FEASIBILITY STUDY

Towns of Elkin and Jonesville

Replacement of the Hugh Chatham Bridge
SR 1402/SR 1190 (Gwyn Avenue)

Surry and Yadkin Counties

Division 11

B-4820

Prepared by the
Program Development Branch
N. C. Department of Transportation

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I. General Description

This feasibility study describes the proposed replacement of the Hugh Chatham Bridge (Bridge No. 338), which crosses over the Yadkin River, the Yadkin Valley Railroad, and several local streets. The project location is shown on Figure 1. As part of the study, several alternate locations for the new bridge were investigated, the details of which are as follows:

- ***ALTERNATIVE 1:*** Replace Bridge No. 338 in the existing location and widen SR 1402/SR 1190 (Gwyn Avenue) to multilanes from US 21 Business (Elm Street) to NC 268 (Market Street), a distance of approximately 0.5 miles.

- ***ALTERNATIVE 2:*** Replace Bridge No. 338 on new location approximately 0.9 miles east of the existing structure. A new connector road is proposed from NC 67 to SR 1144 (Johnson Ridge Road), a distance of approximately 1.8 miles.

- ***ALTERNATIVE 3:*** Replace Bridge No. 338 on new location approximately 1.4 miles east of the existing structure. A new connector road is proposed from NC 67 to Parkwood Drive utilizing the existing SR 1144 (Johnson Ridge Road) with the remainder on new location, a distance of approximately 1.3 miles.

- ***ALTERNATIVE 4:*** Replace Bridge No. 338 on new location approximately 1.4 miles east of the existing structure. A new connector road is proposed from NC 67 to Parkwood Drive utilizing the existing SR 1144 (Johnson Ridge Road) with the remainder on new location, a distance of approximately 1.2 miles.

- ***ALTERNATIVE 5:*** Replace Bridge No. 338 by converting the existing grade separation at I-77 and NC 268 (Bridge No. 6 and 13) into a partial cloverleaf interchange.

This is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. The purpose of this study is to describe the proposed project including cost, and to identify potential problems that may require consideration in the planning and design phases.

II. Background

The purpose of this project is to replace the Hugh Chatham Bridge (Bridge No. 338), which is currently closed to traffic due to structural integrity issues, and to improve the traffic safety and operations in this area. Bridge No. 338 currently carries SR 1402/SR 1190 (Gwyn Avenue) over the Yadkin River, the Yadkin Valley Railroad, and several local streets. This project also proposes to improve the accessibility between the towns of Elkin in Surry County and Jonesville in Yadkin County by constructing a multilane facility, including a grade separation over the Yadkin Valley Railroad. The Town of Elkin, the Town of Jonesville, and Yadkin County officials support this project.

SR 1402/SR 1190 (Gwyn Avenue) is designated as an urban local in the North Carolina Statewide Functional Classification System and as a major thoroughfare in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. SR 1402/SR 1190 currently is a two-lane curb and gutter section with a width of 20' from face of curb to face of curb.

SR 1144 (Johnson Ridge Road) is designated as an urban local in the North Carolina Statewide Functional Classification System and is designated as a minor thoroughfare in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. SR 1144 currently is a two-lane shoulder section with a pavement width of 24' from edge of pavement to edge of pavement.

I-77 is designated as an interstate in the North Carolina Statewide Functional Classification System and as a major thoroughfare freeway in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. I-77 currently is a four-lane divided shoulder section with a width of 124' from edge of pavement to edge of pavement.

US 21 Business is designated as an minor arterial in the North Carolina Statewide Functional Classification System and as a major thoroughfare in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. US 21 Business currently is a four-lane undivided curb and gutter section with pavement widths varying from 40' to 64' from face of curb to face of curb.

NC 268 is designated as a minor arterial and a collector in the North Carolina Statewide Functional Classification System and as a major thoroughfare in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. NC 268 currently is a two-lane shoulder section and a two-lane curb and gutter section with pavement widths varying from 24' to 48' from edge of travelway to edge of travelway.

NC 67 is designated as a minor arterial and a collector in the North Carolina Statewide Functional Classification System and as a major thoroughfare in the 1991 Elkin-Jonesville-Arlington Thoroughfare Plan. NC 67 currently is a five-lane curb and gutter section with a pavement width of 64' from face of curb to face of curb.

Transportation Improvement Program (TIP) project I-2808 is within the proposed project study area. This project entails the pavement rehabilitation of I-77 from south of SR 1125 in Yadkin County to US 21 Bypass in Surry County. I-2808 is currently partially funded for construction.

TIP project I-4025 is also within the proposed project study area. This project entails the replacement of Bridge No. 6 and the rehabilitation of Bridge No. 13 on I-77. I-4025 is currently unfunded.

There are several existing bridges within the project study area: Bridge Nos. 6, 13, 21, and C65. Please see Table 1 for detailed information on these structures.

It is anticipated that the proposed project will have a railroad grade separation, since it will intersect the Yadkin Valley Railroad 'K' line. The railroad is made up of one track that carries approximately 6 freight trains per day at speeds averaging 30 miles per hour. According to Rail Grade Separation Guidelines, a separation should be constructed in rural areas where the exposure index is 15,000 or more. Currently, the exposure index for the Hugh Chatham Bridge is 73,800, which greatly exceeds the recommended limits. Further, it is the policy of the Rail Division to pursue grade separations in new location projects, as opposed to at-grade crossings.

III. Traffic and Safety

Depending on the alternative, existing traffic signals will need to be modified to accommodate the proposed improvements. They are located at the following intersections:

- US 21 Business/NC 67 and US 21 Business (Elm Street)
- SR 1190 (Gwyn Avenue) and NC 268 (Main Street)
- SR 1403 (Jonesville Bypass) and NC 67

The current year Average Daily Traffic (ADT) along SR 1402/SR 1190 (Gwyn Avenue) is 12,300 vehicles per day (vpd). For the design year 2035, the traffic volume along SR 1402/SR 1190 is estimated to be 19,000 vpd. Truck traffic is estimated to make up approximately 2 percent of the daily traffic.

The current year ADT along I-77 at the NC 268 grade separation is 34,400 vpd. By design year 2035, the volume is estimated to increase to 52,900 vpd. The current year ADT along NC 268 at the I-77 grade separation is 1,300 vpd and is estimated to increase to 2,400 vpd by design year 2035. Truck traffic along I-77 is estimated to make up approximately 34 percent of the daily traffic.

If the existing grade separation is converted into an interchange, the traffic along I-77 in the current year is estimated to increase to 34,600 vpd. By the 2035 design year traffic is estimated to be as high as 53,500 vpd. The current year traffic along NC 268 is

estimated to range from 2,000 vpd to 4,600 vpd. By the 2035 design year, the traffic is estimated to range from 3,300 vpd to 7,900 vpd.

The estimated current year ADT along the proposed connector road in Alternatives 2-4 is 7,500 vpd. For the design year 2035, the traffic volume is estimated to be 12,600 vpd. Truck traffic along the connector road is estimated to make up approximately 3 percent of the daily traffic.

If the existing Hugh Chatham Bridge were to reopen to traffic, it would operate at a level of service (LOS) E. By the 2035 design year, the bridge is projected to operate at a LOS F. However, with the proposed improvements under Alternative 1, the bridge is projected to operate at a LOS D, thus greatly improving traffic safety and operations in this area.

The existing grade separation at I-77 operates at a LOS C under the current traffic volumes. By the 2035 design year, I-77 is projected to continue operating at a LOS C or better. However, with the proposed modifications to convert this grade separation to a partial cloverleaf interchange under Alternative 5, I-77 is projected to operate at a LOS D or better in the design year.

The connector road in Alternatives 2-4 is projected to operate at LOS C or better in the 2035 design year.

Between 2003 and 2006, 4 crashes were reported along SR 1402/SR 1190. The crash rate for SR 1402/SR 1190 is 110.19 crashes per 100 million vehicle miles (crashes/100MVM) traveled. This rate is lower than the statewide rate of 370.44 crashes/100MVM for two-lane undivided rural secondary routes. All of the crashes were property damage only crashes. The types of crashes reported were Angle (50%), Fixed Object (25%), and Rear End (25%). With the proposed geometric improvements in Alternative 1, the likelihood of these types of crashes occurring in the future should be reduced.

Between 2003 and 2006, 4 crashes were reported along SR 1144 from NC 268 and Parkwood Drive. The crash rate for SR 1144 is 614.42 crashes/100MVM. This rate is significantly higher than the statewide rate of 370.44 crashes/100MVM for two-lane undivided urban secondary routes. All of the crashes were property damage only crashes. The types of crashes reported were Angle, Animal, Left Turn, and Ran Off Road. With the divided highway improvements and standard 12' lane widths recommended in Alternatives 3 and 4, these types of crashes should be reduced.

Between 2003 and 2006, 74 crashes were reported along I-77 from NC 67 and US 21. The crash rate for I-77 is 116.47 crashes/100MVM. This rate is significantly higher that the statewide rate of 80.40 for rural interstate routes. There were 23 injury crashes, 50 property damage only crashes, and 1 fatal crash. The most prevalent types of crashes were Rear End (28%), Fixed Object (23%), Ran Off Road (14%), Sideswipe (12%), and Movable Object (11%).

IV. Description of Alternatives

It is proposed to replace Bridge No. 338 due to traffic safety and accessibility constraints in the area. As part of the study, several alternate locations for a new bridge were investigated, the details of which are as follows:

ALTERNATIVE 1: This alternative proposes replacing Bridge No. 338 in its existing location and widening SR 1402/SR 1190 (Gwyn Avenue) from Elm Street to NC 268 (Market Street), a distance of approximately 0.5 miles. The costs below include a new bridge over the Yadkin River, the Yadkin Valley Railroad, and local streets.

Cross-section: Four-lane divided curb and gutter section, 60' from face of curb to face of curb, with 14' outside lanes to accommodate bicycles, a 4' concrete median, and 5' sidewalks on 100' right-of-way.

With this alternative, it is anticipated that there will be three (3) residences and eleven (11) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be $19,800,000.

Right-of-way	$2,800,000
Construction	$17,000,000
Total Cost (Alternative 1)	$19,800,000

Due to Bridge No. 338's close proximity to Downtown Historic District of Elkin, the bridge provides a connection for the "Start with Your Heart" walking program. According to the AASHTO bicycle lane standard, the outside lanes in a curb and gutter section shall be 14 feet and the paved shoulders in a shoulder section shall be 4 feet.

In addition to the replacement of Bridge No. 338 and the multilane widening of SR 1402/SR 1190, the following intersection improvements are recommended and are included in the costs shown above:

- SR 1190 (Gwyn Avenue) and NC 268
  - addition of northbound left and right turn lanes on SR 1190
  - addition of a southbound through lane on SR 1190

ALTERNATIVE 2: This alternative proposes replacing Bridge No. 338 approximately 0.9 miles east of the existing structure and constructing a new connector road from NC 67 to SR 1144 (Johnson Ridge Road), a distance of approximately 1.8 miles. The costs below include a new bridge over the Yadkin River and the Yadkin Valley Railroad, new bridges over Dutchman Creek, and a new partial cloverleaf interchange at the intersection with NC 268.

Cross-section: Four-lane divided shoulder section, 79' from edge of pavement to edge of pavement, with 12' lanes, a 23' raised grass median, and 8' shoulders (4' of which are paved) on variable right-of-way. Due to the topography, the necessary right-of-way will range from 150' to 300'.

With this alternative, it is anticipated that there will be eleven (11) residences and one (1) business relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be $45,100,000.

Right-of-way	$5,700,000
Construction	$39,400,000
Total Cost (Alternative 2)	$45,100,000

In addition to the replacement of Bridge No. 338 and the construction of a new connector road, the following improvements are recommended and included in the costs shown above:

- The realignment of SR 1144 (Johnson Ridge Road). The new cross-section is a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

- The realignment of Parkwood Drive. The new cross-section is a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.1 miles.

- The widening of NC 268 between the proposed interchange terminals. The new cross-section is a three-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

- The following improvements at the intersection of NC 67 and SR 1403 (Jonesville Bypass):
  - addition of northbound left and right turn lanes on SR 1403
  - addition of through lanes on SR 1403
  - addition of dual westbound left and right turn lanes on NC 67
  - addition of dual southbound left turn lanes on the proposed connector

- The following improvement at the intersection of NC 268 and the proposed southbound on ramp.
  - addition of dual eastbound left turn lanes on NC 268

ALTERNATIVE 3: This alternative proposes replacing Bridge No. 338 approximately 1.3 miles east of the existing structure and constructing a new connector road from NC 67 to Parkwood Drive utilizing the existing SR 1144 (Johnson Ridge Road) with the remainder on new location, a distance of approximately 1.9 miles. The costs below include a new bridge over the Yadkin River and the Yadkin Valley Railroad, and a new partial cloverleaf interchange at the intersection with NC 268.

Cross-section: Four-lane divided shoulder section, 79' from edge of pavement to edge of pavement, with 12' lanes, a 23' raised grass median, and 8' shoulders (4' of which are paved) on variable right-of-way. Due to the topography, the necessary right-of-way will range from 150' to 260'.

With this alternative, it is anticipated that there will be thirty-two (32) residences and one (1) business relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be $44,200,000.

Right-of-way	$8,200,000
Construction	$36,000,000
Total Cost (Alternative 3)	$44,200,000

In addition to the replacement of Bridge No. 338 and the construction of a new connector road, the following improvements are recommended and included in the costs shown above:

- The construction of a two-lane service road from Aaron Road to approximately 350' north of Foxmall Drive, a distance of approximately 0.3 miles. The proposed cross-section will be a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way.

- The construction of a two-lane service road from Colony Lane to approximately 950' north of Marion Street, a distance of approximately 0.4 miles. The proposed cross-section will be a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way.

- The widening of NC 268 between the proposed interchange terminals. The proposed cross-section will be a three-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

- The following improvements at the intersection of NC 67 and SR 1403 (Jonesville Bypass):
  - addition of northbound left and right turn lanes on SR 1403
  - addition of through lanes on SR 1403
  - addition of dual westbound left turn lanes and a single right turn lane on NC 67
  - addition of an eastbound right turn lane on NC 67
  - addition of dual southbound left turn lanes on the proposed connector

- The following improvement at the intersection of NC 268 and the proposed southbound on ramp.
  - addition of dual eastbound left turn lanes on NC 268

ALTERNATIVE 4: This alternative proposes replacing Bridge No. 338 approximately 1.3 miles east of the existing structure and constructing a new connector road from NC 67 to Parkwood Drive utilizing the existing SR 1144 (Johnson Ridge Road) with the remainder on new location, a distance of approximately 1.5 miles. The costs below included a new bridge over the Yadkin River and the Yadkin Valley Railroad, and a new partial cloverleaf interchange at the intersection with NC 268.

Cross-section: Four-lane divided shoulder section, 79' from edge of pavement to edge of pavement, with 12' lanes, a 23' raised grass median, and 8' shoulders (4' of which are paved) on variable right-of-way. Due to the topography, the necessary right-of-way will range from 150' to 190'.

With this alternative, it is anticipated that there will be thirty-three (33) residences and one (1) business relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be $34,400,000.

Right-of-way	$7,400,000
Construction	$27,000,000
Total Cost (Alternative 4)	$34,400,000

In addition to the replacement of Bridge No. 338 and the construction of a new connector road, the following improvements are recommended and included in the costs shown above:

- The construction of a two-lane service road from Aaron Road to approximately 350' north of Foxmall Drive, a distance of approximately 0.3 miles. The proposed cross-section will be a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way.

- The construction of a two-lane service road from Colony Lane to approximately 950' north of Marion Street, a distance of approximately 0.4 miles. The proposed cross-section will be a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way.

- The widening of NC 268 between the proposed interchange terminals. The new cross-section is a three-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

- The realignment of SR 1404 (Mayberry Road). The new cross-section will be a two-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

- The following improvements at the intersection of NC 67 and SR 1352 (Fall Creek Church Road):
  - addition of a northbound left turn lane on SR 1352
  - addition of a westbound right turn lane on NC 67
  - addition of dual southbound left turn lanes on the proposed connector

- The following improvements at the intersection of NC 268 and the proposed southbound on ramp:
  - addition of dual eastbound left turn lanes on NC 268

ALTERNATIVE 5: This alternative proposes converting the existing grade separation at I-77 and NC 268 into a partial cloverleaf interchange.

With this alternative, it is anticipated that there will be zero (0) residences and zero (0) businesses relocated due to this project. The total cost of this alternative, including construction and right-of-way, is estimated to be $15,500,000.

Right-of-way	$300,000
Construction	$15,200,000
Total Cost (Alternative 5)	$15,500,000

In addition to converting the existing I-77/NC 268 grade separation into a partial cloverleaf interchange, the following improvements are recommended and included in the costs shown above:

- The addition of an auxiliary lane on Bridge 6 for the off ramp loop of the interchange.

- The addition of an auxiliary lane on Bridge 13 for the on ramp loop of the interchange.

- The widening of NC 268 between the proposed interchange terminals. The new cross-section is a three-lane shoulder section with 12' lanes and 8' shoulders (4' of which are paved) on 100' right-of-way for a distance of approximately 0.2 miles.

V. Community Issues

A detailed community impact investigation was not conducted for this feasibility study, however possible impacts to Elkin Park III are anticipated.

Maps at the Survey and Planning Branch of the North Carolina State Historic Preservation Office were used to determine if any historic properties on the National Register of Historic Places (NRHP) or state study lists exist within the proposed project study area. Bridge No. 338 (Hugh Chatham Bridge) is registered as a historic site. Downtown Historic District of Elkin is within the project study area.

VI. Natural Environment Issues

The following is a preliminary review of environmental issues that might have a potential impact to the project. The information obtained for the environmental screening is from a Geographic Information System (GIS) database. The purpose of the environmental screening is to identify potential environmental issues early in the process.

Stream Classification

The proposed project study area is located in the Yadkin River Basin. Several of the alternatives cross Dutchman Creek and Sandyberry Creek, which have a stream classification of C. All of the alternatives cross the Yadkin River, which has a stream classification of WS-IV. These water bodies will likely need to be surveyed and have the appropriate coordination with the North Carolina Department of Environment and Natural Resources (NCDENR) and the U.S. Army Corps of Engineers (USACE) during any environmental document study.

Wetlands

The potential wetland impacts within the proposed project study area are the wetlands associated with Dutchman Creek, Sandyberry Creek, the Yadkin River, and an unnamed pond. Permitting with the U.S. Army Corps of Engineers (USACE) will likely need to be obtained before construction of the project, and appropriate mitigation measures should be taken if deemed necessary. A portion of the proposed project study area is located in a floodplain.

Threatened and Endangered Species

The Yadkin River and an unnamed pond are designated as North Carolina Wildlife Resources Commission trout areas.

Hazardous Waste

The Elkin and Jonesville Wastewater Treatment Plants are located within the proposed project study area.

VII. Recommendations

ALTERNATIVE 1: It was found that the four-lane divided curb and gutter section would be able to accommodate design year 2035 traffic volumes, with the second lowest cost of all alternatives considered. In addition, the traffic volumes projected to utilize this alternative are significantly higher than any other alternative evaluated. Further, since the existing bridge is historic in nature, replacement of the structure in the same location would not only allow the bridge to retain the significance of its name, but the Department could later evaluate bridge aesthetics which would help to preserve the historic character of the structure. Providing that Bridge No. 338 can be replaced at its current location, Alternative 1 is the preferred alternative. This alternative may significantly impact the Elkin Historic District and a city owned park. Further analysis of this alternative will be required during later planning and design phases to determine if these potential impacts can be adequately addressed.

ALTERNATIVE 2: It was found that the four-lane divided shoulder section would be able to accommodate design year 2035 traffic volumes. This alternative will impact the Town of Elkin Wastewater Treatment Plant. This alternative is also the most expensive of all the alternatives studied in the feasibility study. Given the greater cost and significant utility impacts, we do not recommend the alternative to be carried forward at this time.

ALTERNATIVE 3: It was found that the four-lane divided shoulder section would be able to accommodate design year 2035 traffic volumes. This alternative provides good connectivity between Elkin and Jonesville, but it is the second most expensive alternative of the five considered.

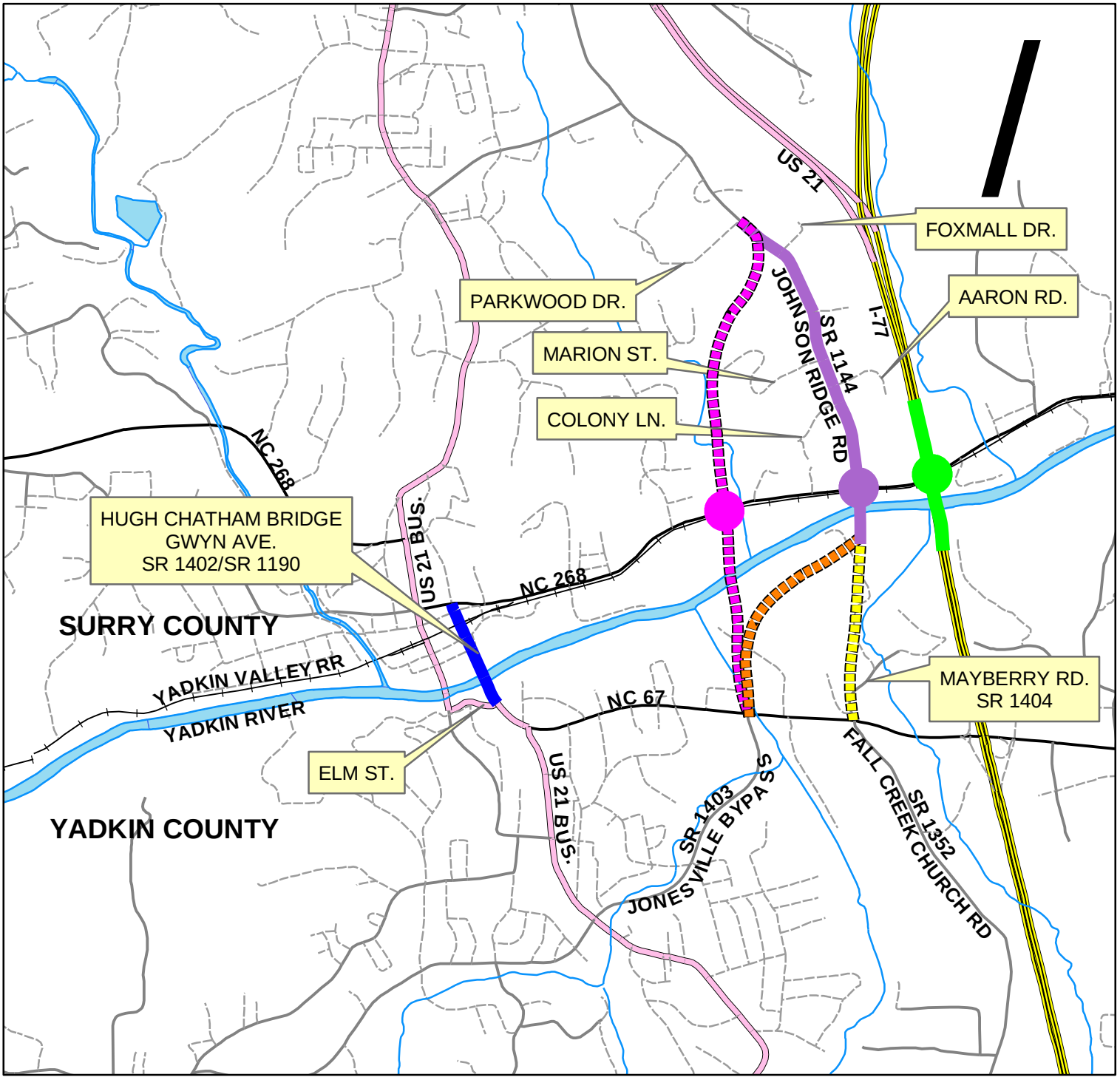
ALTERNATIVE 4: It was found that the four-lane divided shoulder section would be able to accommodate design year 2035 traffic volumes. This alternative provides connectivity between Elkin and Jonesville, similar to Alternative 3 but at a lower cost.

ALTERNATIVE 5: It was found that converting the existing grade separation of I-77 and NC 268 into a partial cloverleaf interchange would be able to accommodate design year 2035 traffic volumes. However, the interchange spacing between the existing I-77/NC 67 interchange and the existing I-77/US 21 interchange with the proposed interchange posses a concern and further analysis of this alternative may be considered during later planning and design phases to fully evaluate this.

The total estimated cost for the preferred Alternative 1 with a four-lane divided curb and gutter section, 12’ inside travel lanes, 14’ outside travel lanes to accommodate bicycles, a 4’ concrete median, and 5’ sidewalks on 100’ right-of-way, a new bridge over the Yadkin River, the Yadkin Valley Railroad, and local streets, and the recommended intersection improvements is $19,800,000.

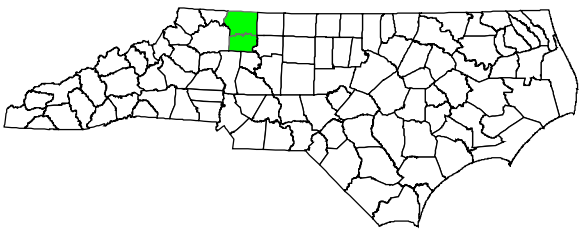
Table 1
Structure Information for B-4820 Project

Structure Number	Facility Carried	Feature Intersected	Structure Description	Structure Length	Vertical Clearance	Horizontal Clearance	Year Constructed	Sufficiency Rating
338 Hugh Chatham Bridge	**SR 1190**	**Yadkin River, Local Streets, Railroad**	**Reinforced concrete deck on prestressed concrete girders and steel truss**	**1509'**	**22' 1"**	**20'**	**1931**	**2.0**
6	I-77	NC 268, Yakin River, Railroad	Reinforced concrete deck on I-beams	788'	25' - 4"	28'	1965	75.0
13	I-77	NC 268, Yakin River, Railroad	Reinforced concrete deck on I-beams	766'	26'	28'	1960	3.0
21	US 21 BUS.	Yadkin River	Reinforced concrete deck on I-beams	400'	N/A	43.5'	1971	77.8
C65	NC 268	Dutchman's Creek	2 lines 132'x84' cm pipe arch	25'	N/A	22'	1979	98.8



2,900 1,450 0 2,900 Feet

- ALTERNATIVE 1 PROJECT LIMITS
- ALTERNATIVE 2 PROJECT LIMITS
- ALTERNATIVE 3 PROJECT LIMITS
- ALTERNATIVE 4 PROJECT LIMITS
- ALTERNATIVES 3 & 4 PROJECT LIMITS
- ALTERNATIVE 5 PROJECT LIMITS



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROGRAM DEVELOPMENT BRANCH

B-4820

REPLACEMENT OF THE HUGH CHATHAM BRIDGE
(SR 1402/SR 1190/GWYN AVENUE)

SURRY AND YADKIN COUNTIES

DIVISION 11 FIGURE 1