



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

W. LYNDO TIPPETT  
SECRETARY

April 24, 2003

**MEMORANDUM TO:** Ms. Nancy W. Dunn, Member, Board of Transportation  
Mr. Pat Ivey, P.E. , Division Engineer, Division 9  
Mr. David King  
Mr. Calvin Leggett, P.E.  
Mr. Troy Peoples, P.E. (3) Attention: Jim Dunlop, P.E.  
Mr. John Williamson  
Mr. Gregory J. Thorpe, PhD (2)  
Ms. Deborah Barbour, P.E.  
Mr. Jay Bennett, P.E.  
Mr. Mike Bruff, P.E.  
Mr. A. L. Avant  
Mr. Van Argabright, P.E.  
Mr. Doug Lane  
Mr. Omar S. Sultan

**FROM:** Mr. Derrick W. Lewis, P.E.  
Feasibility Studies Unit

A handwritten signature in black ink that reads "Derrick W. Lewis".

**SUBJECT:** Feasibility Study FS-0109A; Widen NC 109 to Multi-lanes from NC 47 in Denton to I-85 in Thomasville, Davidson County.

Our staff has completed a feasibility study for the proposed project referenced above. This brief analysis suggests improvements that would be logical if the project were to be funded. A copy of our report is attached for your information.

DWL/dl

Attachment

cc: Mr. Len Sanderson, P.E.  
Mr. David L. Smith, P.E.

**Feasibility Study**

**Widen NC 109 to Multi-Lanes  
From NC 47 in Denton  
To I-85 in Thomasville**

**Davidson County**

**Division 9**

**FS-0109A**

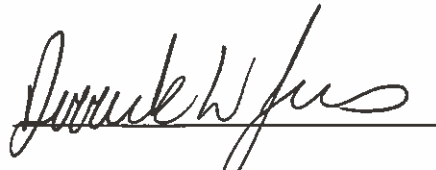


**Feasibility Studies Unit  
Program Development Branch  
N.C. Department of Transportation**

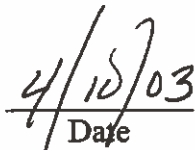
Documentation Prepared by Ko & Associates, P.C.



L. Jack Ward, P.E.  
Project Manager  
Ko & Associates, P.C.



Derrick W. Lewis, P.E.  
Feasibility Studies Unit Head  
Feasibility Studies Unit, NCDOT

  
Date

# **FS-0109A**

## **Widen NC 109 to Multi-Lanes From NC 47 in Denton To I-85 in Thomasville**

### **Davidson County**

#### **Division 9**

### **I. Introduction**

This feasibility study describes the preliminary studies relative to the proposed widening of NC 109 in Davidson County from NC 47 in Denton to I-85 in Thomasville. The project study area is shown in Figure 1.

### **II. Executive Summary**

NC 109 serves as a major thoroughfare in the High Point-Thomasville urbanized area and is classified as a minor arterial on the Statewide Functional Classification System. It is a strategic north-south corridor linking Asheboro, Albemarle, Denton and the rural areas of western Randolph, southeast Davidson, and Montgomery Counties to the employment centers in the High Point-Thomasville and Winston-Salem urbanized areas. NC 109 is a vital travel link for commerce between these urban areas and supports job opportunities for the rural communities served by NC 109 to the employment centers located in the Piedmont Triad (Greensboro, Winston-Salem - High Point - Thomasville) and Lexington areas.

The projected design year 2025 travel demand generally ranges from 21,500 vehicles per day (vpd) north of US 64 to a low of 16,000 vpd in Denton. As NC 109 approaches the employment centers south of Thomasville in the vicinity of I-85, the 2025 travel demand is expected to increase to 56,200 vpd south of I-85 and 60,100 vpd north of I-85. The increase in traffic on NC 109 near I-85, in part, is caused by travel between the interstate corridor and the employment centers served by NC 109 and by the residential areas (suburbs) of Thomasville. Unless alternate travel routes around the Thomasville downtown area are developed, traffic flow on NC 109 through the I-85 interchange area [Julian Avenue (SR 2185) to Liberty Drive (SR 2055)] will be problematic (see section "Interchange of I-85 with NC 109 in Thomasville", page 6).

This study investigates the feasibility of widening NC 109 to a four-lane divided highway from Denton to I-85, a distance of 16.9 miles. The studied cross section for the majority of the project is a four-lane highway with a 46-foot grass median. It is anticipated that there will be approximately 4 residents and 3 businesses relocated due to this project. Based on the preliminary cost estimate prepared by NCDOT, we estimate that this project will cost \$70,300,000 for construction and \$5,000,000 for

right-of-way, for a total cost of \$75,300,000. The project has been separated into three sections. The sections are shown on Figure 1A and are as follows:

**Section 1** is from NC 47 (SR 2511) intersection to just north of the shopping center entrance near the northern town limits of Denton, a distance of 0.64 miles. It is recommended that this section be widened to a four-lane divided curb and gutter section, 70 feet wide face to face of curbs with an 18-foot wide raised grass median. A transition to the four-lane divided roadway with a 46-foot median will occur at the northern end of this section. The recommended right of way width is mostly 100 feet wide, but transitions to approximately 325 feet at the northern end of Section 1.

**Section 2** begins at the entrance to the shopping center (0.3 mile north of SR 1001) and ends at Lambeth Road (SR 2067) in Thomasville, a distance of 1.5 miles. It is recommended that this section be widened to a four-lane divided roadway with a 46-foot grass median. It should be noted that two railroad grade separations are recommended for this section of NC 109. The existing right of way width on this section is approximately 325 feet. This right of way should be sufficient to contain most of recommended improvements, but some additional right of way will be required at the proposed railroad grade separations along this section. Improvements to the existing US 64 interchange are addressed in TIP project R-2220 and additional improvements to this interchange are not included in this feasibility study.

**Section 3** is from Lambeth Road (SR 2067) northward to Julian Avenue (SR 2185) a distance of 1.25 miles. It is recommended that this section be widened to a six-lane divided curb and gutter section from Lambeth Road to I-85.

A raised grass median is recommended from Lambeth Road (SR 2067) to the WB exit and on ramps for I-85. The median will control left turns to enhance safety and traffic operations through this section. Left turns will only be allowed at Lambeth Road (SR 2067), Liberty Drive (SR 2055), Cedar Lodge Road (SR 2184), and the I-85 EB and WB on ramps. The SB right-turn lane will start at the EB exit ramp and end at Lambeth Road (SR 2067) and the NB right-turn lane will start at Lambeth Road (SR 2067) and end at the EB on ramp. The section of NC 109 between the I-85 ramp terminals will be improved to contain NB and SB double left-turn lanes. The WB exit ramp for I-85 will be improved to include double left-turn and right-turn lanes and the EB exit ramp will be improved to include double left-turn lanes and a single "free" right-turn lane.

It would be difficult to detail further improvements to NC 109 from the WB exit and on ramps northward to Julian Avenue (SR 2185) without additional traffic data. Adding additional laneage on this section would be disruptive and may require a barrier median. A barrier median would adversely affect travel patterns to the commercial establishments along this section.

The estimated costs of the sections are as follows:

**Section 1:** Widening to a four-lane divided curb and gutter section, 70 feet wide face to face of curbs with an 18-foot wide raised grass median from NC 47 in Denton to just north of the shopping center entrance near the northern town limits of Denton.

Right of way.....	\$ 2,300,000
<u>Construction.....</u>	<u>\$ 2,000,000</u>
Total Cost.....	\$ 4,300,000

It is estimated that no residences and 3 businesses will be relocated.

**Section 2:** Widening to four-lanes with a 46-foot grass median from just north of Denton to Lambeth Road (SR 2067) in Thomasville.

Right of way.....	\$ 1,500,000
<u>Construction.....</u>	<u>\$ 63,600,000</u>
Total Cost.....	\$ 65,100,000

It is estimated that 4 residences and no businesses will be relocated.

**Section 3:** Adding travel lanes and turning lanes (including a raised median) from Lambeth Road (SR 2067) to the I-85 WB exit and on ramp in Thomasville.

Right of way.....	\$ 1,200,000
<u>Construction.....</u>	<u>\$ 4,700,000</u>
Total Cost.....	\$ 5,900,000

It is estimated that no residences and no businesses will be relocated.

This study is the initial step in the planning and design process for this project and is not to be considered the product of exhaustive environmental or design investigations. The purpose of the study is to describe the problem, recommend a feasible treatment including estimated costs, and identify potential problem areas that deserve consideration in the planning and design phases.

### **III. Purpose and Need for the Project**

The primary purpose of this project is to widen NC 109 to a basic four-lane divided roadway in order to improve the traffic operations and safety of this facility from Denton to Thomasville. The two-lane section of NC 109 between Denton and Thomasville currently provides a LOS D (2001 ADT) with an average operating speed for the peak hour of 46.3 mph. If not improved, the 2025 peak hour LOS will drop to LOS E with a 37.7 mph average speed. When NC 109 was relocated to its current location, right of way was purchased to contain a four-lane divided roadway.

Two TIP projects in the vicinity will complement this proposed project, they are: (1) TIP project R-2220, the improvement to US 64 from Asheboro to I-40 in Lexington

and (2) TIP project R-2568, the improvement to NC 109 from I-85 business in Thomasville to I-40 in Winston-Salem. Both of these TIP projects will assist and complement FS-0109A in improving commerce across North Carolina and improving access from rural areas to the employment centers. The City of Thomasville endorses this project.

#### **IV. Existing Conditions**

NC 109 in the project area is mainly a two-lane rural roadway. In Denton, NC 109 is a four-lane urban roadway from NC 47 (SR 2511) to the entrance to the shopping center at the north town limits where it transitions to the two-lane roadway. NC 109 remains a two-lane roadway until Lambeth Road (SR 2067) where it transitions into a five-lane urban roadway. From just south of the entrance to the shopping center in Denton northward to just south of SR-2055 in Thomasville, right of way already exists to contain a four-lane divided roadway.

#### **Capacity Considerations**

The HCS2000 Release 4.1, Synchro 5.0, and SimTraffic were used to analyze the traffic carrying ability for the proposed improvements of NC 109 from NC 47/SR 2511 in Denton to I-85 in Thomasville. The capacity analysis includes the following intersections with NC 109: (1) NC 47/SR 2511, (2) US 64 and (3) I-85 (See Figure 1A).

The projected 2025 Average Daily Traffic (ADT) volumes as shown in Figure 2 were provided by the Statewide Planning Branch (NCDOT). The mainline 2025 ADT for the proposed project range from a high of 60,100 vehicles per day (vpd) just north of I-85 in Thomasville to a low of 16,000 vpd in Denton; however, along the majority of the project between Denton and Thomasville the 2025 ADT is approximately 20,000 vpd.

#### **Mainline Capacity**

The existing NC 109 two-lane roadway from Denton to Thomasville (2001 ADT) functions at LOS D. If NC 109 is not improved by 2025, the peak hour LOS will drop to an E. As a four-lane divided roadway between Denton and Thomasville, NC 109 will function at a LOS B for the 2025 peak hour.

#### **Intersection of NC 47 /SR 2511 with NC 109 in Denton**

This existing signalized intersection for 2025 will function at a LOS C for the peak hour. NC 109 north of this intersection is a four-lane roadway and a three-lane roadway to the south. It would be difficult to improve traffic flow at this intersection without widening NC 109 south of this intersection.

### Interchange of US 64 with NC 109

NC 109 currently crosses US 64 with a “rural” diamond interchange (two-way ramps in all quadrants). This section of US 64 is to be improved by TIP project R-2220. [Current plans at NCDOT have this section of US 64 being upgraded to a four-lane divided roadway with an improved diamond interchange that favors the traffic flow onto US 64 (stop movements are on the ramp terminals with NC 109). In addition, SR 2099 is to be relocated to form a new intersection on NC 109 rather than intersect US 64 at its current location.] The “widened” NC 109 was analyzed with an improved diamond interchange as planned for R-2220 and with an improved diamond interchange that favors movement onto NC 109. LOS A is provided at the signalized ramp terminals for both scenarios. NC 109 has the larger through movement for 2025, 17,600 vpd on NC 109 versus 12,200 vpd for US 64. NC 109 already has the required right of way to contain the improved four-lane divided roadway. Providing the extra right of way on US 64 for an improved diamond that favors the traffic flow onto US 64 will be disruptive to existing development located on US 64 near the existing interchange. Using the average delay per vehicle for the 2025 PM peak hour, constructing the diamond interchange to favor movement onto US 64 will create 43 percent more delay than constructing the interchange to favor NC 109.

### Interchange of I-85 with NC 109 in Thomasville

Traffic was provided only for the ramp terminals on NC 109 for the I-85 interchange (See Figure 2 for the 2025 ADT). As NC 109 approaches the employment centers south of Thomasville in the vicinity of I-85, the 2025 travel demand is expected to increase to 56,200 vpd south of I-85 and 60,100 vpd north of I-85. This increase in traffic on NC 109 near I-85, in part, is caused by travel between the interstate corridor and the employment centers served by NC 109 and by the residential areas (suburbs) of Thomasville. From Liberty Drive (SR 2055) northward into Thomasville, NC 109 is basically a five-lane urban roadway with considerable commercial development, driveways and intersections. No traffic was provided for the entrances to the shopping centers or intersecting roadways. A 2025 PM peak hour capacity analysis was performed for NC 109 (existing five-lane roadway) with a diamond interchange at I-85. The ramp terminals will function at a LOS F. The interchange area was analyzed with a single point urban interchange (SPUI) with NC 109 roadway basically a five-lane roadway but with double left-turn lanes at the ramp signal. The SPUI would also provide a LOS F but total delay for the 2025 PM peak hour of travel would be reduced 65 percent. Upgrading NC 109 to include three through lanes in each direction, the LOS for the SPUI improved to LOS E. [Constructing a SPUI would require a complete rebuild of the interchange.]

The abutments for the I-85 bridge over NC 109 are 92 feet apart. By providing double-left turn lanes for the EB and WB exit ramps, double right-turn lanes for the WB exit ramp, and a single “free” right-turn lane for the EB exit ramp and NB and SB double left-turn lanes on NC 109 for the EB and WB on ramps, the LOS for the 2025 PM peak traffic would be LOS E for the northern ramp terminals and LOS F for the southern ramp terminals. This improvement would only require that basically one lane be added on NC 109 under the I-85 bridge and will provide a LOS D for the

ramp terminal intersections with I-85 through 2015 but will probably fail between 2015 and 2020.

Additional Improvements to NC 109 through the I-85 interchange area cannot be accomplished without a re-construction of the entire I-85 interchange. Improvement to NC 109 north of the I-85 interchange to Julian Avenue (SR 2185) would be disruptive with substantial right of way damage. NC 109 north of Thomasville (I-85 Business to I-40 in Winston-Salem) is programmed to be upgraded to a multilane facility (TIP R-2568). Unless an alternate route is developed to attract NC 109 through traffic away from the I-85 interchange area, traffic flow through this area and northward into Thomasville will be problematic.

### V. Recommendation

Based on our analysis, we recommend that NC 109 be widened to a four-lane divided curb and gutter section with an 18-foot wide raised grass median from NC 47 to the northern town limits of Denton, a four-lane divided roadway with the 46-foot grassed median from Denton to Lambeth Road in Thomasville, and a six-lane divided curb and gutter section from Lambeth Road to I-85, a total distance of approximately 16.9 miles.

The estimated cost of constructing the recommended improvements to NC 109 from Denton to Thomasville is as follows:

Right of way.....	\$ 5,000,000
Construction.....	\$ 70,300,000
Total Cost.....	\$ 75,300,000

This project is estimated to have approximately 4 residential and 3 business relocations.

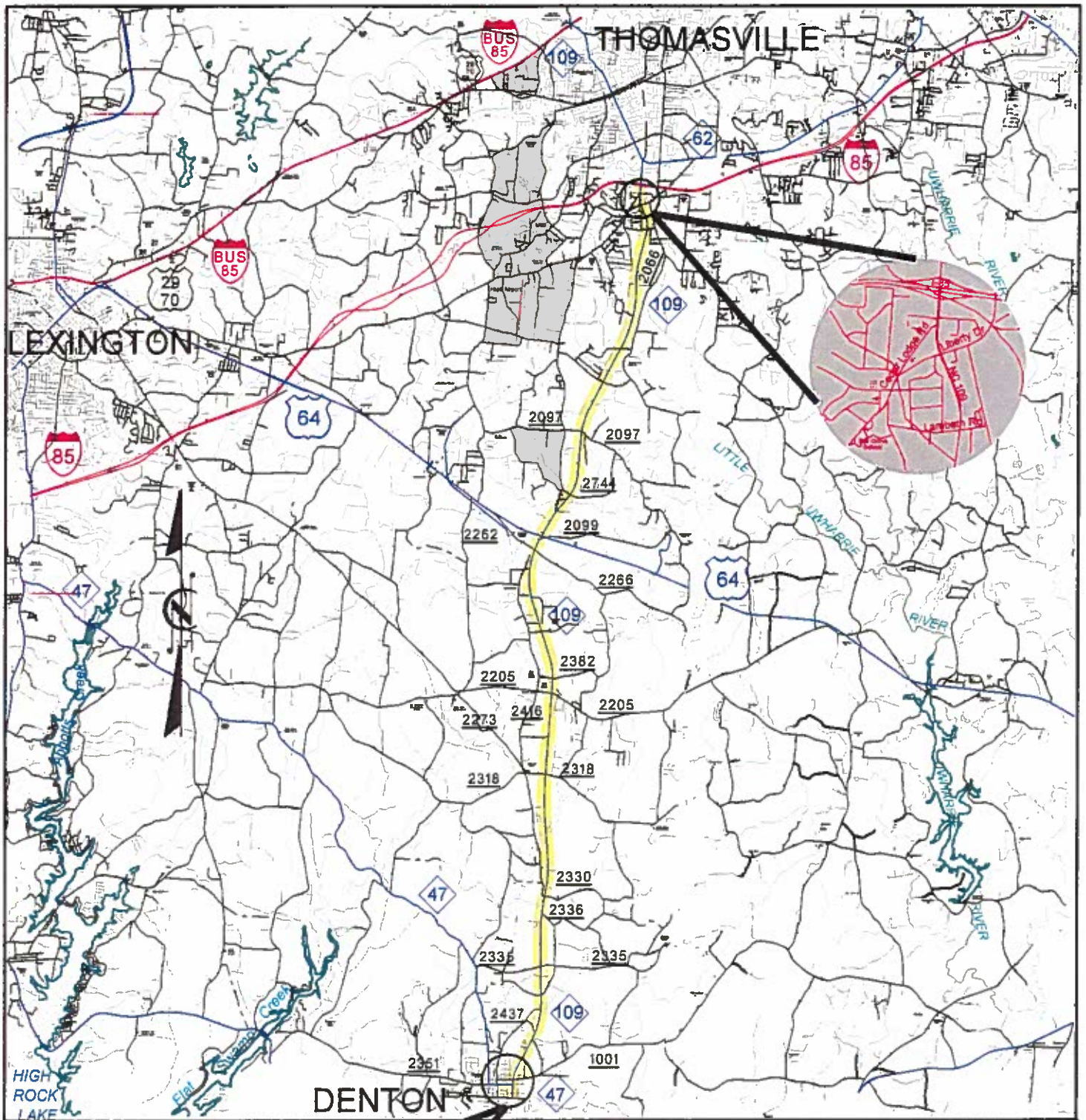
### VI. Other Comments

NC 109 (Section 2) crosses the Thomasville-Denton railroad in two locations. Flashing lights and gates controls the existing crossings. This railroad currently serves two trains per day. The cost for providing these grade separations is included in the cost above.

An environmental screening by a certified environmentalist was not conducted for this study. However, environmental impacts are expected to be minimal since most of the construction will be within the existing right of way.

In addition, no historic properties are known to exist in the study corridor. No stream re-alignments are anticipated.





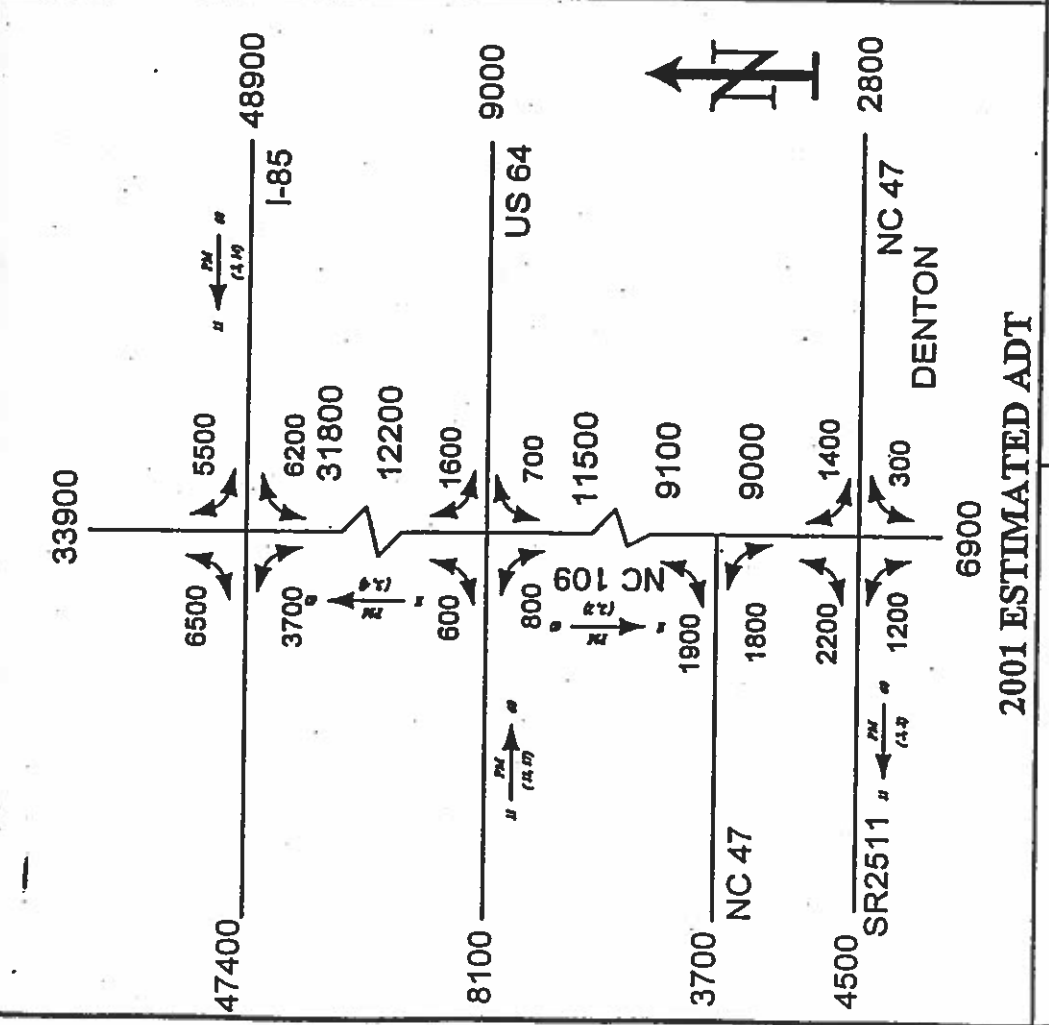
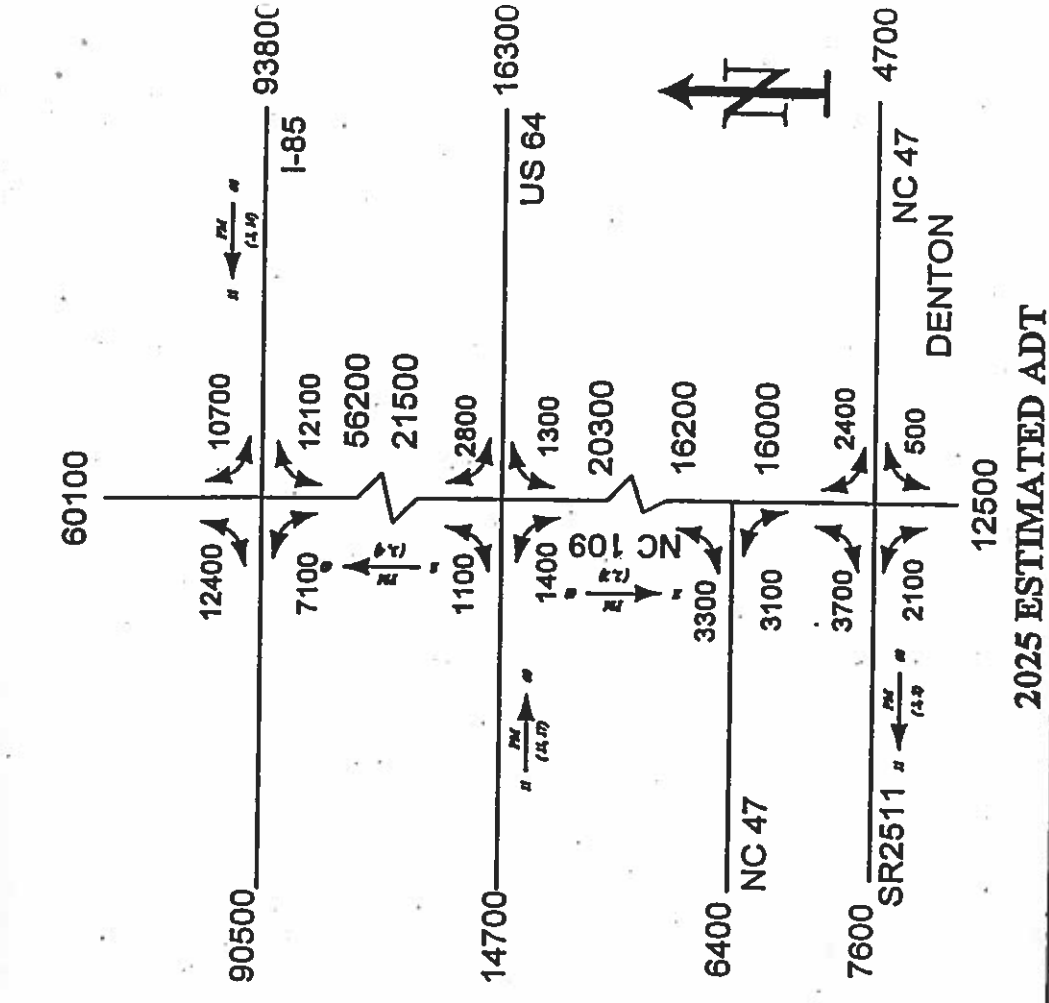
PROPOSED AREA FOR IMPROVEMENT



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**PROGRAM DEVELOPMENT BRANCH**

**FS-0109A**  
**IMPROVEMENTS TO NC 109**  
**FROM NC 47 IN DENTON TO US I-85 IN THOMASVILLE**  
**DAVIDSON COUNTY**

**FIGURE 1**



**LOCATION:**  
 NC 109 from I-85 Business in  
 Thomasville to NC 47 in Denton

**PROJECT:**  
 Widen to multilanes

**COUNTY:** DAVIDSON

**DIV. 9 DATE:** January 2002

**TIP # FS-0109A FIGURE 2**

**LEGEND**

### VPD—# OF VEHICLES PER DAY  
 ###- MUCH LESS THAN ### VPD  
 X MOVEMENT PROHIBITED  
 DBV PM (d, y) D  
 DHV DESIGN HOURLY VOLUME (% = K30)  
 K30 = 30<sup>TH</sup> HIGHEST HOURLY VOLUME  
 D DIRECTIONAL SPLIT (%)  
 PM PM PEAK PERIOD  
 (d, y) DUALS, TT-ST'S (%)  
 NOTE: DHV → D  
 INDIC 'S THE DIRECTION D.  
 REV7 .FLOW FOR AM PEAK



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
PROGRAM DEVELOPMENT BRANCH**

FS-0109A  
IMPROVEMENTS TO NC 109  
FROM NC 47 IN DENTON TO US I-85 IN THOMASVILLE  
DAVIDSON COUNTY

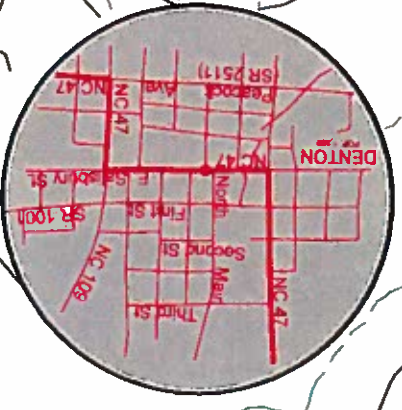
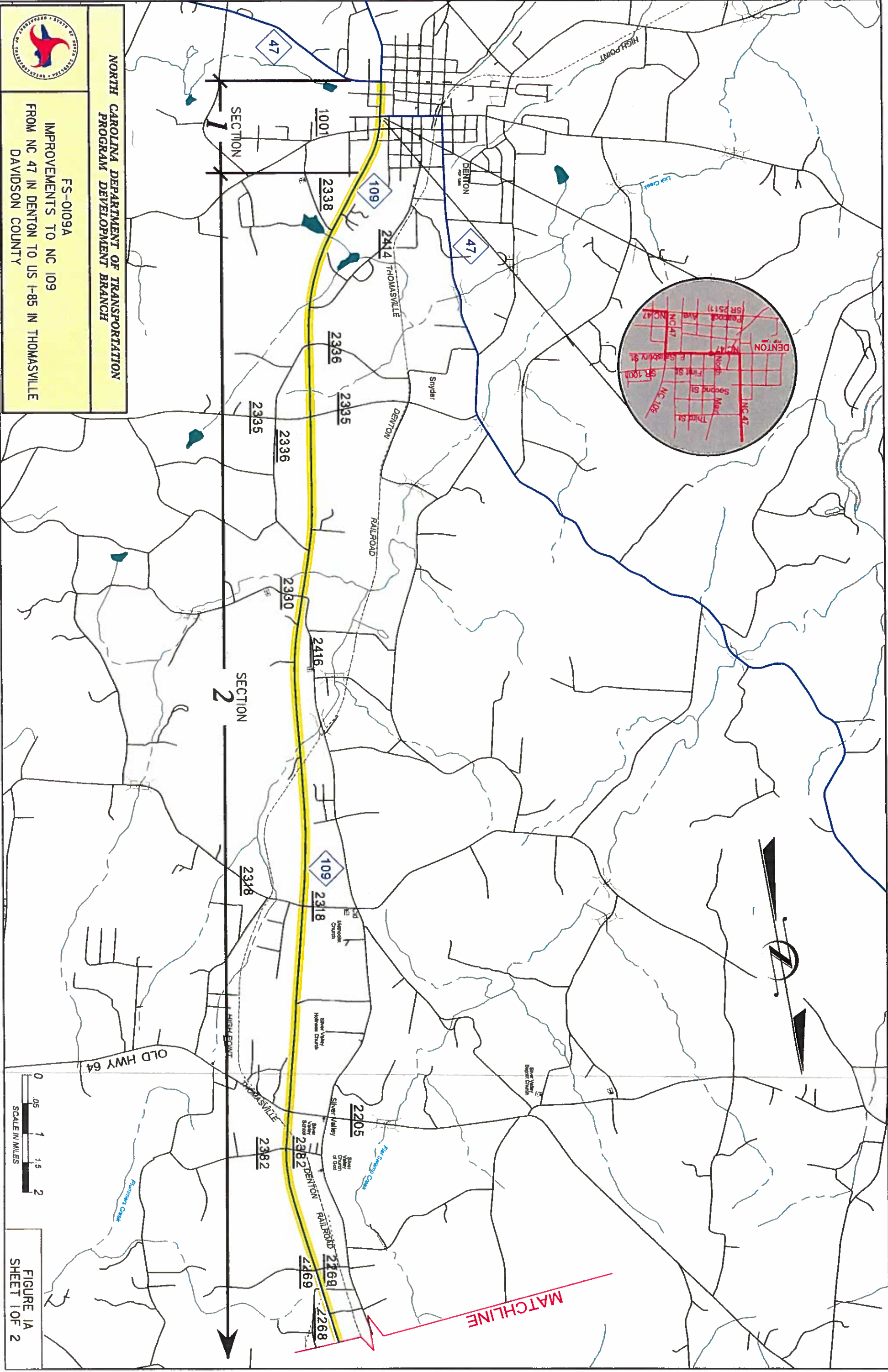


FIGURE 1A  
SHEET 1 OF 2

MATCHLINE

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**PROGRAM DEVELOPMENT BRANCH**

FS-0109A  
 IMPROVEMENTS TO NC 109  
 FROM NC 47 IN DENTON TO US I-85 IN THOMASVILLE  
 DAVIDSON COUNTY

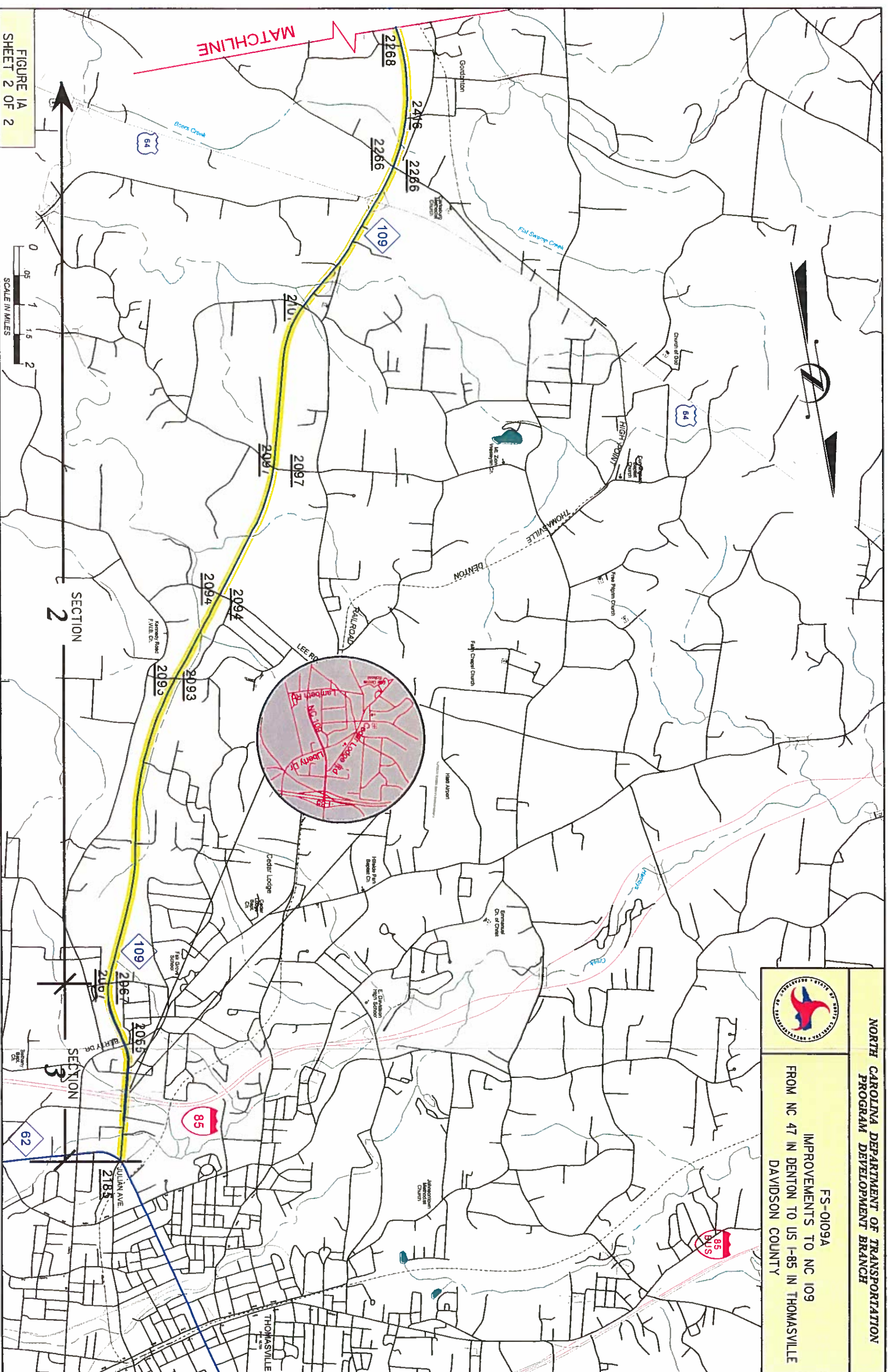


FIGURE 1A  
 SHEET 2 OF 2