# I-95 Bridges

## An application for Bridge Investment Program (BIP) Funding

**March 19, 2024**

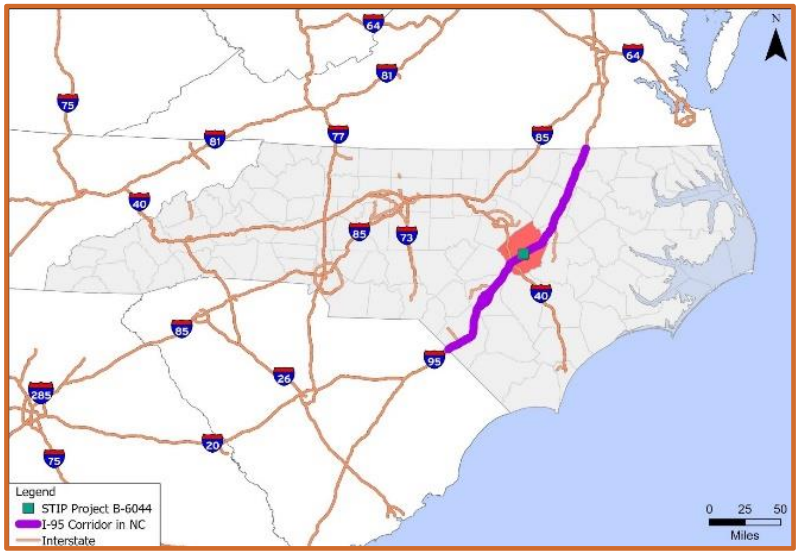
**North Carolina Department of Transportation (NCDOT)**

**UIE: XSN8A4TT1DY5**

## I. Project Description

The North Carolina Department of Transportation (NCDOT) urgently seeks $37,880,500 in USDOT Bridge Investment Program (BIP) Bridge Program funding to replace four deteriorating bridges on the vital I-95 travel and freight corridor in Johnston County, North Carolina. I-95 is part of the Federal Highway Administration's (FHWA's) National Highway System (NHS), the National Highway Freight Network (NHFN), and the North Carolina Strategic Highway Network (STRAHNET). All the structures are listed in the National Bridge Inventory (NBI) in either fair or poor condition. The image below shows the location of the bridges.


I:95 Bridges in Johnston County




I-95 Bridges Context Map

The four bridges were constructed between 1955 and 1958 and are at the end of their designed lifespan. The bridge inspection reports for the facilities are included as supplemental material. The reports document many signs of deterioration, including delamination, cracking, exposed rebar, missing header and joint material, and corrosion. Bridge 00000001010085 has temporary shoring and is in poor condition. NCDOT classifies the bridge as structurally deficient. The 2022 bridge inspection report notes that the bridge is open but would be posted or closed except for temporary shoring.

The other three bridges, currently in fair condition, were built at the same time using the same materials and construction standards. NCDOT Classifies Bridges 000000001010082, 000000001010100, and 000000001010101 as functionally obsolete. Increasing maintenance costs over the past five years have been documented, and without almost constant maintenance, the condition of all of the structures would continue to degrade.

### *Location*

The project is located in the Southeastern Plains Level 3 Ecoregion, in the Rolling Coastal Plain and Southeastern Floodplains and Low Terraces Level 4 Ecoregions. The project flows through the Neuse River Basin. Specific locational data for each bridge is shown below:

| Structure No. | Latitude | Longitude |
|---|---|---|
| 000000001010082 | 35275866 | 078225040 |
| 000000001010085 | 35275960 | 078225068 |
| 000000001010100 | 35283930 | 078220448 |
| 000000001010101 | 35283972 | 078220463 |

The project area is partially located in the Smithfield, North Carolina 2020 Census-designated Urbanized Area. While the project is not located in an Area of Persistent Poverty (APP), the project area crosses Census Tracts that are classified as Historically Disadvantaged Communities (HDCs).

Census Tract 37101040601 is listed as disadvantaged due to agricultural land loss combined with low income, high average energy costs, high rates of diabetes, transportation barriers, low median income, and a high percentage of residents who have less than a high school education.

Census Tract 371010412042 is listed as disadvantaged due to agricultural land loss combined with low income, transportation barriers, and a high percentage of residents who have less than a high school education.

Additional information is provided in the enclosed Excel Template.

## II. National Bridge Inventory Data

Please refer to the attached Excel Template.

## III. Project Budget – Grant Funds, Sources, and Use of All Project Funding

NCDOT seeks $37,880,500 million in BIP Bridge Project funding for the I-95 Bridges Project. The funding will allow NCDOT to move forward with 2024 – 2033 State Transportation Improvement Program (STIP) project B-6044. The project has completed environmental documentation and acquisition. However, due to funding concerns, the project has been delayed until 2029 for construction. BIP funding will allow the project timeline to advance, with construction letting in FY 2026.

The Categorical Exclusion (CE) for the project was signed on October 18, 2022. NCDOT has completed right of way (ROW) acquisition. To date, NCDOT has spent over $436,600 in planning and ROW costs. Including federal expenditures, the total previously incurred costs are $2,043,990.

NCDOT developed cost estimates based on ROW plans on January 23, 2024. The total costs of construction were estimated to be $47,700,000. This estimate includes $6,588,000 in contingency funds. The cost estimate is included in the supplemental materials.

North Carolina's Strategic Transportation Investments Act (STI) of 2013 requires that capital projects compete through a data-driven project prioritization process that considers, but is not limited to, cost and mobility improvements for each proposed project.

The process has three major competition categories, Statewide Mobility, Regional Impact, and Division Needs. These categories are based on the proposed project's type of transportation asset class. STIP Project B-6044 was selected for funding through the Statewide Mobility category in the current (2024-2033) STIP. Due to the limited nature of Statewide Mobility funds, construction was scheduled for FY 2029. If BIP Funding is provided, Statewide Mobility funds are available to provide the NCDOT Match ($10,069,500).

B-6044 Remaining Costs ($2024):

- Dynamic Message Sign (DMS): $250,000
- Construction: $47,700,000

### *Source of Funds*

| Item | State Funds | BIP Funds | Total Funds |
|---|---|---|---|
| B-6044 | $10,017,000 | $37,683,000 | $47,700,000 |
| DMS Installation | $52,500 | $197,500 | $250,000 |
| **Subtotals** | **$10,069,500** | **$37,880,500** | **$47,950,000** |

As NCDOT has proceeded through ROW for the project, risks are limited to the permitting and construction phases. As noted previously, NCDOT has already had substantial coordination with resource agencies, minimizing that risk. To account for risks related to construction, NCDOT includes contingency fees in all construction cost estimates. For B-6044, the overall construction contingency is 16% ($6,588,000).

## IV. Merit Criteria

### Criteria #1: State of Good Repair

All of the bridges were built or reconstructed before 1960 and are at the end of their designed lifespan.

Below is a summary of the condition of the four bridges included in this application:

| 1 – Bridge No. 000000001010082 on I-95 over Black Creek (NBI#377607) | |
|---|---|
| **Notes:** In 2018, the superstructure condition had fallen to 5. Extensive efforts in 2020 and 2022 improved the superstructure condition to the current rating, but these improvements are at best a band aid that will not slow the deterioration of the structure long term. | **Sufficiency Rating:** 76.71 |
| | **Deck Condition:** 6 |
| | **Superstructure Condition:** 7 |
| | **Substructure Condition:** 6 |
| | **Built:** 1958 |

| 2 - Bridge No. 000000001010085 on I-95 over Black Creek (NBI # 377610) | |
|---|---|
| **Notes:** Listed in Poor condition on the NBI. The bridge has temporary shoring. | **Sufficiency Rating:** 48.28 (Structurally Deficient) |
| | **Deck Condition:** 6 |
| | **Superstructure Condition:** 4 |
| | **Substructure Condition:** 6 |
| | **Built:** 1955 |

| 3 – Bridge No. 000000001010100 on I-95 over the Neuse River (NBI # 377624) | |
|---|---|
| **Notes:** Current listed maintenance needs include a priority repair need for the deck due to missing header and joint material as well as multiple instances of cracking, delamination/spall, and damaged pilings and railings. | **Sufficiency Rating:** 65.13 (Functionally Obsolete) |
| | **Deck Condition:** 7 |
| | **Superstructure Condition:** 6 |
| | **Substructure Condition:** 5 |
| | **Built:** 1957 |

| 4 - Bridge No. 000000001010101 on I-95 over the Neuse River (NBI # 377625) | |
|---|---|
| **Notes:** Current listed maintenance needs include exposed Rebar, corrosion, and delamination/spall. | **Sufficiency Rating:** 54.00 (Functionally Obsolete) |
| | **Deck Condition:** 5 |
| | **Superstructure Condition: 6** |
| | **Substructure Condition: 5** |
| | **Built:** 1955 |

Structure 000000001010085 is currently classified as in poor condition and the other structures are in fair condition. The deck condition of Structure 000000001010100 had fallen to a 6 out of a possible 10 in 2018. A maintenance effort of $82,000 boosted the deck condition to the current 7, but this did not supply a long-term solution to the bridge condition. As shown in the table below, maintenance costs for these bridges have exceeded $570,000 in the last 14 years.

| I-95 Bridges Maintenance Costs (2010 – 2023) | | | | |
|---|---|---|---|---|
| | B000000001010082 | B000000001010085 | B000000001010100 | B000000001010101 |
| 2010 | $31,351 | $20,263 | | $60,375 |
| 2011 | | | | $832 |
| 2012 | | $4,191 | $3,097 | $11,453 |
| 2013 | | | $6,729 | $6,729 |
| 2014 | $35561 | $2,781 | $3,965 | $6,910 |
| 2015 | $1,018 | $3,944 | $18,110 | $15,122 |
| 2016 | | | | $22,031 |
| 2017 | | $2,531 | $2,828 | $645 |
| 2018 | | | $657 | $3,791 |
| 2019 | | $2,792 | $6,501 | $2,237 |
| 2020 | | | | $16,462 |
| 2021 | $14,544 | $41,018 | $19,042 | $53,115 |
| 2022 | $67,823 | | $3,126 | $27,607 |
| 2023 | | | $41,232 | $10,524 |
| **Total** | **$150,297** | **$77,520** | **$105,287** | **$237,833** |
| **Grand Total** | **$570,937** | | | |

Of that total, over $306,000 has been spent in the last five years. Given the increases in materials costs and the aging infrastructure, these expenditures are only expected to increase in the coming years. Given the age of the structures, it is not unreasonable to anticipate that increasing maintenance would be required to avoid load restrictions in the coming years.

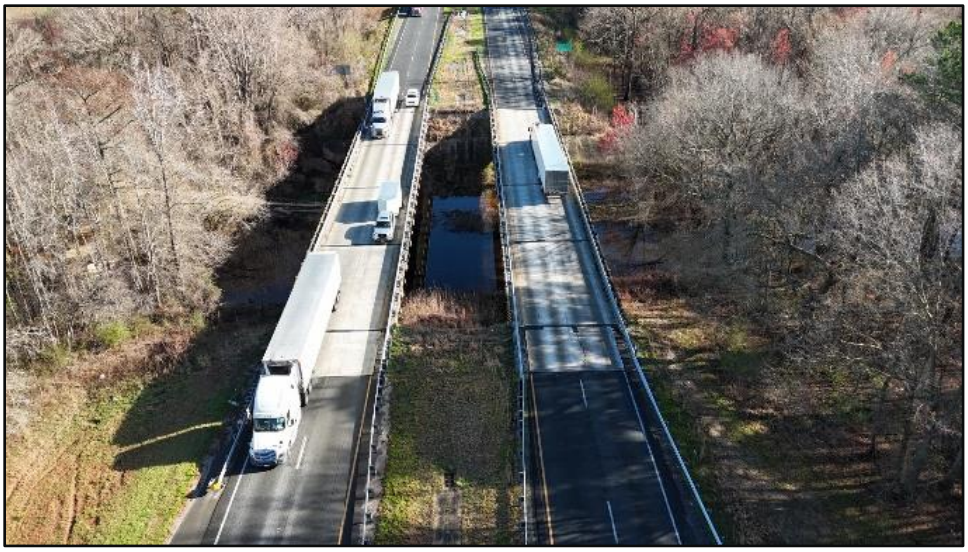
The BCA details the anticipated expenditures needed to maintain the I-95 structures in a functioning condition. Given the State of North Carolina's extensive inventory of aging bridges, such regular expenditures are not feasible. NCDOT is able to program funding for part of the proposed replacement of the I-95 bridges; however, BIP funding is urgently needed to make up the gap in funding. BIP funding, along with State monies will provide the long-term solution of replacement structures instead of stop-gap measures to deteriorating infrastructure. With modern construction techniques, the new structures are anticipated to require minimal maintenance for the next century.

**Criteria #2: Safety and Mobility**

The I-95 bridges were constructed in the 1950s, when roadway design standards were very different.

First, the facilities lack sufficient paved shoulder width for service vehicles or stranded motorists to pull off of the travel lanes. The bridges have deck drains that discharge stormwater directly into the sensitive Neuse River watershed. In addition, the relatively flat grade of the structures is prone to ponding during increasingly heavy rainfall events.

BIP funding will provide a new facility with 14-foot shoulders that allow drivers to safely leave the travel lane if they encounter difficulties. This wider shoulder also provides additional space for emergency and maintenance vehicles. The structure will be designed to channel stormwater off the facilities, reducing pollutants entering the vulnerable Neuse River watershed.



Bridge Nos 000000001010082 and 000000001010082 Over Black Creek

Bridge Nos. 000000001010100 and 000000001010101 Over Neuse River

From December 1, 2018, through November 20, 2023, there were 105 reported crashes within the 1.7-mile construction limits of the four bridges. This includes 17 crashes with non-fatal injuries and an estimated $695,700 in property damage. The crashes included 31 fixed object, 21 rear end/slow or stop, and 25 sideswipes for vehicles traveling in the same direction.

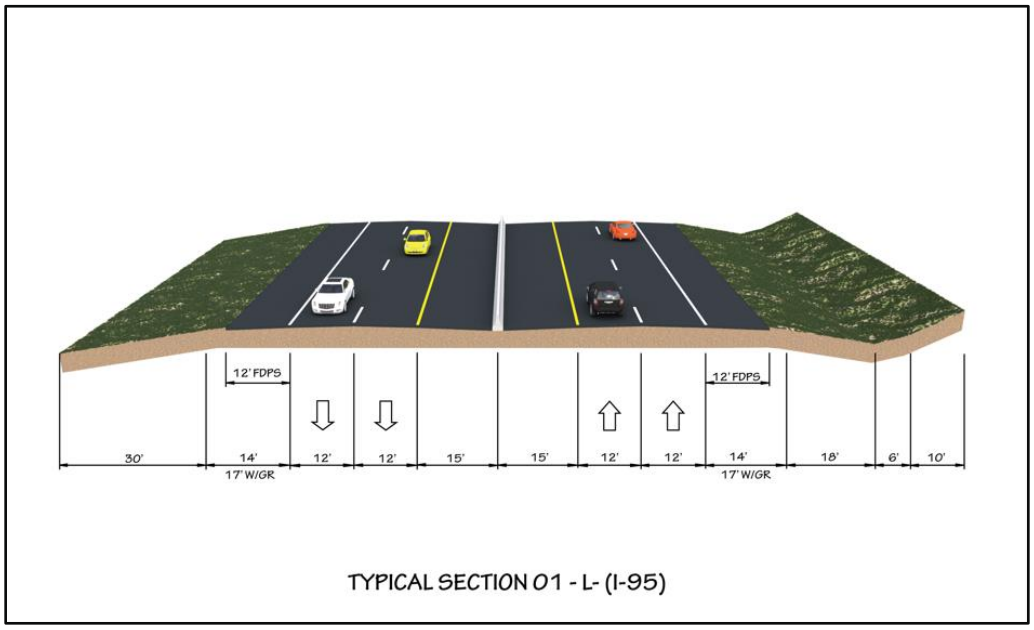
Frequent crashes on this part of I-95 often lead to detours. From November 2, 2022 through January 15, 2024, there were 12 crashes that required detours through the project area with an average duration of almost 1.5 hours. Maintenance and other required activities to maintain the structures also cause lane closures and other delays.

US 301, which is a parallel route in this area, does not have the capacity to accommodate I-95 closure for more than a few hours. There are regular news reports of crashes on I-95 closing the facility for hours. A failure of the I-95 structures could delay traffic for days or weeks.

As noted below, the community along the project corridor is historically disadvantaged; diversions of traffic through these neighborhoods creates issues for safety, air quality, and noise pollution.

In addition to the narrow typical section, there are additional issues with the current facilities. The deck structures are relatively flat, leading to potential ponding during high rainfall events.

The replacement of the bridges will provide 14-foot of paved shoulder area, allowing maintenance vehicles and disabled motorists safer areas off the main travel lanes. The wider facility will accommodate future widening of I-95. It will also allow greater recovery time for vehicles whose drivers temporarily lose control or who seek to avoid a slow or stopped vehicle. The superelevation of the roadway will be increased to 0.025, this will allow for more efficient and effective drainage of the structure. The BCA provides a cost estimate associated with the proposed safety improvements.




Proposed Typical Section

While the I-95 corridor is a vital part of the nation's economy, it does provide a barrier to those who lack automobiles. The Mountain to Sea Trail (MST) is currently co-located with the Buffalo Creek Greenway in Smithfield and then continues south and east on US 301, using the US 701 over I-95 bridge to Devils Racetrack Road as a temporary route for trail users to cross I-95. The East Coast Greenway (ECG) is currently located on US 301 south of Smithfield and at the interchange it currently continues down US 301 onto Boyette Road.

NCDOT met with North Carolina Department of Parks and Recreation (NCDPR) and ECG representatives on July 26, 2019, to discuss the temporary route and a more permanent route for the MST and ECG. NCDOT noted the plans to replace the I-95 bridges over the Neuse River (Bridge Nos 500100 and 500101). Meeting attendees agreed to evaluate accommodating a greenway under the Neuse River Bridges.

**Criteria #3: Economic Competitiveness and Opportunity**

The interstate system has played a vital role in the expansion of the nation's economy. According to research conducted by the FHWA, "From 1950 to 1989, approximately one-quarter of the nation's productivity increase is attributable to increased investment in the highway system." By improving transportation between regions, the interstate highway system has helped to expand the national market for goods as firms can supply their products to much larger geographical areas at lower costs. A National Bureau of Economic Research (NBER) publication found that each dollar of current federal highway grants received by a state raises that state's annual economic output by at least $2.

NBER research found that removing the Interstate Highway System reduces the country's real GDP by $421-$578 billion in 2012 dollars ($565-$776 billion adjusted for 2024 dollars). The cost of removing I-95 from the Interstate Highway System (IHS) was estimated at $19.4-$30.9 billion in 2012 dollars ($26.7-$41.5 billion adjusted for 2024 dollars). The total reduction attributed to domestic trade costs was estimated at $11.3 billion, and $13.3 billion attributed to international trade cost.

In terms of economic impact, few facilities compare with I-95. In a recent NBER Working Paper entitled Highways and Globalization, researchers quantified the value of the 20 longest interstates in the US. As a transnational route, I-95 was found to be one of the most valuable. The route was considered "extremely valuable" as it not only connects the most cities and the most major markets to one another, but also connects to ports.

I-95 is part of the NHS, NHFN, and STRAHNET, highlighting its importance to both national and statewide traffic. One reason that I-95 is one of the most valuable segments of the interstate highway system is that it is connected to the Port of Savannah, Georgia, otherwise known as "The Quiet Giant." 25,000 tons of cargo are transported through this port every day, making it the fourth busiest in the nation. Between 7,000 to 9,000 trucks enter and leave this port daily with goods on their way to retail stores across the Southeast, Midwest, and Gulf Coast, 80 percent of which are distributed on I-95.

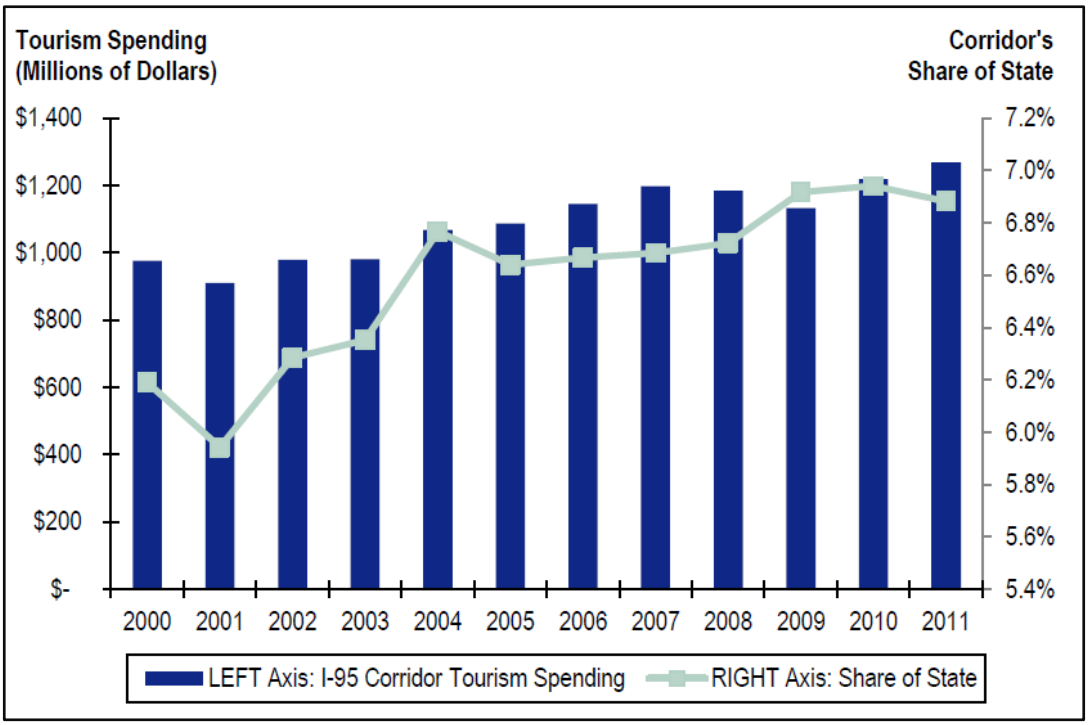
In the project area, the 2024 ADT is estimated to be 45,900 vehicles per day (vpd), with an expected increase to 54,400 vpd by 2044. The facility has a TTST rate of 12 percent and a dual axel rate of 4 percent. This equates to over 5,500 trucks per day traveling the corridor.

Based on data from the Bureau of Transportation Statistics, the value of freight was approximately $1,001 per ton. The maximum weight of a semi truck is 80,000 pounds (40 tons), based on FHWA regulations. Assuming an average cargo weight of 42,000 (21 tons) to 48,000 pounds (24 tons), the daily value of truck freight traffic traveling the I-95 corridor is approximately $115,616,000 to $120,240,000 per day. Recent experience in Pennsylvania and Georgia shows the heavy toll that is taken if interstate bridges fail. Diverting traffic onto secondary roads costs time and increases the risk of crashes on roads not designed to carry such volumes of truck traffic.

I-95 is vital not only in terms of pure economic development, but also as a vital tourism corridor. A vast number of east coast residents have fond memories of escaping the cold of northern winters by traveling to sunny destinations on the I-95 corridor. Specifically in North Carolina,

according to a 2013 study, approximately 7 percent of the state's tourism dollars are provided by the I-95 corridor. In 2011 dollars, that equated to over $1.2 billion dollars per year. Of that amount, $200 million was spent in Johnston County, which offers such tourism attractions as the Clemmons Educational State Forest, the Ava Gardner Museum, the Tobacco Farm Life Museum, and the Bentonville Battlefield State Historic Site. Based on data reported in the 2013 study, the average annual visitation of just these four venues exceeded 72,000 people. This is in addition to the substantive traffic that passes through North Carolina to more southern destinations. It was estimated in 2013 that 66 percent of hotel stays in Johnston County were pass-through stays. These stays provided $14,743,000 to the economy of Johnston County.

Tourism Spending in the I-95 Corridor and Corridor's Share of State (2000-2011)




Source: North Carolina Department of Commerce, calculated by Cambridge Systematics, Inc.; tourism spending is in 2011 dollars.

Maintaining the I-95 corridor is of vital importance to the national and state economy. BIP funding will ensure that these benefits continue to flow.

**Criteria #4: Climate Change, Sustainability, Resiliency, and the Environment**

***Greenhouse Gas Reduction***

NCDOT will examine the use of recycled concrete during project construction, potentially reducing emissions associated with construction activities.

### *Resiliency Benefits*

The Neuse River in the area of the I-95 bridges frequently floods, and debris in the stream channel is a common occurrence. Debris flows are known to damage piers in the water, increasing in maintenance needs. By reducing the number of piers in the water for the Neuse River bridges, the project will provide a more resilient structure that is less likely to be damaged by debris through its useful existence.

### *Environmental Benefits*

The project will replace structures that cross the Neuse River and a major tributary of the Neuse, Black Creek. The Neuse River flows approximately 275 miles through eastern North Carolina to its mouth at the Pamlico Sound. The Albemarle-Pamlico estuary was designated as "an estuary of national significance" by the US Congress in 1987. At the site of the I-95 bridges, the Neuse River has been identified as Critical Habitat for Atlantic sturgeon and a Primary Nursery Area for anadromous fish, notably shad, herring, and striped bass.

Neuse River at the I-95 Bridges

Black Creek Near the I-95 Bridges

The current structures over the Neuse River Bridge consist of multiple piers at each bent, which was a common construction style in the 1950s. The current structure has deck drains, which were designed to allow stormwater to be pulled from travel lanes in this relatively flat area.

Neuse River Bridges

Because the Neuse River is classified as a "Nutrient Sensitive Water,", streamside riparian zones within the study area are protected under provisions of the Neuse River Riparian Buffer Rules administered by North Carolina Division of Water Resources (NCDWR). The Neuse River Buffer Rules establish 50-foot buffers adjacent to subject waterbodies and apply to intermittent and perennial streams in the study area, including Black Creek and Neuse River.

The proposed replacement structures for the Neuse River and Black Creek crossings will convey stormwater off the facility to allow for treatment before it enters the streams. In addition, the structures over the Neuse River will have fewer piers in the water, allowing for more natural stream flow, reducing the area in which debris can be trapped by the structure, while requiring less maintenance, reducing the disturbance of the stream channel after construction.

NCDOT is also focused on reducing construction related impacts associated with the project. The Department has entered an informal Section 7(a)(2) consultation with National Marine Fisheries Service (NMFS) for the federally endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Conservation measures that result from that consultation will be strictly adhered to. NCDOT is subject to a Programmatic Biological Opinion (PBO) of MA-LAA for the northern long-eared bat (*Myotis septentrionalis*) in Highway Divisions 1-8, which encompasses this project. A separate PBO of MALAA for Divisions 2,4,5, and 7 applies to the following Federally listed aquatic species due to proximity to known populations:

- Atlantic pigtoe (*Fusconaia masoni*)
- Carolina madtom (*Noturus furiosus*)
- Dwarf wedgemussel (*Alasmidonta heterodon*)
- Neuse River waterdog (*Necturus lewisi*)
- Tar River spinymussel (*Parvaspina steinstansana*)

NCDOT will submit payments in conjunction with the aquatics PBO and fully adhere to the corresponding conservation measures for aquatic species. Payments made under the PBO are remitted to a fund for conservation. A multi-agency organization/group of species experts will determine how to expend these funds to assist in the recovery of the Carolina madtom and Neuse River waterdog.

All of these measures will serve to remove barriers on the Neuse River to Atlantic Sturgeon and anadromous fish species while aiding in the recovery of federally listed species.

### *Addressing Disproportionate Impacts on Disadvantaged Communities*

The proposed project will avoid relocations or impacts to area residents. NCDOT contacted the Catawba Indian Nation and solicited their input on the project. A small group meeting was held to discuss the accommodation of a future greenway under the I-95 bridges over the Neuse River. A project website was established to seek input and inform the public about project activities.

**Criteria #5: Equity and Quality of Life.**

### *Historically Disadvantaged Communities in the B-6044 Project Area*

The I-95 Project Area includes two census tracts that are listed as Historically Disadvantaged Communities (HDCs).

Census Tract 37101040601 is listed as disadvantaged due to agricultural land loss combined with low income, high average energy costs, high rates of diabetes, transportation barriers, low median income, and a high percentage of residents who have less than a high school education.

Census Tract 371010412042 is listed as disadvantaged due to agricultural land loss combined with low income, transportation barriers, and a high percentage of residents who have less than a high school education.

The construction associated with replacing the I-95 bridges will provide a stimulus to the local economy. Accommodation for a multi-use path under the Neuse River bridge will provide a safe crossing under I-95. In addition, NCDOT has established incentives to encourage the contracting, employment and training of historically disadvantaged companies and populations in transportation projects.

### *Equity During Project Development and Construction*

NCDOT has established a Disadvantaged Business Enterprise (DBE) program to address ongoing discrimination and the continuing effects of past discrimination in transportation markets nationwide. This program will be used in all aspects of project letting.

In accordance with 49 CFR Part 26 and the Special Provisions, NCDOT has established goals for participation of DBEs in USDOT-assisted contracts, as well as State-assisted contracts. The Triennial Goals are set as follows:

- 2020 – 2022 Triennial DBE Goal for Federal Transit Administration - 1.9%
- 2021 – 2023 Triennial DBE Goal for Federal Aviation Administration - 8.9%
- 2021 – 2023 Triennial Combined Goal for NCDOT Division of Aviation (state funded projects) - 10.7%
- 2022 – 2024 Triennial DBE Goal for FHWA - 13.0%
- 2019 – 2021 Triennial Combined Goal for NCDOT (state funded projects) - 12.3% (revising soon).

NCDOT is also committed to improving the depth of the transportation talent pool. Through the NCDOT Office of Civil Rights (OCR), the Department offers an On-the-Job Training (OJT) program. As of 2021, the OJT program included:

- 103 participating contractors
- 33 contractors with an assigned trainee goal
- 5 contractors without an assigned trainee goal
- 111 trainees enrolled.

The Department operates Accelerated Boot Camps (ABCs), which are accelerated, two-week versions of the Highway Construction Trades Academy (HCTA), in NCDOT's 14 Divisions as well as full, six-week versions of the program.

HCTAs and ABCs are customized to the local area and are designed to train participants and connect the talent pipeline to new employment. Currently, typical subjects may include:

- Construction math
- OSHA 10, CPR/First Aid
- Flagger certifications
- Introduction to Earthmoving and Heavy Equipment Training
- Introduction to Commercial Driver's License (CDL).

Participants who participate in OJT or HCTAs can receive Advanced Highway Skills Training (AdT) in current/developing needs areas. This includes bridgework, disaster recovery, EV charging station installation, and CDL for women. The Department is actively examining expansion of these programs to include additional subjects, including broadband installation and maintenance.

NCDOT is also working with its Historically Black Colleges and Universities (HBCUs) and the state's MSI (UNC Pembroke, established by the Lumbee Tribe of North Carolina) to build the transportation labor force. Some examples include:

- NC A&T State University's Center of Excellence for Connected and Autonomous Vehicle Technology.
- Fayetteville State University's SAP Next-Gen Lab for transportation geospatial research.
- Elizabeth City State University's four-year Unmanned Aircraft Systems (UAS) degree program.

NCDOT's OCR will explore the possibility of providing HCTA, ACTs, and/or AdTs in the Division during construction. The Department will encourage the use of DBE firms as part of the letting/administration process.

**Criteria #6: Innovation**

NCDOT will explore the use of recycled concrete and innovative bridge materials to reduce greenhouse gas emissions and materials costs and potentially extend the effective lifetime of the bridge.

NCDOT is currently utilizing a RAISE grant to install broadband on the I-95 corridor. This grant will enable NCDOT to install an ITS-enabled dynamic message sign (DMS) in the I-95 median roadway ROW.

## V. Benefit Cost Analysis

### *Introduction*

This technical memorandum estimates the long-term benefits associated with the I-95 Bridge Investment Program (B-6044 I-95 Bridges) Project. This evaluation discusses the relevant Performance Outcome Criteria mentioned in the Notice of Finding Opportunity. For some measures a qualitative discussion is included. The assumptions and methods used to develop the Benefit-Cost Analysis (BCA) are detailed for each topic and are supported by supplementary material where appropriate. The BCA was calculated using the official Bridge Investment Program Benefit-Cost Analysis Tool developed by FHWA.

The long-term quantifiable benefits are presented for the Project Outcome Criteria include safety, maintenance, and environmental, benefits. Benefits to resiliency is included as a quantitative benefit and is a component of the economic and innovation benefits.

The final section summarizes the anticipated benefits and costs of the I-95 Bridges project and calculates the overall Benefit-Cost Ratio.

### *Years of Analysis*

The analysis is based on the project coming online in 2030. A benefits period of 2030-2059 was used. This 30-year benefits period is consistent with the 2024 BCA Guidance for Discretionary Grant Programs (BCA Guidance) for projects involving the full reconstruction of highways or similar facilities.

### *Methodology*

Benefits are estimated in accordance with the BCA Guidance. Where no specific approach was provided in the Guidance, NCDOT used best practices and research data as specified in the assumptions and methodology for each measure. The benefits quantified in the BCA use 2022 dollars (as advised by USDOT). Benefits for each project element are described within the benefit categories.

### *Analysis Assumptions*

A list of assumptions for the project is provided in the BCA workbook and summarized in Exhibits 1 and 2. Exhibit 1 displays the generalized BCA input values provided by the USDOT for the relevant quantifiable benefits for this project.

**Exhibit 1 - Input values from BCA Guidance[1]**

| Input | Value |
|---|---|
| **General Assumptions** | |
| Analysis Period (Years)- Projects Involving Full Reconstruction of Highways | 30 |
| Discount Rate | 3.1% |
| Discount Rate for Reductions in $CO_2$ Emissions | 2.0% |
| Dollar Year | 2022 |
| Auto Occupancy (Passenger Vehicles, All Travel) | 1.67 |
| Auto Occupancy (Trucks) [1] | 1.00 |
| Business Value of Travel Time (Hourly) | $32.40 |
| Personal Value of Travel Time (Hourly) | $17.90 |
| All Purposes Value of Travel Time (Hourly) | $19.60 |
| Truck Driver Value (Hourly) | $33.50 |
| **Safety – Crash Data Assumptions** | |
| O – No Injury | $4,000 |
| C – Possible Injury | $78,500 |
| B – Non-incapacitating | $153,700 |
| A – Incapacitating | $564,300 |
| K – Killed | $11,800,000 |
| U – Injured (Severity Unknown) | $213,900 |
| # of Accidents Reported (Unknown if Injured) | $162,600 |
| Property Damage Only Crashes | $4,800 |
| **Emissions – Assumption for Damage Costs per Metric Ton** | |
| $NO_X$ –2030 to 2053 | $22,000 |
| $SO_X$ – 2030 to 2053 | $61,500 |
| $PM_{2.5}$ – 2030 to 2053 | $1,069,000 |
| $CO_2$ – 2030 to 2053 | $257 to $357 |

**Note:** Dollar values are in 2022 dollars

[1] Values from https://www.transportation.gov/sites/dot.gov/files/2023-12/Benefit%20Cost%20Analysis%20Guidance%202024%20Update.pdf

**Exhibit 2** lists project-specific assumptions. Most of these project-specific assumptions come from NCDOT and the National Bridge Institute (NBI).

**Exhibit 2 - BCA Calculation Inputs – Project-Specific**

| Input | Value | Source |
|---|---|---|
| **General** | | |
| Annual Average Daily Traffic Volumes (AADT) | Varies by Bridge | NBI |
| Calculated ADDT Growth Rate | 3.36% | |
| Crashes (categorized by type) from 12/1/2018 to 11/30/2023 | Varies by Crash Type | NCDOT Traffic Engineering Accident Analysis System Strip Analysis Report |
| Crash Reduction Factor (CRF) ID 4.15.8 (Increase shoulder widths) | 0.82 | NCDOT Traffic Safety Group |

***Benefits***

**Criterion 1 – State of Good Repair**

Currently, the structures within the Project study area are contributing to an aging, deteriorating facility with frequent and expensive maintenance costs. The Project will provide improved facilities that will have less frequent and less costly maintenance. This includes pavement preservation, bridge maintenance, and general maintenance. These bridges are also being designed to have an asset life of 100 years, which brings residual benefits to the project.

Altogether, state of good repair benefits will total **$13.7 million.**

**Criterion 2 – Safety and Mobility**

An in-depth crash strip analysis report was completed for the Project based on the 5-year period from December 1, 2018, to November 30, 2023. The crash analysis assessed all 105 crashes that occurred during this time, including a breakdown by crash type – fatal, non-fatal injuries and property damage only crashes (types A, B, and C). These breakdowns were converted to the KABCO Injury Classification Scale. Property Damage Only (O) crashes accounted for the majority, over 80 percent, of all crashes. Benefit values were estimated by using a combination of monetized values per injury level.

The improvements associated with the construction of the Project will enhance the safety of drivers on the facility by providing a wider shoulder. After a review of multiple Crash Reduction Factors (CRFs) from the NCDOT Traffic Safety Group (refer to **Exhibit 3**), it was found that an 18 percent reduction in crashes for the Project facility is a reasonable estimate based on CRF ID 4.15.8 for widening and the multiple substandard features being revised to meet current standards. Using the factors previously listed, the total safety benefit savings will total **$3.0 million.**

**Exhibit 3 – Project Crash Reduction Factor**

| ID | Countermeasure Description | CMF | Expected Crash Reduction | Application |
|---|---|---|---|---|
| 4.15.8 | Increase shoulder widths; applies to rural multi-lane highways with speed limits of 45 to 70 mph | 0.82 | 18% | CRF applied to Build scenario |

**Criterion 3 – Economic Competitiveness and Opportunity**

I-95 is a critical north-south corridor for passenger and freight movement in North Carolina and the east coast. In a recent NBER Working Paper entitled Highways and Globalization, researchers quantified the value of the 20 longest interstates in the US. As a transnational route, I-95 was found to be one of the most valuable. The route was considered "extremely valuable" as it not only connects the most cities and the most major markets to one another, but also connects to major ports on the eastern seaboard. NBER research also found that the cost of removing I-95 from the Interstate Highway System (IHS) was estimated at $10.3-16.4 million per mile in 2012 dollars. Therefore, if the I-95 bridges for this project were to be closed due to structural issues, a detour along US 301 would likely be utilized. This would close five miles of I-95 in Johnston County. Using a cost of $13.3 million per mile as the mid-point estimate, the cost of closing this five-mile stretch of I-95 is estimated at $66.5 million in 2012 dollars, which equates to $84.8 million in 2022 dollars.[2]

Several businesses in Johnston County rely on I-95 for efficient transportation of agricultural products, manufactured goods, and raw materials. Of the eight counties I-95 traverses in North Carolina, Johnston County has the second greatest number of business establishments with 1,900 in 2013. The county also had the greatest number of manufacturing establishments of the eight counties with 121 establishments and an estimated 6,200 employment in 2011[3].

The impact of a potential bridge failure and the travel times associated with it were examined as a benefit. Bridge failure rates from a 2014 Utah State study were used to determine the likelihood that one of the I-95 bridges would fail and require detouring onto parallel facilities.[4] The travel time savings between the current and detour routes were then calculated to determine the impacts. Automobiles had a detour route 1.6 miles longer than the current route. Due to bridge load restrictions on bridge 000000001010037 (US 301/NC 96 Bridge over CSX Railroad), trucks had a detour route 6.0 miles longer. These benefits will total **$12.2 million.**

**Criterion 4 – Climate Change, Sustainability, Resiliency, and the Environment**

The Project will provide increased ability to adapt to major weather events such as flooding. While the bridges are above the current and projected floodplain through the end of the benefits period, the No-Build alternative will not include removal of deck drains and channeling stormwater from the bridge to offsite retention areas where infiltration allows for the removal of contaminants. Thes measures under the Build Alternative will reduce water runoff and pollution entering Black Creek and the Neuse River. As quantified in the BCA, the total environment

[2] http://www.nber.org/papers/w27938
[3] https://connect.ncdot.gov/projects/Driving95/I-95%20Economic%20Assessment.pdf
[4] https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=3187&context=etd

benefit will total **$7.1 million**.

Stormwater runoff is especially important issue for the Neuse River, as it is habitat for anadromous fish such as the federally endangered Atlantic Sturgeon and federally threatened Neuse River waterdog, one of the rarest Salamanders in the southeast United States.[5] In addition, the new bridge design will reduce the number of piers in Black Creek in the Neuse River, thus improving the riverbed habitat.

In addition, when installed and originally maintained, the two bridges over Black Creek were coated with lead paint primer. The Project will remove the lead paint primer, thus reducing potential lead contamination in the waterway.

**Criterion 5– Equity and Quality of Life**

Benefits for Equity and Quality of Life cannot be quantified for this Project. However, the Merit Criteria narrative describes potential qualitative impacts to residents as the Project is found in disadvantaged census tracts. This includes a reduction of detours required due to safer conditions on I-95. The current detour sends travelers and freight down US 301, includes many HDC communities in the project census tracts.

**Criterion 6– Innovation**

The benefits related to Criterion 6 are qualitative. These include areas such as adding overhead variable message signs, evaluating innovative bridge material, and the use of recycled concrete.

**Summary**

The analysis resulted in an overall 1.07 BCR across the four bridges, and a 31.1 million net present value. (refer to **Exhibit 4**). This is considered a "Medium" economic analysis rating. NCDOT has concluded that these benefits reasonably justify the costs of the Project.

**Exhibit 4 – Total Project Benefit-Cost Analysis**

| Bridge ID | Total Discounted Costs | Total Benefits | Benefit-Cost Ratio |
|---|---|---|---|
| B000000001010100 | $26,964,857 | $15,000,712 | 0.56 |
| B000000001010101 | $3,364,158 | $7,249,160 | 2.15 |
| B000000001010082 | $1,740,563 | $6,947,104 | 3.99 |
| B000000001010085 | $1,740,563 | $6,875,502 | 3.95 |
| **Total** | **$33,810,141** | **$36,072,477** | **1.07** |

[5] https://www.fws.gov/species/neuse-river-waterdog-necturus-lewisi

## VI. Project Readiness and Environmental Risk

### a) Technical Feasibility and Technical Competency

The B-6044 project has followed FHWA's established procedures and guidance for the implementation of a highway project. The project was initially listed in the 2020-2029 STIP as the replacement of the bridges over Black Creek. The project was expanded in the updated June 2021 2020-2029 STIP to include the bridges over the Neuse River, which is the current project.

NCDOT followed its normal procedures for the project. It was determined that the project did not need to follow the Department's Section 404 Merger Process, but extensive coordination has taken place prior to development of the environmental document (CE), which was signed in October 2022. NCDOT has completed ROW acquisition and is moving forward with final designs. The construction cost estimate was finalized in January 2024 and includes a 16 percent contingency cost, which based on project experience has proven sufficient in the past. Geotechnical investigations for the structure have been completed and no new substantive issues were encountered.

In terms of scope, schedule, and budget risk mitigation issues, NCDOT has the technical competency to undertake this important project. The Department is responsible for approximately 13,700 bridges in the state. In 2024, NCDOT is providing $47 million in state funds for bridge maintenance, $333 million for bridge replacements, and $86.5 million for bridge preservation. In addition, NCDOT has successfully secured and is delivering on federal grant funding for bridge replacements, including a 2018 RAISE Grant to replace 77 bridges in 17 rural counties, a 2022 RAISE Grant to replace 28 bridges in Western North Carolina, and a 2022 MPDG Grant to replace the Alligator River Bridge.

### b) Project Schedule

The I-95 Bridges project has passed through the following milestones:

- Programming in the STIP – 2018
- Start of NEPA – August 2021
- Completion of NEPA (Signed CE) – October 2022
- Permit Drawing Package Submitted – April 2023
- Start of ROW Acquisition – August 2023 (completed November 2023)

The I-95 Bridges Project after BIP funding is secured:

- Finalize Permit – November 2025
- Submit Final Design – FY 2025
- Begin Construction – FY 2026
- Complete Construction – FY 2030

ROW acquisition was finalized in November 2023. All real property and ROW acquisition necessary for the project was completed in a timely manner in accordance with 49 CFR 24, 23 CFR 710, and other applicable legal requirements.

### c) Required Approvals

The environmental document (federal CE) was completed in October 2022. ROW acquisition is complete. NCDOT has coordinated with resource agencies with regards to permit requirements. Although the Neuse River is considered a navigable water in this location, a Coast Guard permit is not required. The department has also resolved issues associated with federally endangered species. Due to the presence of anadromous fish species in the Neuse River, relevant construction moratoria have been documented and will be followed.

NCDOT has involved the public throughout the project development process. This includes coordination with tribal and other interested parties and establishing a Title VI-compliant project website to inform the public and obtain input.

## Section VII. Administration Priorities and Departmental Strategic Plan Goals

The I-95 bridge replacements meet multiple goals of the highway program. Please see the Merit Criteria section for additional information.

### Safety

As demonstrated in criterion 2, the I-95 bridge replacements will provide substantial safety benefits for travelers on I-95 by replacing aging bridges with new structures that meet current design standards. The new structures should only require minimal maintenance for the next 50 years. The bridges were constructed almost 70 years ago, meaning they are approaching or have reached the end of their useful structure service life. A structure failure could potentially lead to a catastrophic accident or loss. While a complete structure failure is unlikely, the outdated roadway geometry on the bridges presents a safety risk of much greater probability. Safety for users of other modes such as walking and biking will also be improved, as the project will accommodate the East Coast Greenway under the Neuse River I-95 bridges. The project will also install needed drainage infrastructure improvements. By implementing these safety improvements, the project area will align with the National Roadway Safety Strategy (NRSS).

### Climate Change and Sustainability

As demonstrated in criterion 4, the I-95 bridge replacements will improve resiliency within the protected Neuse River Watershed. The new structures will have fewer bridge piers in the water, reducing risk of damage by debris during increasingly frequent weather events, improving habitat conditions for threatened and endangered species, and allowing for more natural stream flow. Water quality will be improved by removing deck drains that currently discharge untreated stormwater directly into the Neuse River. NCDOT will encourage the use of recycled concrete, as appropriate, to reduce greenhouse gas emissions.

### Equity

As demonstrated in criterion 5, the I-95 bridge replacements will improve the safety of four structures within Historically Disadvantaged Communities (HDCs). Ensuring the structures remain usable in a safe manner is vital for residents accessing local resources within the historically disadvantaged communities. No disproportionate impacts were uncovered in the

project's environmental document and community impact assessment. A project website has been used to solicit local input and will continue to be used to convey relevant information to local residents. The accommodation of the East Coast Greenway through collaboration with stakeholders, will allow for safe, multimodal passage under I-95 and the only pedestrian crossing of I-95 for dozens of miles.

**Workforce Development, Job Quality, and Wealth Creation**

As demonstrated in criterion 5, the I-95 bridge replacements will create jobs and provide an economic stimulus in eastern North Carolina. In creating jobs and investment, NCDOT is committed to addressing ongoing discrimination and the continuing effects of past discrimination in transportation, with Disadvantaged Business Enterprise (DBE) goals and special opportunities for underrepresented workforce members. Procurement of a construction contract will include DBE participation goals of above 12%. To ensure all potential workers are represented, NCDOT's Accelerated Boot Camps (ABCs) are held across the state to train local participants for new opportunities. NCDOT's On the Job Training (OJT) program also provides unique opportunities for public-private partnership through apprenticeship programs with selected contractors and trainees. The goal of the programs is to target women, minorities and other disadvantaged populations, including veterans, the disabled, and residents of poorer Tier 1 counties where there's a need for such training and jobs. To ensure all populations have equal opportunity to participate in OJT programs, resources are offered that help support OJT trainees and participants. Allowable supportive services include temporary daycare assistance while employed or training, provided Personal Protective Equipment (PPE), additional training for classification or upskilling, and short-term transportation assistance.

## Conclusion

Funding for replacement of the I-95 bridges will meet BIP goals for improving the safety, efficiency, and reliability of people and freight traveling over the bridges. Not only will the number of bridges in poor or at risk of falling into poor condition be reduced, the total person miles traveled over bridges in poor condition will also be reduced.

The included Excel Spreadsheet and Merit Criteria discussion provide context for the proposed improvements. The project budget and BCA submittals detail the cost effectiveness of the proposal. NCDOT looks forward to your review and approval for funding this important project.