

# FEASIBILITY STUDY

## US 220 from Asheboro to I-85 Evaluate the Need to Improve Highway to Interstate Standards

Randolph and Guilford Counties

Divisions 7 and 8

FS-0108A



Prepared by  
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A handwritten signature in blue ink that reads "Ron Hairr".

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Feasibility Studies Unit Head

10/6/03  
Date

## Randolph and Guilford Counties

### US 220 from Asheboro to I-85 Improve Highway to Interstate Standards

#### FS-0108A

#### I. General Description

This feasibility study describes the improvements required to upgrade US 220 to meet interstate standards between SR 1462/West Presnell Street Extension in Asheboro and I-85 in Greensboro. Included in the project are upgrades to the SR 1462 interchange and the SR 2269 interchange. The project study limits for the 23 mile route are shown in Figure 1.

The sources used in evaluating the facility for required upgrades to interstate standards are listed as follows:

- "A Policy on Design Standards – Interstate System", AASHTO, July 1991.
- "Roadway Design Manual", NCDOT, January 2, 2002.
- "A Policy on Geometric Design of Highways and Streets", AASHTO, 2001.

It is anticipated that there will be 19 residences and 4 businesses relocated due to this project. A preliminary estimate of cost was prepared by NCDOT. This estimate includes approximately \$6,900,000 for right-of-way and \$58,700,000 for construction for a total cost of \$65,600,000.

Right-of-Way .....	\$6,900,000
Construction .....	<u>\$58,700,000</u>
Total Cost.....	\$65,600,000

#### II. Need for the Project

The purpose of this project is to upgrade the existing US 220 route to meet interstate standards for designation as part of the I-73 (and I-74) corridor. The project begins in Randolph County at SR 1462 and ends at I-85 in Greensboro.

Generally, the overall horizontal and vertical geometry of US 220 and the access ramps and loops meet minimum requirements for use as an interstate facility, although there are deficiencies along the route. The existing conditions are described as follows: The design speed is 70 miles per hour. The lane width is 12 feet and the median width varies over the route with a minimum width of 16

feet. The 16 foot minimum median includes a concrete barrier and/or raised median section with guardrail. The freeway ditch width is 16 feet with a slope of 6:1. The northbound outside paved shoulder varies from 5 feet to 9 feet, and the southbound outside paved shoulder is 5 feet. The northbound and southbound median paved shoulders are 4 feet. It was not possible to determine whether the existing paved shoulders were full depth or partial depth based on the plan sets. The determination of existing full depth or partial depth paved shoulders needs to be made during later planning and design stages, and ultimately the paved shoulders are to be constructed as full depth.

The existing guardrail is offset 12 feet on the outside. In the locations where there is a depressed grass median, the guardrail is offset 10 feet from the inside. In the locations where there is a raised concrete median, the guardrail is offset 2 feet from the inside. All overhead structures except the bridges on routes SR 1462 and SR 2269 have 16 foot minimum vertical clearance and adequate lateral clearance for 12 foot paved shoulders. All bridges along US 220 except the bridges over SR 1950 have 40 foot roadway clear width providing for 6 foot median shoulder, 24 foot roadway and 10 foot outside shoulder. All interchanges except US 220/Presnell Street and US 220/SR 2269 interchanges have adequate spacing between their entrance and exit ramp terminals and have no weaving problem.

Currently, the traffic estimates (2001) range between 31,000 and 48,000 vehicles per day (vpd) with the highest volumes recorded between SR 1462 and SR 2269 on the section furthest south. Traffic projections estimate the 2025 volumes to range between 45,600 and 70,600 vpd. The traffic projections are shown in Figures 2a, 2b, 2c, 2d, 2e and 2f.

Capacity analyses were performed for five sections of the US 220 mainline for existing (2001) and 2025 projected traffic. The anticipated levels of service (LOS) for US 220 were determined using methodologies contained in the *Highway Capacity Manual (HCM) Basic Freeway Segment Analysis* and are shown in Table 1.

<b>Table 1.</b> <b>US 220 Feasibility Study</b> <b>Freeway Section Analyses</b> <b>Peak-Hour Level-of-Service (Density in pc/mi/ln)</b>			
Freeway Section on US 220		2001 Peak-Hour LOS (Density)	2025 Peak-Hour LOS (Density)
At US 311 Bypass (Between SR 1712 and US 311/SR 2270)	South of Bypass	B (17.5)	D (32.7)
	North of Bypass	N/A	D (26.6)
At County Line (Between SR 1987/US 220 Business and NC 62)		B (15.7)	C (23.2)
At SR 1117 (Between SR 1104 and I-85/Greensboro Loop)		B (17.0)	D (27.8)
North of I-85		B (17.2)	C (22.4)

Table 1 shows acceptable LOS (LOS D or better) for the selected sections along US 220 by the year 2025. The analysis indicates that the four-lane section will be adequate to serve traffic on the mainline sections through 2025, except for the section from the SR 2269 interchange southward through the interchange with SR 1462/West Presnell Street. This section will require a six-lane facility for traffic service and lane balance between the two previously noted interchanges.

Accident data obtained for US 220 from 1998 through 2001 indicates the total crash rate, from the City of Asheboro to the Guilford County line, is 51.19 accidents per 100 million vehicle miles (100MVM) traveled. The statewide average for rural North Carolina freeways (full access control with four or more lanes divided) is 63.50 accidents per 100MVM traveled and the statewide average for rural North Carolina interstates is 64.04 accidents per 100MVM traveled. As shown, the existing facility has a lower rate compared to both types of facilities. The highest percentages of accidents on US 220 are as follows: approximately 22 percent of accidents were with fixed objects, 19 percent were rear end slow or stop, and 16 percent were with animals. Individually, all other accident types are approximately six percent or less of total accidents. Improvements to upgrade the freeway to interstate standards are expected to reduce fixed object accidents by increasing the outside guardrail offset and increasing the clear zone. Rear end slow or stop and other congestion related accidents may potentially be reduced if geometric improvements including freeway widening and interchange modifications are implemented as recommended in the vicinity of the SR 2269 and SR 1462 interchanges.

### **III. Environmental Screening**

The following is a preliminary review of environmental issues that might have a potential impact to the project with the alternatives for improving US 220 to meet the interstate standards required for the highway to be renamed as I-73 / I-74. The information obtained for the environmental screening is from readily available database information only. No survey work, other than a field inspection, was performed for this study. The environmental screening is not a substitute for the project planning/environmental documentation process. The purpose of the environmental screening is to identify potential environmental issues early in the process. For the purpose of this study, potential environmental issues were identified within a 200-foot corridor along the existing US 220 alignment between Asheboro and I-85. Figures 3a, 3b, and 3c, the environmental screening maps, show the location of potential environmental issues.

#### **Historic Properties**

As part of the environmental screening process, the North Carolina State Historic Preservation Office (SHPO) was contacted to determine if any historic resources on the National Register of Historic Places (NRHP) or state lists exist within the proposed project corridor. No properties within the project corridor were found to be either on local/state lists or on the NRHP. Figure 3a shows the location of historic districts and sites within the general area of US 220.

For the purpose of this screening, a field inspection was conducted to identify properties within the study corridor that had the potential to be older than 50 years. Based on the field review, no properties were identified.

#### **Floodplains**

Both Randolph County and Guilford County are regular participants in the National Flood Insurance Program. The following Federal Emergency Management Agency (FEMA) floodplain map panels were reviewed: Panel # 370195075B, Randolph County, North Carolina; Panel # 3701950200B, Randolph County, North Carolina; Panel # 370196004B, City of Asheboro, north Carolina; Panel # 3701960007B, City of Asheboro, North Carolina, Panel # 370196011B, City of Asheboro, Panel # 3701990001A, Town of Randleman, North Carolina; Panel # 3701110181C, Guilford County, North Carolina; Panel # 3701110185B, Guilford County, North Carolina; 3701110190B, Guilford County, North Carolina; Panel # 3701110195B, Guilford County, North Carolina; Panel # 3753510018C, City of Greensboro, North Carolina; and Panel # 3753510022C, City of Greensboro, North Carolina. The proposed project corridor would cross the 100-year floodplain along Muddy Creek in Randolph County. The width of the floodplain crossing the proposed corridor is approximately 500 feet. The

base flood elevation is unknown. When constructing this project, local and state regulations regarding the 100-year floodplain should be followed.

### **Stream Classification**

The proposed project corridor is located in the Cape Fear River Basin. The project corridor crosses two tributaries to Back Creek, Muddy Creek, a tributary to Polecat Creek, and Ryan Creek. Back Creek has stream classification of a Water Supply that is undeveloped (WS-II), High Quality Waters (HQW), and Nutrient Sensitive Waters (NSW). Muddy Creek has stream classifications of freshwater that contains aquatic life and is fit for secondary recreation (C) and Nutrient Sensitive Waters (NSW). Polecat Creek has a stream classification of a moderately developed water supply (WS-III). Ryan Creek has stream classifications of freshwater that contains aquatic life and is fit for secondary recreation (C) as well as nutrient sensitive waters (NSW). These water bodies should 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.

### **Reservoirs**

The proposed project corridor crosses the future Randleman Lake and the critical water supply watershed. It is currently understood from the Piedmont Water Authority that the dam for the future reservoir has been completed, and the lake will be filled by 2005.

### **Wetlands**

National Wetland Inventory Maps for the Asheboro, Randleman, Pleasant Garden, and Greensboro quads (USGS) were reviewed to determine whether the proposed project corridor would impact any wetlands. The proposed project corridor crosses wetlands associated with Muddy Creek. Eight small pockets of wetlands are also found along the corridor adjacent to US 220. During the preparation of any environmental assessment, it is recommended that these wetlands be surveyed and delineated. Proper permitting from the U.S. Army Corps of Engineers should be obtained before construction of the project, and appropriate mitigation measures should be taken.

### **Threatened and Endangered Species**

The North Carolina Natural Heritage Program and the United States Fish and Wildlife Service (FWS) were contacted to determine the presence of any threatened and endangered species within the proposed project corridor. The following threatened and endangered species were determined to exist within the Asheboro, Randleman, Pleasant Gardens, and Greensboro quads as shown in

Table 2. A survey for this species should be completed during preparation of any environmental assessment, and if this species is found to be present, additional investigations should be taken.

<b>Table 2.</b>			
<b>Threatened and Endangered Species Found within the US 220 Corridor</b>			
<b>Name (Scientific Name)</b>	<b>Federal Status<sup>1</sup></b>	<b>State Status<sup>2</sup></b>	<b>Quad (Habitat)</b>
Schweinitz's Sunflower ( <i>Helianthus schweinitzii</i> )	LE	E	Asheboro (Open woods and roadsides)
<sup>1</sup> Definitions of Federal Status: LE=Listed Endangered, LT=Listed Threatened, FSC=Species of Concern <sup>2</sup> Definitions of State Status: E= Endangered, T=Threatened, C=Candidate			

Source: United States Fish and Wildlife Service, 2002.  
 North Carolina Natural Heritage Program, 2002.

**Environmental Justice**

Executive Order 12898 requires that Federal agencies identify and address disproportionately high and adverse effects of federally funded projects on minority and low-income projects. The Census 2000 demographic data were reviewed at the block level for high levels of minority and Hispanic populations. 1990 Census economic median household data were reviewed at the Block Group level for lower than normal income levels. Potential EJ concerns related to minority populations and Hispanic populations are located near the southern end of the project corridor as well as near the interchange of US 220 and US 311 (see Figure 3c). High levels of minority and Hispanic populations are also located at the northern terminus of the corridor where US 220 junctions with I-85. To determine potential EJ concerns related to income levels, 1990 Census data were used because Census 2000 economic data is not available.

**Hazardous Materials**

Hazardous materials impacts were not considered as a part of this study due to the fact that the improvements to upgrade the facility to interstate standards are expected to be contained within the existing right of way with the exception of interchange upgrades at SR 1462 and SR 2269. If additional right of way is sought for interchange improvements, state and Federal databases should be reviewed and before purchasing right of way property, a Phase I environmental audit should be conducted to precisely determine hazardous materials impacts.

## IV. Recommendations

To upgrade existing US 220 to I-73 / I-74 and accommodate the projected traffic for design year 2025, the following improvements and modifications are essential:

- Relocate the US 220/SR 2269 interchange north of existing location and replace US 220 exit ramp to Presnell Street (north of Presnell Street) with a loop and ramp south of Presnell Street. Higher traffic volumes and existing deficiencies including a narrow median, insufficient vertical and horizontal clearance, and close interchange spacing require improvements to the SR 2269 and SR 1462 interchanges including an additional lane in each direction on US 220 south of SR 2269. Relocated US 220/SR 2269 includes a new structure over the railroad.
- Acceleration and deceleration lengths for each entrance and exit ramp should meet the minimum acceleration length of 580 feet and deceleration length of 340 feet as recommended by AASHTO standards. The cost for upgrading each of the existing ramps to full depth pavement has been included in the cost estimate in this report.
- Replace the existing 16-foot concrete curb and gutter median south of SR 2269 with a 26-foot median (12 foot paved shoulders and a two foot concrete barrier).
- Provide 12-foot full depth outside paved shoulders (full depth or partial depth can not be determined from plan sets – sections which are not currently full depth are to be constructed full depth upon widening).
- Provide four foot full depth paved shoulders along the median north of SR 2269 (with a depressed grass median).
- Provide four foot full depth paved shoulders for ramps.
- Remove and reset the guardrail to provide a 14 foot offset (includes a 12-foot useable shoulder and two feet of clearance) from the travel lane. This improvement requires two feet of additional embankment.
- Upgrade guardrail anchor units.
- A design exception will be needed to allow narrower shoulder widths on overpasses. If a design exception can not be obtained, all US 220 bridges over crossing roads will need to be widened by 2 feet (except bridges over SR 1950) for 12-foot outside paved shoulders. The estimated cost of this proposed widening is approximately \$1,800,000, and is not included in the cost estimates of this project.

- Replace US 220 overhead bridges at SR 1469 and SR 2269 to meet minimum requirements for horizontal and vertical clearances.
- Upgrade existing signs and install new signs as needed.
- Provide a clear zone of 30 feet to 46 feet from the edge of the travel lane for side slopes of 6:1 to 4:1.
- Provide a six-lane cross-section for traffic service and lane balance from SR 2269 through the interchange with SR 1462/West Presnell Street.

### Cost Estimates

Table 4 provides a breakdown of the cost estimates for the project.

<b>Table 4. Cost Estimates</b>			
	<b>Construction</b>	<b>Right of Way</b>	<b>Total</b>
23 miles of Mainline Improvements (US 220 from SR 1462 to I-85)	\$46,200,000	\$0	\$46,200,000
Improvements to SR 1462 Interchange	\$2,800,000	\$2,200,000 (19 residences and 2 businesses relocated)	\$5,000,000
Improvements to SR 2269 Interchange	\$9,700,000	\$4,700,000 (2 businesses relocated)	\$14,400,000
<i>Total</i>	<i>\$58,700,000</i>	<i>\$6,900,000</i>	<i>\$65,600,000</i>

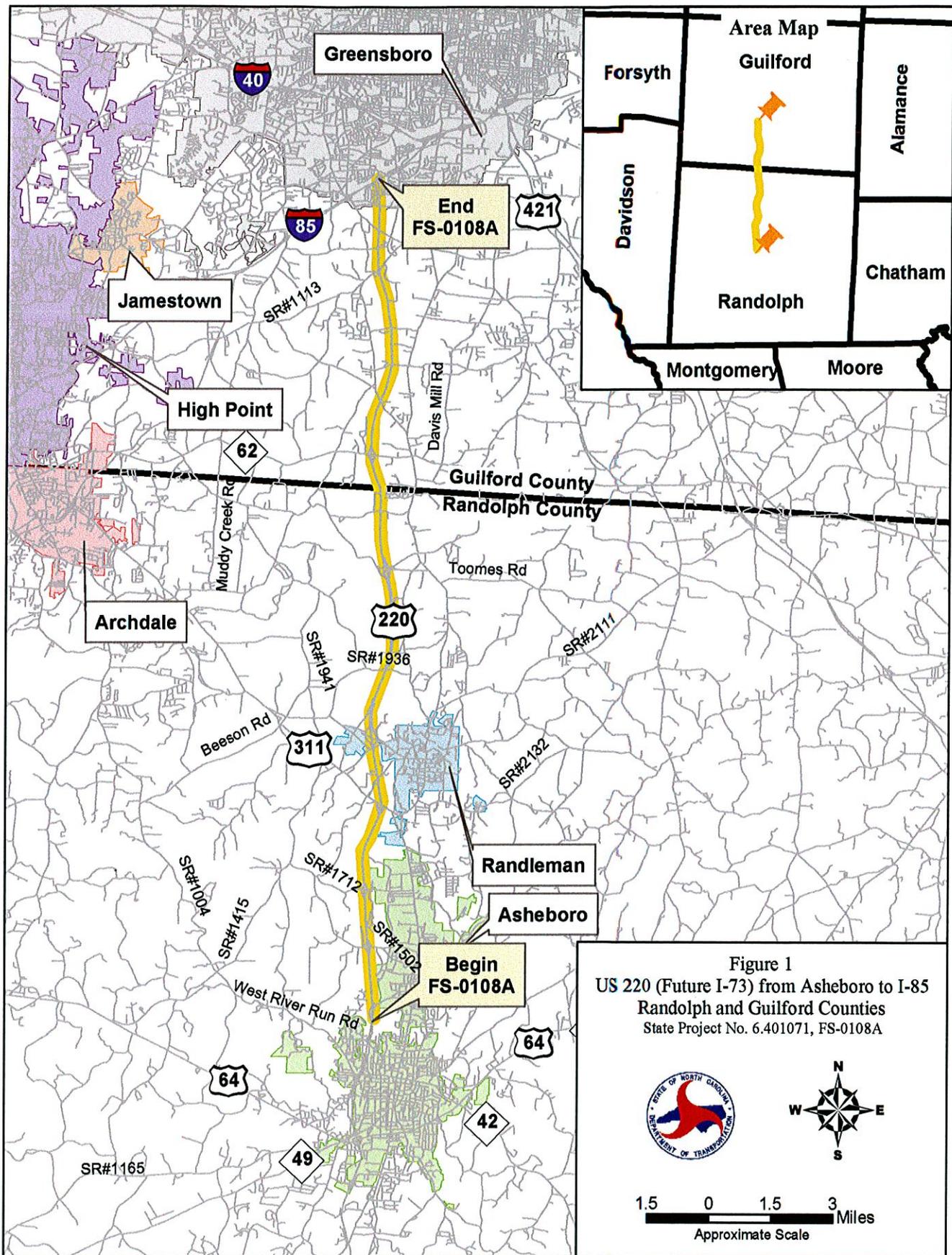
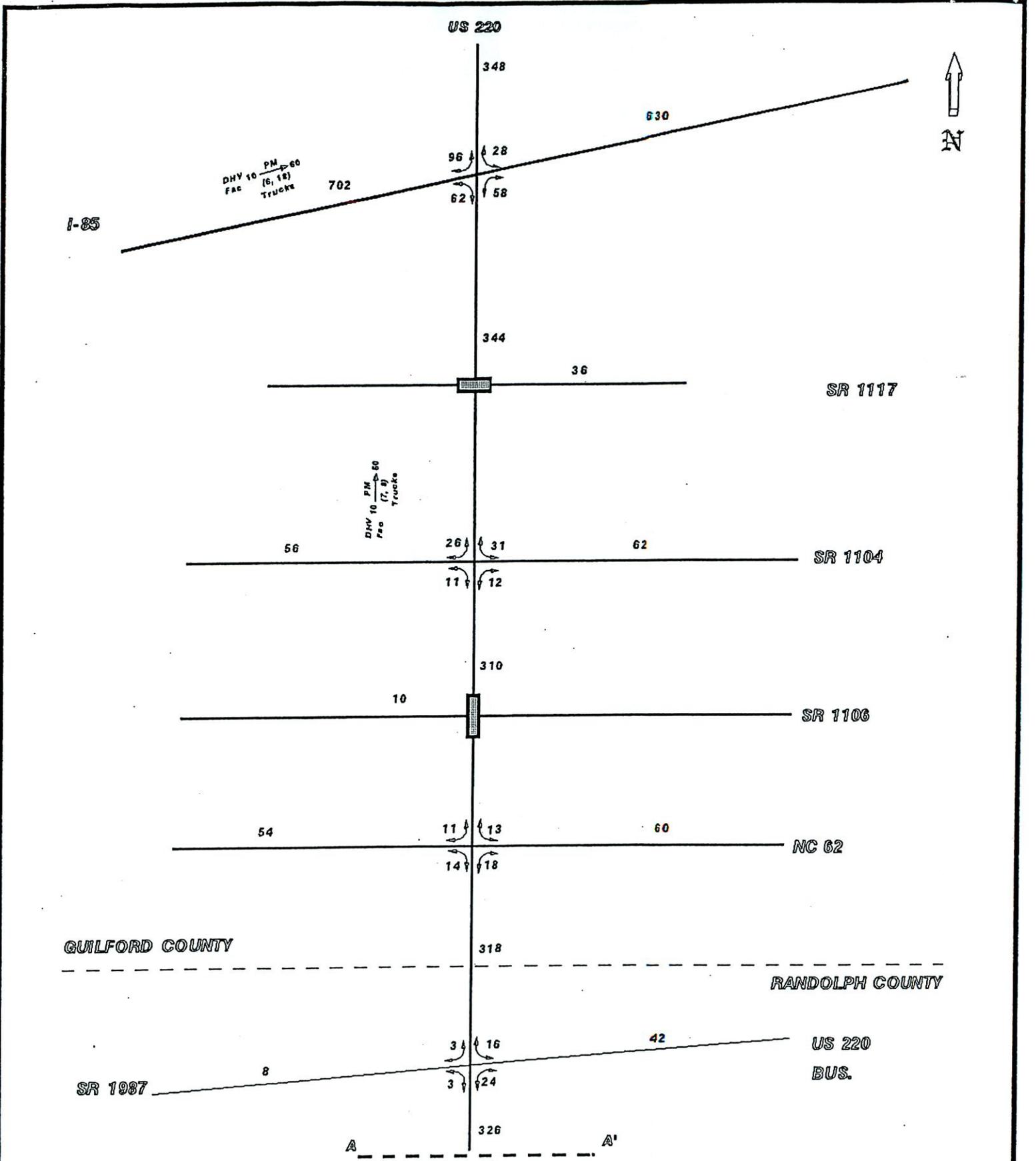


Figure 1  
 US 220 (Future I-73) from Asheboro to I-85  
 Randolph and Guilford Counties  
 State Project No. 6.401071, FS-0108A



1.5 0 1.5 3 Miles  
 Approximate Scale



FS-0108A

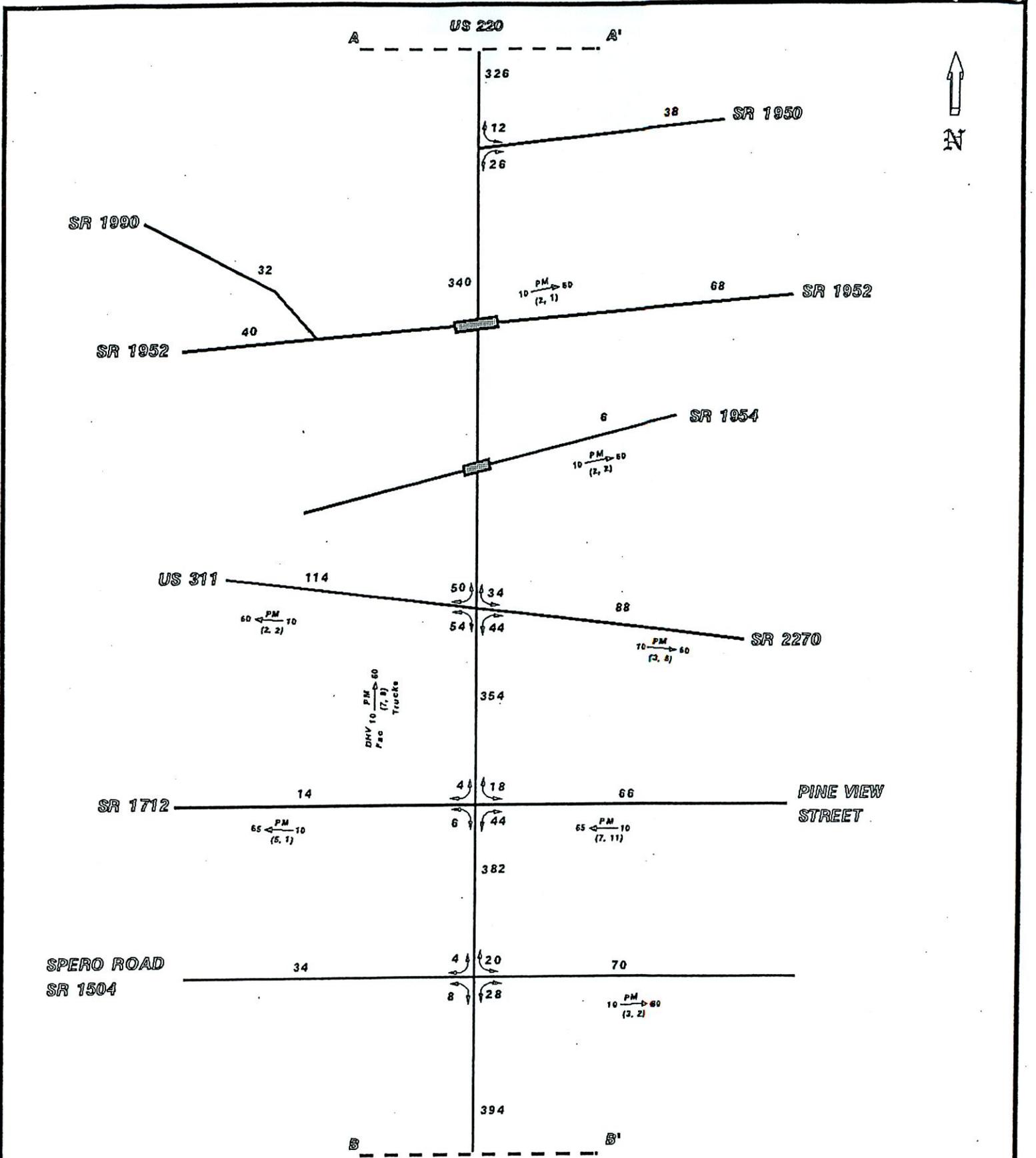


Estimated 2001 ADT Volumes in Hundreds

US 220 (EXISTING) FROM SR 1462 NORTH OF ASHBORO TO I-85  
 COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A June, 2001

Project # 8.1741101 **Figure 2a.**



FS-0108A

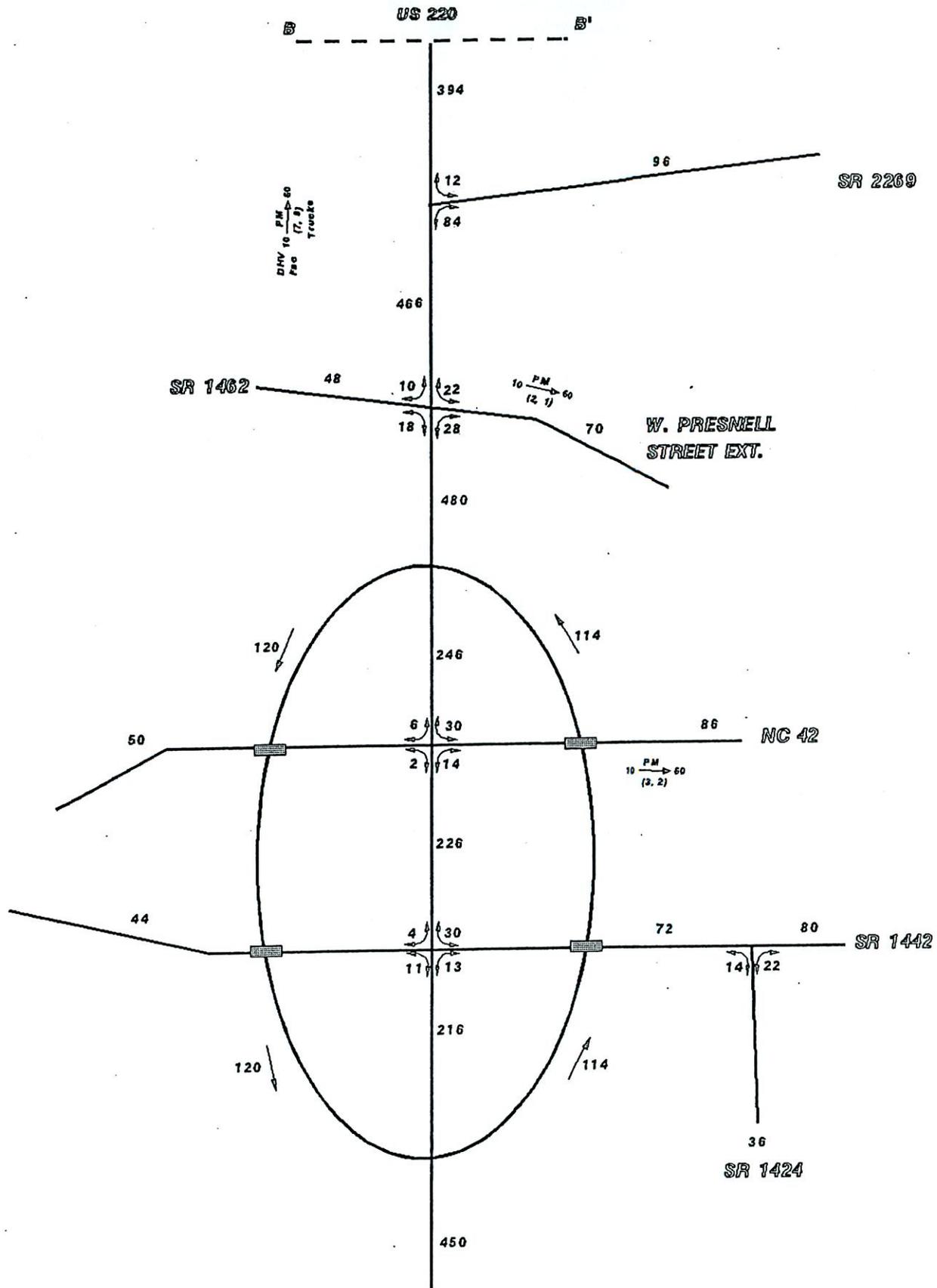


Estimated 2001 ADT  
Volumes in Hundreds

US 220 (EXISTING) FROM SR 1462  
NORTH OF ASHBORO TO I-85  
COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A June, 2001

Project # 8.1741101 **Figure 2b.**



Estimated 2001 ADT  
Volumes in Hundreds

**Legend**

XXX VPD Vehicle/Day  
 DHV Design Hourly Volume (%)  
 D Directional Flow (%)  
 PM PM Peak  
 (0.0) Duels, TTST (%)

Note: DHV → D  
 Indicates the direction D  
 Reverse flow direction for AM Peak

Drawing not to scale

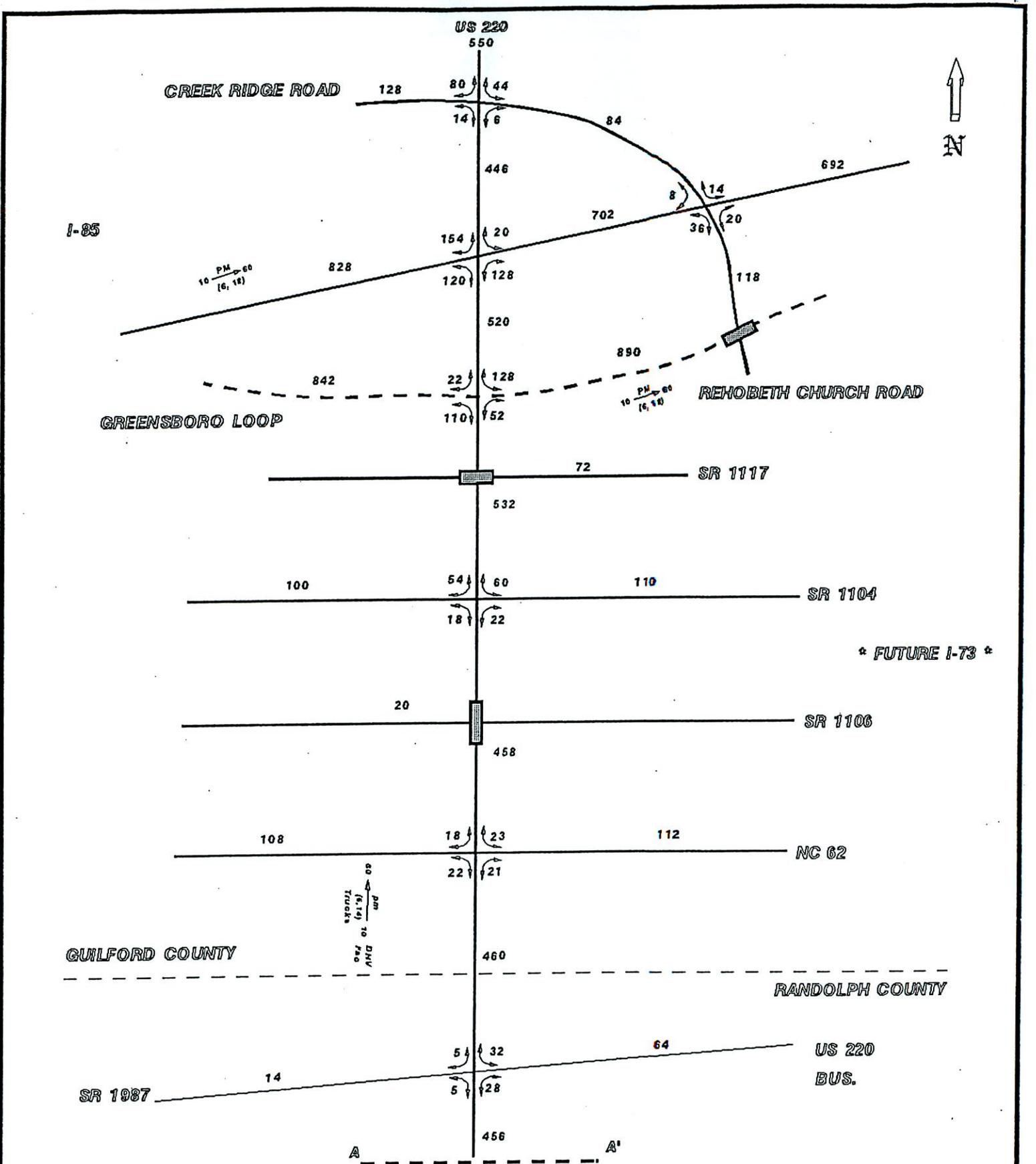
FS-0108A



US 220 (EXISTING) FROM SR 1462  
 NORTH OF ASHBORO TO I-85  
 COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A June, 2001

Project # 8.1741101 **Figure 2c.**



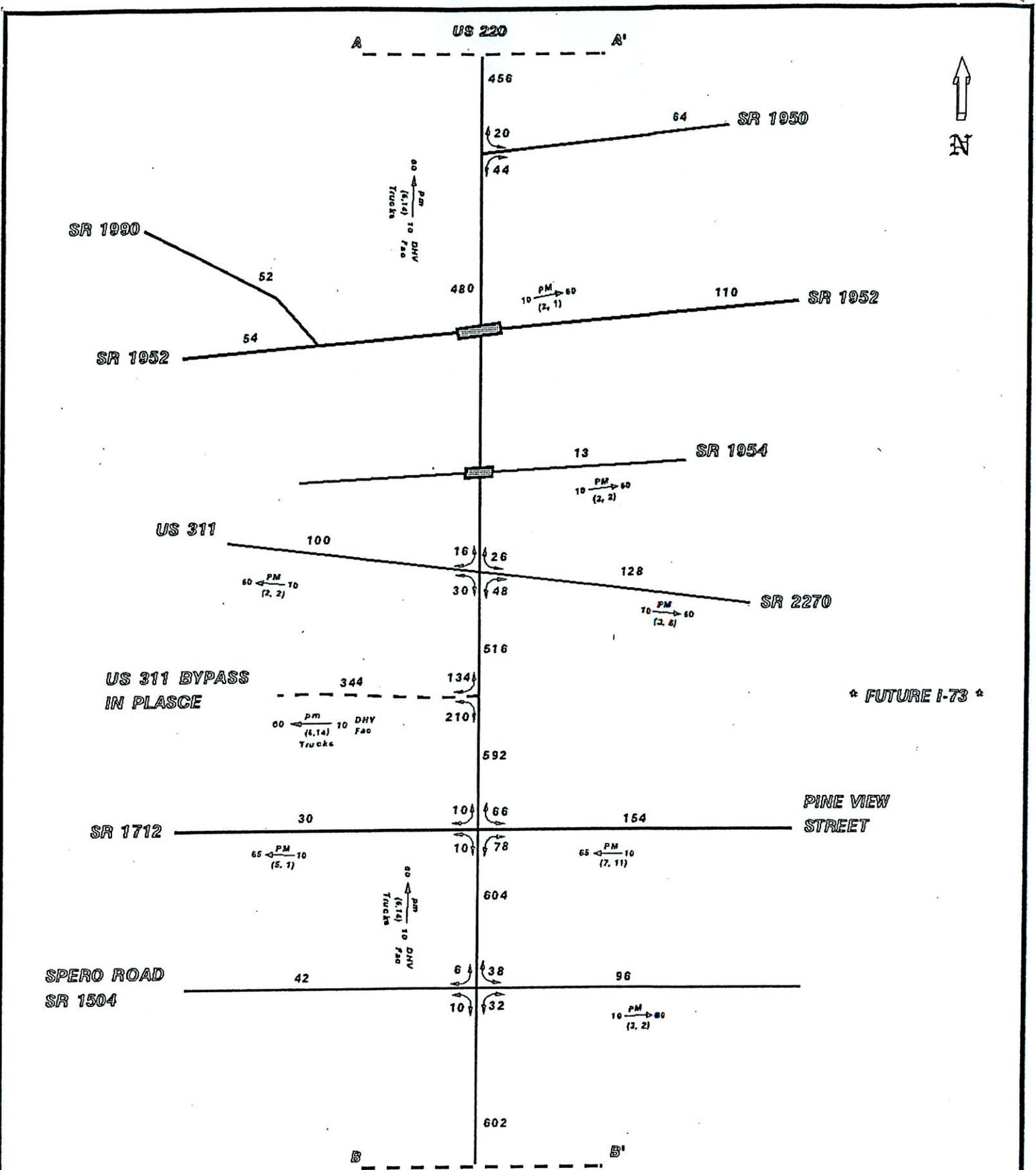
FS-0108A



US 220 (FUTURE I-73) FROM SR 1462 NORTH OF ASHBORO TO I-85  
 COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A June, 2001

Project # 8.1741101 **Figure 2d.**



**Legend**

XXX VPD Vehicles/Day  
 DHV Design Hourly Volume (%)  
 D Directional Flow (%)  
 PM PM Peak  
 (0,0) Duals, TTST (%)

Note: DHV → D  
 Indicates the direction D  
 Reverse flow direction for AM Peak

Drawing not to scale

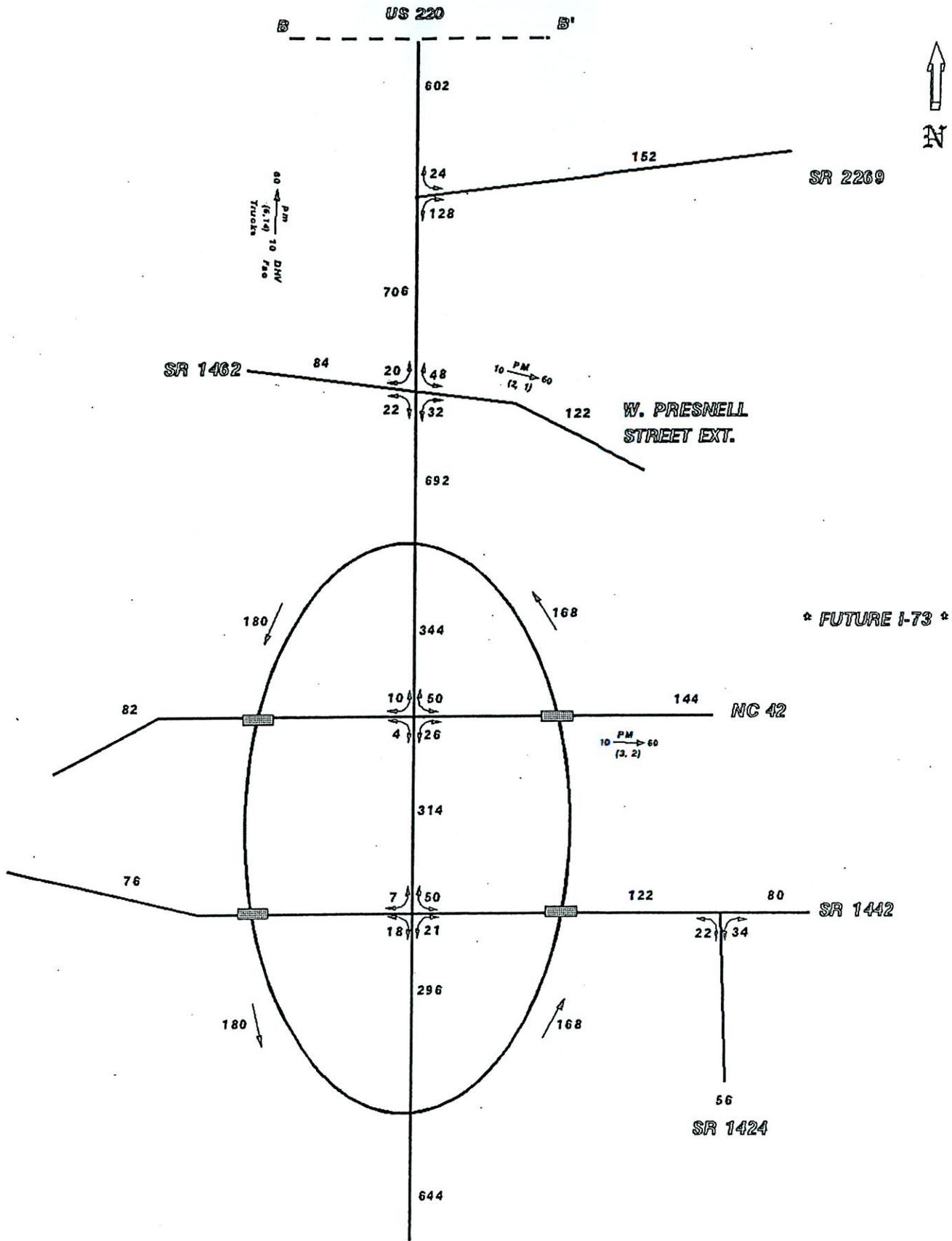
**FS-0108A**



US 220 (FUTURE I-73) FROM SR 1462 NORTH OF ASHBORO TO I-85  
 COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A June, 2001

Project # 8.1741101 **Figure 2e.**



**Legend**

XXX VPD Vehicle/Day  
 DHV Design Hourly Volume (%)  
 D Directional Flow (%)  
 PM PM Peak  
 (0,0) Duals, TTST (%)

Note: DHV → D  
 Indicates the direction D  
 Reverse flow direction for AM Peak

Drawing not to scale

# FS-0108A



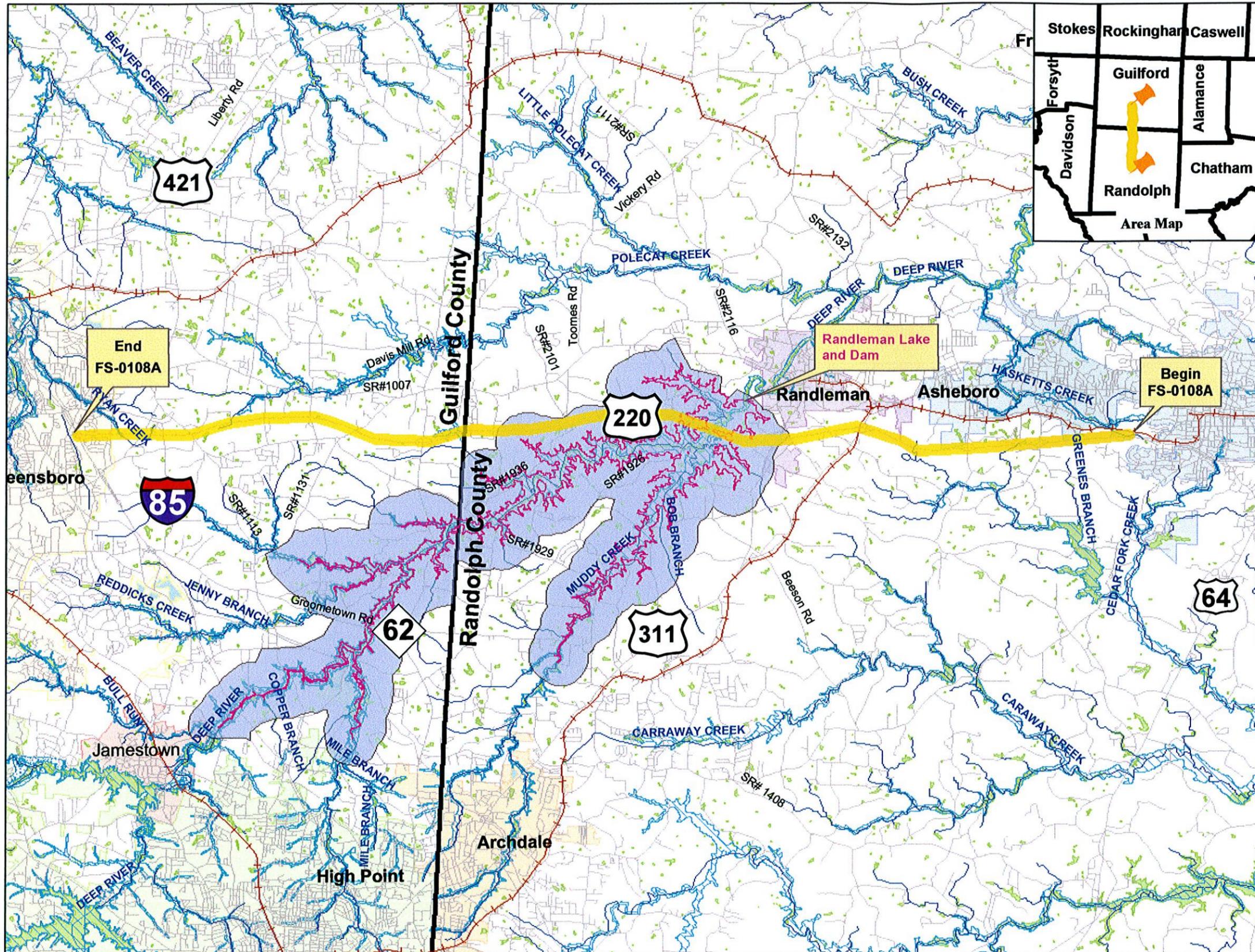
**Estimated 2025 ADT  
 Volumes in Hundreds**

US 220 (FUTURE I-73) FROM SR  
 1462 NORTH OF ASHBORO TO I-85  
 COUNTIES: GUILFORD & RANDOLPH

TIP # FS-01080A      June, 2001

Project # 8.1741101      **Figure 2f.**

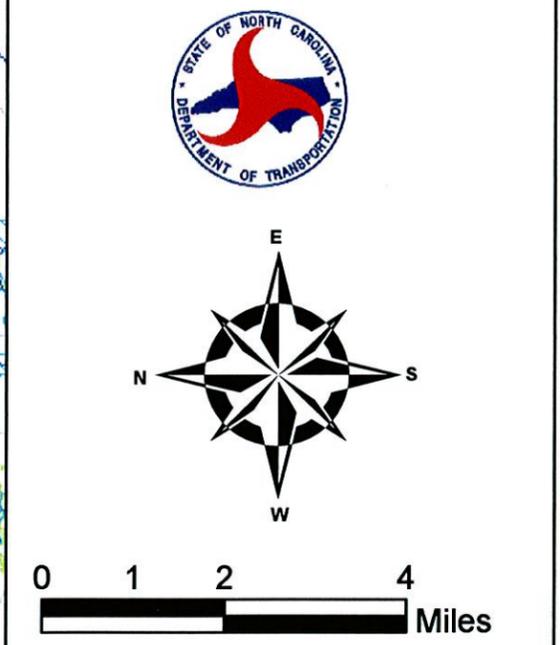


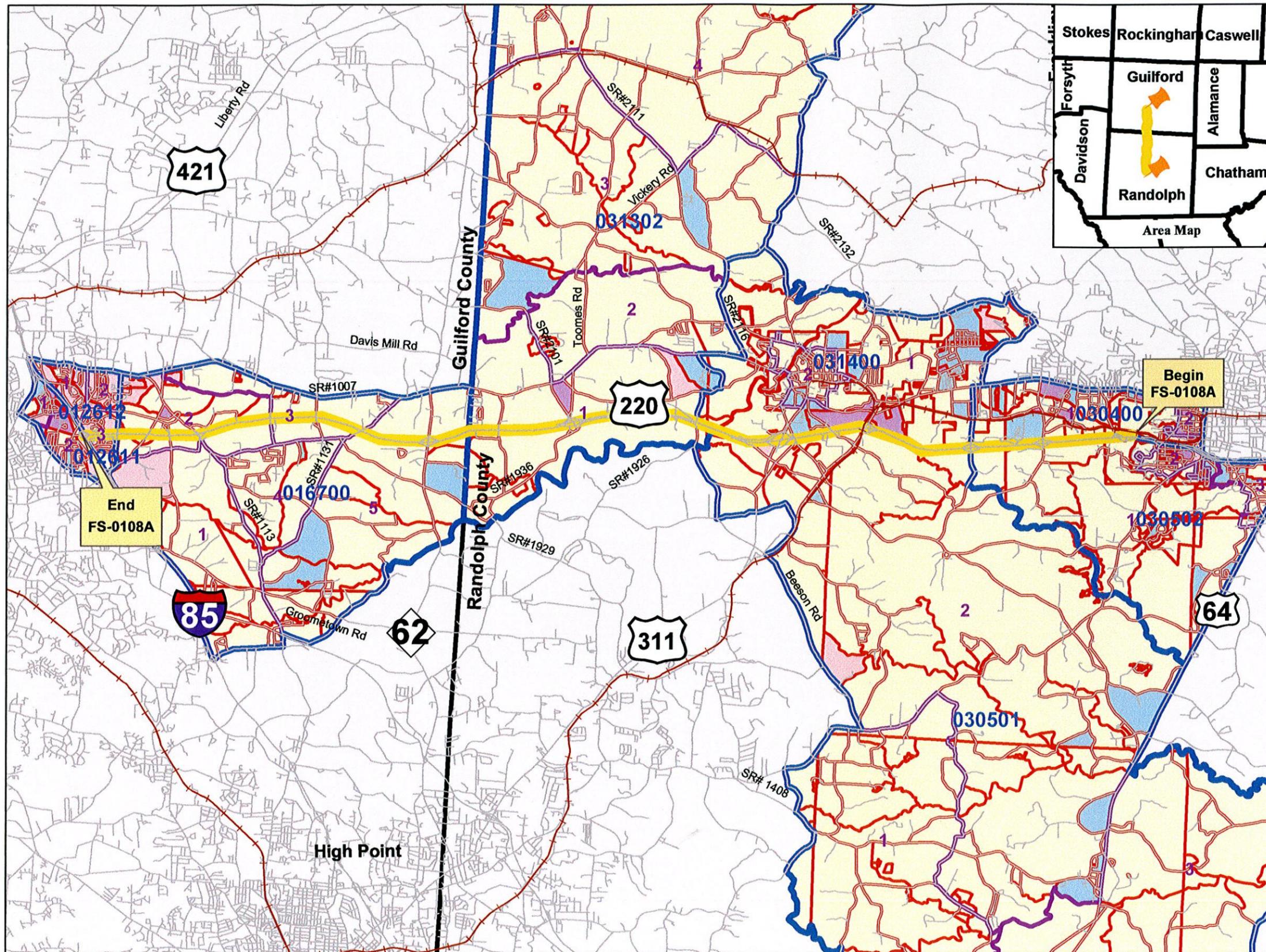


**Figure 3b.**  
**Environmental Screening Map**  
**Natural Environment**

US 220 (Future I-73) from  
 Asheboro to I-85  
 Randolph and Guilford Counties  
 State Project No. 6.401071, FS-0108A

- LEGEND**
- Streams
  - Railroads
  - Roads
  - Floodplains
  - Wetlands
  - Groundwater Discharge Sites
  - Randleman Lake (future)
  - Critical Water Supply Watershed





**Figure 3c.**  
**Environmental Screening Map**  
**Socioeconomic Environment**  
 US 220 (Future I-73) from  
 Asheboro to I-85  
 Randolph and Guilford Counties  
 State Project No. 6.401071, FS-0108A

- LEGEND**
- Railroads
  - Roads
  - Census 2000 Tracts
  - Census 2000 Block Groups
  - Census 2000 Blocks
  - Hispanic EJ Concerns
  - Minority EJ Concerns
  - Minority and Hispanic EJ Concerns

