of marshes, wetlands, and water bodies on either side.

The existing 2,851-foot long bridge over the Harbor River is a center swing-span bridge that is 24-feet wide with two 10-foot driving lanes. The existing road on either end of the bridge consists of two 12-foot driving lanes with 4-foot paved shoulders and is built on fill, creating a causeway across the marshy floodplains. Runoff from the existing bridge deck is collected by scuppers that discharge directly into the Harbor River and bordering wetlands. There are no closed drainage systems or major drainage crossings within the project limits.

The project site is located in a rural area and lies within the 100-year floodplain. Estuarine systems are found within the study project corridor and include deepwater tidal habitats and adjacent tidal wetlands. The predominant soils consist of muddy, fine sands.

# 2 Drainage Design Criteria

The hydrologic analysis is to be performed in accordance with SCDOT's Requirements for Hydraulic Design Studies dated May 26, 2009. Storm drainage systems will be designed with Geopak Drainage using a 10-year design storm. The Rational Method will be used to determine peak runoff values for storm drainage calculations since all drainage areas will be less than 100 acres. The published SCDOT rainfall intensity values for Hilton Head most represent the rainfall pattern for the project site. Table 2-1 details the drainage design criteria for the project.

**Table 2-1. Drainage Design Criteria**

| DRAINAGE DESIGN | | | | |
|---|---|---|---|---|
| **DESIGN ELEMENT** | | | **DESIGN CRITERIA** | **SOURCE** |
| Design Discharge | Cross-Line Pipes | | 50-year | SCDOT Requirements for Hydraulic Design Studies, May 26, 2009 **Section 2.2.2** and **2.2.3** |
| | Systems and Ditches | 0 – 40 AC | 10-year | |
| | | 40 – 500 AC | 25-year | |
| | | > 500 AC | 50-year | |
| Spread Criteria | Roadway | Design Storm | 10-year | SCDOT Requirements for Hydraulic Design Studies, May 26, 2009 **Section 2.2.4** |
| | | Spread Width | ½ travel lane | |
| | Bridge | Design Storm | 10-year | HEC-21, Section 3.1 |
| | | Spread Width | Shoulder Width | |
| Minimum Ditch and Pipe Grades | | | Ditch = 0.1%, Pipe = 0.3% | SCDOT Requirements for Hydraulic Design Studies, May 26, 2009 **Section 2.2.5** |
| Minimum Velocity of Pipe | | | 3 ft/sec | |
| Minimum Pipe Size | Storm Drainage Systems & Cross-Line Pipes | | 18" | SCDOT Requirements for Hydraulic Design Studies, May 26, 2009 **Section 2.2.6** |
| | Yard Drains & Driveway Pipes | | 15" | |
| Minimum Cover | Yard Drains | | 1.0' | SCDOT Requirements for Hydraulic Design Studies, May 26, 2009 **Section 2.2.7** |
| | Pipes except Yard Drains | | 2.0' for CB-16<br>3.0’ for CB-17 & 18 | |

Grassed swales are to be designed in accordance with SCDOT’s Stormwater Quality Design Manual. A grassed swale is allowed a maximum drainage area of 5 acres to properly treat the runoff. It must be capable of conveying the 10-year, 24-hour storm event without overtopping or reaching erosive peak runoff velocities and shear stresses.

# 3 Proposed Conditions

The proposed design typical section for the road between the project limit tie-ins and the bridge consists of two 12-foot travel lanes and two 10-foot shoulders, in which 4-feet of the shoulders will be paved. The bridge consists of two 12-foot travel lanes and two 10-foot paved shoulders.

Conceptual drainage designs were prepared for each of the five proposed bridge alternatives. The proposed drainage designs consist of deck drains spaced throughout the bridge where runoff will be collected in closed drainage systems suspended underneath the bridge. The bridge deck drain systems are proposed to tie to manholes located at the ends of the bridge. Closed drainage will convey the bridge runoff from the manholes into grassed swales. The grassed swales will provide water quality treatment before outfalling into the surrounding marshes and outside of 1,000-feet away from shellfish beds, per OCRM requirements.

The deck drains closest to the crest of the bridge should be placed so that spread will be less than 10-feet. Deck drains should then be spaced so that the spread will remain within the shoulder and that 0 cfs will run off of the bridge at its ends. Through analysis, it was determined that deck drains with 6-inch diameter openings would collect runoff and that a12-inch diameter PVC pipe would convey the runoff from the deck drains to the drainage system off of the bridge.

Catch basins should be placed at the ends of the approach slabs to collect runoff from the approach slabs and to tie in the bridge deck drain systems. Manholes should be used on superelevated sides of the roadway in lieu of catch basins to tie the bridge deck drain systems to the roadway drainage systems.

Smooth wall pipe will be used to convey the runoff in the closed drainage systems. The minimum pipe grade in the systems should be 0.3 percent. The minimum pipe size to be used in the roadway drainage systems is 18-inch diameter.

# 4 Temporary Sediment and Erosion Control

Throughout the duration of the project, a single row of silt fence will be installed and maintained at the construction limits along the length of the project. A double row of silt fence will be placed where the construction impacts are adjacent to marshes, wetlands, or streams.

Inlet protection is to be provided at all existing and proposed inlets that are impacted by the proposed improvements. Type B Inlet Structure Filters will be used at manhole and drop inlet locations and Type E and F Inlet Structure Filters will be used at catch basins located in the curb and gutter sections.

Appropriately sized energy dissipaters will be installed at all storm drainage outlets to reduce discharge velocities.

All erosion control measures were proposed according to SCDOT Standard Drawings from Sections 804 and 815.

# 5 Permanent Water Quality Considerations

The drainage systems are proposed to outfall at each end of the bridge into ditches that will convey the runoff to a distance greater than 1,000-feet from shellfish beds before outfalling into the marshes. The last 100-feet of the ditches should be grassed swales constructed and maintained per SCDOT's Stormwater Quality Design Manual to provide water quality BMPs. The proposed grassed swales will have a minimum flow length of 100-feet with a 2-foot wide base and 0.5-foot high earthen flow control structures spaced throughout to achieve water quality benefits and reduce runoff velocities and shear stresses. The minimum longitudinal grade recommended is 0.5 percent. Front and back side slopes will be no steeper than 2H:1V.

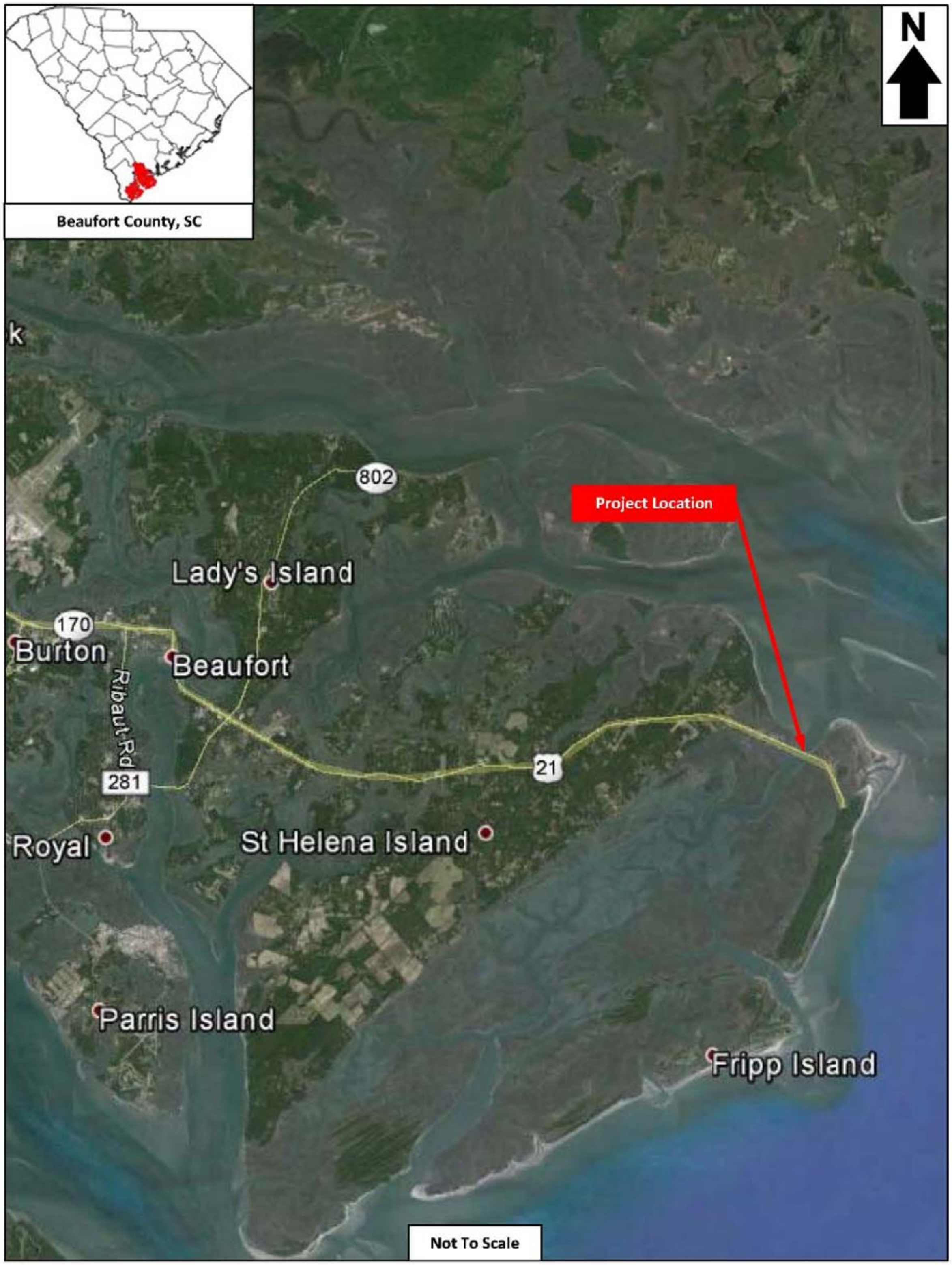
In Alternatives 1A, 1B, and 3, the ditches and grassed swales are proposed to be created between the proposed roadway fill slopes and the existing roadway. The ditches and grassed swales will run adjacent to the fill slopes to beyond the 1,000-foot shellfish bed minimum distance and then can discharge directly to the marsh. By utilizing the existing causeway section that will be abandoned, construction disturbance impacts to the surrounding wetlands will be minimized.

In Alternatives 2A and 2B, the roadway alignments are further from the existing corridor. To pipe the drainage systems to a point where the fill slopes meet to create swales similar to that in Alternatives 1A, 1B, and 3 would create systems lower than the existing ground they would outfall upon. Therefore, it is suggested that the drainage systems be piped to a distance near the 1,000-foot shellfish bed minimum and then outfall into grassed swales that are constructed into berms along the fill slopes of the proposed roadway. The grassed swales on the berms will treat the runoff for 100-feet and then discharge directly into the marsh.

# 6 Project Maps

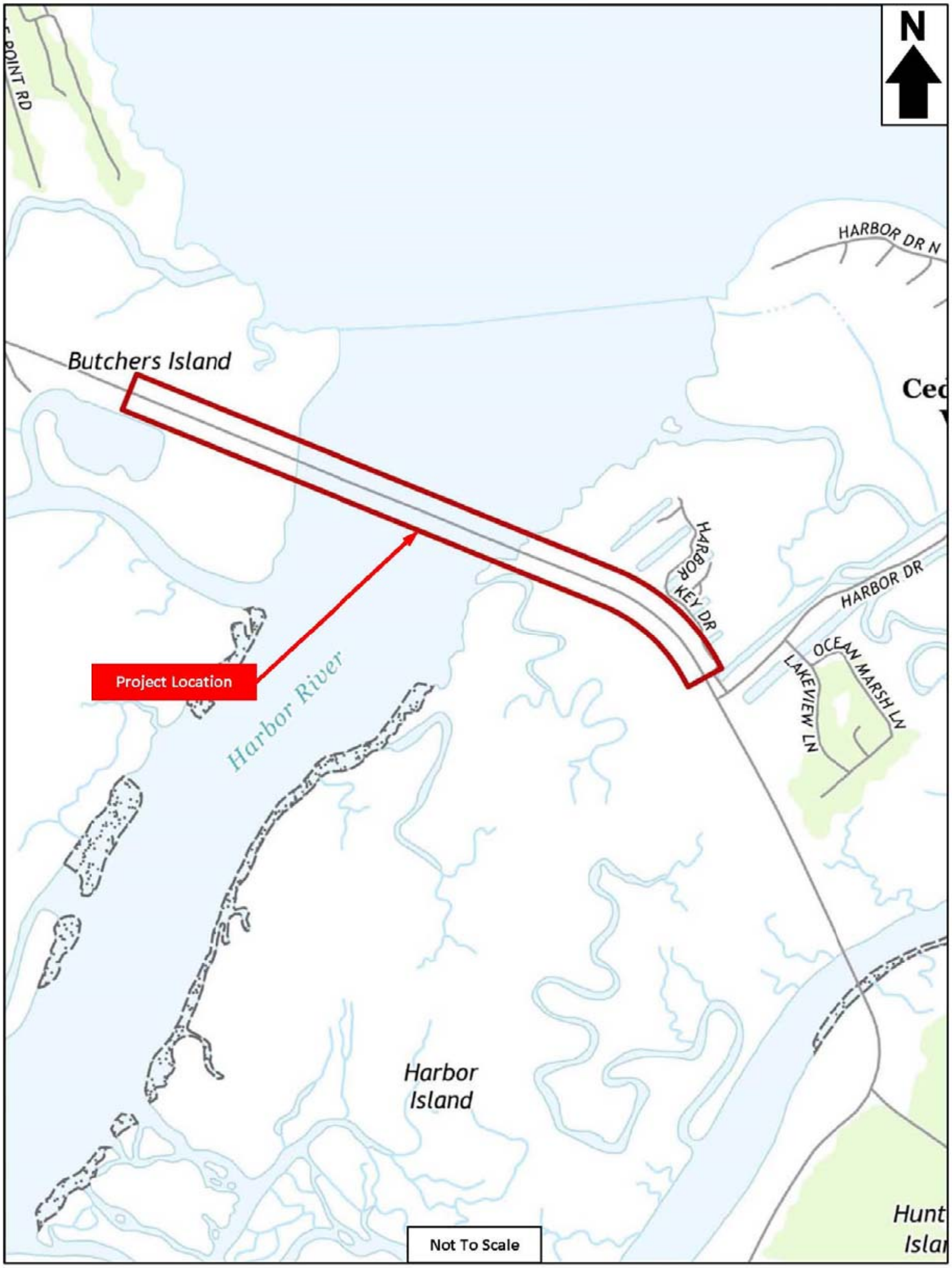
See Figures 1 through 7 for the project’s vicinity, location, quad mapping, soils, FEMA flood information, and drainage areas.

## Figure 6-1. Vicinity Map

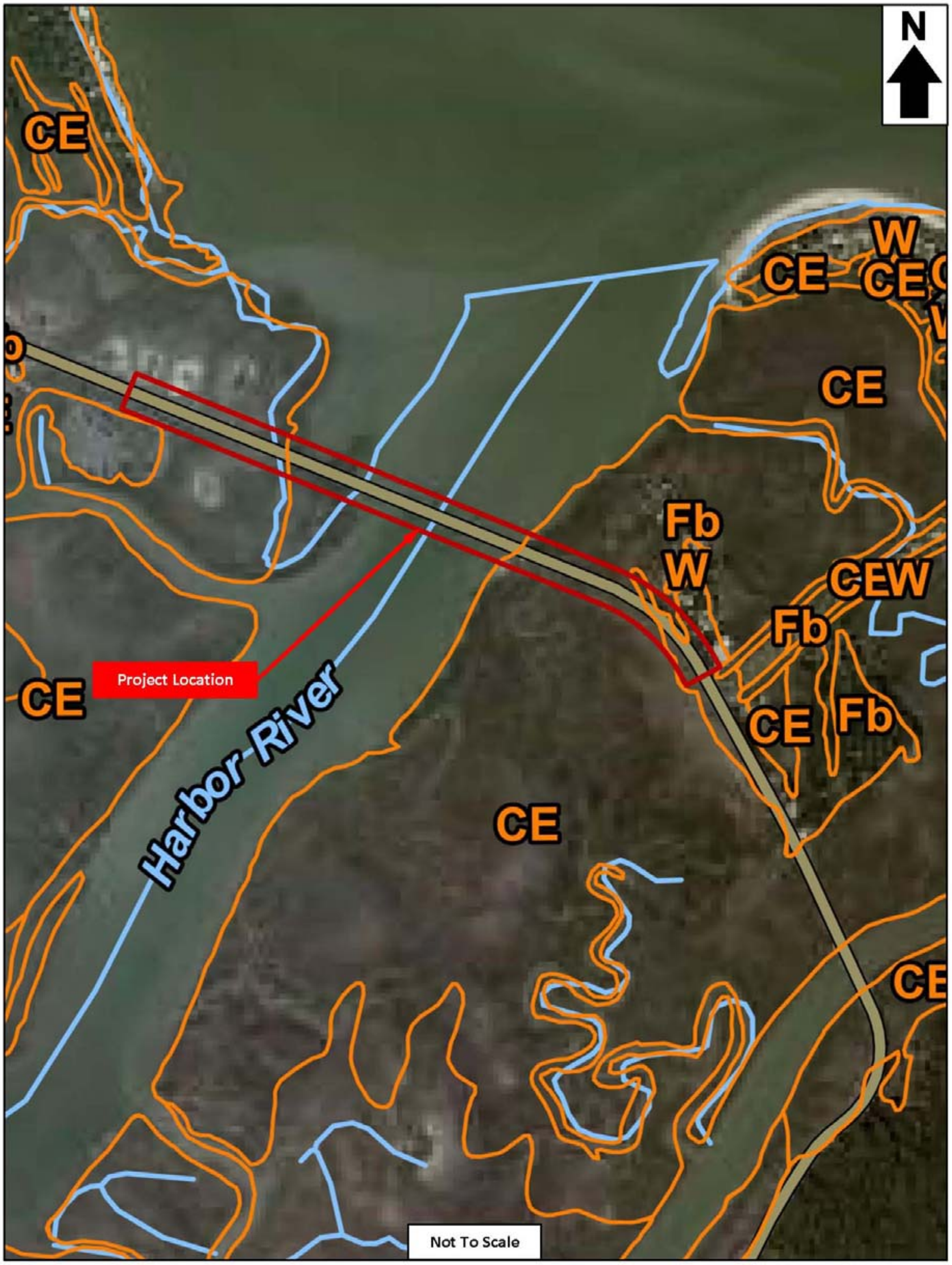


## Figure 6-2. Location Map

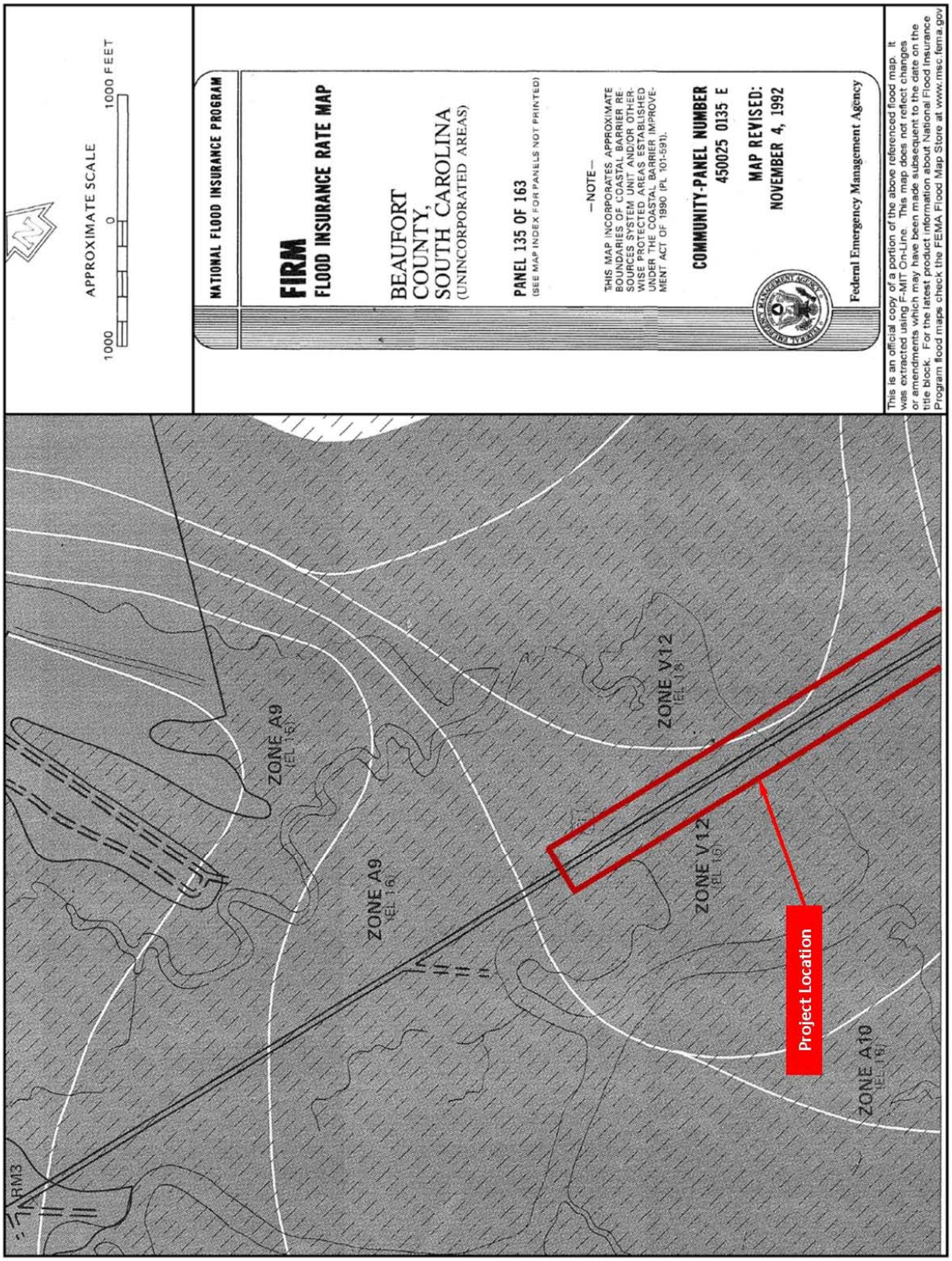
## Figure 6-3. USGS Quad Map



## Figure 6-4. Soils Map



## Figure 6-5. FEMA Flood Map



## Figure 6-6. FEMA Flood Map