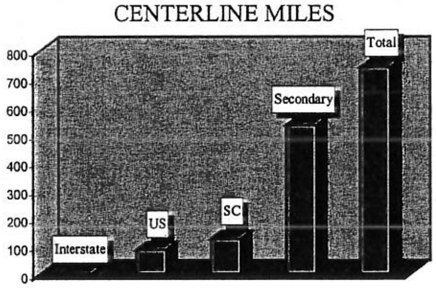
Road Inventory: Greenwood County is served by a system of roads ranging from US routes that have linkages throughout the country to the local secondary system. The facilities designated as "US" or "SC" are generally regionally significant and traverse more than one county. The secondary system was originally referred to as "farm to market" roads. These roads primarily serve local travel needs. Approximately 72% of the roads on the state system in Greenwood County are classified as secondary routes.

Figure 3.1 shows the breakdown of roads on the state system in Greenwood County. Of the total 738-centerline miles, 83 miles are US Highways, 123 miles are SC Highways, and 531 miles are on the secondary system.

Figure 3.1
CENTERLINE MILES



Source: SCDOT

Transportation facilities are classified by the relative importance of the movement and access functions assigned to them. In the hierarchy of highway facilities, freeways, expressways, and arterials constitute the major highway system, while collector and local streets comprise the local street system. In Greenwood County there are 120 centerline miles of arterials, 85 centerline miles of collectors, and 358 centerline miles of local roads.

Traffic Signal Inventory: There are 102 traffic signals in Greenwood County (SCDOT – Traffic). Of that total, 15 are linked to closed loop networks. In a closed loop system, all signals are connected and controlled by phone at a remote location. Closed loop systems in Greenwood County are predominantly located in the urbanized area. One example of a closed loop network in this area is on US 25/178 Business.

Bridge Inventory: There are 136 bridges in Greenwood County. Of those, 84% are in satisfactory condition. Bridges are evaluated by the SCDOT under the Bridge Management System. An unsatisfactory bridge would fall into two categories: *Structurally Deficient* or *Functionally Obsolete.* A bridge is classified as structurally deficient when certain bridge condition codes concerning the structural and/or waterway adequacy fall below a prescribed Federal Highway Administration level. This does not necessarily imply that the bridge has to be load restricted or closed.

Table 3.1 shows the bridges in Greenwood County that have been identified as having structural deficiencies.

Table 3.1

Structurally Deficient		
Road	Location	Feature
US25	6.0 mi SE of Greenwood	SouthernRailroad
US221	7.4 mi SW of Greenwood	Hard Labor Creek
SC 72	City of Greenwood	CSX Railroad
S-27	2.5 mi SE of Ninety Six	Ninety Six Creek
S41**	3.4 mi SE of Ninety Six	Ninety Six Creek
S-60	8.8 mi SE of Ninety Six	Halfway Swamp
S-62	20 mi SE of Callison	Cuffeytown Cr
S-98***	1.0 mi NE Coronaca	CSX Railroad
S-228	1.2 mi NW Ninety Six	Big Rock Creek
S-268	2.6 mi N of Greenwood	Rocky Creek
S-84	5.2 mi NW of Greenwood	John's Creek
S-85	3.2 mi NE of Greenwood	Rocky Creek
S-82	6.3 mi SE of Callison	Little Mtn Creek

Source: SCDOT
** Scheduled to be let in August 2000
*** Scheduled to be let in July 2001

A functionally obsolete classification occurs when certain bridge condition codes, such as the geometric, structural, and/or waterway adequacy fall below a prescribed FHWA level. As shown in Table 3.2, there are currently eight bridges in Greenwood County in this category.

Table 3.2

Functionally Obsolete		
Road	Location	Feature
US 25 Byp	2.7 mi SE Greenwood	SC34 / RR /Co Rd
SC 34	11.9 mi SW Greenwood	Hard Labor Creek
SC 246	6.5 mi NE Greenwood	CSX Railroad
S-38	Town of Ware Shoals	Ninety Six Creek
S-71	1.9 mi SE Callison	Ninety Six Creek
S-271	1.5 mi SW Coronaca	Halfway Creek
S-361	City of Greenwood	Cuffeytown Creek
S-424 *	4.1 mi NE Greenwood	CSX Railroad

Source: SCDOT
** Scheduled to be let in 2003

Pavement Conditions: Pavement evaluation is conducted by the SCDOT Pavement Management Section. The Pavement Management Program rates pavement using a value of 2.5 or lower to determine if a roadway should be considered for rehabilitation. This program evaluates the pavement on the primary system in each county on a three-year basis. Table 3.2 lists the roads in Greenwood County that fell below the value of 2.5 in 1997.

Table 3.3

Facilities with Substandard Pavement	
SC 34	Harvey St to Phoenix St
SC 72 Bus.	Andrews St to US 25/178
SC 225	Florida Ave to Alexander St
SC 254	SC 72 Bus to Sproles St
SC 254	Sproles St to Grace St
SC 420	US 178 to US 25 Bus
US 25	SC 185 to SC 254
US 25	SC 254 to Riley Rd

Source: SCDOT

A pavement evaluation program for the state secondary system is under development.

Recent Improvements: From July 1988 to June 1998, total investment in Greenwood County for projects completed, under construction, or proposed was $77,679,146. This includes new construction/widenings, bridge replacements, C-fund projects, resurfacings, safety/signs/signals, and railroad crossings (See Table 4, Appendix C or specific project information).

The Statewide Transportation Improvement Program (STIP) is a five-year program that includes all projects scheduled for improvement over the next five years for both urban and rural programs. The STIP is updated every two years.

In the FY 1999-2003 STIP for Greenwood County, the Western Bypass (SC 225), from North of SC 10 to West of US 25/178 is scheduled for improvement. This project is approximately 3.31 miles long and will widen the existing facility from 2 to 5 lanes.

Also, SC 34 is scheduled to be realigned and intersect with US 25 Business near Orange Street. This project should reduce through traffic on SC 34 and improve safety on adjoining parallel facilities.

Travel Patterns: Journey-to-work data from the 1990 Census provides information on employment trip characteristics. The travel data suggests that Greenwood is an employment destination for the Upper Savannah Region. As shown in Table 3.4, nearly one-fourth of the workforce in Greenwood County commutes from neighboring counties.

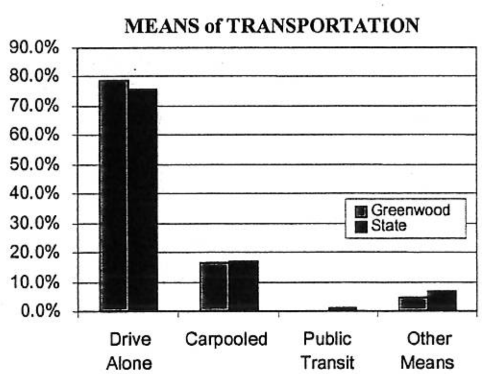
Table 3.4

County	*Employees*	*Percent*
Greenwood	24,368	81.8%
Abbeville	1,598	5.4%
Edgefield	225	0.8%
Laurens	1,595	5.4%
McCormick	472	1.6%
Newberry	117	0.4%
Saluda	508	1.7%
All Others	912	3.1%
Total	29,795	100%

Source: US Census

The journey-to-work data also includes information on employment trips by mode choice. Single-occupant auto trips were the predominate choice of travel. As with most communities in South Carolina, this statistic is not uncommon. The chart below illustrates the comparison of mode choice for Greenwood and South Carolina.

Figure 3.2



The low transit usage is a function of available service. There are two private taxi services that are licensed by the city of Greenwood and a Dial-a-Ride Program.

For work trips, approximately 80 percent of commute times fall between 5 and 20 minutes. The state average for work trips is 20.5 minutes.

Vehicle Miles of Travel: Another measure of demand on the road system is Vehicle Miles of Travel (VMT). VMT is calculated by multiplying Average Annual Daily Traffic (AADT) by the centerline road miles for an area. From 1990 to 1997, VMT increased 21.5% in Greenwood County. The growth in VMT for Greenwood is consistent with the overall growth in traffic for the state during the same time period.

An interesting comparison can be made between population growth and changes in VMT. The Table 3.5 illustrates the comparison for Greenwood County.

Table 3.5

Year	*Population*	*VMT*
1990	59,567	466,098,758
1997	65,201	566,537,670
%Growth	9.5%	21.5%

Source: SCDOT

VMT has increased more than twice the rate of population during the same time period. As in most communities, the increase in VMT is a major contributor to congestion.

Growth Corridors: Based on historic traffic count data from 1990 to 1997, there are two notable corridors that have had the most growth in traffic:

- SC 72, from the Abbeville County line to US 25; and
- 72 Business, from the bypass to US 25.

The traffic volumes on SC 72 and SC 72 Business have been impacted by regional commuting patterns between

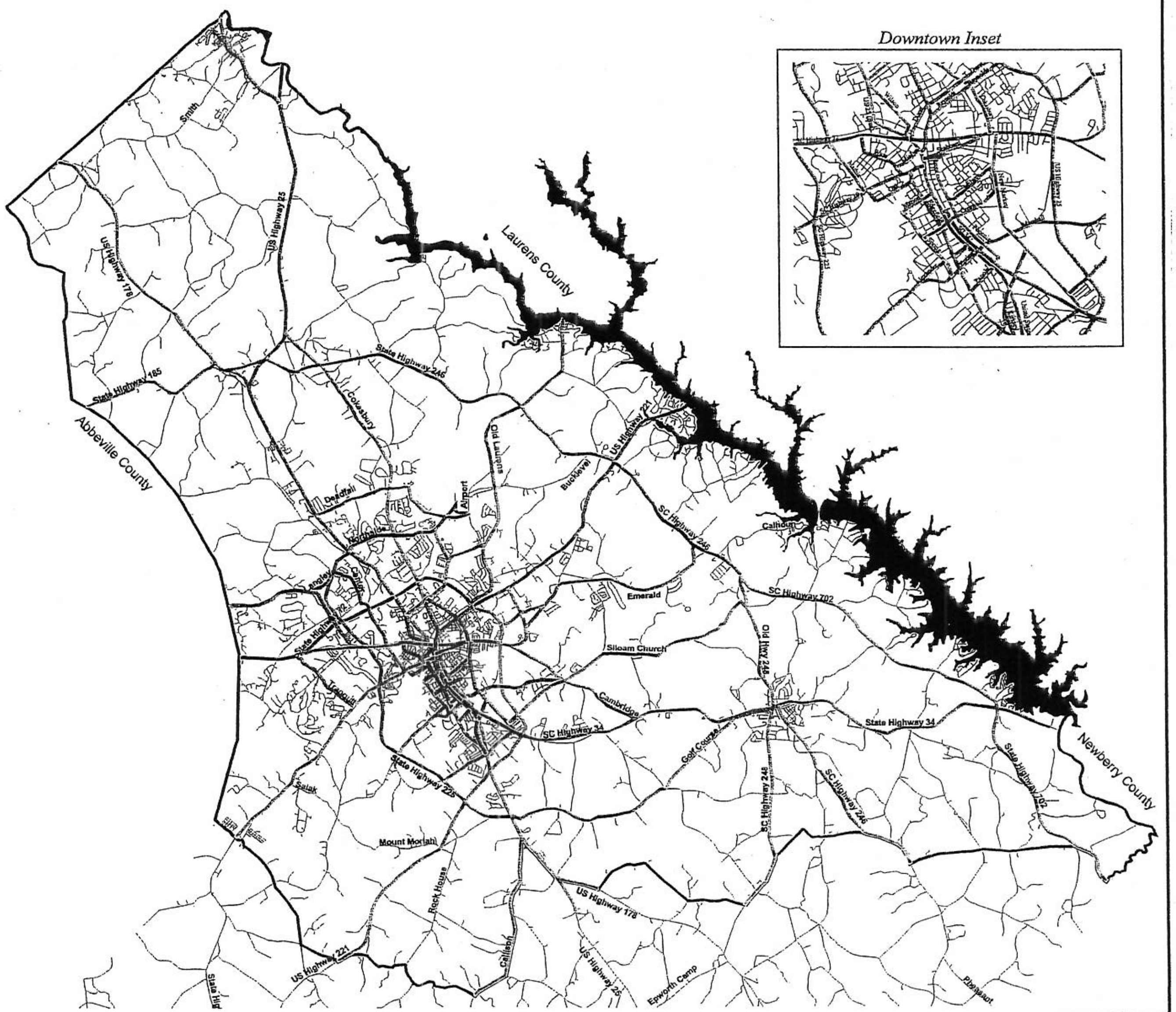


Figure 3.3

Traffic Growth Trends 1990-1997

Greenwood Study Area

Data Source: Census Tiger Data
Produced by SCDOT Planning April 2000

Greenwood and Abbeville County. SC 72 Bypass has also seen a significant amount of commercial development and has become a destination for shopping activity in the region. Figure 3.3 illustrates traffic growth trends from 1990 to 1997.

Roads with the highest overall traffic volumes in Greenwood are facilities that support regional travel and provide access to developed commercial corridors. Table 3.6 illustrates the location of the highest 1997 traffic volumes.

Table 3.6

10 Highest AADTs in Greenwood		
Road	Location	AADT
US 25 Bus	S-249 to SC 72 Bus	23,700
US 25	US 221 / SC 72 Bus to US 25/178	23,600
US 25	S-236 to US 221/SC 72/SC72 Bus	22,400
US 25 Bus	SC 72 Bus to US 25/178 / SC 72	19,600
US 25	S-29 to S-236	18,400
SC 72	S-754 to US 25/178/25	15,000
US 25	SC 72 /US 25/178 to S-58	14,900
US 221	US 25/178 / SC 72 to S-157	14,500
US 25	S-58 to SC 246	12,600
S-29	US 221 to US 25 Byp	12,500

Source: SCDOT

Traffic Accidents: Two categories of accident data were analyzed for roads included on the Greenwood network: accident rates and total number of accidents. Typically, the accident rate is the most common measure used when evaluating accident data for a particular location. The following equation is used to determine an accident rate for a road segment:

$$\text{Accident Rate} = \frac{\text{Accidents} * 1{,}000{,}000}{365 * \text{AADT} * \text{Length} * \text{No. of yrs.}}$$

This equation illustrates the influence that traffic volume and segment length can have on accident rates. Smaller segment lengths and lower volumes can increase accident rates, while longer segments and higher traffic volumes can decrease them. As a general rule, accident rates above 20.0 are considered higher than normal. Figure 3.4 illustrates accident rates by road segment. Based on an accident rate threshold of 20.0, SC 34 from Epting Street to Creswell Street has the highest propensity for accidents in Greenwood County.

In addition to accident rates, the total number of accidents by road segment was considered. Generally, the facilities with the most traffic tend to have the most accidents. In Greenwood, US 25, US 25 Bypass, SC 72, and US 221 have segments with the highest number of accidents. In addition, intersections with the most accidents were identified. Again, using total accidents, the intersection locations correspond with high volume road segments.

Accident rates were not calculated by intersection. Figure 3.5 illustrates total accidents by road segment and intersection.

ACCIDENT DATA SUMMARY

Table 3.7

10 Highest Accident Segments		No. of Accidents
Road	Location	
US 25	SC 72 Bus / US 221 to US 25/178	94
SC 72	SC 72 to S-29	94
US 25	SC 72 Bus / US 221 to US 25/178	86
US 25	S-249 to US 25/178/221	70
US 221	US 25/178 / SC 72 to S-157	52
US 25	SC 72 Bus to S-249	48
US 25	S-58 to SC 72 / US 25178 Bus	38
US 25	S-58 to SC 246	37
SC 34	US 25 BP to SC 246/248	29
S-29	US 221 US 25 BP	27

Table 3.8

10 Highest Accident Intersections		No. of Accidents
Road	Crossing Route	
US 25	S-73 (Laurel)	38
US 25	US 25 Bus	29
US 25	S-236 (N Emerald)	23
US 25	S-58 (Calhoun)	22
US 25	SC 254	19
US 221	US 25 Bus	15
US 25	S-640 (Cobb)	15
US 221	S-51 (Milford Springs)	14
US 25	S-39 (Old Laurens)	14
US 25	S-281	14

Source: Department of Public Safety

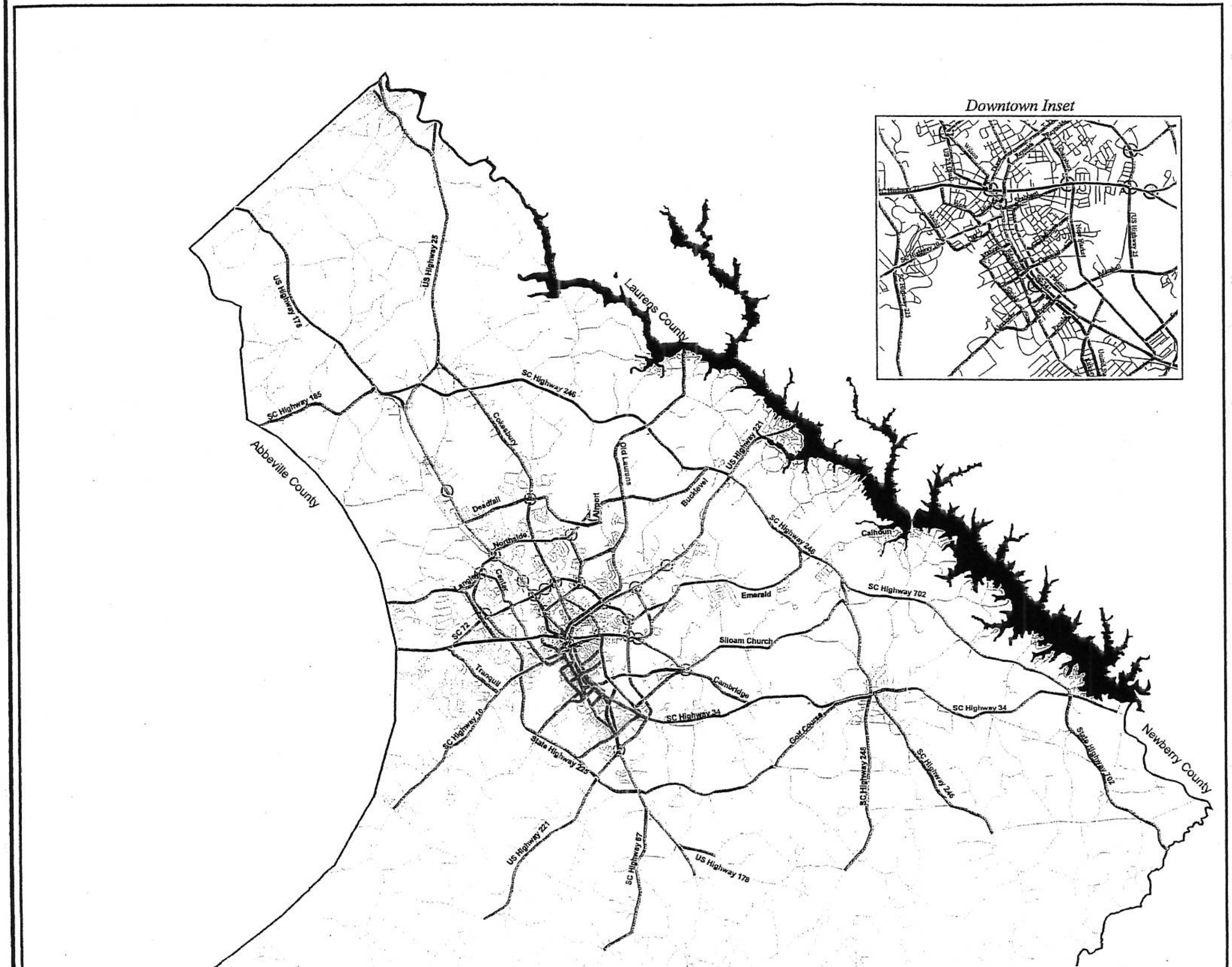


Figure 3.4

1998 Accident Data

Total Accidents

Greenwood Study Area

N
W E
S

Number of Accidents

- 0 - 7
- 8 - 17
- 18 - 29
- 30 - 52
- 53 - 94
- Highest Accident Intersections

Note : Highlighted intersections had 8 or more accidents

SCDOT
South Carolina Department of Transportation

Data Source: Census Tiger Data
Produced by SCDOT Planning March 2000

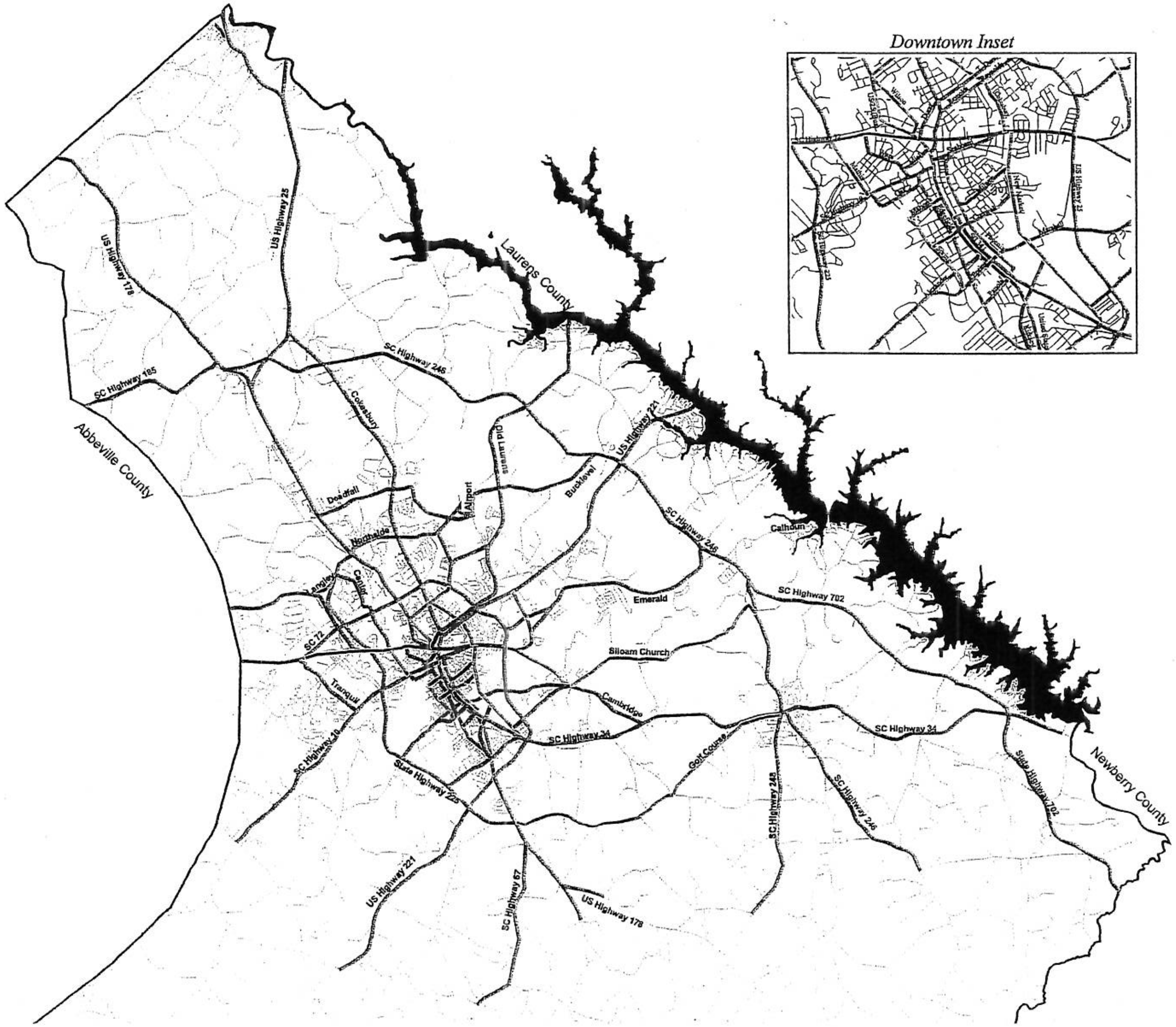


Figure 3.5

1998 Accident Data
Accident Rate
(Accidents per Million Miles of Travel)

Greenwood Study Area

N W E S

1 0 1 2 Miles

Accident Rates

- 0 - 5
- 5 - 9.99
- 10 - 14.99
- 15 - 19.99
- 20 - 28.74

SCDOT
South Carolina Department of Transportation

Data Source: Census Tiger Data
Produced by SCDOT Planning June 2000

Modeling Process: Travel forecasting models consist of a set of mathematical models that are used to determine existing traffic patterns and to predict future traffic patterns and demands. The social and economic characteristics of a region, as well as the highway network, are important elements used in simulating travel patterns. In order to predict future travel demands, a set of models are calibrated to replicate current traffic conditions.

At the most basic level, a transportation model is structured around the following four-step process:

TRIP GENERATION - Estimation of the number of trips produced by and attracted in each traffic analysis zone in the study area, based upon the socioeconomic characteristics of each zone.

TRIP DISTRIBUTION - Determination of the origin zone and the destination zone for each trip, based on the types of trips produced by and attracted to each zone, and also based on travel times.

MODAL CHOICE - Calculation of which trips will use the highway network and which will use the transit network. The Greenwood Model, however, does not include transit trips.

TRAFFIC ASSIGNMENT - Loading of trips onto a highway network, and identifying which routes would be taken from origin (traffic analysis zone) to destination (traffic analysis zone).

Basic Data Inputs: The transportation model requires basic types of input data, such as the highway network, friction factors, socioeconomic information and regression equations.

The highway network describes the road system in a computerized format. Nodes represent intersections and links define a section of roadway between two nodes. Attributes, such as speed, capacity and functional classification are assigned to each link.

The Greenwood Study Area has 142 internal traffic analysis zones, represented by centroids in the highway network, plus 18 external stations (locations where traffic enters and exits the study area). A centroid is an assumed point in a traffic analysis zone that represents the origin or destination of all trips to or from a zone. Base year (1997) traffic counts are input data into the highway network for use during calibration.

Friction factors are numeric values, which describe the relative change in the attractiveness of making a particular type of trip, (e.g., from home to work, from home to a destination other than work, etc.), given incremental changes in the travel time, associated with making the trip. These factors are measures of the impedance to interzonal travel due to the separation between zones. Like trip generation rates, friction factors are also influenced by the socioeconomic characteristics of the area.

Friction factors were taken from the 1974 Greenwood Study. For the 1997 update, the only modification to the original friction factors was the exclusion of truck-taxi rates. Table 1 in Appendix D shows the Final Distribution Rate Table used for the 1997 Greenwood study.

The socioeconomic data is provided by traffic analysis zone and include the following variables: population, dwelling units, employment, auto registrations, school enrollment and retail square footage. The base year 1997 land use data is needed for calibration in order to simulate existing traffic conditions. Once calibration is achieved, the projected land use data for the year 2020 is used to predict future traffic conditions and volumes.

Regression equations are used to relate known and projected socioeconomic data to trip making by calculating productions and attractions in each traffic analysis zone. They are influenced by the current socioeconomic characteristics of the urban area.

Calibration and Validation: The following is a description of the calibration process used for the Greenwood Transportation Model.

1. Build Highway Network.
2. Establish Traffic Analysis Zones.
3. Establish External Stations and Base Year Counts.
4. Determine External-Internal Trips at External Stations.
5. Create External-External Trip Table for Base Year.
6. Create Production and Attraction File Using Base Year Socioeconomic Data.
7. Distribute Productions and Attractions (Gravity Model – defined on page 14).
8. Assign Total Vehicle Trip Table to 1997 Base Year Network.
9. Replicate Base Year Ground Counts within Acceptable Degree of Accuracy based on National Cooperative Highway Research Program (NCHRP 255 Report) standards.

Trip Generation: The activities and travel characteristics of an area are related to the socioeconomic data used in the modeling process. Each type of land use generates the number and type of trips by applying trip generation rates or regression equations.

The regression equations are applied to the 1997 land use data to calculate the productions and attractions for four trip purposes: Homebased Work, Homebased Other, Non-homebased and External-Internal. This output file, known as the production and attraction file, is an input file for the gravity model. As an initial step in calibration, the number of trips produced should be evaluated for reasonableness.

The trip rates can be developed from travel surveys or borrowed from similar areas. Travel surveys were completed during the original study in 1971, however, these rates did not seem to be appropriate for the expanded area resulting in too many trips on the network. As a result, the equations from another areas with characteristics similar to those in Greenwood were applied to the Greenwood model. Table 2 in Appendix D shows the final trip generation equations for all trip purposes.

External station locations were established based on the locations from the original study in 1971. Due to expanded study area, 8 count stations were added to the original 10 locations. The analysis of the 1971 external - external (E-E) trip matrix served as a basis for the 1997 external - external (E-E) trip table. E-E trips pass through the Greenwood Study Area without making a stop. Traffic counts were obtained at each of the eighteen locations. By applying a growth or fratar factor to the E-E trips, a 1997 E-E trip table was created, estimating the number of external - external trips and the number of external - internal (E-I) trips. The E-I trips are included in the production and attraction file and input into the gravity model. E-I trips have one end outside the Greenwood Study Area and one end within the study area. The 1997 E-E table is added to the gravity model trip table in the trip distribution phase. Table 4.1 shows the eighteen external station numbers, locations and 1997 average daily traffic.

Table 4.1

EXTERNAL STATION	LOCATION	ADT 1997
143	US 178	3,200
144	SC 248	800
145	SC 246	1,100
146	SC 702	1,300
147	SC 34	3,100
148	US221/SC72	10,200
149	S-39	2,500
150	US 25 N	6,500
151	US 25 Bus.	2,600
152	SC 252	3,500
153	US 178	3,600
154	SC 185	2,400
155	S-1	700
156	SC 72	9,600
157	SC 10	2,000
158	US 221	3,300
159	SC 67	2,000
160	US 25	3,300

Trip Distribution: The primary objective of trip distribution is to allocate the total number of trips originating in each zone to all possible destination zones. In other words, it is the process that will determine from where the generated trips will be distributed (from production zone to attraction zone). This phase of travel forecasting builds directly upon the output of the trip generation phase. The most commonly used method is the gravity model. The gravity model is a mathematical model of trip distribution based on the premise that trips produced in any given area will distribute themselves in accordance with the accessibility of other areas and the opportunities they offer. A zone-to-zone trip table is generated and is added to the external-external trip table.

Trip Assignment: Trip assignment is the final stage in the modeling process. The assignment of trips is made between each pair of traffic analysis zones to particular routes throughout the network and assigns volumes on each link. The type of assignment model used for Greenwood is the equilibrium assignment model.

Equilibrium Assignment Procedures are as follows.

1. Assign all trips between zone pairs (origin-destination) to minimum paths.

2. Adjust travel time on all network links based on volume-to -capacity ratio

3. Determine new minimum paths for network using adjusted travel times

4. Assign trips to network using adjusted travel times.

5. Repeat steps 2-4 until network reaches equilibrium or the prescribed number of iterations is completed.

At this point, the assigned volumes are compared to the actual ground counts. If this comparison shows significant differences, then modifications are made until the model simulates ground counts with an acceptable degree of accuracy based on the NCHRP.

Calibration Results: For purposes of comparing actual ground counts to the simulated assigned volumes, the study area was divided into five sections: northwest (north of US 221), south (south of US 221, excluding the bypass and central business district), west central (west of US 25 to SC 225), east central (east of US 25 to SC 72/US 25 Bypass) and the SC 72/US 25 Bypass.

The final run of the model resulted in assigned volumes that compared closely with the actual ground counts. Overall, the model results were within 1% of the observed ground counts.

Validation included a detailed link-by-link comparison of traffic counts to assigned model volumes for each of the five sections. Every link observed fell within the maximum desirable deviation as defined by the NCHRP - 255 report. Table 4.2 summarizes the 1997 traffic counts versus the assigned traffic volumes for each section.

Table 4.2

AREA	1997 COUNTS	ASSIGNED VOLUMES	RATIO
Northwest	107,800	106,266	0.986
South	110,000	118,295	1.075
Bypass	95,400	95,360	1.00
West Central	142,100	132,376	0.932
East Central	94,700	91,028	0.961
Cordon Line	61,700	61,710	1.00
GRAND TOTAL	**611,700**	**605,035**	**0.989**

The Greenwood Transportation Model agrees closely with observed traffic patterns and results are within an acceptable level of deviation. Therefore, the model is deemed to be validated and can be used as a tool for forecasting future traffic patterns and volumes.

Existing (1997) Deficiencies: To determine where deficiencies exist, a separate analysis was conducted of 1997 traffic counts and highway capacities.

The majority of roads within the Greenwood Study Area operate within the desired level of service with the exception of the following locations:

S-100 between S-99 and S-157; and S-236 between US 25 Bypass and S-100. The 1997 average daily traffic on these two segments were 10,000 and 11,000, respectively. In both cases, the volume exceeds the capacity of a two-lane facility.

Forecasting Future Traffic: To predict future traffic patterns and demands, the calibrated set of models is used and structured around three phases of travel forecasting: trip generation, trip distribution, and traffic assignment.

1. Develop Existing Plus Committed Network.

2. Apply Trip Generation Models using Future Socioeconomic Data.

3. Trip Distribution - Distribute Productions and Attractions (Gravity Model).

4. Traffic Assignment - Assign Future Trips to the Existing Plus Committed Network.

Traffic volumes are assigned on each link of the network. Measures of effectiveness derived from the output file, such as vehicle miles of travel, vehicle hours of travel, average speed, and trip length in minutes and miles, are used to compare networks and alternative scenarios.

Existing Plus Committed Network: The existing plus committed network (E + C) consists of the current road system and the addition of roadway improvements that are expected to be completed within the next several years.

The Western Bypass (SC 225) was the only committed project within the study area that was listed in the Statewide Transportation Improvement Program through the year 2003. Construction plans are to widen SC 225 from two lanes to five lanes from just north of SC 10 to west of US 25/178.

The conversion of US 25 from four lanes to five lanes from Kirksey Street to Court Street was added as a committed project to the E + C network. Also, a section of SC 34 will be relocated to directly connect to US 25 just south of Orange Street. The remaining portion of SC 34 up to Marshall Road (S-187) will operate as an access road.

The basis for the existing plus committed network was the 1997 calibrated model network, since the network agreed closely with the observed 1997 traffic volumes and traffic patterns. The future socioeconomic data was substituted for the base year (1997) and 2020 traffic was assigned to the E + C network. The projected traffic corresponds with the future land uses and should isolate deficiencies that could occur if no other roadway improvements are completed. The existing plus committed network will be the basis for alternate networks and will guide in the development and evaluation of alternative and test networks.

Travel Patterns for 2020: The major highways in the Greenwood Study Area consist of 3 US routes and 8 SC routes. US 25/178 is the principal north-south highway and is expected to remain one of the most heavily traveled roads throughout the study area. Average daily traffic is expected to be as high as 34,000 in the downtown area between S-249 and SC 72 Business as compared to 23,700 1997 ADT.

At the northern boundary of the study area on US 25, the projected 2020 traffic volumes are higher (7,800 ADT) than at the southern boundary (3,900 ADT). The 1997 ADT at the northern boundary was 6,500 and 3,300 at the southern boundary.

On the northeast side of the study boundary, US 221 overlaps with SC 72 and traverses south to McCormick County. The highest 1997 ADT (10,200) along the study area boundary was on the northeast boundary on US 221 and is expected to remain the highest by the year 2020 (12,200). SC 72 is the principal east-west highway and had the next highest 1997 ADT (9,600) at the study area boundary. Here, the 2020 average daily traffic is estimated to increase to 11,200.

The US 25/178/221 Bypass around the eastern portion of the city allows through traffic movements to avoid the central business area. The highest 1997 ADT on the Bypass was located between US 221/SC 72 Business and US 25/178

(23,600) where traffic decreased as it moved southward. On the same section of the roadway, the 2020 projected volume is approximately 26,000, tapering to approximately 10,000 on the south side between US 25 and SC 34. The projected volumes between Marshall Road (S-187) and Cambridge Road (S-29) exceed the capacity of a two-lane principal arterial. On all other routes located at the perimeter of the study area boundary, traffic volumes do not exceed 4,300.

Routes or segments of routes throughout the study area that are expected to exceed volumes of 20,000 include US 25/US 178 and US 25/178 Bypass. Routes or segments outside the central business district that are expected to have volumes greater than 10,000 are: US 221, SC 225, SC 72, SC 10, SC 34, S-236, and S-100. Inside the central business district, volumes are expected to be greater than 10,000 on Reynolds Avenue, Seaboard Avenue, and a segment of Cambridge Avenue.

The two-lane and five-lane sections of the Western Bypass (SC 225) will be able to accommodate current and projected traffic. This facility may divert a limited amount of through traffic from the US 25 and is projected to have a minimal impact on congestion.

Volumes on SC 225 increase going northward beyond W. Alexander Street, and are expected to increase about 30% between Maxwell Avenue and Cambridge Avenue, from 10,000 in 1997 to 13,000 in 2020. Between Cambridge Avenue and US 25/178 Bypass, volumes are expected to increase about 40% from 7,700 in 1997 to almost 11,000 in 2020. The greatest percentage of increase will be between Center Street and US 25 by about 52%, from 8,000 in 1997 to 12,200 in 2020. The overall growth in population and employment within the study area is reflected in the increase in the total number of trips. The total number of trips increased from 273,500 in 1997 to 325,400 in 2020, which is an increase of 19%. The modeled vehicle miles of travel are estimated to increase by approximately 21% between 1997 to 2020.

The total number of trips expected to cross the study area boundary is estimated to be 73,600, an increase of 19% since 1997. Approximately 89% had either origins or destinations within the study area. About 11% are estimated to travel through the study area without making a significant stop.

Future Deficiencies (E+C): For the purposes of this study, a level of service "C" was chosen for the design capacity level. Calculations and evaluations were based on this standard.

A volume-to-capacity (V/C) ratio of less than 1.0 represents acceptable, stable traffic conditions. A ratio of 1.0 or greater represents unstable traffic flow or congested conditions. The level of service and corresponding V/C ratios is shown on Table 3 in Appendix D.

The existing plus committed network was used to analyze future deficiencies in the event no other road improvements are completed. Overall, the transportation system will be able to accommodate the projected traffic volumes, however, there are specific locations where excess traffic may be beyond the desired levels of traffic flow, and therefore, considered as capacity deficient. Figure 4.1 illustrates the results of the E+C network.

Locations where capacity deficiencies are predicted to occur are as follows:

1. S-236 Emerald Road – from east of US 25/178 Bypass to S-157 Evans Pond Road.

2. S-100 Emerald Road – from S-147 Evans Pond Road going east towards S-246.

3. SC 34 – from Ninety-Six to S-29 Cambridge Road.

4. SC 10 – from SC 225 to just west of Tranquil Road

5. SC 246 – deficient on both sides of intersection @ S-100 and also just north of US 221

6. US 25/178 Bypass – between Cambridge Road and S-187 Marshall Road.

7. US 25/178 Bypass – between Reynolds Avenue and E. Durst Avenue

8. SC 72 Bus – between S-29 and SC 254

Minor deficiencies occur at the following locations:

9. Northside Drive – just west of intersection @ SC 254

10. SC 254 – just north of intersection @ Northside Drive

11. E. Laurel Avenue – just east of SC 254 and also just east of US 25/178 Bypass

12. US 25 – north of Seaboard Avenue to just south of Mill Street

13. Maxwell Avenue – just west of US 25.

14. W. Cresswell Avenue – between Edgefield Street and US 25.

15. Edgefield Street – just south of W. Cresswell Avenue.

The most critical volumes in the system occur on Emerald Road (S-236) from east of US 25/178 Bypass to S-100, and on S-100 from S-236 to beyond Evans Pond Road (S-157). In 1997, the ADT on S-236 was 10,000 and is predicted to range between 13,700 and 18,500 by the year 2020. On S-100, the 1997 ADT was 11,000 and the highest volumes are projected to range between 9,900 and 15,000. These volumes significantly surpass the existing capacity as a two-lane facility.

The street system in the downtown area should be adequate to handle the volume of traffic, although there are some areas of congestion. The highest volume of traffic within the downtown area is on US 25 and it is slightly over capacity north of Seaboard Avenue to just south of Mill Street.

Proposed Roadway Improvements:
The existing plus committed (E+C) network provided input and guidance to the development of alternative networks. In the process of testing alternative networks, the initial 2020 traffic volumes were assigned on the E + C network in order to determine where deficiencies might occur and where road improvements might be needed. Individual routes were examined and

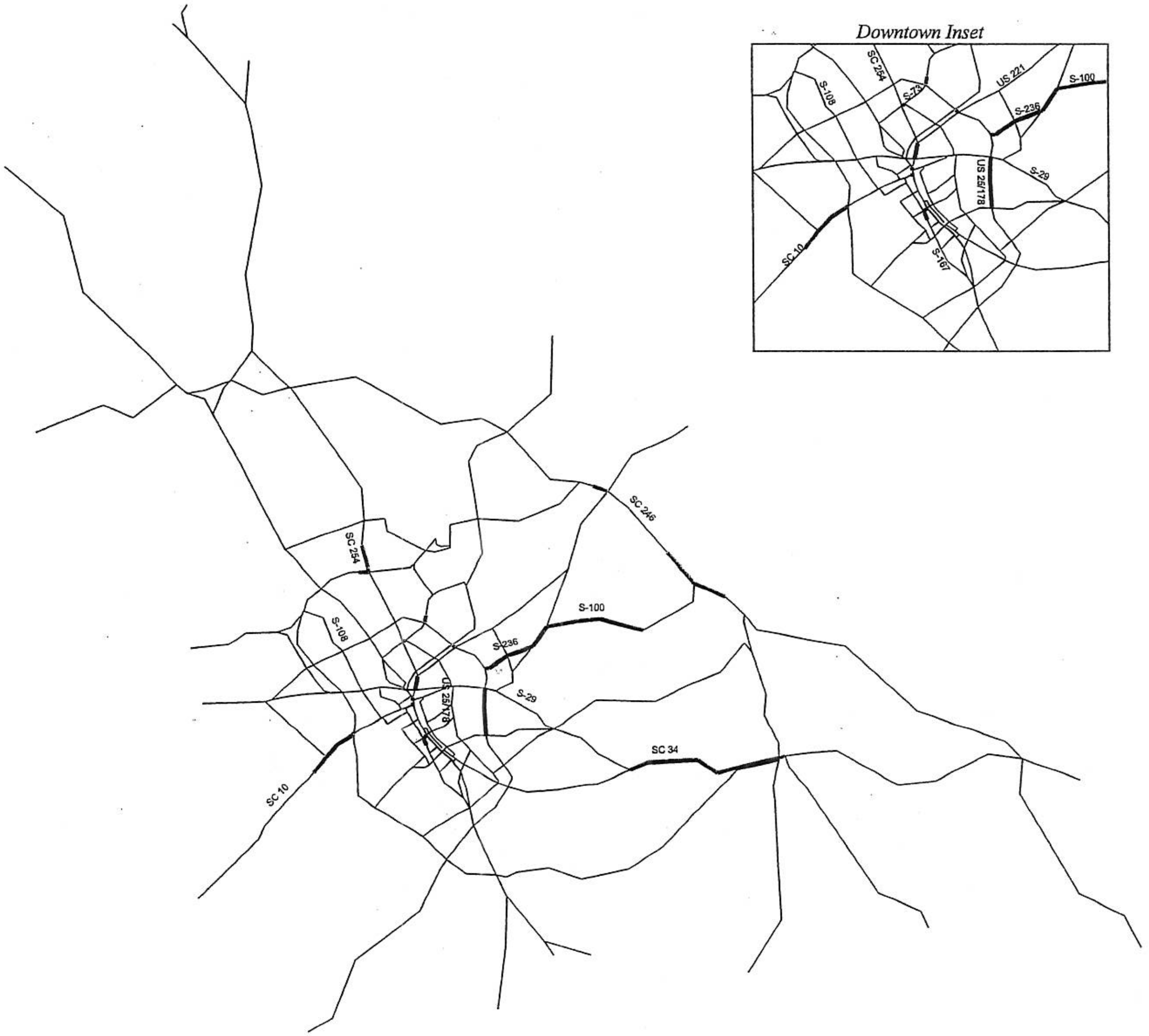


Figure 4.1

Greenwood Thoroughfare Plan

E + C Network
V/C Ratios - Levels of Service
Based on LOS "C" Capacities

N W E S

Legend

LOS	V/C Ratio
A-C	0 - 1
D	1.01 - 1.15
E	1.16 - 1.34
F	1.35 - 2

SCDOT
South Carolina Department of Transportation

Data Source: Census Tiger Data
Produced by SCDOT Planning June 2000

future volumes were compared with the capacity of each roadway.

The following projects were evaluated as potential improvements. The improvements are based on capacity deficiencies identified in the E + C network, as well as projects that were identified by the Steering Committee to improve access and traffic flow. The location of each potential project is shown in Figure 4.2.

1. Emerald Road / Phase I – Widen to five lanes from US 25 to Empire Road.

2. Emerald Road / Phase II – Widen to five lanes from Empire Road to SC 246.

3. SC 34 – Widen to five lanes from the town of Ninety-Six to east of Orange Street.

4. US 25/178 Bypass – Widen to five Lanes from US 25 to S-29.

5. SC 246 / Phase I – Widen to five lanes from north of Bucklevel to south of Emerald.

6. SC 246 / Phase II – Widen to five lanes from US 25 to north of Bucklevel.

7. Northside Drive – Widen to five lanes from just south of US 25 to SC 246.

8. Seaboard Connector – Construct a new facility from Seaboard at US 25 to Edgefield.

9. Mathis/Spring Connector – Construct a new facility from Maxwell to Marion.

10. Seaboard/Cokesbury Connector – Widen existing Cokesbury from two to five lanes and add connector over to Seaboard; new facility from Seaboard at US 25 to Edgefield Street.

11. Cokesbury/New Market Link – Construct a new facility from Cokesbury to New Market.

12. Durst Connector – Widen existing road to five lanes from US 25 to Cambridge and add new connector to Maxwell Avenue.

13. One-Way Pair/Durst and Reynolds
Durst – US 25 Bypass to Grace Street
Reynolds – Grace Street to US 25 Bypass.

Five alternate networks were designed from the list of potential projects to eliminate deficiencies. The alternate networks are described using various scenarios of potential projects.

Evaluation of Alternative Networks

<u>Alternate 1</u>

Improvements modeled in Alternate I include:

1. *Emerald Road/Phase I* – widen from two lanes to five lanes from US 25/178 Bypass to Empire Road;
2. *Emerald Road/Phase II* – widen from two lanes to five lanes from Empire Road to SC 246;
3. *SC 34* – widen from two lanes to five lanes from the town of Ninety-Six to east of Orange Street; and
4. *US 25/178 Bypass* – widen to five lanes from US 25 to S-29 Cambridge Avenue.

These potential projects were modeled as a result of capacity deficiencies on all, or a portion the roadway. The widening of these facilities did not increase the projected traffic volumes, however, the volume-to-capacity ratio was significantly lowered on each of these roadways, indicating that the five-lane facilities could easily accommodate the projected traffic. There was no impact on traffic flow or traffic patterns on other routes.

Alternate 2

Improvements modeled in Alternate 2 are listed below. Items (1) through (4) were also modeled in Alternate 1.

1. *Emerald Road, Phase1* - From US 25 to Empire Road widening from two lanes to five lanes.

2. *Emerald Road, Phase 2* - From Empire Road to SC 246 widening from two lanes to five lanes.

3. *SC 34* - From the town of Ninety-Six to east of Orange Street widening from two lanes to five lanes.

4. *US 25/178 Bypass* - Widening to five lanes from US 25 to S-29 Cambridge Road.

5. *SC 246 Phase I* - From north of Bucklevel Road to south of Emerald Road widening from two lanes to five lanes.

6. *SC 246 Phase II* - From US 25 to north of Bucklevel Road widening from two lanes to five lanes.

7. *Northside Drive* - From south of US 25 to SC 246 widening from two lanes to five lanes.
8. *Seaboard Connector* - New five-lane facility from Seaboard at US 25 to Edgefield Street.

The widening of Emerald Road, Phase I and Phase II, SC 34 and the US 25/178 Bypass were proposed as improvements due to traffic projections exceeding desirable capacity levels as two-lane facilities. The result of these widenings indicated no increase in projected traffic volumes, however, traffic volumes would fall within acceptable capacity levels.

Phase 1 and 2 of SC 246 were recommended to increase mobility and create more efficient traffic flow from the southeast side of the study area to US 25. Even though widening to five lanes showed no significant changes in traffic volumes, capacity deficiencies would be alleviated on SC 246 at the intersection of Emerald Road and also just north of the intersection at US 221.
Northside Drive had no capacity problem as a two-lane facility, however, widening was considered to improve traffic flow in an east-west direction between US 25 and SC 246. The slight deficiency just west of US 25 was eliminated, even though the widening did not extend west of US 25.

The Seaboard Connector allowed through movements from the existing Seaboard Avenue to SC 10. Southbound traffic on US 25 utilized turns onto the new Connector to get to Maxwell Avenue (SC 10), thus decreasing the turns onto Maxwell from US 25. This movement resulted in a decrease in volumes on US 25 between Seaboard Avenue and Maxwell Avenue. Also, turns onto the Connector from Maxwell contributed to the substantial decrease in volumes on Maxwell between Edgefield Street and US 25, and eliminated the slight deficiency on Maxwell just west of the intersection at US 25. There was no increase in volumes on the existing

Seaboard Avenue. Slight congestion levels remained on US 25 just north of Seaboard Avenue and only minimal increase in volumes resulted on Edgefield Street from SC 10 to Marion Avenue.

Alternate 3

The eight project candidates that were modeled in Alternate 2 were also modeled in Alternate 3 along with two additional improvements and revisions to the Seaboard Connector. This network includes all of the projects that were identified for consideration as potential projects, *excluding* the Durst Connector. A description of the revised Seaboard Connector and the two additional projects are listed below.

1. Seaboard/Cokesbury Connector - Widen existing Cokesbury from two to five lanes from Reynolds Avenue to Cambridge Avenue, and add connector to Seaboard. Construct a new facility from Seaboard @ US 25 to Edgefield Street.

2. Mathis/Spring Connector - Construct a new facility from Maxwell to Marion.

3. Cokesbury/New Market Link - Construct a new facility from Cokesbury to New Market.

The revision of the Seaboard Connector was considered as one approach to draw traffic away from SC 72 Business between S-29 and SC 254. Volumes decreased on SC 72 Business by approximately six percent, but still remained over the desired capacity.

Although projected traffic volumes on Cokesbury increased as much as twenty-five percent, the level of service was well within an acceptable range. The increase in traffic between Durst Avenue and E. Laurel Avenue did not interfere with stable traffic flow, however, there was slightly more congestion from Cokesbury to SC 254.

The increase in volumes on New Market Road due to adding the Cokesbury/New Market Link did not change the level of service.

The Mathis/Spring Connector was added as a two-lane facility from Maxwell to Marion. It is parallel to Main Street and creates a diversion of traffic from the central city area with decreased volumes on parallel streets.

The most significant decreases in traffic volumes were on US 25 from Cresswell Avenue northward to Seaboard and the level of service on US 25 just north of Seaboard was within the capacity level. Whereas in the existing plus committed network, and Alternates 1 and 2, this segment was over-capacity. Traffic also decreased on Edgefield Street.

Traffic increased on Mathis Street between W. Cambridge Avenue and Maxwell Avenue, and on Spring Street. Traffic decreased on Cambridge between Maxwell and US 25.

As in Alternates 1 and 2, the widening of Emerald Road, including Phase I and Phase II, did not increase the volume of traffic, but did alleviate the capacity problems.

There was no significant change in traffic volumes on SC 246 or Northside Drive, although capacity problems at the intersections of SC 246 at US 221 and

SC 246 at Emerald Road were alleviated.

Alternate 4

The Durst Connector was separately evaluated and compared with the E + C Network to determine how traffic patterns would be affected where SC 72 Business and US 25 intersect with Cambridge Avenue (S-29). Durst Avenue was widened to five lanes from US 25 Bypass to Cambridge Avenue with a new five-lane connector over to Maxwell Avenue just beyond Mill Street.

Durst was greatly impacted by the amount of traffic that diverted from Reynolds Avenue. Volumes on Durst increased, while volumes on Reynolds were significantly decreased. On SC 72 Business, between Reynolds and SC 254 volumes dropped. This drastically reduced the volume to capacity ratio to a satisfactory level of service. Traffic also decreased on US 25 south of Cambridge to Maxwell Avenue, relieving the congestion just north of Seaboard. Congestion was also alleviated on Maxwell since volumes decreased from US 25 to where the Durst Connector intersects with Maxwell. From that point, traffic volumes increased to the Western Bypass due to traffic merging into SC 10 from the Durst Connector.

Alternate 5

Another recommendation was to determine the impact of a *one-way pair* of streets, Reynolds Avenue and E. Durst Avenue from Grace Street to the US 25/178 Bypass. Reynolds Avenue was coded as one-way going away from the central city, and E. Durst Avenue was coded as one-way coming in towards the central city.

As a result, the greatest impact was the increased traffic on E. Durst Avenue, while Reynolds Avenue had less traffic. Even though Durst had higher volumes, they remained within an acceptable capacity. On E. Durst Avenue, west of SC 254 over to Cambridge, volumes also increased. Increased volumes were also indicated on Cokesbury, between Durst and E. Laurel, and on SC 254 between Reynolds going northward to the US 25/178 Bypass.

These increases in volumes caused no additional capacity problems, except for the congestion that remained on E. Laurel from Cokesbury to SC 254. Volumes on US 25/178 Bypass between Reynolds and Durst remained capacity deficient. The decreased volumes on SC 72 Business between Cambridge and SC 254 also remained capacity deficient.

Measures of Effectiveness: In addition to comparing volumes to capacities, there are various measures of effectiveness that are commonly used to assess alternate roadway plans. During the evaluation process, comparisons were made of the system operating characteristics, such as vehicle miles of travel, vehicle hours of travel and average speed. The existing plus committed network as compared to the 1997 base year network shows a 19% increase in the total number of trips within the study area, a 21% increase in vehicle miles of travel, and a 24% increase in vehicle hours of travel. The average system speed was slightly lower in the E + C network. See Table 4 in Appendix D for the Measures of Effectiveness for each alternative network.