

US 321 Calibrating Our National Network to Encourage Commerce and Tourism – 321 CONNECT

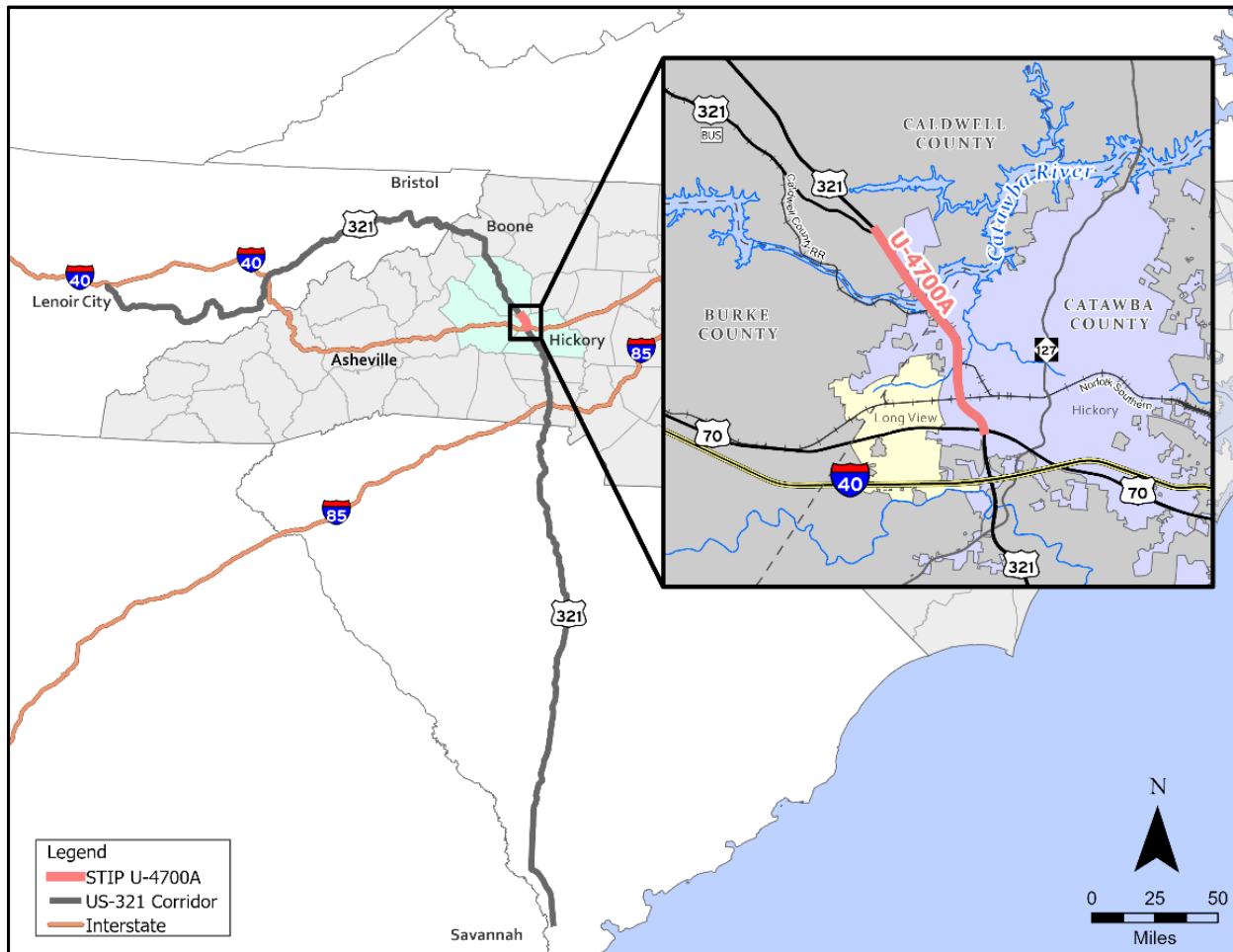
OUTCOME CRITERIA

The 321 CONNECT project addresses the criteria established by USDOT. The discussion for each criterion is augmented by supplemental materials provided on the [321 CONNECT project website](#).

PROJECT DESCRIPTION

The North Carolina Department of Transportation (NCDOT) urgently seeks \$30,945,000 in Nationally Significant Multimodal Freight and Highways Projects (INFRA) funds to maintain the project schedule for the shovel-ready 321 CONNECT (Calibrating Our National Network to Encourage Commerce and Tourism) project. 321 CONNECT is a major project with an estimated future eligible cost of over \$282 million.

Figure 1. Project Study Area



CRITERIA

Criterion #1: Safety

Safety is a primary purpose of 321 CONNECT because the project eliminates an existing at-grade highway/rail conflict, incorporates corridor-wide safety countermeasures, and addresses documented crash patterns on a high-volume NHS/STC corridor. The current facility was designed in the 1950s and the last major upgrade of US 321 within the project area was in 1978. The current roadway does not meet current design standards. The construction of U-4700A, enabled by INFRA funding, will improve the operations and safety of this congested area.

An at-grade crossing of US 321 and Caldwell County Railroad (CWCY), a shortline railroad, is just south of the Catawba River crossing and is utilized by four trains per week. The U-4700A project will replace the at-grade crossing with a grade separation. This will remove the existing railroad conflict, thus eliminating crossing closures as well as the potential for collisions between trains and highway traffic. The grade separation of the railroad is part of the structure over Catawba River. Crossing both the railroad and the river necessitates an increase in height compared to the existing structure, which will also improve resiliency to future flood events.

321 CONNECT will replace the current conventional intersections with reduced conflict intersections (RCIs). A 2017 report from the Federal Highway Administration found that:

- RCIs with traffic signals reduced crashes 15% compared to conventional intersections.

In 2023, [NCDOT's Traffic Safety Unit](#) completed a safety study of 31 RCIs that were constructed without traffic signals in North Carolina between 2009 and 2017. The study found that this intersection type:

- Reduced total crashes by 50%
- Reduced frontal impact crashes (head-on or T-bone crashes) by 80%. These crash types are associated with serious injuries.

A [2010 study by NCDOT](#) found that RCIs also increased traffic throughput, with an average reduction in travel times of 20% when traveling through a signalized RCI. There was a minor increase for drivers on minor arterials adjacent to signalized RCIs, but that average was only 20 seconds more. NCDOT has published [crash reduction factors](#) associated with various improvements, including RCIs.

Based on [NCDOT Data](#), there have been six bicycle and 19 pedestrian crashes on or approaching the facility. This has resulted in four fatalities and 17 crashes that resulted in injuries (from possible injuries to serious injuries).

The U-4700A Project will include new active transportation infrastructure. This includes the following improvements:

- Pedestrian accommodations at the proposed 2nd Avenue SW interchange and other intersections by converting facility to an RCI (included as qualitative).
- Converting the existing northbound Catawba River Bridge to a bicycle/pedestrian only facility. The bridge has a roadway width curb to curb of 28 feet and is 825 feet long, for a total area of 23,100 square feet when considering just the structure. Including the logical tie-in points to the City of Hickory's Riverwalk Greenway (currently open) on the south side of the Catawba River and Limbaugh Lane on the north side, the total distance

that will be opened to cyclists and pedestrians is approximately 1,200 feet. This would provide 0.23 mile of cycling lanes at \$1.86 per cycling mile and 1,200 feet of at least 20 feet of sidewalk at \$11 per foot.

These new pedestrian and bicycle facilities will provide improved connections and may begin to restore communities that were divided by the construction of US 321. There are 11 census tracts immediately adjacent to the U-4700A corridor that include 14,930 occupied housing units (per the 2020 Census). It is assumed that 75% of these housing units are within the project study area and that each household will make 5.5 trips/day/household (Source: Bureau of Transportation Statistics).

It is assumed that reconnecting these communities will lead to a travel mode shift of 3% of all trips to be pedestrian trips and 2% of all trips to be bicycle trips. Additionally, there will be mortality reduction benefits for the new bicycle and pedestrian trips.

RCIs not only provide safer crossings for bicyclists and pedestrians; they also allow cities to synchronize traffic signals to control vehicular speed. If a traveler drives at the posted speed, they will encounter green traffic signals throughout the signal-controlled corridor. If they exceed the speed limit, they will encounter a red traffic signal at the next controlled intersection. Over time, drivers adjust to this and are more likely to maintain the posted speed. This can also reduce the number and intensity of vehicular crashes. In the past 10 years, NCDOT reports that in addition to bicycle and pedestrian crashes on US 321, there have been [19 other types of fatal or serious crashes reported](#). Of those crashes, four resulted in fatalities.

It has been shown that an increase in shoulder width, as provided by the Project, will greatly enhance the safety of drivers on the facility. After a review of multiple Crash Reduction Factors (CRFs) from the NCDOT Traffic Safety Group (Table 1), it was determined that a 19% reduction in crashes for the Project facility is a reasonable estimate based on CRF ID 4.15.6 for widening shoulder widths to meet current standards.

Table 1 - Project Crash Reduction Factor

ID	Counter Measure Description	CMF	Expected Crash Reduction	Application
2.3.1	Signalized to Signalized RCI	0.5		
2.4.1	Two-Way Stop at Unsignalized RCI	0.78		
Used in BCA		0.64	36%	CRF applied to Build Scenario

Source: [North Carolina Project Development CRF Information](#)

The multiple design changes described will yield substantial safety benefits. **Based on an analysis of the current facility and the improvements proposed to US 321, it is anticipated that 321 CONNECT will produce an estimated \$95.6 million of benefits in crash cost savings and \$2.1 million in Bicycle/Pedestrian amenity and mortality savings for a total safety benefit of \$104.5 million.**

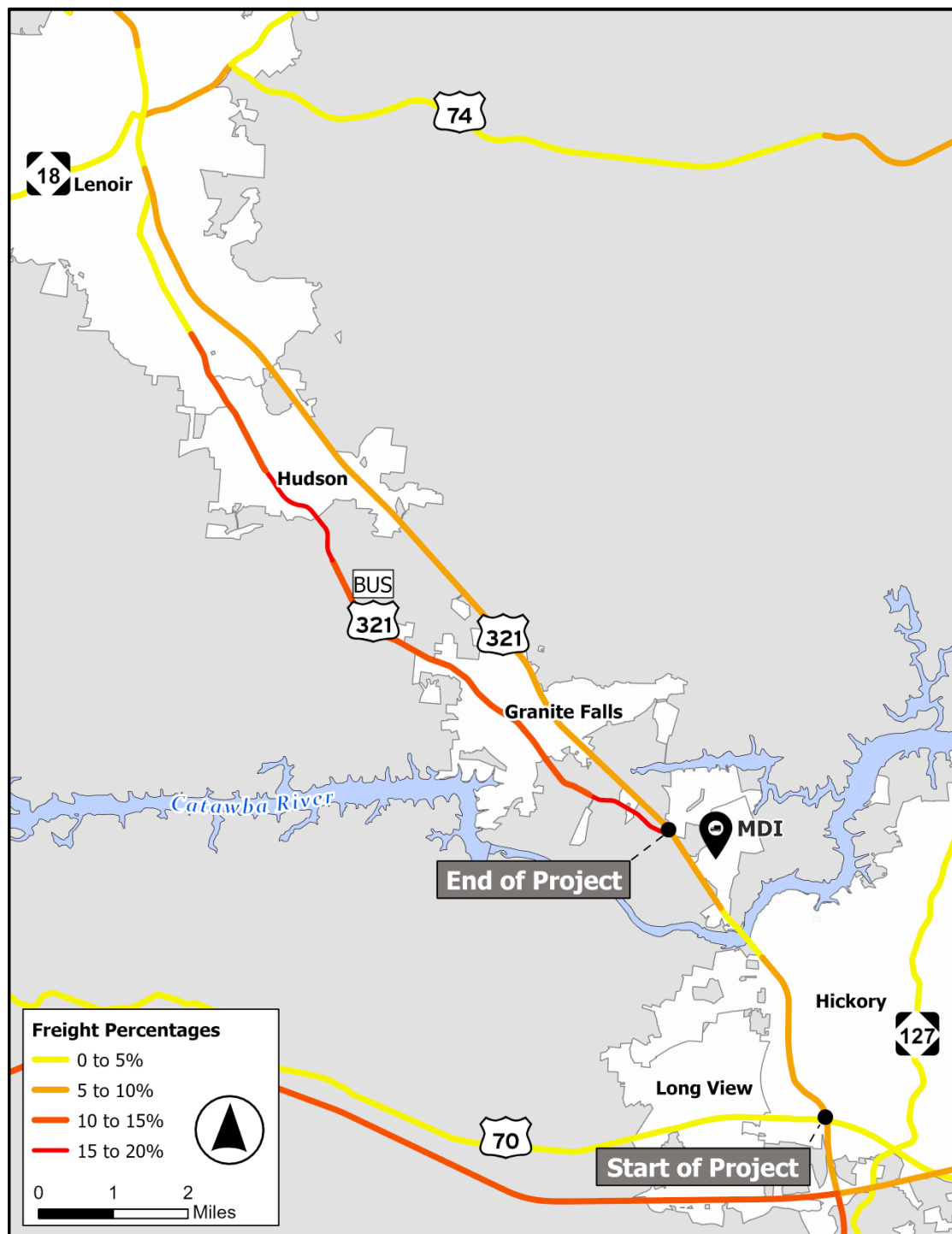
Criterion #2: Economic Competitiveness and Opportunity*Economic Impacts*

Economic competitiveness and opportunity are primary purposes of 321 CONNECT because the project modernizes a constrained NHS/STC freight corridor that supports manufacturing, distribution, workforce access, and tourism across western North Carolina. The US 321 Corridor is of vital importance to North Carolina and is an important national resource. North Carolina lists the facility as North Carolina Strategic Transportation Corridor D. Corridor D extends from the South Carolina State line to Tennessee, connecting I-85 and the Gastonia area, the I-40 corridor in Hickory and the family tourism centers in the North Carolina Mountains. Official NCDOT materials state that segments of US 321 between Hickory and Lenoir already experience congestion and that many intersections operate at level of service (LOS) E and F, indicating congested conditions. These conditions are projected to worsen without improvement if the facility is not improved. This could cause a significant bottleneck for freight and passenger traffic.

The U-4700 project will widen the facility to six lanes and eliminate a current at-grade crossing of the Caldwell County Railroad. More reliable truck trips improve scheduling, reduce buffer time in deliveries, strengthen warehouse and distribution performance, and improve the corridor's attractiveness for future industrial investment. Based on the Finding of No Significant Impact for the project, the post-construction facility will operate at LOS B or C. This will provide a substantial travel time savings benefit for this critical freight corridor. The project will also replace the Norfolk Southern bridge over US 321 (Bridge 0146). The replacement structure will be double tracked to allow for future expansion of passenger and freight service to western North Carolina. Plans exist to provide passenger rail service from [Salisbury NC to Asheville NC](#). That project is currently not funded but could be realized during the service life of the replacement structure.

According to the [NC Strategic Transportation Corridors Vision Plan for Corridor D](#), the corridor generated or received 91.6 million tons of freight valued at \$103 billion. This amount is projected to increase to 117.1 million tons valued at \$167.3 billion by 2045. This projection shows a 28% increase in tonnage and a 61% increase in freight value.

Figure 2. Truck Percentage of Average Annualized Daily Traffic Along the Project Corridor



Trucks provide the bulk of freight movement through the area, carrying over 87% of the total tonnage and accounting for almost 95% of the total freight value. This underscores the importance of US 321 for maintaining this critical connection. While there are no full-service truck parking facilities on US 321 in this area, the 321 CONNECT Project would improve truck access for the

Petroleum World Truck Stop at 820 US 321 in northwest Hickory. It would also increase the reliability of travel times to multiple area truck parking facilities with overnight parking, including the Speedy Mart at 1360 Fairgrove Church Road, the Citgo Fuel Center at 3361 Highway 70 in Newton, and the Wilco Travel Plaza at 1343 Rock Barn Road NE, in Conover.

From Hickory northward, the corridor is especially important because it combines high traffic demand, freight connectivity, mountain access, and known operational/resiliency needs. The [NC Strategic Transportation Corridors Vision Plan for Corridor D](#) Master Plan identifies the segment from U.S. 70 north of Hickory to the Tennessee state line as a long-term four-lane divided expressway with median and limited access, reflecting its strategic importance for safe and reliable movement through the foothills and mountains.

The 2020 document details a vision for the 63 miles of US 321 north of Hickory. Improvements including the U-4700 project would reduce a typical trip through the corridor from 2.4 hours to 1.9 hours and increase average speed from 47 mph to 57 mph by 2040. This directly supports INFRA goals related to economic competitiveness, mobility efficiency, and safety/reliability.

The U-4700A corridor supports both freight and tourism, connecting five municipalities across three counties. This is not a local access road; it is a regional commerce corridor whose performance directly affects manufacturers, distributors, workers, and customers across western North Carolina.

The corridor serves a diversified employment base that depends on dependable truck access and predictable travel times. The current project draft identifies major employers in the corridor area, including CommScope and Corning Optical Communications with more than 1,000 employees each, Apple and Prysmian with more than 500 employees each, and major food processing, warehousing, and distribution activity associated with Target, Walmart, Pierre Foods, Performance Food Group, Cargo Transporters, and Merchants Distributors, Inc. In fact, Merchants Distributors, Inc., is the largest employer in Caldwell County, with more than 2,000 employees. Reliable transportation is key for the economic health of Western North Carolina.

Figure 3: MDI Facilities on US 321

Beyond its incredible importance as a commercial corridor, US 321 is also a vital connection for American families, especially those with small children. The area provides year-round tourism opportunities from skiing in the winter, spring vacation getaways, family recreation sites in the summer and spectacular leaf viewing in the fall. Specific locations include:

- Blowing Rock
- Tweetsie Railroad
- Appalachian Ski Mountain
- Moses H. Cone Memorial Park
- Horn of the West
- Mast General Store
- Great Smoky Mountains National Park
- Gatlinburg, Tennessee.

Increasing the mobility through the 321 corridor will improve the vacation experience of American families wishing to access these popular destinations.

Job Creation

The Catawba Apprenticeship Network (CAN) through Catawba Valley Community College (CVCC) has worked to develop apprenticeship opportunities. Participating companies work predominantly with high school students and offer opportunities for complete scholarships for a two-year Associate's degree. Other programs include:

- Manufacturing Solutions Center (CVCC) – covering hosiery, textiles, engineering and testing
- US 321 Workforce Innovation Center (CVCC) – with Hickory Aviation Museum, robotics, maritime technology and avionics

- Catawba Valley Furniture Academy
- Alexander County Furniture Academy

These programs are critical in the 321 CONNECT area corridor, especially for populations that lack a high school education. American Community Survey (ACS) data from 2020 to 2024 for adults 25 years or older who lack a high school education in the three counties in our study area is shown below.

- Catawba County – 11.8%
- Burke County – 14.0%
- Caldwell County – 15.1%

The economic, freight movement and job creation benefits for this project are associated with travel time savings of \$102.4 million, 17.0 million from future detour avoidance, and \$109 million in avoided freight disruption savings. The total economic benefits are estimated to be \$221.5 million.

Criterion #3: State of Good Repair

Providing a facility that is in good repair for the foreseeable future is intertwined with the safety components of the project. The proposed widening of US 321, combined with replacement of the deficient bridges over the Catawba River, will provide a substantial, sustainable improvement to the current transportation network.

Due to the limited nature of federal and state transportation funds, it is critical that grant funding results in facilities that require minimal maintenance after construction. In the case of U-4700A, a no-build or “do-nothing” alternative would result in substantial ongoing maintenance operations to keep the US 321 corridor in good operating condition. For this reason, INFRA funding is critical to maintain the construction schedule of U-4700A.

The need for the project is exemplified by the maintenance requirements of the bridges crossing the Catawba River. The bridge inspection report in 2022 classified the substructure as 4 (poor condition) with the deck rated as 5 (fair condition) and the superstructure rated as 6 (fair condition). The southbound facility, which was constructed in 1962, is considered structurally deficient. The inspection noted metal deterioration in one location, which is considered a critical find, as well as ten additional items that were assigned as priority maintenance. Cracking was noted in the surface asphalt of the structure, which required additional maintenance activities. NCDOT recently completed a rehabilitation project of the Catawba River southbound bridge on US 321. The total cost of the project was \$2,674,024. This extensive work does not solve all of the issues with the structure. Based on the April 26th NCDOT Bridge Inspection Report, the superstructure of the facility had declined to a 5 (Fair condition), while the deck and substructure are classified as 7. Spalling and cracks are still noted on the bridge deck and corrosion is noted on several plate girders. Exposed REBAR was also documented.

The northbound bridge (0366), built in 1983, was also inspected in June 2022. The deck and superstructure were rated as 4 and the substructure was rated as 5. The bridge is also considered to be structurally deficient. The structure, which was built in 1983, has corrosion and cracking, with some exposed rebar noted. A total of nine items were assigned as priority maintenance activities. Repairs raised the 2026 rating of the facility of the deck and superstructure to 5 and 6, respectively, while the substructure declined to a rating of 4. At some point the age and condition

of the bridges will require replacement. The longer the replacement is delayed, the more expensive the project will be and the greater the required maintenance costs.

Figure 2: Rehab Work on US 321 Southbound Bridge over the Catawba River



In the draft North Carolina Statewide Resilience Improvement Plan currently being reviewed by FHWA, US 321 is listed as a “High Criticality Corridor.” The 321 CONNECT project is designed to ensure the improved resilience of this critical facility. 321 CONNECT crosses the Catawba River, a vital resource as well as a noted recreational site. As part of the safety improvements for the project, US 321 will be grade-separated from the railroad just south of the river. This will necessitate raising the new bridges over the Catawba River by 25 feet. This height increase ensures more resilient structures that will retain connectivity even under more extreme precipitation events.

The project will also replace Bridge 0146, which carries the Norfolk Southern (NS) AS line over 321. The AS line is an active route serving western North Carolina, including Asheville and Knoxville. The line provides freight service to multiple facilities in Hickory. The existing structure was built in 1955 and is functionally obsolete. The new structure will be slightly higher and will be double tracked to provide additional capacity for future freight and passenger service.

Figure 3. Norfolk Southern AS Line Looking North

A tributary of the Catawba River, Frye Creek has a floodplain that crosses US 321. As shown in Figure 4, the stream banks are overgrown, which contributes to flooding concerns. Recent years have seen an increase in intensified precipitation events in North Carolina. This trend is expected to continue. This project will allow NCDOT to update the roadway drainage system along US 321. 321 CONNECT will update undersized and overgrown drainage structures, providing increased storage capacity for stormwater and reducing flooding concerns along Frye Creek and other streams along US 321. These improvements are consistent with Objective 2 of the National Climate Resilience Framework – Increase resilience of the built environment to both acute climate shocks and climate stressors.

As noted in innovation outcomes, INFRA funding will allow NCDOT to install a flood gauge at Frye Creek, that will be integrated into [NCDOT's Flood Warning System](#). This will provide freight and system resilience and provide on-time warnings of potentially hazardous conditions.

In addition to the structure maintenance costs, there are likely additional costs that would be borne by the state if construction of U-4700A were delayed. Some portions of 321 CONNECT area have not been substantially improved since 1955. Even the most recent improvements for the US 70 interchange date to 1978.

Once the proposed improvements are completed, NCDOT estimates that the savings on repaving costs along the US 321 corridor would average \$300,000 per decade. **The state of good repair benefits are estimated to be \$49.9 million in reduced operations and maintenance costs. As these and the above listed benefits will extend beyond the timeframe specified in the BCA, the residual benefits of the project are estimated to be \$12 million.**

Criterion #4: Innovation

Innovative Solutions for Resiliency and the Environment

If the 321 CONNECT project is funded, NCDOT will install a flood gauge at Frye Creek, which will be connected to North Carolina's Flood Inundation Mapping and Alert Network for Transportation (FIMAN-T). FIMAN-T was developed as a partnership between NCDOT and NC

Emergency Management (NCEM) to provide NCDOT officials and emergency management stakeholders with real time and forecasted flood inundation depths along roads, bridges and other NCDOT assets in support of risk-based decision-making during flooding events.

Figure 4: Frye Creek During a Rain Event



The flood gauge sensor-based monitoring will provide NCDOT officials and emergency management stakeholders with real-time and forecasted flood inundation depths along roads, bridges, and other NCDOT assets. FIMAN-T pulls from various datasets to provide visualization and metrics for roadway inundation, bridge hydraulic performance, and identification of potentially impacted NCDOT assets. The system reports critical emergency response information, such as bridge freeboard (the distance between the water surface and the bridge's low chord elevation), allowing for a more informed response by NCDOT, NCEM and other stakeholders.

BridgeWatch is also an online application service that allows NCDOT to proactively monitor flood levels and rainfall conditions conducive to flooding at valuable bridges and culverts. These internal tools, in combination with DriveNC.gov, allow DOT staff to send customized electronic alerts via cell phones, emails, application dashboards, etc. when roadways and bridges are experiencing dangerous or critical conditions.

Currently, the FIMAN-T application includes 37 counties and 76 flood gauges throughout North Carolina. This gauge will be the first in Catawba County and the first in the Northern Piedmont. This single gauge is sufficient, with currently available stream modeling, to monitor flood conditions throughout the entire Frye Creek watershed. This will provide real-time information on flooding conditions for all of the streets and structures within the floodplain of the river. These improvements are consistent with Objectives 3 and 4 of the National Climate Resilience Framework – mobilize capital, investment and innovation to advance climate resilience at scale and equip communities with information and resources needed to assess their climate risks and develop the climate resilience solutions most appropriate for them.

Innovative Financing Solutions

While all states struggle to finance needed transportation projects, the needs of North Carolina are particularly complex. In addition to managing the second largest roadway system in the United States, the state is still working to restore western North Carolina's transportation network following the devastation of Hurricane Helene. The state has pursued several innovative financing tools to meet project needs. To finance the purchase of right of way for the U-4700 project, NCDOT utilized Grant Anticipation Revenue Vehicle (GARVEE) bond financing. GARVEE bonds are an FHWA-recognized transportation finance tool that used future Federal-aid reimbursements to generate upfront capital and accelerate delivery of eligible highway projects.

Innovative Construction Techniques

NCDOT will explore the use of recycled concrete and innovative bridge materials to reduce materials costs and potentially extend the effective lifetime of the bridge. As part of an Accelerated Innovation Deployment Demonstration (AID) grant, NCDOT recently utilized glass fiber reinforced polymer bridge deck technology on the [Harkers Island Bridge](#). Such materials are corrosion resistant and can allow for structural health monitoring of the bridge by embedding fiber optic sensors in the bridge deck.

Innovative Project Delivery

The U-4700 project was included in NCDOT's NEPA/Section 404 Merger Process. This process was most recently updated in 2023. Under the Merger Process, NCDOT meets with resource agency representatives at key points during project development to reach concurrence on:

- Purpose and Need and Study Area Defined
- Detailed Study Alternatives Carried Forward
- Bridging Decisions and Alignment Review
- Least Environmentally Damaging Practicable Alternative
- Avoidance and Minimization Measures
- Hydraulic Design Review
- Permit Drawing Review

The Merger Process is designed to provide increased coordination with the goal of expediting permitting. No outstanding concerns have been identified that could impact project permitting. NCDOT has developed a project commitments dashboard which ensures that commitments made during project development are tracked and followed during and after construction. As discussed in the Requirements document, NCDOT has developed a comprehensive schedule for 321 CONNECT. The Department is confident not only of initiating construction activities within 18 months of funding obligation, but also of delivering this complex project completely in FY 2030.