

FEASIBILITY STUDY

Replacement of Bridge No. 216
over Hominy Creek
and
Modification of I-240-NC 191
Interchange near Asheville
Buncombe County

B-1062

Prepared by
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Replacement of the subject bridge has been included in the Transportation Improvement Program for several years. Design and right-of-way acquisition have been completed for a new structure at the existing location. The bridge was originally scheduled for replacement in fiscal year 1985 but has been delayed due to uncertainties about the method of replacement. Repairs have been made to the structure, which is tentatively scheduled for replacement in fiscal year 1995 in the current Transportation Improvement Program.

The purpose of this feasibility study is to reevaluate the original recommendation and determine if the intended course of action is appropriate, based on current conditions.

I. Statement of Problem

Replacement of the bridge is complex because the structure is situated underneath two I-40 bridges (see Figure 2). As a result, a replacement structure at this location must be limited to a two-lane width. In order to avoid this restriction, a relocation of NC 191 would be necessary. Such a relocation would parallel I-240 on the south side and would connect with the existing I-240/Brevard Road interchange. The interchange contains certain design deficiencies which may result in future operational problems as volumes increase.

II. Summary

For the benefit of the reader, the alternatives studied in this report are described as follows (see Figure 3):

- Alternate 1A - New structure at existing location with road closure.
Estimated cost is \$765,000.
- Alternate 1B - New structure at existing location with on-site detour.
Estimated cost is \$1,540,000.
- Alternate 2A - Two-lane relocation of NC 191 to connect with I-240/NC 191 interchange. No improvements to interchange.
Estimated cost is \$1,675,000.

- Alternate 2 B - Two-lane relocation of NC 191 to connect with I-240/NC 191 interchange. Minor (three lane) interchange improvements. Estimated cost is \$2,815,000.
- Alternate 2C - Four-lane relocation of NC 191 to connect with I-240/NC 191 interchange. Major (five lane) interchange improvements. Estimated cost is \$4,115,000.

III. Existing NC 191

Bridge No. 216 is located on NC 191 just south of Asheville. The structure crosses Hominy Creek and passes under the dual structures on I-240. In the vicinity of the bridge the pavement narrows from 24 feet to 20 feet on both approaches to the structure. The shoulders are approximately 10 feet wide. The north approach contains a 10-degree curve; the south approach, a 5-degree curve. The structure is within a short (approximately 300-foot) tangent section.

Bridge No. 216 is a two span reinforced concrete bridge approximately 149 feet long. The superstructure is a reinforced concrete slab overlain with a 3-inch bituminous wearing surface. The substructure is two reinforced concrete arches. Clear roadway width on the structure is 20 feet. The structure is not posted for weight limits less than legal maximum. The structure is posted as a "Narrow Bridge".

NC 191 is designated a minor thoroughfare on the Asheville Urban Area Thoroughfare Plan map dated January 6, 1975. The route is designated as an urban minor arterial in the Statewide Functional Classification System. NC 191 is also a part of the Federal Aid Urban System (FAU-5026).

North of the bridge, NC 191 leads into Asheville but terminates about one mile north of I-240. South of the bridge, NC 191 is an important land service route paralleling I-26 through an extensive commercial-industrial area south of Asheville.

The NC 191/I-40 area is becoming heavily industrialized as evidenced by the existence of major development such as the Carolina Power and Light Company regional office and yard; U. S. Postal Service Mail Distribution Center; Southern Bell Company; and a truck terminal. Located in the immediate vicinity of the NC 191 interchange with I-40 is the Western North Carolina Farmers Market, a wholesale and retail farm product operation of the N. C. Department of Agriculture.

Utilities are being extended southward from Asheville along the NC 191 corridor. As water and sewer are provided the City anticipates that annexation will occur. A business park is planned, and commercial tracts are for sale.

At the I-26/NC 191 interchange (south of the studied area), the Biltmore Square Mall is under construction.

Although NC 191 is basically a two-lane facility from the bridge site to I-26, it appears that a multi-lane facility is being developed at some points. At the I-40 interchange, a five-lane curbed roadway exists. From I-26 to NC 112, a multi-lane cross section (five lanes plus turning lanes) is under construction.

The current traffic volume on NC 191 at the studied bridge site is 11,600 VPD. This volume is expected to increase to approximately 21,000 VPD by the end of the planning period (year 2010).

IV. Existing I-240/NC 191 Interchange

The existing I-240/Brevard Road interchange has a diamond-type configuration with several noted deficiencies. The ramp in the northwest quadrant is closer than normal to the mainline (I-240) due to the presence of NC 191 in that quadrant. An undesirable connection exists between Fairfax Avenue and the ramp in the northeast quadrant. Bridge No. 242 (over I-240) has a length of 149 feet and a clear roadway width of 28 feet. The structure has 25 years remaining life, a sufficiency rating of 70.9, and is not posted. The vertical clearance (14.1) feet underneath the bridge is significantly less than the required standard of 16.5 feet over Interstate routes. The crossroads through the interchange extends northward as NC 191 for a distance of approximately one mile. Immediately south of the interchange, the crossroads terminates and serves as a private drive to the Aston Park Health Care Center.

V. Studied Alternatives

There are physical constraints that must be considered in the development of replacement alternatives for Bridge No. 216. Along the existing alignment, the projections of the substructure piers of the I-240 bridges limit the width of a replacement structure to less than 43.86 feet clear roadway width. With reference to the existing centerline, clearance on the west side is 20.43 feet and on the east side, 23.43 feet. Based on the arterial classification of NC 191 and the current Bridge Policy, the minimum desirable vertical clearance is 16 feet 6 inches with 6 inches being allowed for future resurfacing. The existing minimum vertical clearance at the southernmost I-beam of the I-240 structure is 15.04 feet.

Due to the limited horizontal clearance available, it is not possible to provide a 4-lane bridge along the existing alignment without significant modification of the substructures of the I-240 bridges. Such modification would be cost prohibitive.

Several replacement alternatives were studied as follows (see Figures 3 and 5):

In Alternate 1A, Bridge No. 216 would be replaced at its existing location with a new 40-foot clear width structure approximately 170 feet long. NC 191 would be closed to through traffic between I-40 and I-240 and traffic would be detoured via I-26/I-240 creating 0.5 mile additional travel for through trips beyond the common points on I-26 and I-240. It is estimated that approximately 50% of the current ADT on the studied portion of NC 191 consists of through trips. Local trips between West Asheville and the Farmers' Market could use Sand Hill Road-Bear Creek Road-Shelbourne Road in lieu of NC 191 (Brevard Road) with additional travel of about 2 miles. During an estimated 18 month construction period, these trips would generate \$2,100,000 additional road user costs if NC 191 were closed to traffic during the replacement.

Alternate 1B provides for replacing Bridge No. 216 at its existing location and maintaining traffic on NC 191 utilizing a temporary detour immediately east of and downstream from the existing structure. The replacement structure would be a new 40-foot clear width bridge approximately 170 feet long. The temporary structure would vary in width from 30 feet at the south end to a wider (as necessary) section at the north end so as to provide the smoothest traffic flow practicable to accommodate a large number of garbage trucks and tractor trailers serving the landfill. The geometry at the north end of the temporary detour will dictate a low detour speed. The temporary structure will be approximately 150 feet long. The estimated cost of the temporary detour is \$775,000. Compared to the conservative estimate of road user costs incurred in closing the road during replacement, the temporary detour provides a "benefits" ratio of 3.0. Therefore, maintenance of traffic is economically justifiable. The division engineer and the City of Asheville recommend that traffic be maintained on-site.

The centerline of the replacement structure under both Alternates 1A and 1B should be shifted eastward from the existing approximately 1.50 feet in order to center it within the available opening. The approach work under both alternates should be kept to a minimum. Using a desirable 50:1 taper, the approach work can be held within an estimated 200 feet on each side of the new structure.

The length of the replacement structure is controlled by the existing approach roadway grades. Estimated cost and approach work are based on maintaining the these grades which result in the structure being in a sag vertical curve.

Alternate 2A provides for replacing Bridge No. 216 and constructing a two-lane facility on a new alignment. The proposed alignment leaves NC 191 approximately 600 feet south of the existing structure, runs eastward parallel to I-240 and ties into NC 191 at the existing I-240/NC 191 interchange. After serving to maintain traffic, the existing structure and abandoned south approach would be removed. The north approach would remain for access to the landfill haul road.

This alternate would require the construction of a new 40-foot clear width structure approximately 280 feet long. Approximately 1650 feet of new approach roadway (relocated NC 191) will be required. A 24-foot pavement with 8-foot shoulders would be provided.

This alternate will require the relocation of one residence (mobile home) and the taking of a portion of and realignment of the drive to the Aston Park Health Care Center. The Center is a privately owned rest home/medical care facility for the elderly.

Turning movements at the I-240/Brevard Road interchange are shown in Figure 4.

In conjunction with this Alternate 2A, no interchange improvements would be provided. As a result, the introduction of traffic proposed by this alternate would create unacceptable operating conditions.

Alternate 2B is identical to Alternate 2A except that interchange improvements would be provided to alleviate congestion that will result from the introduction of NC 191 traffic.

The existing bridge over I-240 accommodates one lane of traffic in each direction. Therefore, left turns from the crossroads onto the ramps will block through traffic lanes. As a result, a minimum structure width of three lanes would be required. Widening of the structure is not feasible due to the previously mentioned substandard vertical clearance. A replacement structure (40 feet in width) would be required.

Since the elevation of the structure is to be increased, the ramp grades will have to be revised (See Figure 3). Reconstruction of the ramp in the northwest quadrant should include a realignment to intersect the ramp terminal in the northeast quadrant to facilitate future signalization. This will require the relocation of a segment of NC 191 in the northwest quadrant of the interchange to remove it from the interchange area.

In addition, it would be desirable to sever the Fairfax Avenue-ramp connection in the northeast quadrant.

The above recommended interchange improvements would be adequate to provide an acceptable level of service for a few years.

Alternate 2C is identical to Alternate 2B with the following exceptions:

1. A four-lane facility would be provided.
2. A five-lane structure and approaches would be provided through the interchange area.

VI. Comparison of Alternatives

The estimated cost of each studied alternative is as follows:

Alternate 1A - \$ 765,000
Alternate 1B - \$1,540,000
Alternate 2A - \$1,675,000
Alternate 2B - \$2,815,000
Alternate 2C - \$4,115,000

The primary disadvantage of Alternates 1A and 1B is that the ultimate improvement to NC 191 will be limited to two lanes.

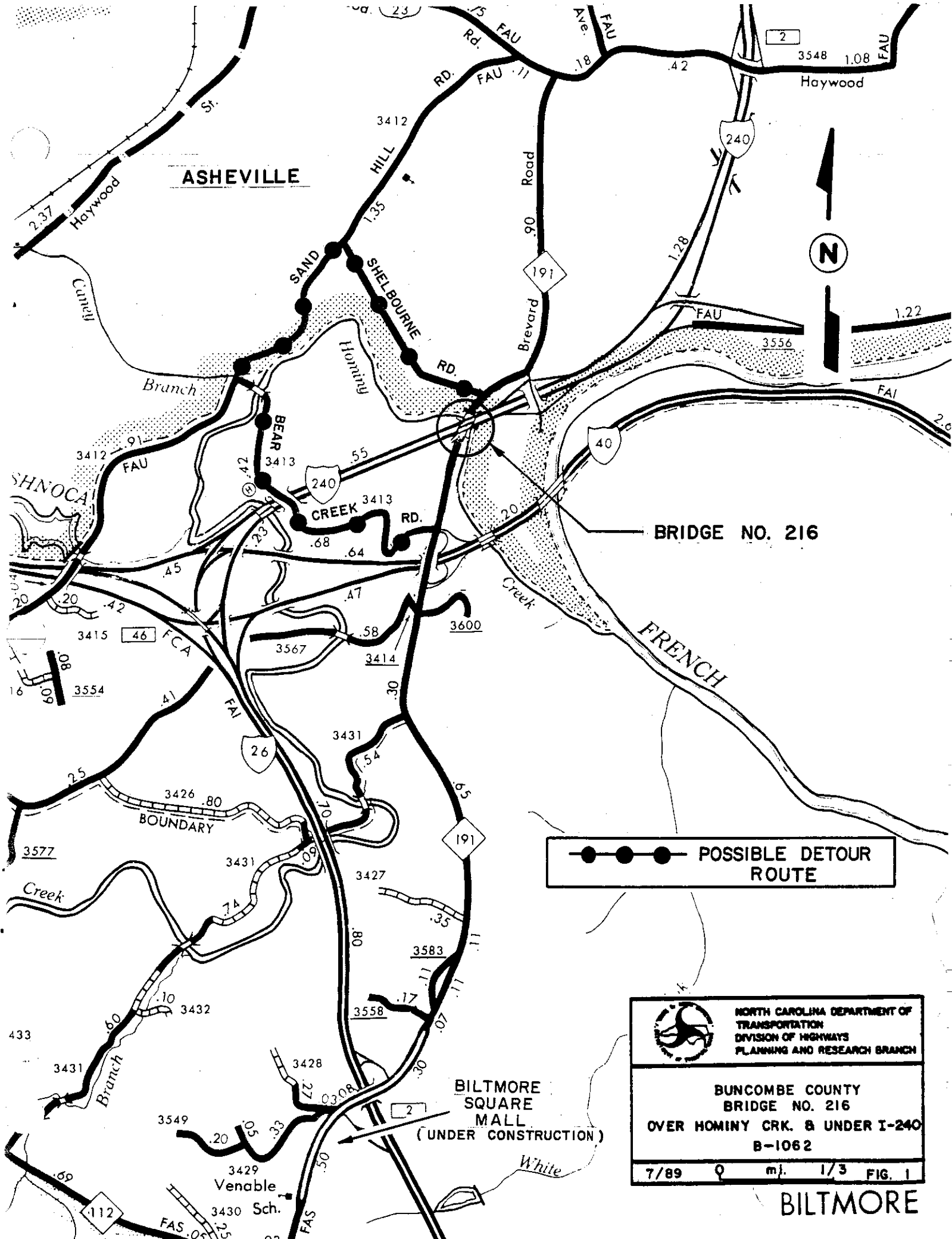
Although Alternate 1A has the lowest cost of any studied alternative, it does not appear that road closure is tolerable.

Alternate 2A provides a two-lane facility at virtually the same cost as Alternate 1B. Alternate 2A allows for an ultimate multi-lane facility to be constructed but, initially, results in unacceptable operating conditions at the I-240/Brevard Road interchange.

Alternate 2B allows for an ultimate multi-lane facility and accommodates interchange traffic for a few years but costs at least \$1,000,000 more than each alternate previously discussed.

Alternate 2C provides an initial four-lane facility and accommodates future interchange capacity but has the highest cost of any studied alternative.

WE/plr





NORTH APPROACH
LOOKING NORTH



BRIDGE No. 216
EAST SIDE



SOUTH APPROACH
LOOKING NORTH



NORTH CAROLINA DEPARTMENT OF
TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

BUNCOMBE COUNTY
BRIDGE NO. 216
OVER HOMINY CRK. & UNDER I-240
B-1062

NATIONAL GUARD ARMORY

SHELBOURNE RD.

BRIDGE NO. 216
(UNDER I-240
STRUCTURES)

I-240

ALTERNATE 1A
EXISTING LOCATION

ALTERNATE 1B
TEMPORARY DETOUR

TO I-40
FARMERS MARKET

ALTERNATE 2A

HOMINY CREEK
LANDFILL ROAD

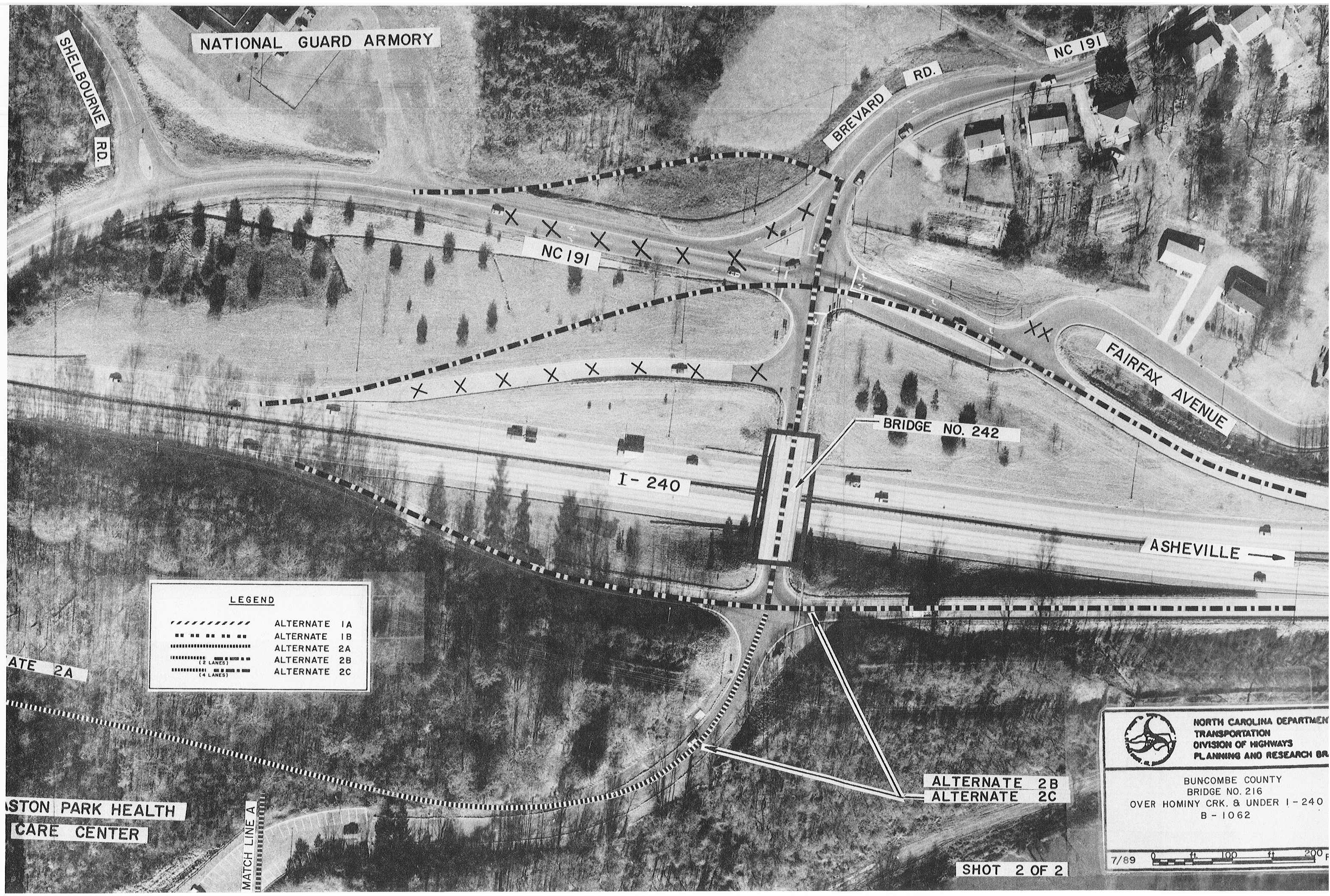
ASTON PARK HEALTH
CARE CENTER

SHOT 1 OF 2

MATCH LINE A

LEGEND

=====	ALTERNATE 1A
-----	ALTERNATE 1B
=====	ALTERNATE 2A
=====	ALTERNATE 2B
=====	ALTERNATE 2C



NATIONAL GUARD ARMORY

SHELBOURNE RD.

NC 191

BREVARD RD.

NC 191

FAIRFAX AVENUE

BRIDGE NO. 242

I-240

ASHEVILLE

LEGEND


-----	ALTERNATE 1A
=====	ALTERNATE 1B
=====	ALTERNATE 2A
===== (2 LANES)	ALTERNATE 2B
===== (4 LANES)	ALTERNATE 2C

ATE 2A

BOSTON PARK HEALTH CARE CENTER

MATCH LINE A

ALTERNATE 2B
ALTERNATE 2C

 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BR

BUNCOMBE COUNTY
BRIDGE NO. 216
OVER HOMINY CRK. & UNDER I-240
B-1062

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ESTIMATED TRAFFIC VOLUMES

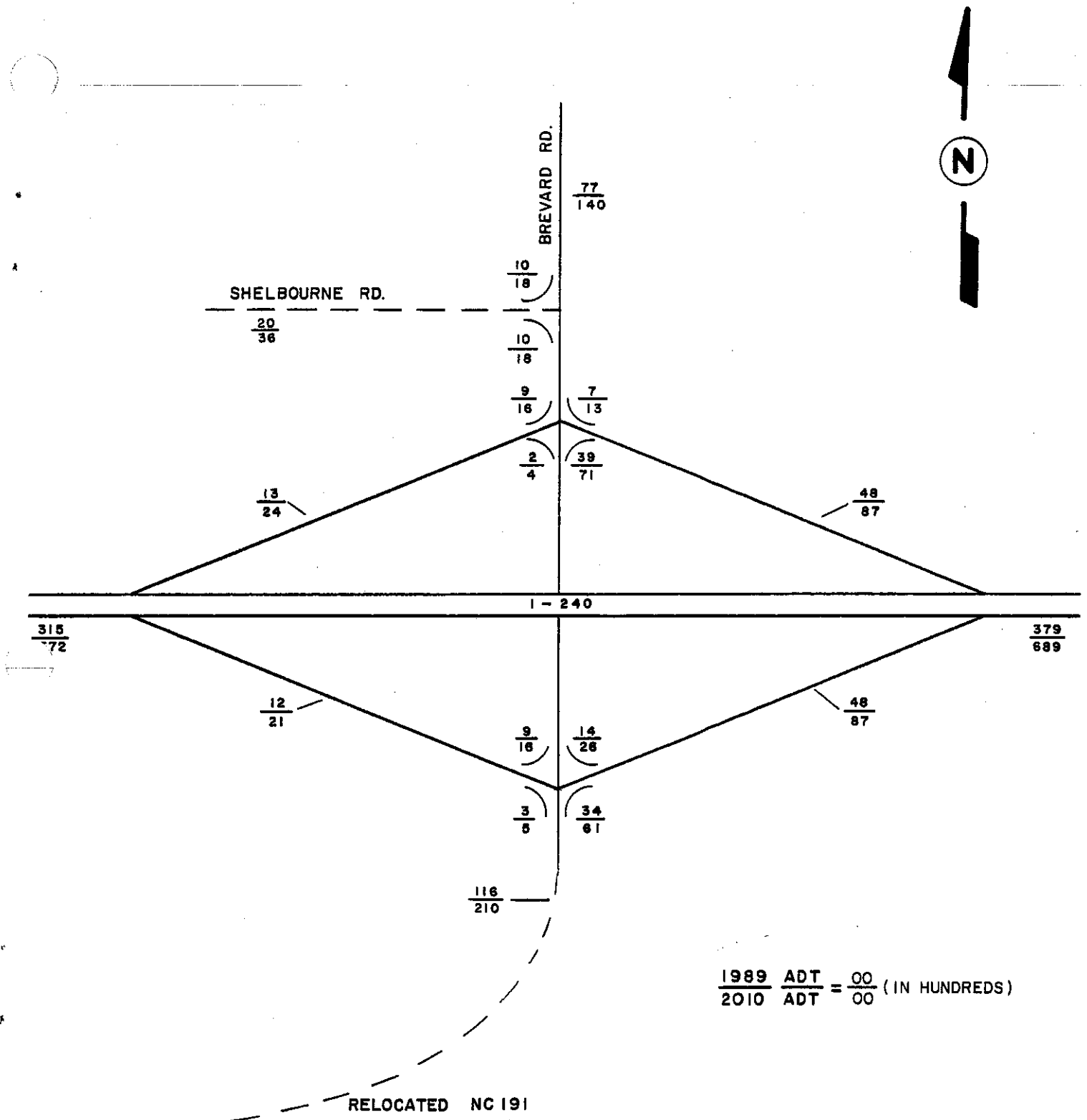
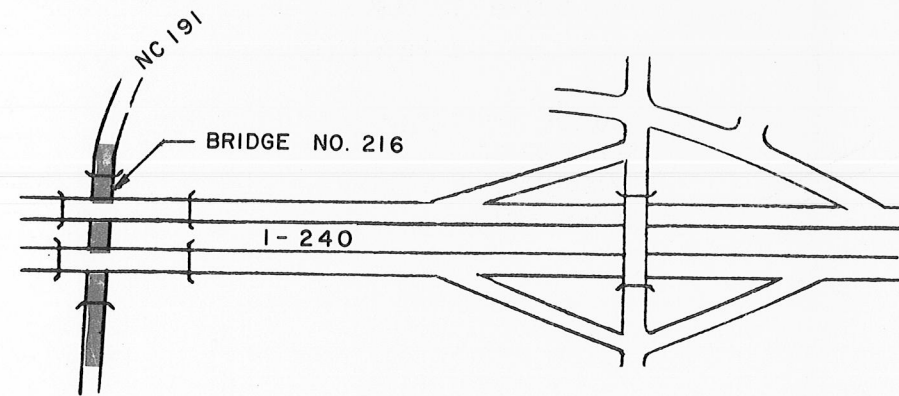
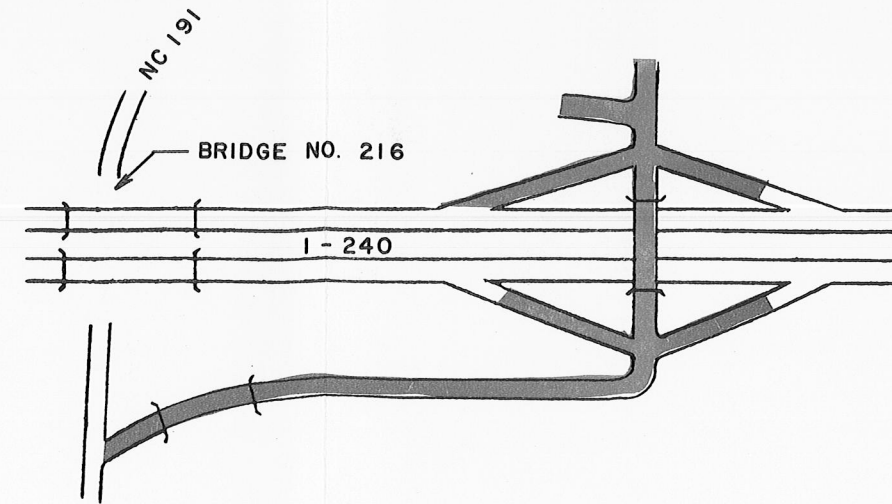


FIGURE 4



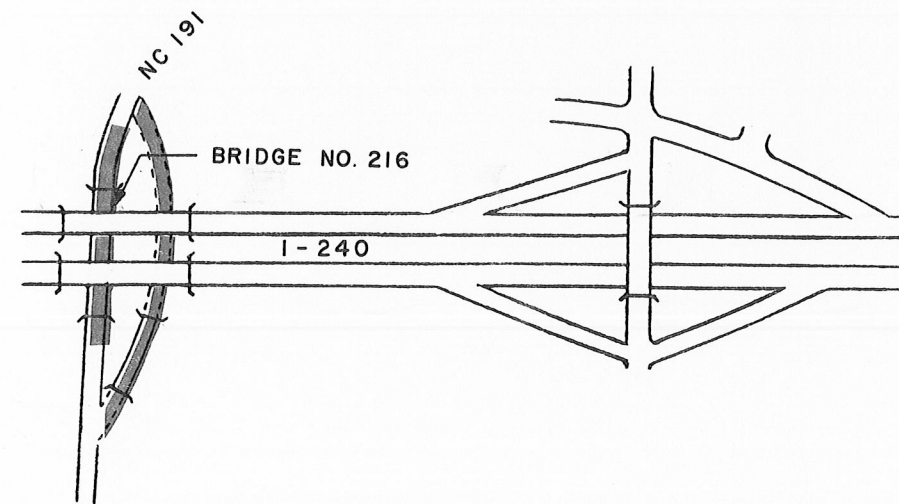
ALTERNATE 1A
EST. COST \$765,000

PROVIDE TWO - LANE
RIVER BRIDGE AT
EXISTING LOCATION.
CLOSE ROAD.



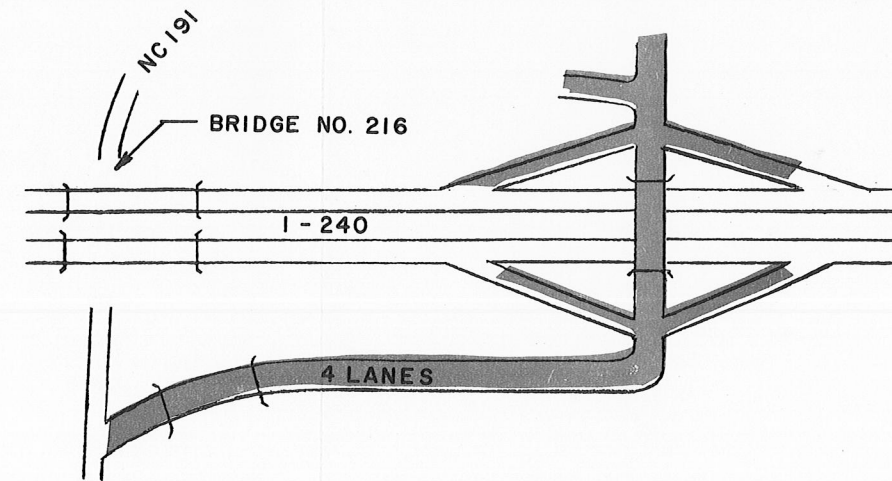
ALTERNATE 2B
EST. COST \$2,815,000

REMOVE RIVER BRIDGE.
PROVIDE TWO - LANE
FACILITY ON NEW LOCATION
SOUTH OF I - 240.
PROVIDE THREE - LANE
INTERCHANGE BRIDGE
AND RAMP IMPROVEMENTS.



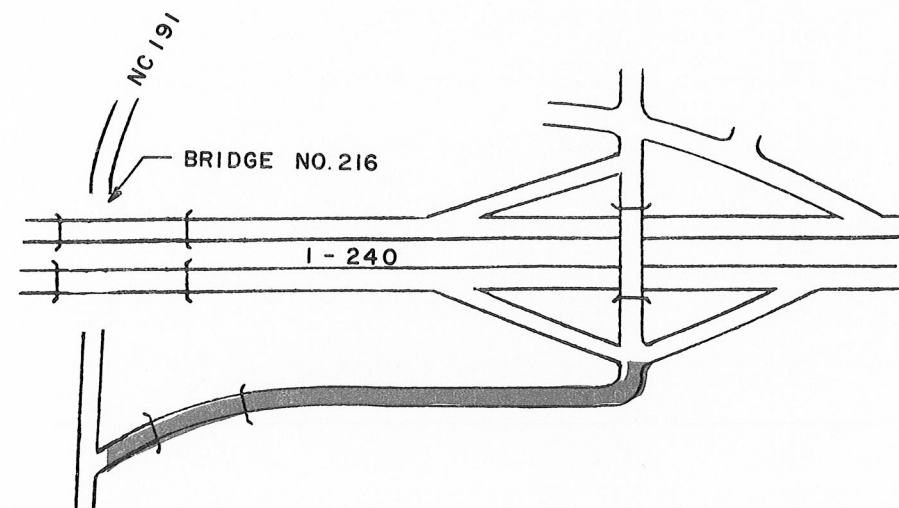
ALTERNATE 1B
EST. COST \$1,540,000

PROVIDE TWO - LANE
RIVER BRIDGE AT
EXISTING LOCATION,
MAINTAIN TRAFFIC
ON - SITE.



ALTERNATE 2C
EST. COST \$4,115,000

REMOVE RIVER BRIDGE,
PROVIDE FOUR - LANE
FACILITY ON NEW LOCATION
SOUTH OF I - 240.
PROVIDE FIVE - LANE
INTERCHANGE BRIDGE
AND RAMP IMPROVEMENTS.



ALTERNATE 2A
EST. COST \$1,675,000

REMOVE RIVER BRIDGE,
PROVIDE TWO - LANE
FACILITY ON NEW LOCATION
SOUTH OF I - 240.
NO INTERCHANGE
IMPROVEMENTS