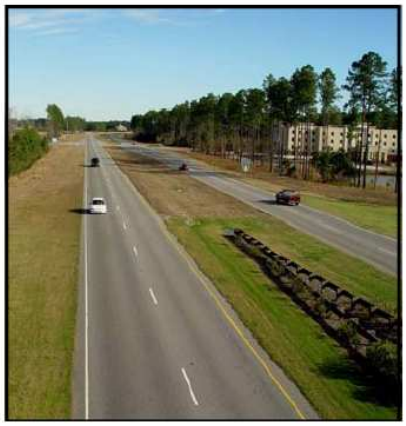
reduce VMTs and travel demand on the region's roads is a challenge the Participating Local Governments cannot solve individually, but must be addressed at the regional level. This is so because the Regional Road Network is used by residents throughout the region, can be impacted by development throughout the region, and can only be realistically funded by a region-wide effort.

Regional Road Network



The Regional Road Network for southern Beaufort County is made up of 183 miles of principal arterials, minor arterials and major collectors. The majority of roads making up the Regional Road Network are owned and maintained by the South Carolina Department of Transportation (SCDOT), with the exception of Buckwalter Parkway and Bluffton Parkway (Beaufort County); Calhoun Street (Bluffton) and 3.4 miles of roads owned by the Town of Hilton Head Island.

Along with southern Beaufort County's fast pace of growth, three other factors place an additional strain on the Regional Road Network – geography – due to the waterways in the region; lack of parallel roads due to existing development; and relatively low density development.

Level of Service (LOS) Standard

Level of Service (LOS) is a term used in describing the operation and functionality of roadways and intersections. Level of Service defines the operational characteristics of roadways and intersections in terms of quality measures of speed, travel time, freedom to maneuver, traffic interruptions and comfort and convenience.

Six LOS letters designate each level of quality of vehicular flow, from A to F, with LOS "A" representing the best operating conditions and LOS "F" the worst. The Participating Local Governments have decided as a matter of policy that in order to maintain a minimum quality of life in the region, conditions on the Regional Road Network should not fall below LOS "D".[2]

[2] The County and Bluffton presently measure LOS "D," based on an average daily basis. This is so because SCDOT annually measures traffic volume at major roadway segments over a 24-hour period. The resulting figure is called the Average Annual Daily Traffic (AADT) count. SCDOT does not provide annual traffic count information on intersections, but will conduct counts for problem intersections on an as needed basis. The Town of Hilton Head Island measures LOS on a peak hour basis. This is so because Hilton Head conducts their own manual traffic counts at all of their major intersections to determine peak hour data during the second week of June, which represents a high volume but not the peak volume time of the year. The differences between the data that the Town collects and SCDOT's AADT data are that the Town looks at

Map 5: Existing Conditions of the Regional Road Network

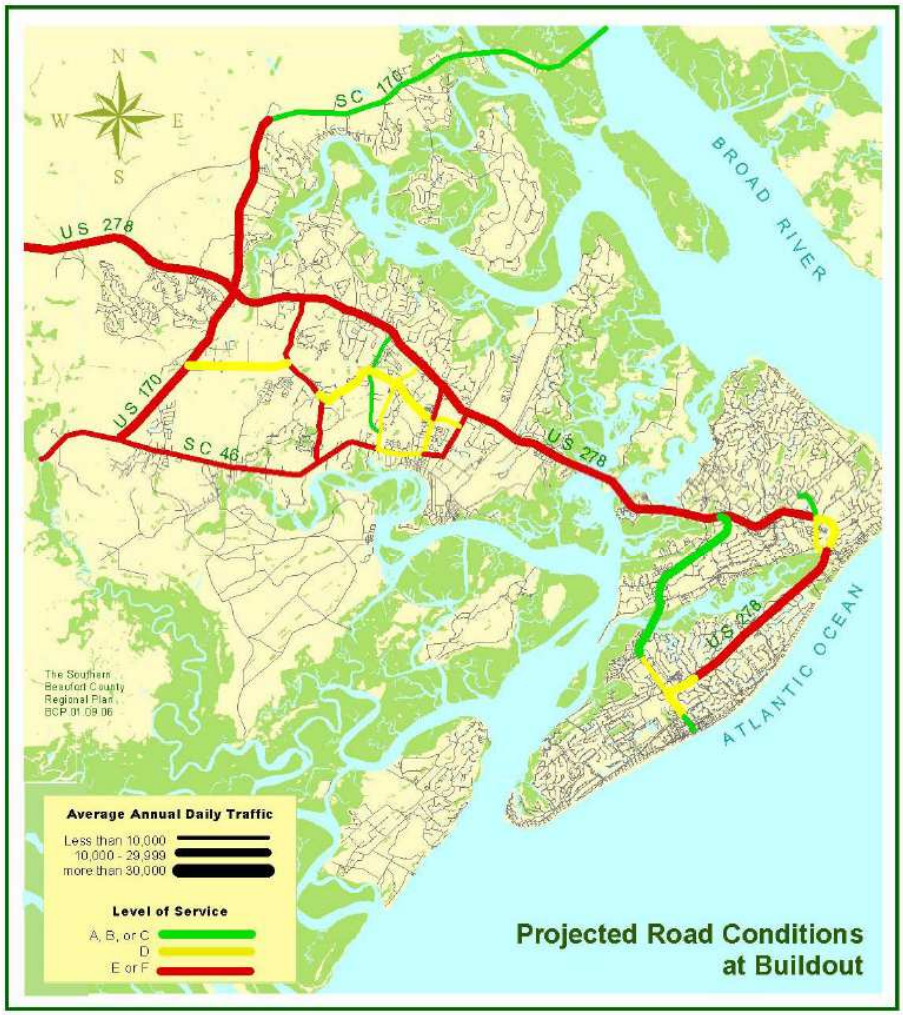
Existing Conditions and Future Road Demand

Today there are deficient conditions on the Regional Road Network. US 278 between SC 46 and the bridges to Hilton Head Island is currently failing (LOS E or F), with existing daily volumes exceeding available capacity, creating congestion, delays, and increased accident potential. Estimates indicate that it will cost approximately $31 million dollars to

peak hour demand rather than average daily traffic volumes. The Town's data is also specific to intersections. At each intersection, counts are made for each turning movement.

make the needed road capital improvements to correct these existing deficiencies (see Transportation and Other Public Facilities Background Report).

Map 6: Projected Conditions of the Regional Road Network at Buildout



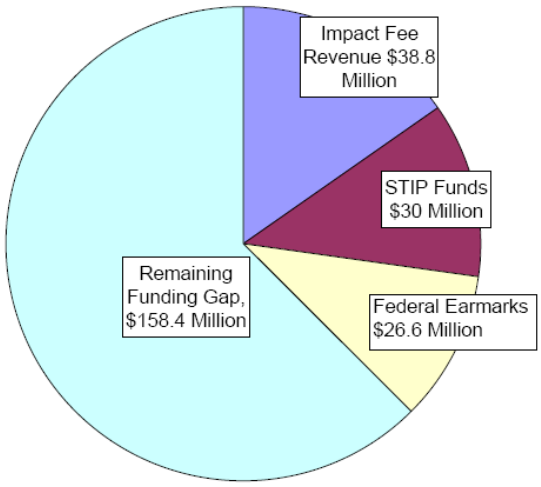
Map 6 indicates where future road deficiencies are anticipated on the Regional Road Network, at buildout assuming no additional road improvements are made (based on the population estimates outlined in Chapter 2). Estimates indicate it will cost approximately $222 million dollars to implement current plans for road capital improvements to address these needs to ensure the system operates at LOS "D."

However, even if these road capital improvements are completed, a number of roads will still operate below LOS "D". This is due to local policies that discourage road widenings on certain roads such as William Hilton Parkway (U.S. 278 Business) and May River Road (SC 46).

Funding Gap

Historically, the principal source of dedicated road funding for southern Beaufort County has been Statewide Transportation Improvement Program (STIP) dollars through the South Carolina Department of Transportation (SCDOT). In addition to STIP monies, both the Town of Hilton Head Island and Beaufort County have implemented road impact fee programs. These two sources of revenue for road funding will not be adequate to fund the capital road improvement needs for the Regional Road Network to address either existing deficiencies or projected needs at buildout. In order to illustrate the magnitude of the transportation funding shortfall, **Figure 11** compares the region's needs in terms of the costs to make the needed capital improvements as compared to anticipated revenues from SCDOT and local road impact fees.

Figure 11: Transportation Funding Gap



If the Regional Road Network in southern Beaufort County is going to operate at LOS "D," it will be necessary for the Participating Local Governments to develop a strategy to find additional dedicated revenue sources to address the $158.4 million funding gap for the Regional Road Network.

Potential Revenue Sources to Address Funding Gap

As part of the regional planning process, it was determined that given the size of the funding gap for transportation, one funding tool or a one-dimensional funding strategy for transportation is not realistic. Instead, it was agreed that the Participating Local Governments must take a broad-based and multi-dimensional approach to funding transportation needs, continuing to use existing revenue sources where they make sense, and prioritizing and evaluating the most appropriate revenue sources, both from existing authorized sources, as well as revenue tools that require state enabling legislation. It is also recognized that, given the size of the funding gap and the existing funding options in the region, the funding strategy will evolve over time.

Based on these principles and the analysis undertaken in the background reports and implementation reports, the following revenue sources were identified as legitimate sources of revenue on which the Participating Local Governments should focus to address the funding gap for capital road improvements for the Regional Road Network.[3] The first two funding options are enabled by the state to be used by local governments. The last two options would require changes to state enabling legislation

- **Impact Fees:** Although Beaufort County already has transportation impact fees in place, these fees do not adequately cover the actual cost the local governments are incurring to accommodate them, in terms of providing transportation capital improvements. Estimates indicate that an increase in the transportation impact fee from $440 to $1,600 per single-family unit (and comparable amounts for nonresidential development), for example, would generate $72 million in additional revenue, in southern Beaufort County.
- **Capital Projects Sales Tax:** This funding tool is available to the county today and would go the furthest in generating needed

[3] Property taxes are not included for consideration for several reasons. First, if used, they would likely triple the county's current debt service payments and require significant property tax increases. Secondly,, the Beaufort County School District also has significant capital needs due to the growth in the region, and will most likely use property taxes to fund these needs.

revenues for capital road improvements. It is estimated that two consecutive 7-year applications of a 1 cent Capital Projects Sales Tax would generate roughly $175 million for capital projects in southern Beaufort County.[4] It is recommended that $136 million go toward transportation projects. It is important to note that any sales tax option would require approval in a countywide referendum. Two similar referendums failed in 2002 and 2004, making the use of this tool a challenge.

- **Real Estate Transfer Fee:** This revenue option consists of a fee on the transfer, sale or conveyance of real property. It is estimated a countywide real estate transfer fee at a rate of one quarter of one percent (0.0025) (excluding Hilton Head Island) would generate approximately $130 million countywide over the next 15 years. Of that amount, approximately half ($65 million) could go toward capital road projects in southern Beaufort County. This revenue option would require changes to state enabling legislation.
- **Local Option Gas Tax:** Both federal and state gas taxes are paid on each gallon of gas purchased locally. None of these funds go directly to local governments to address road capital needs. Some local communities across the nation, especially in high-growth areas, are authorized to impose local gas taxes. If South Carolina enabled such a tax, it is estimated that a 5 cent local option gas tax would generate $43.6 million countywide over the next 15 years.

Specific strategies for addressing this funding gap for transportation are discussed in more detail in Chapter 3: Cost of Growth.

Coordinated Policies to Preserve Capacity and Reduce Vehicle Miles Traveled (VMT's)

The magnitude of southern Beaufort County's transportation problem and its funding shortfall points to the importance of looking at ways to preserve the existing capacity of the Regional Road Network and to reduce vehicle miles traveled. Policies and programs to further these efforts include encouraging the use of public transportation, ferry systems, multi-use pathways, and making roadways function more efficiently (access management and intelligent transportation systems).

[4] It is estimated that $350 million would be generated countywide. It is assumed that half of the available Capital Projects Sales Tax revenue would go to projects in southern Beaufort County.

Public Transportation

The Lowcountry Regional Transportation Authority (LRTA) provides public transportation in southern Beaufort County. LRTA serves five counties (Beaufort, Jasper, Colleton, Hampton, and Allendale) and focuses primarily on bringing rural residents to jobs in Beaufort County.

The Lowcountry Public Transit Coordination Feasibility Study[5] identified several factors that make the efficient provision of public transportation difficult in the region. While southern Beaufort County is rapidly becoming urbanized, residential densities remain fairly low at 1 to 2 dwelling units per acre. Low residential density in conjunction with decentralized commercial and employment areas make it difficult to provide regular transit service that can attract people away from their automobiles.

Recognizing these limitations, the study explored mainline transit service along U.S. 278. This would consist of a regularly scheduled fixed route service with frequent service levels and long hours of operation. Providing for limited stop transit service is very important to consider when planning for the future configuration of the U.S. 278 corridor.

Ferry Service

Ferry service is a possible alternative mode of transportation given the region's many navigable waterways and the potential to reduce travel demands on US 278 and SC 170. Effective ferry terminals would require sizable waterfront property for parking and multi-modal facilities to transport people from the terminal to places of employment. Funding and commute times are also obstacles that need to be overcome in order to make ferry service a viable alternative to automobile transportation. Given the transportation constraints under which the region is operating, however, this is another option that might require further consideration.

Multi-Use Pathways

Another way to address current and future transportation demand is to promote walking, running, and cycling as viable alternatives to automobile transportation. The Town of Hilton Head Island has been the leader in the region in establishing an extensive network of multi-use trails consisting of over 49 miles of public multi-use trails with over 31 additional miles planned in their ten year Capital Improvements

[5] Day Wilburn and Associates, 2003

Program. One of the ways the Town promotes their trails is by providing the public with information showing the relationship of multi-use pathways to shopping areas, employment centers and other areas of interest.

In the Bluffton area, the Southern Beaufort Greenway Plan calls for improving the pedestrian climate in historic Bluffton while connecting it with the newer annexed areas such as Palmetto Bluff, the Buckwalter Tract, and the Shults Tract. The next phase of the plan calls for the construction of a multi-use trail along 278 from Buckwalter Parkway east to Hilton Head Island, connecting with Hilton Head's trail network.

Expansion of the multi-use trail system could result in some reduction in VMT's, and create more sustainable development within the region.

Access Management Standards

Managing the points of access to the major roads in the Regional Road Network can improve the efficiency of those roads, effectively increasing the capacity of the roads to carry traffic. Major projects could include physically limiting points of access to a regional road while creating frontage streets to accommodate local traffic. Less costly techniques can include attention to signal spacing, signal timing, driveway spacing, driveway design, shared driveway access, construction of acceleration and deceleration lanes, and enhanced connectivity standards for new development. Effective access management standards benefit a community by reducing accidents, increasing roadway capacity, providing better access to businesses, and improving mobility.

There are different access management standards that apply today within the different Participating Local Governments.

There are definite benefits in establishing a uniform set of access management standards in southern Beaufort County. Access management standards worthy of consideration include signal spacing, timing and coordination; driveway spacing and design; deceleration lanes; shared driveway access; frontage roads and backside access; and general road connectivity.

Intelligent Transportation Systems (ITS)

There are three components to Beaufort County's existing Intelligent Transportation System: video surveillance, response vehicles, and radio advisory broadcasts. The County operates 26 surveillance cameras along SC 170 and US 278, with images updated every five seconds. Based on the images, the County's Emergency Management Department can send vehicles to remove wrecked or stranded vehicles, place electronic message boards to alert drivers to detour options, and broadcast over designated AM radio stations. The system helps officials respond quickly to unforeseen events, and thereby minimize delays for motorists (and, accordingly, helps maintain the maximum traffic-carrying capacity of these roadways). In addition, when accidents and congestion occur, the county may notify SCDOT to send incident management vehicles to remove wrecked or stranded vehicles, dispatch law enforcement officials, update electronic message boards to notify drivers of detours, or broadcast traffic information over designated AM radio stations. Images from the cameras are also placed on the county's web site allowing motorists the ability to assess traffic situations before leaving home.

The ability of safety officials to respond quickly to congestion issues is important to minimize delays on major roads such as US 278. For this reason, the County's ITS system should be expanded to targeted road on the Regional Road Network throughout the region.

Removing Land from Potential Development

Significant efforts have been made by local governments in southern Beaufort County to reduce potential vehicle miles traveled on the Regional Road Network by purchasing land to prevent potential future development. The Town of Hilton Head Island, using Real Estate Transfer Fee funds, has acquired over 1,100 acres in the last 15 years and has calculated that these acquisitions have prevented the construction of 4.5 million square feet of commercial space, 1,365 motel rooms, 3,266 multi-family and time-share units, and 26,216 peak hour trips.

Beaufort County's Rural and Critical Land Preservation Program has also been used to remove land from potential development. These efforts should continue into the future.

Traffic Impact Analysis Ordinances

Traffic Impact Analysis Ordinances require a developer to determine the impact of their proposed development on the road network and

provide mitigation, if necessary. The performance standard to determine whether mitigation is needed is LOS "D" along affected roadways and intersections. Typical improvements recommended by a traffic impact analysis to mitigate the impacts of development include the provision of turning and deceleration lanes, the installation of traffic signals, and sharing access with adjoining developments.

TRANPLAN Model

The primary purpose of the TRANPLAN model, used both by Beaufort County and Hilton Head Island, is to estimate future traffic volumes on the road network. This enables the Town and County to plan for road projects in a timely manner to provide sufficient growth capacity to meet the projected demand. The TRANPLAN model can also help determine the transportation impacts and ultimately the decision of whether to approve large projects, such as a PUD or large-scale zoning amendments.

Environmental and Aesthetic Concerns

Even if the region were able to fund all the transportation improvements identified as necessary to accommodate new growth and development, the impact of these improvements on the region's natural assets and aesthetic qualities discussed earlier in this plan need to be addressed.

Chapter 2 (Objective 3.2) of this plan recommends road connectivity as a way to make the Regional Road Network more efficient by offering alternative travel routes. However, connecting wildlife habitat and reducing its fragmentation is also recognized as an important goal. Achieving both types of connectivity goals has the potential to serve cross-purposes. In planning for future roadways, considerations should be given for the network of open spaces that is called for in this plan. Innovative road construction techniques have also been used to aid in linking wildlife habitat.

Chapter 3 (Common Goal 2) addresses the importance of maintaining and promoting the aesthetic qualities along the region's travel corridors through coordinated planning and the adoption of uniform development standards. Joint corridor planning needs to address the potential adverse impacts that future road improvements will have on the aesthetic qualities of the travel corridors.

Common Goals, Objectives and Implementation Actions

Addressing the cost of funding future road capital improvements in southern Beaufort County is a challenge the Participating Local Governments cannot solve individually. The issue will be addressed on a regional level, through a broad-based effort to plan and fund transportation improvements and work to reduce vehicle miles traveled on the region's main corridors

Common Goal 1: Coordination of Transportation Planning

Transportation planning will be coordinated between Beaufort County and the towns of Bluffton and Hilton Head Island (the "Participating Local Governments"), and Jasper County and its municipalities.

Objective 1.1 Level of Service Standard. To ensure a minimum quality of life, the Participating Local Governments will adopt a level of service standard on the Regional Road Network of LOS "D." To improve road conditions on the Regional Road Network, all the Participating Local Governments will evaluate adopting a LOS based on peak hour conditions.

Implementation Action: Recognize Regional Road Network and establish a common level-of-service (LOS) standard.

Description:

- The Participating Local Governments will recognize that the Regional Road Network is subject to coordinated planning, regulation and funding.
- Ordinances and policies will be amended to recognize LOS "D" as the standard that should be maintained on the Regional Road Network;
- Beaufort County and Bluffton staff should explore changing their transportation LOS standard to a peak-hour/peak-season standard.

Responsibility: Participating Local Governments

Objective 1.2 Formalize Regional Transportation Planning. The Participating Local Governments will formalize through an Intergovernmental Agreement a coordinated regional transportation process that coordinates transportation planning with land use planning and forecasts, and addresses: data collection, monitoring, modeling, planning, and funding issues related to the Regional Road Network.

Implementation Action: Establish a formal structure for coordinating transportation planning at the regional level through an Intergovernmental Agreement.

Description:
- Formalize Southern Beaufort County Highway Improvement Team through intergovernmental agreement and change name to Southern Beaufort County Transportation Planning Team (SBCTPT).
- Prepare a regional transportation plan that identifies existing conditions and deficiencies and cost to address deficiencies.
- SBCTPT will serve as key entity in the region for transportation data collection, modeling and monitoring.

Responsibility: Participating Local Governments, Southern Beaufort County Transportation Planning Team

Objective 1.3 Jasper County. The Participating Local Governments will engage in coordinated regional transportation planning with Jasper County and its municipalities.

See Chapter 7, Figure 14

Objective 1.4 Coordinated Reviews. The Participating Local Governments will develop and implement joint review of major development proposals prior to their approvals to ensure the proposal does not have an adverse impact on the Regional Road Network.

Implementation Action: Codify requirements for review and/or mitigation of extra-local transportation impacts on the Regional Road Network by requiring all projects that trigger traffic impact analysis requirements to be circulated to all local traffic engineers.

Description: This action would provide an opportunity for discussion on key issues of concern, such as access management, driveway spacing, etc. The exact procedure for intergovernmental reviews should be determined by the Southern Beaufort County Transportation Planning Team.

Responsibility: Participating Local Governments

Common Goal 2: Funding Transportation Needs on Regional Road Network

The Participating Local Governments will work cooperatively with the state and federal governments to develop a strategy to fund existing and future transportation capital improvements needs on the Regional Road Network to maintain the adopted LOS standard in a way that is environmentally and context sensitive, so that the images and character of the Participating Local Governments is maintained, to the maximum extent practicable.

Objective 2.1 Joint Funding. Because of the relationship between new growth and development and its impact on the Regional Road Network, the Participating Local Governments, to the maximum extent practicable, will establish funding arrangements in which the Participating Local Governments jointly fund the needed capital transportation projects on the Regional Road Network.

Implementation Action: Establish formal work group or entity to address regional transportation funding.

Description:

- Develop a specific transportation funding strategy for the Regional Road Network.
- In the longer term, analyze the consequences of the region becoming a metropolitan planning organization (MPO).

Responsibility: Southern Beaufort County Transportation Planning Team

Objective 2.2 Funding Options. The sources of funding considered by the Participating Local Governments will include but not be limited to: road impact fees; Statewide Transportation Improvement Program (STIP) funds, the optional sales tax, toll roads, tax increment financing, assessment districts, and ROW dedication policy.

Implementation Action: Develop a coordinated funding strategy to fund the Regional Road Network.

Description:

- Increase road impact fees to require payment of full costs of Participating Local Governments to accommodate new development. (For example, an increase in Transportation impact fees from $440 to $1,600 per single family unit (and comparable amounts for nonresidential development) would yield roughly $72 million at buildout for southern Beaufort County.)
- Hold a referendum to establish a 1% capital projects sales tax for the maximum 7 year term. Two consecutive 7 year terms would generate roughly $136 million at buildout for transportation projects in southern Beaufort County.
- Lobby the State Legislature to enable local governments to establish a real estate transfer fee. A .0025 real estate transfer in Beaufort County (with the exception of Hilton Head Island) would generate $65 million over a 15 year period for southern Beaufort County.
- Lobby the State Legislature to enable a local option gas tax. A 5 cents tax could potentially generate $22 million over a 15 year period for southern Beaufort County.

Responsibility: Participating Local Governments; Legislative Delegation

Objective 2.3 Priority on Funding Existing Deficiencies on US 278. In developing a coordinated road improvement plan and funding strategy for the Regional Road Network, priority will be given to first planning for and funding the existing deficiencies on US 278.

Objective 2.4 New Development Pays Pro Rata Share. As a general matter of policy, new growth and development will bear a proportionate share of the cost of the provision of new road capital improvements required by such development on the Regional Road Network.

See Transportation Objective 2.2

Common Goal 3: Coordinated Policies to Reduce Vehicle Miles Traveled (VMT's)

The Participating Local Governments will work cooperatively to develop strategies to reduce VMT's on the Regional Road Network.

Objective 3.1 Public Transportation. The Participating Local Governments will place an emphasis on the expansion of public transportation as an alternative means of transportation in the region (e.g., van pooling, ride sharing, buses, para-transit, ferry service and similar initiatives).

Implementation Action: Support LRTA in planning for and expanding public transportation options in the region.

Description:
- Encourage LRTA to continue pursuing mainline transit service along U.S. 278; and to continue to study the public transportation network with special emphasis given to alternatives such as ferry services.
- Adopt standards in local development codes that provide incentives for employees to use alternative transportation, encourage alternative transportation amenities such as bus stops and multi-use paths.

Responsibility: Lowcountry Regional Transportation Authority (LRTA); Participating Local Governments

Objective 3.2 Multi-Use Trail System. The Participating Local Governments will coordinate and place additional emphasis on expansion and implementation of a multi-use trail system through the Hilton Head Comprehensive Plan, the Southern Beaufort Greenway Plan, and the Beaufort County Trails and Blueways Master Plan.

Implementation Action: Coordinate planning and funding for a system of non-motorized transportation alternatives.

Description:
- Evaluate existing plans in light of reducing VMT's on the Regional Road Network and identifying where trails are needed to connect activity points.
- Take advantage of road widenings and new development proposals to construct segments of the planned multi-use trail system.

- Strategize additional funding sources.

Responsibility: Southern Beaufort County Transportation Planning Team

Objective 3.3 Access Management Standards. The Participating Local Governments will coordinate access management standards to improve the efficiency of the Regional Road Network, especially along shared corridors. Those standards will address signal spacing, signal timing and control, driveway spacing, driveway design, deceleration lanes, shared driveway access, frontage roads, and connectivity standards.

Implementation Action: Develop access management plan and standards for Regional Road Network.

Description: Compile all access management rules currently in place for each jurisdiction and identify which roads on the Regional Road Network are to be candidates for additional access management standards. Develop plan and standards for access management.

Responsibility: Southern Beaufort County Transportation Planning Team

Objective 3.4 Intelligent Transportation Systems. The Participating Local Governments will adopt a program to ensure the establishment of an Intelligent Transportation System for the entire Regional Road Network.

Implementation Action: Develop a plan for the ITS system to enable its extension throughout the Regional Road Network.

Description:
- Explore where the current ITS system should extend
- Pursue funding and operation of system extension through an intergovernmental agreement.

Responsibility: Southern Beaufort County Transportation Planning Team

Objective 3.5 Land Use Policies. The Participating Local Governments, where appropriate, will adopt land use policies, such as regulations to encourage mixed use development at higher intensity nodes that result in reduced VMT's on the Regional Road Network, more pronounced connectivity standards, and adequate public facility standards. In addition, the Participating Local Governments will further evaluate and consider, where appropriate, rate of growth regulations.

See Land Use Objective 3.1

Objective 3.6 Land Acquisition. The Participating Local Governments will coordinate their efforts to identify and purchase land in order to remove it from potential development. This is a growth management tool that can reduce future transportation demand and be coordinated with other goals and objectives to

See Land Use Objective 8.3

Common Goal 4: Context Sensitive Design on Major Road Corridors.

The Participating Local Governments will work cooperatively to maintain and enhance regional commercial travel corridors and scenic corridors to promote a positive image of the region, and to protect regional character and quality of life, environmental quality, and aesthetics.

Objective 4.1 Regional Travel Corridors. As provided in the Land Use Goals, the Participating Local Governments will establish coordinated review, administration, and enforcement of development to maintain a strong community aesthetic and function along the following regional travel corridors: US 278, Buckwalter Parkway, Bluffton Parkway, Burnt Church Road, Bluffton Road, William Hilton Parkway, and the Cross Island Parkway.

See Land Use Objective 2.2

Objective 4.2 Regional Scenic Corridors. As provided in the Land Use Goals, the Participating Local Governments will establish coordinated review, administration, and enforcement of development to maintain the views and images of the Lowcountry created along the following regional scenic corridors: SC 46 (May River Highway) and SC 170 (Okatie Highway).

See Land Use Objective 2.3

Objective 4.3 Open Space Network. The Participating Local Governments will adopt standards to protect the network of open spaces, discussed in the Natural Assets and Natural Constraints to Growth Report, including innovative road construction techniques to link wildlife habitat and preserve wetlands.

See Natural Assets Objectives 8.2 and 8.4

APPENDIX 3 - AERIALS

Bluffton Parkway Phase 5A

Location:
Burnt Church Road to US 278 - Mackays Creek

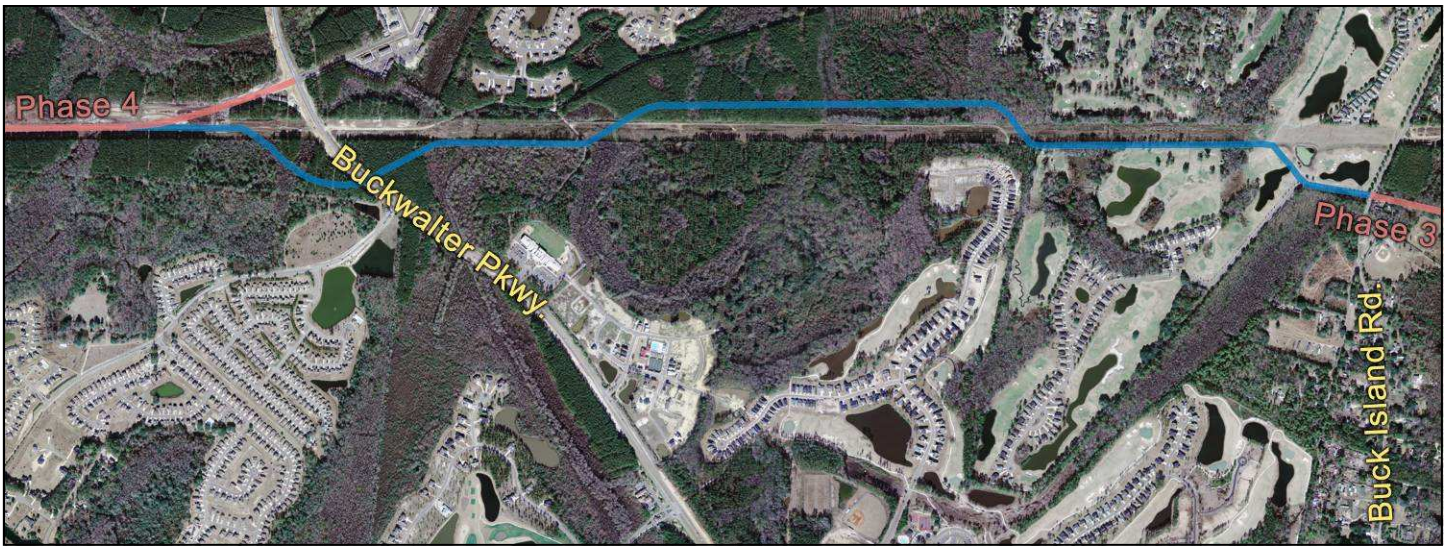
Description:
3 Miles, 4-Lane Divided Road, 8; Multi-use Pathways

Design Consultant:
Florence & Hutcheson, Inc.

Project Status:
- Environmental Document Approved by FHWA on February 22, 2008
- Public Hearing Scheduled for March 18, 2008
- Detailed Roadway Engineering Design by Florence & Hutcheson Commencing in March 2008

Project Funding:

County Roadway Sales Tax	$50,000,000
County Road Impact Fee	$10,000,000
Town and City Funding	$ 400,000
Total	$60,400,000
Expenditures to Date	$ 1,016,707



Bluffton Parkway Phase 5B

Location:
Buckwalter Parkway to Buck Island Road

Description:
2.5 Miles, 4-Lane Divided Road, 8' Multi-use Pathways

Design Consultant:
Florence & Hutcheson, Inc.

Project Status:
- Working in Conjunction with 5A

SC 170 (Okatie Highway) Widening

Location:
SC 46 (May River Road) to Tide Watch Drive (Rivers Bend)

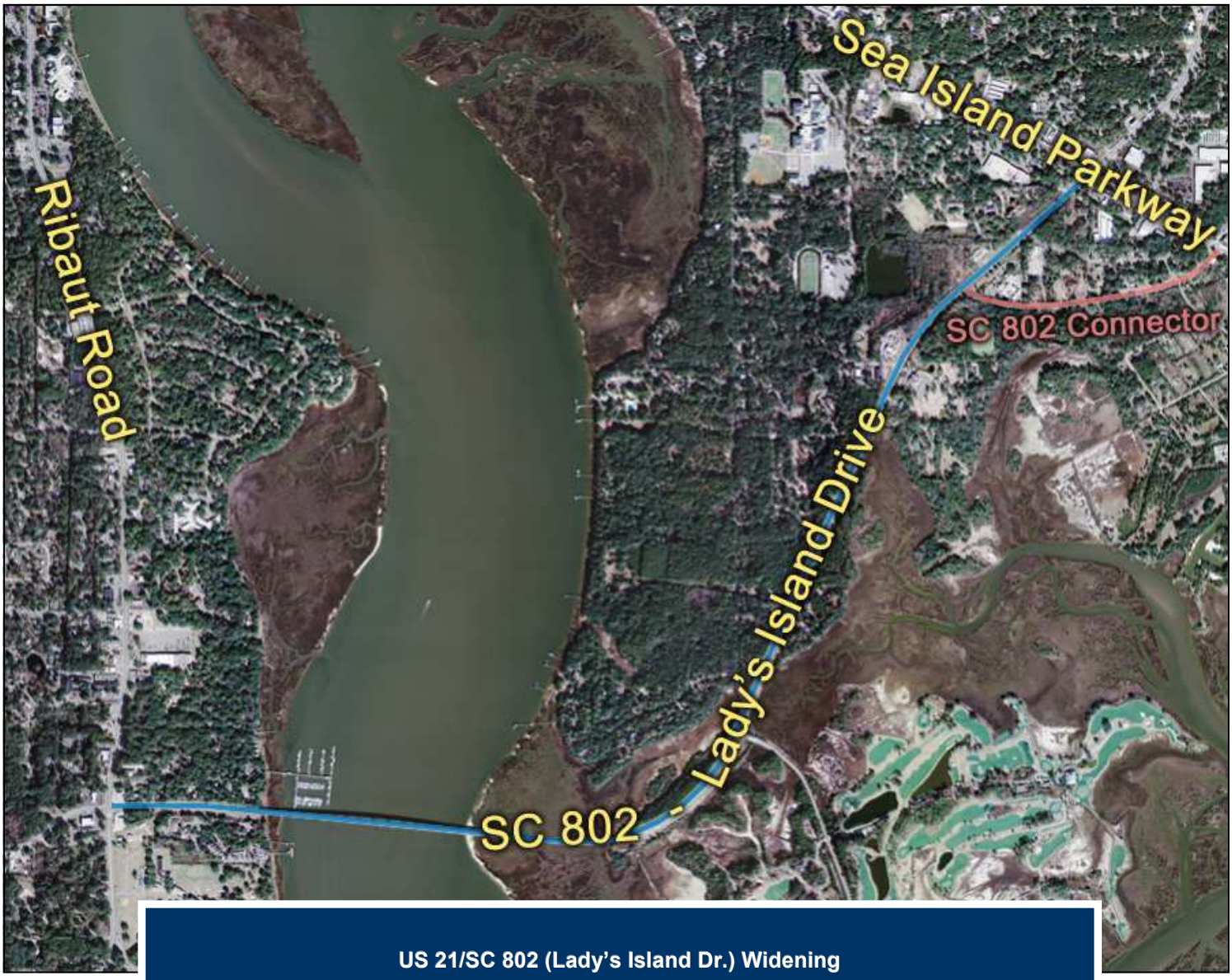
Description:
6 Miles, 4 and 6-Lane Divided Roadway, Context-Sensitive Design Based on Existing Trees, Pathways/Paved Shoulders

Design Consultant:
Thomas & Hutton Engineering Company

Project Status:
- Corridor Survey Complete
- Draft Traffic Report Complete
- Waiting on Decision from SCDOT About Clear Zone Issues to Save Trees
- Potentially Dividing into Three Phases

Project Funding:

County Roadway Sales Tax	$6,000,000
County Road Impact Fee	$20,000,000
Total	$26,000,000
Expenditures to Date	$227,399



US 21/SC 802 (Lady's Island Dr.) Widening

Location:
SC 802 (Ribaut Road) to US 21 (Sea Island Parkway)

Description:
2.8 Miles, 4-Lane Divided Roadway with New Bridge, Sidewalks, Pathways and Bike Lanes

Design Consultant:
Collins Engineers, Inc.

Project Status:
- Right-of-Way Plans being Prepared
- Draft Environmental Assessment (EA) Submitted to FHWA on March 3
- Second Public Meeting was Held January 30, 2008

Project Funding:

County Roadway Sales Tax	$35,500,000
Total	$35,500,000
Expenditures to Date	$1,029,470

SC 802 (Savannah Highway) Project Location

Lowcountry Regional Transit Plan

Draft

Prepared by

URS

and

TranSystems

for the

South Carolina Department of Transportation

February 2008

Table of Contents

South Carolina Department of Transportation
Draft Statewide Multimodal Transportation Plan
Lowcountry Regional Transit Plan

I. Introduction

A goal of the transit element of the overall Statewide Plan was to produce recommendations that are geared toward both "statewide" and "regional" interests. At the regional level, strategies and action items were defined that local planners (including COGs, MPOs, and municipalities) and transit agencies can support and use. These action items vary from region to region, depending on the pertinent concerns and needs in each area. For the purposes of this study, the "regions" are defined as the ten planning regions in South Carolina as defined by COG boundaries. This document is the Lowcountry Regional Transit Plan. A separate overall Statewide Plan and nine other Regional Plan documents that are tied to the overall statewide transit plan examine each of the other regions of the state.

A map showing the location of the Lowcountry Council of Governments, along with the other nine regions, is included as Figure 1.

Figure 1: Location of Lowcountry Region

Source: South Carolina Department of Transportation

II. Regional Transit Needs

Based on the transit demand projections, this section analyzes the strategies to meet the current and future demand, and estimates the costs involved, including operating cost, vehicle expansion and replacement cost, and facility cost.

Operating cost is defined based on transit subsidy, or the cost of operating services less fare box revenue. The vehicle cost is defined in terms of numbers of vehicles purchased and the cost of each purchase. The facility cost is assumed to be related to the number of vehicles an operator has, and whether the operator is an existing one or a newly started one. All cost calculations use year 2005 constant dollars.

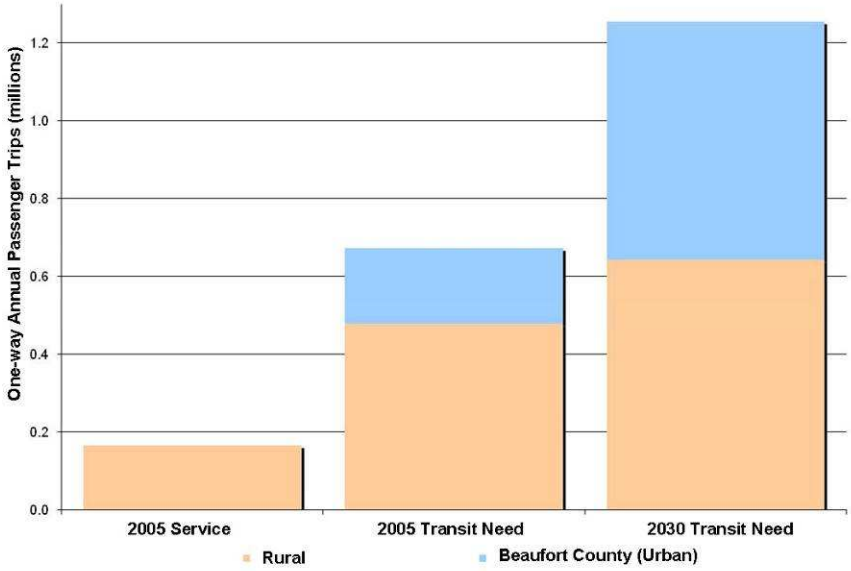
A. Transit Needs in the Region

For the purpose of estimating costs, a targeted level of transit need was required based on the predicted level of demand. Demand was forecasted using three methods: Mobility Gap method, Arkansas Public Transportation Needs Assessment (APTNA) method, and the Adjusted Needs (Per Formula) method. The Adjusted Needs method was selected as the targeted level of demand in cost calculation. This method is selected because it is somewhat in the mid-range of the other two methods and represents a significant increase in transit services in most of the counties compared with existing services. The Adjusted Needs estimate would seem to present an achievable goal in comparison with the much higher, upper limit of the transit demand predicted by the Mobility Gap method.

Based on the Adjusted Needs forecast, the total transit demand in 2005 was estimated at 674,000 one-way person trips. In the same year, 166,316 trips were provided. The average percentage of demand met is 25 percent. To meet the current transit need, 478,000 trips are needed among the existing rural transit systems and 196,000 trips are needed among the existing urban systems. This is shown in Figure 2. The demand forecast shows that by 2030, the estimated transit demand will exceed 1.25 million trips. Among those trips, 644,000 will be demand for the existing rural transit systems and 611,000 will be demand for existing urban transit systems.

Table 1 shows the 2005 estimated and 2030 forecasted transit need for the rural and urban portions of Lowcountry. The existing service is based on data provided by SCDOT for FY 2005. The 2005 and 2030 transit needs are from the Adjusted Needs forecast. The 2005 unmet need is the difference between predicted transit need and the existing service. Using the data in the table, zero percent of Lowcountry's urban needs and 35 percent of Lowcountry's rural needs are being met.

Figure 2: Existing Service & Transit Need (million trips)



Since the demand is forecasted on a county level, the distribution of the demand to each individual transit operator was based on the year 2005 SCDOT data reports. These reports give the information on the counties an operator serves and the current ridership.

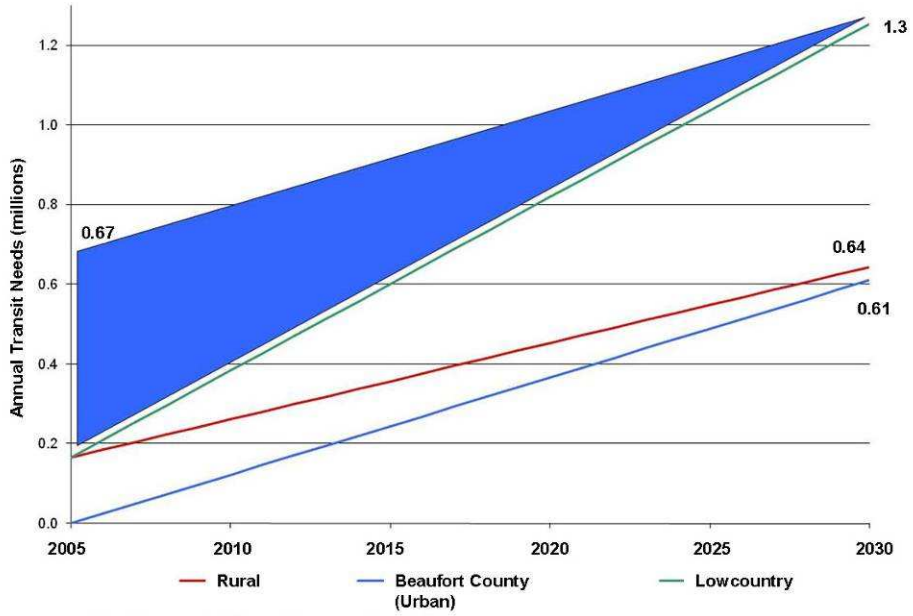
Table 1: 2005 and 2030 Transit Need

	2005 Service	2005 Transit Need	% of Need Met	2030 Transit Need
Beaufort County	59,799	171,957	35%	261,536
Colleton County	52,439	150,794	35%	183,367
Hampton County	26,506	76,218	35%	91,766
Jasper County	27,572	79,286	35%	107,268
Rural	166,316	478,255	35%	643,937
Beaufort County (Urban)	0	195,730	0%	610,763
Total LCCOG	166,316	673,985	25%	1,254,700

(In One-Way Annual Passenger Trips)

To meet the unmet demand, our general assumption is that service will not decrease, even if demand goes down. For counties for which the current predicted demand is higher than the service provided, services gradually increase between years 2005 and 2030 until needs are met, as shown in Figure 8. This is accomplished by a uniform annual increase. To meet the goal, for the existing systems, overall, they should provide an equivalent of 44,000 additional one-way person trips service annually. This is illustrated in Figure 3.

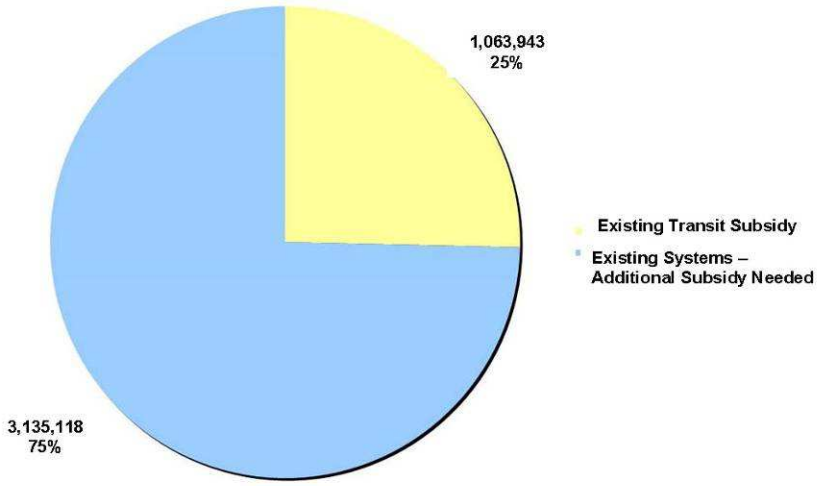
Figure 3: Transit Need and Strategy to Meet: 2005 to 2030



B. Transit Net Operating Costs

For the existing systems, to meet all their demand in 2005, $4.19 million in operating subsidies (operating costs minus fare revenue) are needed. Comparing to the current subsidy of $1.06 million, $3.14 million in additional subsidy is required. This is shown in Figure 4. It must be noted that this only gives the estimation to meet all the demand in 2005. In terms of implementation, not all the subsidy is required in place at the beginning, as discussed later.

Figure 4: Estimate of Subsidy Needed for 2005



In the year 2030, to meet all the demand, the predicted subsidy is $6.3 million ($4.8 million for the existing rural transit systems and $1.5 million for existing urban transit systems).

Table 2 shows the year 2005 estimated and year 2030 forecasted transit subsidy for the rural and urban counties. The existing subsidy is estimated based on the data provided by SCDOT for FY 2005. The 2005 subsidy is based on the predicted transit need, and the unit subsidy per person-trip from the existing subsidy estimation. Similarly, 2030 subsidy is also calculated based on the unit subsidy and the predicted demand at that time.

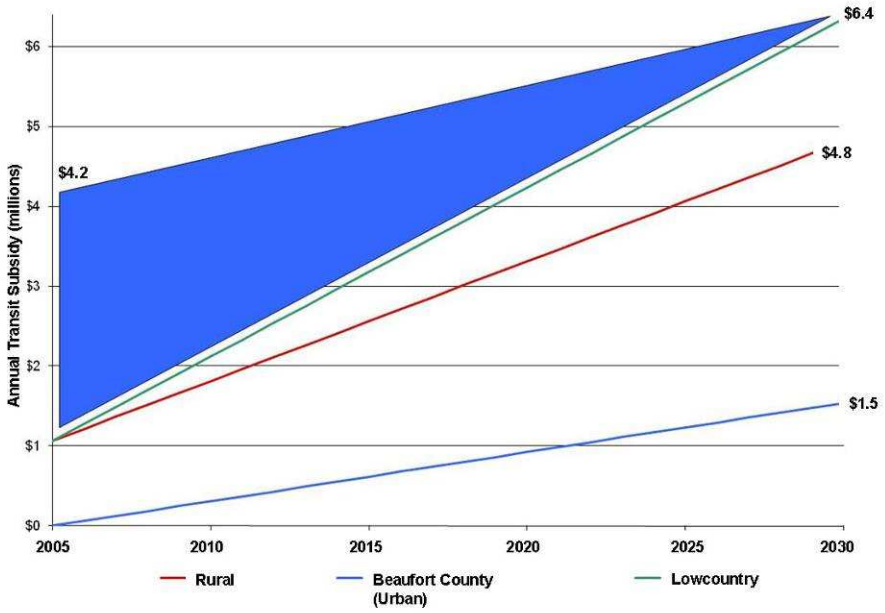
Table 2: Transit Subsidy for 2005 & 2030

	2005 Existing	2005 Need	% of Need Met	2030 Need Subsidy
Beaufort County	$382,542	$1,264,329	30%	$1,866,960
Colleton County	$335,462	$1,157,525	29%	$1,366,563
Hampton County	$169,557	$621,897	27%	$726,953
Jasper County	$176,382	$647,025	27%	$849,883
Total Rural	$1,063,943	$3,690,777	29%	$4,810,359
Beaufort County (Urban)	$0	$508,283	0%	$1,539,868
Total LCCOG	$1,063,943	$4,199,060	25%	$6,350,227

(Subsidy = Operating Cost – Farebox Revenue)

The total $4.19 million in operating subsidy is estimated to meet all the 674,000 one-way trips for 2005, and $6.3 million (in year 2005 dollars) is projected to meet all the 1.25 million one-way trips to meet the expected 2030 transit need. However, as assumed, not all the demand is going to be met at the beginning. The actual subsidy required for 2008 (since 2005 is past, the unmet subsidy is distributed from 2005 through 2030, by a 25-year period) is $1.7 million ($1.5 million for existing rural systems and about $200,000 existing urban systems). Then the subsidy is increased by a uniform rise annually to reach the goal of meeting all the demand in the year 2030. In this case, the annual subsidy increase should be $211,000 ($150,000 for existing rural transit systems and $61,000 for existing urban transit systems). Figure 5 shows how the transit need would be met by increasing subsidy gradually.

Figure 5: Transit Subsidy & Strategy to Meet: 2005 to 2030



C. Capital Needs

This section examines major capital needs including vehicles and facilities.

1. Vehicle Needs

The following data and assumptions are used in vehicle estimation:

- The existing number of vehicles is based on data provided by SCDOT (FY 2005).
- Total vehicle requirement: based on transit demand forecast and vehicle production.
- A vehicle is added for every 15,300 new riders per year, which is based on the following assumptions:
  - Vehicle utilization is 5 riders per vehicle hour.[1]
  - Each vehicle operates 12 hours per day for 255 days per year.[2]
- Vehicles need to be replaced after 5-12 years in service.
- Between 2005 and 2030, the vehicle fleet size is increased as the level of transit service is increased. The fleet size is expanded at a rate that corresponds with the uniform annual demand increase according to the strategy to meet all the demand gradually from 2005 to 2030. This assumes that there will be no fleet size decrease over the 25 year period.

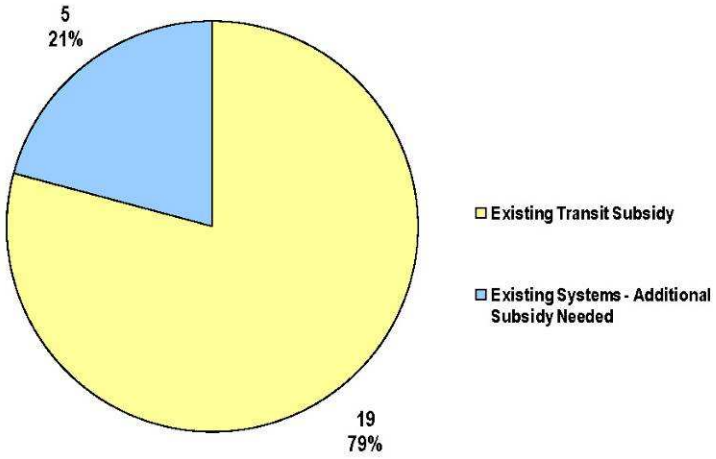
[1] Consistent with existing Section 5311 operations
[2] 3,060 vehicle hours annually

- The cost of each new vehicle purchase is assumed to be $275,000 for Fixed Route vehicles, $60,000 for Demand Response vehicles and $30,000 for Human Resource vehicles and remain constant from 2005 to 2030.

Based on these assumptions, the overall vehicle needs for each year, the vehicles needed to be purchased and replaced, and the related costs were calculated and summarized as follows:

Currently, the existing service providers have 19 vehicles (all rural) in total. To meet all the predicted demand in 2008, about 24 vehicles will be needed. Since the strategy is not to meet all the demand at once, the actual vehicles required in 2008 will be about 24 vehicles (21 for existing rural systems and 3 for existing urban systems). This equates to the number of vehicles needed to meet the level of 2008 need. The following Figure 6 shows the vehicle needs for 2008.

Figure 6: Vehicle Needs for 2008



The vehicles required to meet all the predicted need in 2030 will be 60 (48 for existing rural systems and 12 for existing urban systems). Table 3 shows the vehicles needs to meet the predicted 2030 transit demand, and the vehicles needed in 2008.

Table 3: Vehicle Needs for 2008 & 2030

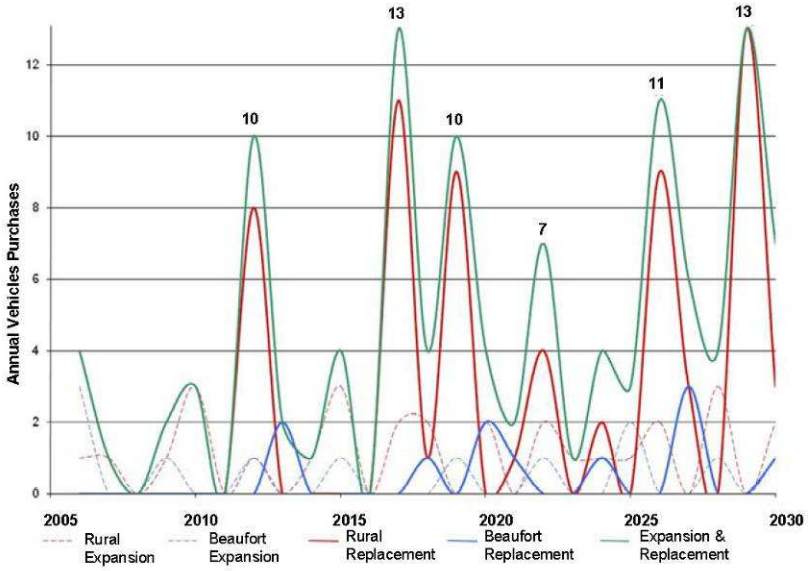
	2005 Existing	Needed in 2008	% of Need Met	Needed in 2030
Beaufort County	6	7	86%	19
Colleton County	5	6	83%	14
Hampton County	4	4	100%	7
Jasper County	4	4	100%	8
Total Rural	19	21	90%	48
Beaufort County (Urban)	0	3	0%	12
Total LCCOG	19	24	79%	60

From 2005 to 2030, 41 vehicles should be purchased for fleet expansion, while 75 vehicles should be purchased for fleet replacement. This adds up to the total purchase of 116 vehicles. The purchases and related costs are shown in Table 4.

Table 4: Vehicle Needs & Cost Over 25 Years

Units	Fleet Expansion Vehicles	Fleet Replacement Vehicles	Total Purchased Vehicles	Total Cost Millions of Dollars
Beaufort County	13	22	35	$6,895,000
Colleton County	9	18	27	$5,370,000
Hampton County	3	12	15	$2,745,000
Jasper County	4	12	16	$3,020,000
Total Rural	29	64	93	$18,030,000
Beaufort County (Urban)	12	11	23	$4,025,000
Total LCCOG	41	75	116	$22,055,000

Figure 7 shows the vehicle capital expenditures between 2005 and 2030.



2. *Facility Needs*

This analysis assumes that facility expansion or construction will be needed between 2005 and 2030 for existing and newly started transit systems. The amount of facility expansion or construction is assumed to be proportional to the number of vehicles required by each system. The capital costs for facility expansion and construction were categorized as having different level of cost requirements. Expansion is for the existing systems while construction is for the new systems. An exception is that an existing system expanding by 41 or more vehicles would be calculated at the construction cost. Table 5 gives the approximate cost based on the above assumptions:

Table 5: Facility Needs Assumptions Based Upon Fleet Size

Fleet Size	Expansion System	New Systems
0	$0	$0
1-10	$875,000	$1,750,000
11-40	$1,500,000	$3,000,000
41-80	$2,750,000	$5,500,000
81-160	$4,625,000	$9,250,000
161-320	$8,375,000	$16,750,000
Over 321	$15,875,000	$31,750,000

Facility costs are assumed at about $280 a square foot for new construction. This assumes masonry or similar construction material and includes design fees, contingencies, project management as well as an allowance for land purchase at about $44,000 an acre. A cost of about $42 a square foot for expansion has been assumed and includes space for parking and fueling vehicles. No expansion of maintenance bays are assumed except in the expansion of a fleet by 41 or more vehicles.

Table 6 summarizes the total vehicle costs and facility costs.

Table 6: Vehicle & Facility Capital Costs: 2005 to 2030

	Vehicle Purchases	Vehicle Cost	Facility Cost	Total Cost
Beaufort County	35	$6.9	$5.8	$12.6
Colleton County	27	$5.4	$1.5	$6.9
Hampton County	15	$2.7	$1.5	$4.2
Jasper County	16	$3.0	$1.5	$4.5
Total Rural	93	$18.0	$10.3	$28.3
Beaufort County (Urban)	23	$4.0	$1.8	$5.8
Total LCCOG	116	$22.1	$12.0	$34.1

(in millions)

D. Total Capital and Operating Costs

The total capital and operating costs is summarized below in Table 7.

Table 7: Total Capital & Operating Costs: 2005 to 2030

	Vehicle Purchases	Vehicle Cost	Facility Cost	Total Cost
Beaufort County	35	$6.9	$5.8	$12.6
Colleton County	27	$5.4	$1.5	$6.9
Hampton County	15	$2.7	$1.5	$4.2
Jasper County	16	$3.0	$1.5	$4.5
Total Rural	93	$18.0	$10.3	$28.3
Beaufort County (Urban)	23	$4.0	$1.8	$5.8
Total LCCOG	116	$22.1	$12.0	$34.1

(in millions)

Lowcountry Council of Governments is projected to have costs of up to 130.4 million dollars over the next 25 years. About 74 percent of this cost is attributed to operating costs, while about 17 percent of the costs are projected to come from vehicle costs and about 9 percent from facility costs.

E. Intercity / Interregional Transit Needs

For residents and visitors who have limited travel options, intercity bus will continue to provide an important mobility service. However, for intercity bus service to have an increased role in transportation in South Carolina, the service must be provided in a way to attract more people who could otherwise fly or drive. It is difficult for intercity bus to be time-competitive with air travel or driving directly between an origin and a destination, but budget-conscious travelers may be more receptive to bus service if it is provided at a deeply-discounted fare. The "no frills" business model being used by Megabus.com and other similar providers is attempting to use low fares to attract customers who would otherwise fly or drive, but the long-term sustainability of this operation remains unproven.

As part of the focus group sessions conducted for this planning process, several community leaders and members of the general public made comments regarding the need for more public transportation options between cities or across state lines. Although the need for improved intercity transportation was recognized in the focus group sessions, there was a greater emphasis on local and regional (commute-oriented) transit needs. The same thought process was also reflected in the stakeholder interviews with regional planners and transit officials, in which most of the comments received addressed regional transit needs as opposed to intercity concerns.

Intercity rail transportation, particularly high speed rail service, has a greater potential than intercity bus to significantly impact how South Carolina residents and visitors travel between cities in the future, due to the reduced travel times, level of comfort, and direct service. Several attempts have been made in the State to use intercity bus service to connect residents to Amtrak service (such as the former Amtrak "Thruway" bus connection between Florence and Columbia that was operated by the Pee Dee Regional Transportation Authority). Although this type of service was previously unsuccessful due largely to the unreliability of Amtrak, using intercity bus service to connect patrons to high speed rail service could serve to extend the reach of the high speed rail corridor. This type of connection should be considered in future high speed rail planning. This could be a very successful service model to connect the Hilton Head and Beaufort areas to high speed rail along the I-95 corridor.

Several public transit agencies in the State offer what can be described as "intercity bus service", designed to connect inland communities to employment opportunities in coastal resort areas like Hilton Head (with trips traveling distances of 50-100 miles or more one-way). Because these trips are daily, commute-oriented trips, they are not specifically included in this "intercity bus" assessment. However, this travel pattern reflects one of the unique transit issues in South Carolina, and considering the rapid growth rate of coastal areas along with high unemployment rates in inland counties, this long-distance transit connection will likely grow in importance over the coming years. Therefore, providing enhancements in these long-distance commuter connections is identified as a focus area for intercity-type travel.

The State of South Carolina currently provides no subsidies for intercity bus service, but these needs should be considered in the future, especially if additional service cuts are made to current operations. If necessary, state investment in intercity bus service should be considered to maintain key connections across the State. Current State funding sources are used by public transit agencies to support the intercity commute-oriented services to jobs along the coast, but additional support for these services may be needed in the future. Additionally, as high speed rail services are developed, the State should examine its role in not only the rail operation, but any connecting bus service as well.

F. Intercity High Speed and Passenger Rail Assessment

Although there is not, as yet, a funded national program for the actual construction of high speed rail passenger corridors, the United States Department of Transportation (USDOT) has designated a network of corridors for the development of high speed rail service in this country. These corridors are generally focused on regional trips that could be competitive with commercial air service from a schedule standpoint. To date, only small amounts of Federal funding have been provided, adequate only for studies. South Carolina is a

member of the Southeast High Speed Rail Coalition, along with its neighbors, North Carolina, Georgia, Florida and Virginia. Two corridors that pass through South Carolina have been adopted as part of the Southeast High Speed Rail Coalition plan. These corridors were added to the Southeast Corridor network designated by the USDOT as future high speed rail passenger routes on December 1, 1998.

Connecting services from major activity centers to a HSR Station along I-95 possibly near Savannah via rail or bus would be very important for access to and from the Lowcountry Region.

III. Critical Corridors

In addition to the needs-based assessment of transit demand, potential for commuter-based transit and other services designed to attract choice riders was also analyzed across the State. Developed in conjunction with the development of the Strategic Corridor System, there were two corridors in the Lowcountry Region identified has having transit supportive characteristics. The purpose of this section is to evaluate potential transit technologies for consideration in the South Carolina Multimodal Transportation Plan, and to identify those that may be most suitable for potential transit applications. A map of these corridors is depicted in Figure 8 at the end of the section.

A. Potential Transit Technologies

Five transit technologies were identified for evaluation as potential corridor application options. The technologies analyzed include:

1. Local Bus;
2. Express Bus;
3. Enhanced Bus / Intelligent Transportation Systems (ITS);
4. Bus Rapid Transit (BRT); and
5. Commuter Rail

1. Local Bus

Local bus service represents the most common and most flexible type of public transportation and is commonly referred to as fixed route as service operates along a defined route and on a pre determined schedule. Service can be provided with vans, small buses, traditional transit buses including low floor configuration, or articulated buses. Stops are typically as placed as frequent as every one to two blocks, or every one-eighth mile. When operated within a smaller area, local service may be called circulator, feeder, neighborhood, trolley, or shuttle service. Complementary paratransit service for eligible persons with disabilities who cannot access or use the local service must be provided as required under the Americans with Disabilities Act of 1990.

2. *Express Bus*

Express bus service provides direct point-to-point service over longer service routes utilizing high-occupancy vehicles. Buses are usually equipped with high-back seats, reading lamps, and other passenger amenities. Service typically operates between central business districts and suburban areas, primarily on weekdays, and during peak hours, however limited midday trips are not uncommon. Suburban terminals may include customer parking and covered waiting areas.

3. *Enhanced Bus/ITS*

Enhanced bus service uses low-floor, low or zero-emission buses with Intelligent Transportation Systems technology such as traffic signal priority and coordination along the entire alignment and on board customer information displays. Enhanced bus service typically operates in mixed-flow traffic along major arterial streets except in congested segments where peak period transit lanes or "queue jump" lanes may be provided. Queue jump lanes allow buses to bypass traffic queues at major intersections and advance more quickly through traffic signals. Bus pull off areas and bus stop passenger amenities may also be included.

4. *Bus Rapid Transit (BRT)*

Bus Rapid Transit uses a number of features to reduce delays and improve customer convenience. BRT systems typically use dedicated busways or bus lanes, although they can also operate in HOV lanes, dedicated guideway facilities, or in mixed traffic on arterial streets with various ITS applications including traffic signal priority. Other features can include improved passenger waiting areas, high-capacity/low-floor buses; fare collection prior to boarding; and advanced customer information systems. BRT systems can improve passenger convenience by using the same vehicle for the collection/distribution portion of the trip and for the faster line-haul portion of the trip; reducing the number of required transfers is a major advantage of BRT systems.

Busways which provide a high level of service and allow high hourly passenger capacities are typically grade separated from cross streets, and have on- line stations with spacing comparable to light rail. Low volume busways often are characterized by at-grade intersections with cross streets. Buses may operate non-stop along the busway/bus lanes or make selected stops based on passenger demand. Buses may also exit the specially designated busway and operate along streets to provide local area circulation and distribution. BRT is considered a viable option for upgrading bus service performance.

5. Commuter Rail

Commuter rail is a mode of passenger transportation using vehicles with steel wheels on steel rails using tracks that are part of a general rail network. The name "commuter rail" covers a multitude of rail system elements to carry passengers. Service typically operates between a central city terminal and outlying suburbs and trains can be diesel powered or use electric-powered rail cars. Commuter rail services may share track with railroad freight trains, or have separate tracks. Some commuter lines are primarily used for peak hour work trips while others have extended off-peak and weekend services. Commuter trains can vary in length from one car to 14, but are generally limited to the length of the platforms at the stations. Some systems use locomotives for power and others have self-propelled cars.

B. Corridor Evaluation Criteria

1. Technology Compatible with Existing Development

Scoring Method:

Appropriate: +1

Somewhat Appropriate: 0

Not Appropriate: -1

The corridors being considered for transit options vary widely in regards to existing development and adjacent land uses. The transit technologies described above can be strategically employed to alleviate congestion, provide mobility options, and/or enhance existing roadway capacities. The attributes of the transit technology should be consistent with the existing characteristics of the corridor. This criterion is qualitative and ratings were determined by assigning the most reasonable score based on existing development characteristics and staff knowledge of the area.

2. Technology Compatible with Level of Service Needs

This criterion examines the future level of service needs for the corridor. The 2030 Average Daily Traffic (ADT) figures were utilized by assuming a ten percent transit mode split. Lower ADT scores in a corridor were assumed to indicate the need for lower capacity transit options, such as local bus, and higher scores indicating the need for higher capacity options, such as BRT or commuter rail. Note: Along highways with multiple segments, the highest ADT along that roadway was used.

Scoring Method:	
ADT less than 2000 then Local Bus Assigned Score: 1	*Other Modes: -1*
ADT 2000-5000 then Local, Enhanced & Express Bus Assigned Score: 1	*Other Modes: -1*
ADT greater than 5000 then BRT & Commuter Rail Assigned Score: 1	*Other Modes: -1*

3. Technology Compatible with Roadway Improvement Plans

This criterion evaluates the technology as compared against the Statewide Multimodal Transportation Plan. The technologies were assessed for various roadway improvement categories including capacity, Intelligent Transportation Systems (ITS), operations (e.g. signal timing), and access management. If the roadway type improvement has potential for promoting the technology, then the technology was considered compatible and assigned a rating of +1. It is important to note that the proposed roadway improvements were not considered to have potential to promote commuter rail. For this reason, commuter rail was assigned a score of 0 to represent its lack of compatibility to this criterion.

Scoring Method	Roadway Improvement			
Technology	Capacity	ITS	Operations	Access Mgmt.
Local Bus	1	1	1	1
Express Bus	1	0	0	1
Enhanced Bus	0	1	1	0
BRT	1	0	0	0
Commuter Rail	0 or 1	0	0	0

4. Railroad Right-of Way Adjacent to the Corridor

This criterion considers the advantage of existing exclusive rail right of way for Commuter Rail. For the technologies other than Commuter Rail, the score is 0.

Scoring Method:
Available or Planned: +1
Available or planned along a Portion of the Corridor: 0
Not Available: -1

5. Technology Compatible with Existing Plans

It is important for the candidate transit technology to be compatible with the existing local, regional, and statewide plans. For this criterion, the Long Range Transportation Plan was utilized, as well as mode specific plans from relevant transit authorities and Metropolitan Planning Organizations (MPOs).

Scoring Method:
Compatible: +1
Somewhat Compatible: 0
Not Compatible: -1

6. Roadway Parallel to the Corridor

This criterion considers the advantage of existing/ planned roadways parallel to the corridor.

Scoring Method:

Available or planned roadway/HOV: +1

Available or planned along a Portion of the Corridor: 0

Not Available or Planned: -1

C. Lowcountry Region Corridors

The Lowcountry Region contains no Critical Corridor segments based on current and projected traffic congestion levels.

Other Potential Transit Corridors

Not all corridors have either current or projected issues with critical traffic congestion. However, many of these corridors, can benefit from future enhancements to coordinated public transportation, and/or new transit services. The methodology detailed in the preceding section is applied to an additional set of segments located within the Atlantic Coast corridor. Among non-critical corridors, these were identified to pose the greatest potential for transit.

Charleston-Beaufort-Savannah

Corridor(s): Atlantic Coast

Region(s): Berkeley-Charleston-Dorchester, Lowcountry

Berkeley - Charleston - Dorchester, Low Country
Atlantic Coast
From Charleston to Beaufort to Savannah

Guideline	LOCAL BUS	EXPRESS BUS	ENHANCED BUS/ITS	BUS RAPID TRANSIT	COMMUTER RAIL
Technology compatible with existing development	Compatible	Compatible	Somewhat Compatible	Incompatible	Incompatible
Rating	*1*	*1*	*0*	*-1*	*-1*
Technology compatible Level of Service needs	Incompatible	Incompatible	Incompatible	Compatible	Compatible
Rating	*-1*	*-1*	*-1*	*1*	*1*
Technology compatible with roadway improvements	Compatible	Compatible	Compatible	Compatible	Somewhat Compatible
Rating	*1*	*1*	*1*	*1*	*0*
Railroad right of way adjacent to the corridor	Partially Adjacent	Partially Adjacent	Partially Adjacent	Partially Adjacent	Partially Adjacent
Rating	*0*	*0*	*0*	*0*	*0*
Technology compatible with existing plans	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible
Rating	*0*	*0*	*0*	*0*	*0*
Parallel roadway/facility	Partially	Not Present	Not Present	Partially	Partially
Rating	*0*	*-1*	*-1*	*0*	*0*
Overall Rating	***1***	***0***	***-1***	***1***	***0***
Carry Forward?	***Yes***	***No***	***No***	***Yes***	***No***

Rating scale:
Desirable/Positive Rating = +1
Neutral Rating = 0
Negative Rating/Less Desirable = -1

Local bus and Bus Rapid Transit (BRT) services performed highest among evaluated modes. From the South Carolina-Georgia state line, the area along this extensive sub-corridor is predominantly rural, as the alignment leads east into the suburban West Ashley community in the Charleston urbanized area. Rural fixed-route and demand-responsive services are provided by the Lowcountry Regional Transportation Authority (LRTA) on the western end of the sub-corridor. Fixed-route and demand-responsive transportation services on the eastern end are provided by the Berkeley-Charleston-Dorchester Rural Transportation Management Association (BCDRTMA, operating as Tri-County Link). Roadway improvements recommended in the Statewide Multimodal Transportation Plan include a range of capacity and operational enhancement and access management strategies, including access controls, grade separation, intersection improvements, and bicycle/pedestrian facility extensions.

Concentrated growth patterns and dedicated right-of-way may improve the future feasibility for BRT services, if such right-of-way can be integrated with capacity improvement projects in the Charleston area. Equipping buses with bicycle racks, or providing bicycle parking/storage facilities close to bus stops, can support connections for bicycle riders along the East Coast Greenway, including the West Ashley Greenway in Charleston County. Long-term considerations can also include a bi-state coordinated BRT or express bus operation between Savannah and Hilton Head Island. Dedicated right-of-way for BRT is likely to be limited by capacity constraints east of SC 170.

Hardeeville-Hilton Head Island
Corridor(s): Atlantic Coast (Connector Segment C-1)
Region(s): Lowcountry

Low Country
Atlantic Coast Corridor
Hardeeville to Hilton Head

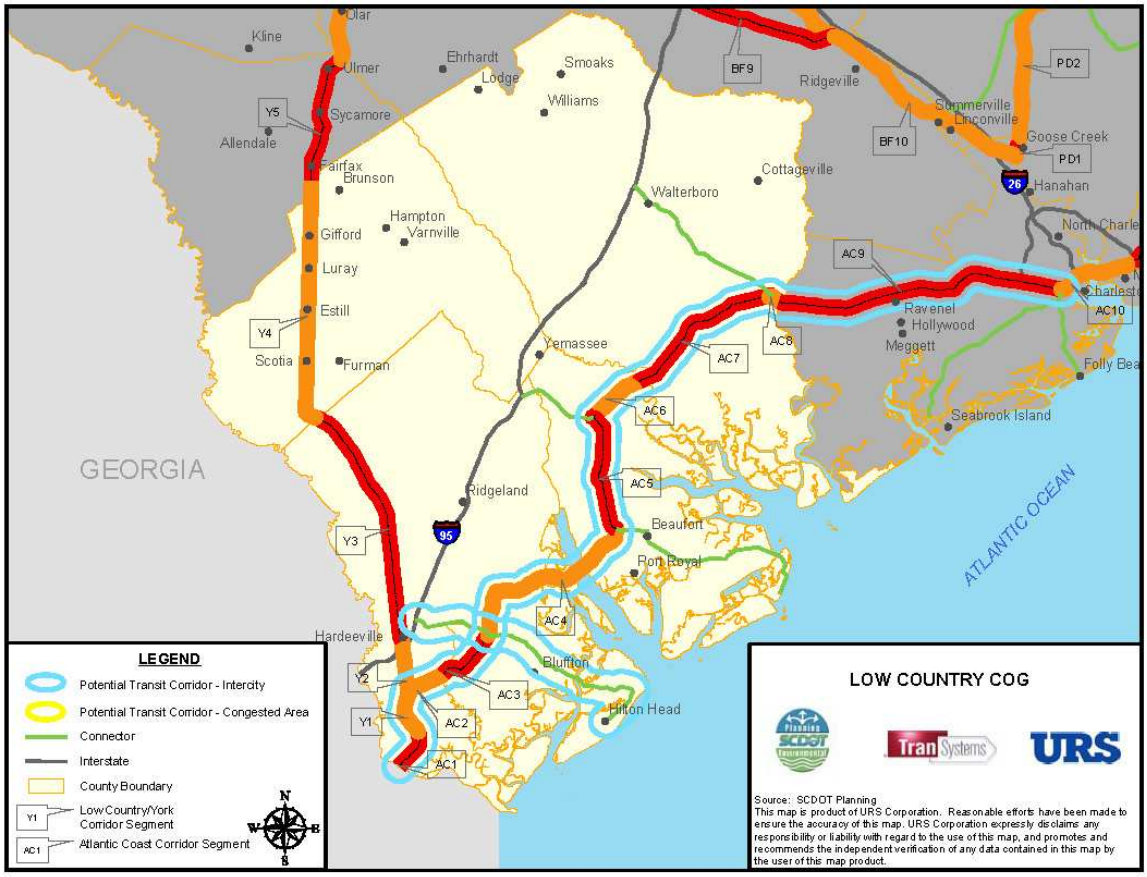
Guideline	LOCAL BUS	EXPRESS BUS	ENHANCED BUS/ITS	BUS RAPID TRANSIT	COMMUTER RAIL
Technology compatible with existing development	Compatible	Compatible	Compatible	Incompatible	Incompatible
Rating	*1*	*1*	*1*	*-1*	*-1*
Technology compatible Level of Service needs	Compatible	Compatible	Compatible	Incompatible	Incompatible
Rating	*1*	*1*	*1*	*-1*	*-1*
Technology compatible with roadway improvements	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible
Rating	*0*	*0*	*0*	*0*	*0*
Railroad right of way adjacent to the corridor	Partially Adjacent	Partially Adjacent	Partially Adjacent	Partially Adjacent	Not Adjacent
Rating	*0*	*0*	*0*	*0*	*-1*
Technology compatible with existing plans	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible	Somewhat Compatible
Rating	*0*	*0*	*0*	*0*	*0*
Parallel roadway/facility	Partially	Not Present	Not Present	Partially	Partially
Rating	*0*	*-1*	*-1*	*0*	*0*
Overall Rating	***2***	***1***	***1***	***-2***	***-3***
Carry Forward?	***Yes***	***Yes***	***Yes***	***No***	***No***

Rating scale: *Desirable/Positive Rating = +1*
Neutral Rating = 0
Negative Rating/Less Desirable = -1

Local bus performed highest among evaluated modes, followed by express bus service and enhanced bus service featuring ITS technology. Development along this corridor is rural west of Bluffton, but the tourist orientation of Hilton Head Island is creating swiftly developing patterns of low-density commercial and resort-residential activity. The Lowcountry Regional Transportation Authority (LRTA) currently operates a rural fixed-route service between Hardeeville and Hilton Head Island via Bluffton.

Potential transit opportunities include expanded LRTA service hours and frequencies along this sub-corridor. Long-term considerations can also include a bi-state coordinated Bus Rapid Transit (BRT) or express bus service between Savannah and Hilton Head Island. Dedicated right-of-way for BRT is likely to be limited by capacity constraints east of SC 170. Figure 8 presents potential transit opportunities within the Lowcountry COG.

Figure 8: Potential Transit Opportunities



IV. Transit Funding Needs

A. Lowcountry Region Discussion

Along with the assessment of current and future transit needs, the other major component of illustrating future conditions is the identification of funding needs to support operating and capital expenses. Given a multitude a city and county governments to appease annually for funding support, a stable regional revenue source could help LRTA avert service impacts due to annual fluctuations in municipal allocations. Transit continues to become an increasingly viable mobility option as population and employment grows in Lowcountry. Higher funding commitment levels from municipal governments in this region may be necessary to support mobility needs both internally, similar to the service initiative on US 278, as well as connections to major commuter sheds outside of the Region, such as Charleston and the Savannah area.

According to the needs analysis, the region will require over $6 million in annual operating costs, which constitutes an increase six times the amount of funding being generated today.

The Hilton Head and Beaufort areas of the Lowcountry Region are in close geographic proximity to the Savannah, Georgia urbanized area. Under current FTA policy, most operating expenses accrued in Savannah and other urbanized areas above 200,000 population are ineligible for federal assistance. If the urbanized area expands across the state line in conjunction with the growth of this part of the Lowcountry Region, the difference in federal funding rules for larger areas will create greater pressure on city and county governments to generate enough revenue to cover transit operating expenses.

The focus groups of community leaders and residents in this region similarly agreed that some measures of private investment should be contributed to transit, either though voluntary corporate investment, or through a combination of business license fees or development impact fees. Non-compulsory private-sector investments can contribute to high-profile capital needs and short-term promotional programs to enhance corporate-public relations. Legal impediments imposed by the development community may delay the local enactment of impact fee programs. Impact fee revenues would be tied to the pace of development at the various municipal levels. As economic development impacts the entire region, business license fee programs should be evaluated through a regional or closely coordinated multi-county approach.

Both focus groups also suggested user fees as a preferable funding mechanism. While user contributions fully supporting any public service are ideal, excessive reliance on this source for transit can result in increased fares, reduced ridership and severe cuts in service, and hampers the ability of the system to expand. As

the benefits of transit extend beyond the mobility improvements of its users, alternative and reliable funding sources must supplement user revenue.

Gasoline taxes were the most highly cited funding mechanism among the focus group of community leaders. Opportunities can be pursued to generate revenues from gasoline taxes, applying either a unified regional approach or closely coordinated endeavors among the county governments. Legislative action is required before gasoline taxation alternatives are considered below the state level. Any motor fuel tax options at the local, regional, state and federal levels should be indexed to inflation to maximize revenue.

Lottery proceeds were the most highly cited funding mechanism among the focus group of residents. Statewide, public sentiment and political concerns may hinder the pursuit of funding from state lottery revenues that currently support public education.

B. Potential New Funding Sources

To fully address transit needs in the state, new revenue sources will need to be tapped. Potential new funding sources could come from a variety of levels, including federal, state, and local governments, transit users, and private industry contributors. Based on the level of transit need in the state, a combination of sources will be needed to make significant enhancements in the level of service that is available. In many communities, transit has been regarded as a service funded largely from federal grants, state contributions, and passenger fares. However, with the strains on the federal budget and restrictions on use of funds, coupled with a lack of growth in state funding, communities are recognizing that a significant local funding commitment is needed not only to provide the required match to draw down the available federal monies, but also to support operating costs that are not eligible to be funded through other sources.

Historically, local governmental funding in South Carolina has been allocated on a year-to-year basis, subject to the government's overall fiscal health and the priorities of the elected officials at the time. Local funding appropriated to a transit system can vary significantly from year to year, making it difficult for systems to plan for the future and initiate new services. To reduce this volatility, systems have been pushing for local dedicated funding sources that produce consistent revenues from year to year. For example, Charleston County has a dedicated half-cent transportation sales tax, a portion of which is allocated to the Charleston Area Regional Transportation Authority (CARTA) and the Berkeley-Charleston-Dorchester Rural Transportation Management Association (BCDRTMA). Richland County has implemented an increased vehicle registration fee, with the proceeds of the increase supporting the Central Midlands Regional Transit Authority (CMRTA) system until its availability expires in 2008.

For both local leaders and residents, there appears to be a growing realization that transit funding should come from all levels of government, in addition to transit users and other sources. As part of the input gathered through the focus group process, participants were asked if they would be willing to have local taxes used to fund public transportation services. Of the community leaders that were surveyed, 89% indicated that they would be willing to have local taxes used for public transportation; likewise, 80% of the residents who participated in the focus groups stated that they would be willing to have their local taxes used to fund public transportation.

C. Possible Funding Mechanisms

Participants in the focus groups were asked to brainstorm a list of possible funding sources for new or expanded public transit services in South Carolina. The list generated by the participants includes potential sources from all levels of government, as well as user fees and private contributions. The complete list as identified by focus group participants is as follows:

- Advertisement
- Alcohol tax
- Bonds
- Business license
- Business tax
- Cigarette tax
- County funds
- City funds
- Corporate investment
- Dedicated state fuel tax
- Employer tax
- Energy tax
- Environmental credits
- Federal government
- Fee option over parking spaces
- Gambling/Lottery
- Gas tax
- Grants
- Hospitality tax
- Impact fees
- Local sales tax
- Lottery/gambling
- Medicare tax
- New dedicated tax
- Non-profit donations
- Parking fee in urban areas
- Private contributions
- Property tax
- Reallocation of DOT funds
- Rental car tax
- Sales tax
- State infrastructure bank
- Tax incentives to industrial parks
- Tax on beneficiaries
- Tire/oil tax
- Tobacco tax
- Tolls
- Traffic fines
- Trailer tax
- Unemployment tax
- Use current dollars better
- User fees
- Vehicle registration fees
- Vehicle sales tax

A number of these potential revenue sources are already used by various states for transit funding. Major sources of state-level transit funding include the following:

- Vehicle license/registration fees*;
- Motor fuels tax*;
- General fund monies*;
- Sales tax on vehicle sales**;
- Bond funds**;
- Retail tax (CA, IN, MA, NY, PA);
- Rental car tax (AR, FL, PA);
- Interest income (CT, NV, WY);
- Corporate taxes (MD, NY);
- Casino revenues (NJ);
- Cigarette tax (OR);
- Lottery funds (PA);
- Oil company tax (CT); and
- Bridge tolls (DE).

*Many States
**Several States

As illustrated by this list, states are using a variety of different sources of revenue for transit purposes, and many states use a combination of multiple sources. Conversely, South Carolina currently uses only one revenue source (proceeds from the state motor fuels tax). This list is not intended to imply that all of these potential sources may be appropriate in South Carolina; however, this list does indicate the breadth of transit funding streams that are being used at the state level.

V. Action Plans

Transit in South Carolina, in its current form, generates numerous benefits for its residents and visitors as well as to its economic health and quality of life. Transportation providers in the State form a comprehensive system despite weak funding streams and non-conducive land use patterns. It is not without its gaps and issues, but public transportation in South Carolina is comprised of a comprehensive network of rural services, human service transportation programs and several urban systems that could be poised for growth. The information and analysis within this Plan indicates, however, that there is considerable unmet demand in the State, given the prospect of continual growth in population, especially in transit dependent sectors of the population. There is also a need for more connectivity, opportunities for improved efficiencies, greater emphasis on commuter transportation and a substantial need for increases in the overall funding for transit.

The Lowcountry Region represents a cross-section of the rural networks, human service transportation programs and commuter service primarily toward the coastal areas. However, LRTA has done an outstanding job over the years of expanding their services through careful planning, coordination among agencies and an incremental approach. The transit landscape in the Region could change significantly depending on changes in economic development and the potential for growth in the Region. For this reason, many of the action items included in the statewide plan apply to the Lowcountry Region.

A. Close the Gap between Funding Needs and Available Funding Levels

Two significant findings in the Statewide Transit Plan are the gap of about $60 million between the current level of transit service and estimated annual transit needs in the State, and the shortfall in revenue exceeding $1 billion over the course of the Plan (2007-2030). These are substantial investment shortfalls in transit and require a broad spectrum of strategies to increase the level of funding from existing sources and identifying new sources so that more of the needs are met. These strategies need to be aggressive, offer transit providers flexibility and should be sustainable in order to facilitate bonding capacity and other long range financing techniques.

Multi-jurisdictional transit providers such as LRTA face an uphill battle every year as they propose funding levels through the various county and municipal budgeting processes. The pressure on closing the gap between available services and potential demand will fall squarely on the ability of agencies like LRTA to obtain a sustainable funding stream whether through a tax or simply more support from local governments.

1. Improve Efforts to Leverage Federal Dollars

First and foremost, greater financial participation at both the State and local government level is critical to the success of transit as a mobility solution. South Carolina ranks a distant fourth among Southeastern States (VA, NC, TN, GA, MS, AL) in terms of state

contribution per capita for transit service and only Charleston has a semi-permanent local funding mechanism directly targeting transit improvements. Many of the transit systems in South Carolina struggle on an annual basis to generate the matching funds for federal formula dollars. There has been little instance of returning federal formula dollars back to FTA, however, so systems are generally achieving the required matching requirements in spite of their struggles. But it raises the question of how many federal *discretionary* dollars could the State have collected if more flexibility and capacity to match federal funds were afforded the State's transit systems.

The number of discretionary programs actually declined after SAFETEA-LU but FTA and other US DOT programs are available to fund transit initiatives and require 20-50% non-federal match. SAFETEA-LU has also included new provisions under Section 5310, 5316 and 5317 which allow the use of non-FTA federal dollars to match funds under these programs. These are generally small sums of funding but target transportation disadvantaged populations. Existing transit and human service transportation providers work in collaboration with the Lowcountry Council of Governments and SCDOT to establish the federally-required and coordinated human service transportation-public transit coordination plan for this region.

2. *Allow Greater Flexibility for Local Jurisdictions to Generate Funds*

A number of potential local funding mechanisms are outlined in this section that could be implemented at the local (some at the State) level to generate funds. Most of these methods require substantial political capital in order to implement them. Adding to the difficulty of establishing these mechanisms is the fact that there are legislative restrictions against them. A concerted effort among transit providers and SCDOT, perhaps in conjunction with TASC, should be undertaken to research these barriers and approach the State Legislature about changes in the restrictions placed on local funding mechanisms. TASC annually prepares a legislative agenda for law makers regarding transit and relaxing these restrictions could be included with the agenda.

Provide Local Control Options for Transit Funding Sources
Broad flexibility with local control for funding options must also be made available such as sales and gas taxes, vehicle registration fees, property taxes and tax allocation districts. Municipalities within South Carolina and elsewhere in the Southeast (including Atlanta, Charlotte and now Charleston) have used local sales tax revenues to pay for transit services. Richland County is currently using part of a vehicle registration fee to fund transit in the short term, until the availability of the revenue source expires in 2008. The General Assembly should provide flexibility in local control for additional transit revenues.

All three counties in the Lowcountry Region seem to be many years away from considering a local funding mechanism dedicated to transit.

3. Increase State Funding for Transit

State funding support for public transit should be increased to expand service and provide increased mobility and travel choices. As is the case with local funding mechanisms, legislation has restricted the use of State motor fuel user fee receipts for transit to ¼ of a cent out of 16.8 cents per gallon. This translates to about $6 million per year for transit programs. This fee is based purely on the level of fuel consumption, and is not indexed to inflation. Therefore, if consumption remains flat, the proceeds from this user fee will also experience little variation from the 18 cents per capita made available for transit funding. In addition to increasing the percentage of the user fee dedicated to transit, the State will need to explore methods to provide incremental increases to account for inflation.

4. Engage Non-Traditional Partners

Transit's role in economic development and supporting tourism is on the rise and transit providers and the state transit association have taken a more visible approach to engaging chambers and economic development agencies in the planning process. A number of transit systems especially those just inland depend heavily on routes that serve the coast and transport many workers to and from jobs on the Strand, as well as other coastal areas. The ridership on these routes has steadily increased in the recent past and the trend should continue. Critical to the expansion of transit as well as the introduction of premium service transit, like bus rapid transit and rail service, will be how well the transit community engages the tourism and development communities into the design of service and ultimately the funding of new service.

LRTA has demonstrated its capacity to partner successfully with human service providers to enhance mobility options, connecting its riders with Council on Aging buses in Allendale and Bamberg Counties for trips to Charleston and Columbia. With the presence of vastly growing tourism centers such as Hilton Head Island in this region, LRTA transit providers should redouble their efforts to approach the business community and tourism industry for their support of transit. Bi-state coordination may assist in the development of connecting routes between Savannah, Georgia and Hilton Head Island. Opportunities to partner with military installation representatives should also be pursued, as was done by the Lowcountry Council of Governments in a joint effort with Marine Corps Air Station Beaufort to study land use patterns and related needs.

B. Increase Coordination among Providers

A number of other key findings from the coordination planning process speak to methods for improving transit in the State. Although the specifics of transportation needs from region to region differ greatly, the primary findings in the process indicate that the needs of each region can be classified under the following:

- Increase service (more days, hours, geographic coverage including rural areas)
- Targeting populations that may not qualify for existing programs (like Medicaid and TANF) but are still low/fixed income and have unmet transportation needs
- Access to jobs many of which are across county or regional boundaries
- Improve response time for return trips through centralized and/or real-time scheduling
- Coordinate fleet replacements and expansion in an effort to reduce capital costs
- Develop programs that increase the utilization of existing services
- Improve the distribution of information to the riding public, human service agencies about available services through the use of a mobility manager (this is underway in the Lower Savannah Region).
- Expense pooling program (fuel, insurance, training etc.)
- Address cost allocation among operators to facilitate greater coordination/cooperation

These issues constitute the commonalities among the regions, but the coordination plan development process did show significant differences in the primary transportation needs of each region. Given the differences in the provision of service and the different evolution of relationships among agencies from region to region, potential strategies to address these issues will vary across the State. Each plan does place the responsibility of developing actual projects to the human service agencies and transportation providers and for the COGs to develop an evaluation process to identify which of these projects will receive funding.

A major goal for the Coordination Plan is to establish a methodology to evaluate potential projects at the Regional level so that limited resources are optimized. Based on the plan development process in the Lowcountry Region the following criteria should be considered when selecting projects.

a) Projects that provide access to jobs.

b) Projects that target new rural inter-community services should receive favorable ratings in the evaluation process.

c) Projects that relax eligibility requirements or increase the number of individuals eligible for service should be considered.

C. Expand Transit Service

There is little doubt that transit can be expanded in its role as a mobility option in South Carolina. Even though there is heightened awareness about the benefits of transit, expansion of service will be predicated upon identifying new service that is cost effective with defined benefits that warrant sustainability and funding.

Demand estimates for the Lowcountry Region suggest there will be at least an 11% increase in transit demand in rural areas, and at least a 16% increase in urbanizing areas every decade between now and 2030 (see Table 12 in the Statewide Transit

Plan). This growth along with increasing congestion on the main thoroughfares leading to and from the Savannah metropolitan area will need the implementation of transit to, at the very least, maintain mobility.

1. Need to Accommodate the In-Flux of Elderly

South Carolina has one of the fastest growing elderly populations in the US because of the State's allure as a retirement destination. Many of these individuals have higher incomes (although may still be fixed incomes) and come from areas of the country where transit plays a greater role as a transportation option. One of the primary reasons the needs assessment shows so many deficiencies in the transportation system is attributable to the pressure the elderly population will exert on the transit network in terms of need for service and the propensity for using the service. Transit systems cannot be slow to react to new developments with elderly populations and should look for opportunities to partner with these developments to help fund transit programs. The Lowcountry Region and particularly Beaufort County, with its highly active retirement population, is above the State average in elderly population growth.

2. Target Gaps in Rural Areas

The needs assessment for the Statewide Plan focused on transit dependent populations which showed that only 34% of the total transit need is being accommodated currently in counties with existing service. This equates to over 4 million trips and the number nears 6 million if those counties without service are included in the estimate. Rural transportation is a core function of transit in South Carolina and service in these areas should be expanded. Opportunities to expand LRTA services between rural communities and centers of commercial activity should continue to be explored.

3. Increase in Commuter Based Services

Even though the needs assessment in the Plan centers on the needs of transit dependent populations, there is a need to attract choice riders. From the Statewide Plan's perspective, development of regional commuter based systems will be left up to the individual regions since they are better equipped to produce ridership estimates and must identify long term funding programs. However, the State should support the implementation of regional commuter based transit through increased funding support, especially for capital expenditures, such as the implementation of formal park and ride facilities, purchase of rolling stock, corridor preservation; as well as the introduction of pilot programs like the SmartRide program.

A key finding in the Plan is that the change in daytime population indicates significant travel patterns between regions and from the suburbs into the urban areas. The State of South Carolina currently provides no subsidies for intercity bus service, but these needs should be considered in the future, especially if additional service cuts are made to current operations. If necessary, state investment in intercity bus service should be considered to maintain key connections across the State and these services could augment commuter based services into the urban areas. Current State funding sources

are used by public transit agencies to support the intercity commute-oriented services to jobs along the coast, but additional support for these services may be needed in the future. Additionally, as high speed rail services are developed, the State should examine its role in not only the rail operation, but any connecting bus service as well.

As a part of the development of the Statewide Transportation Plan, a corridor plan was developed to identify deficiencies in the roadway network that connects key cities and activity centers. Several of these corridors present opportunities for transit to play a role in attracting choice riders and potentially encourage a modal shift away from the automobile. There were several locations identified in the Lowcountry Region that exhibit the characteristics necessary for transit to become a viable option. Table 8 shows the transit options to address these corridor issues and the Corridor Plan contains more detailed information.

Table 8: Potential Transit Options

SC Region	Corridor	Project ID/Sub-Corridor	Route	Segment Length (miles)	Potential Transit Option(s)
Low Country	Atlantic Coast	AC-1 to AC-9	US 17/US 21/SC 170	104.35	Local Bus, BRT
Low Country	Atlantic Coast (Connector)	AC C-1	US 278	18.55	Local Bus, Express Bus, Enhanced Bus/ITS

4. Needs Incremental Approach with Sustainability

Another important component of the Plan is the Vision and Goals included in Section 4 which speak to the potential of transit as a catalyst for economic growth, and its role in maintaining mobility and the quality of life in South Carolina. One key ingredient in realizing this Vision will be to concentrate on core service as the transit network incrementally grows. It will be important to maintain momentum for transit growth by avoiding the pitfalls of growing too fast and spreading services too thin. Planning transit expansion must hinge on the quantification of benefits and designing cost effective service so that they can be justified to funding entities and gain better support from the public and just as important, improve the image of transit in the public's eye. Sustainability is a very important concept to the growth of the transit network and the idea of incremental growth has been embraced and worked very well in the Lowcountry Region.

D. Other Action Items

1. Coordinating Transportation and Land Use Decisions

South Carolina has the fifth worst sprawl rating in the country and ranks fourth in the amount of land being developed on a per capita basis. Even more remarkable is that South Carolina, one of the smallest states (40th in size), ranks ninth in the country in the total number of acres that are being developed. A statewide study conducted by the Center for Urban Policy Research, Rutgers University entitled, *South Carolina Infrastructure Study: Projection of Statewide Infrastructure Costs 1995-2015* (1997),

determined that through compact growth, South Carolina would reduce its infrastructure costs for a 20-year period (1995 to 2015) by nearly $5 billion.

In South Carolina, the State is responsible for transportation and local governments are responsible for land use and zoning. Frequently there are inadequate incentives for municipalities to cooperate with one another and the State on transportation and land use issues. There is a need to take voluntary but cumulative steps toward improving transportation and land use planning in the State.

Access management techniques provide a way to manage access to transportation facilities, typically highways. These techniques can help increase public safety, extend the life of major facilities, reduce congestion, support alternative transportation modes, and improve the appearance and quality of the built environment while ensuring appropriate access to adjacent businesses and other land uses. Managing access to transportation facilities and services is one way to preserve the operational integrity of the transportation system while ensuring its compatibility with adjacent land uses. The concepts are very applicable to the US 278 corridor.

2. Upgrade Passenger Rail Service

Develop an integrated Statewide Rail Plan that includes coordination of all entities relative to passenger rail service, including freight interests and Amtrak. Address future growth and development opportunities facilitating passenger rail service. Identify options for a sustainable source of state funding with which to support capital and operating costs of passenger rail and/or other incremental transportation services. Work with the railroad companies to ensure that upgrades are made to track and other equipment that benefit both passenger and freight rail:

- Work with both public and private sector interests to improve the State's rail infrastructure and passenger and freight rail service.
- Continue to support the interstate efforts to implement high speed rail in the Southeast. Connections to HSR stations in either Charleston or Savannah could enhance mobility in the Lowcountry Region.

TRAFFIC ANALYSES AND PLANNING STUDY

BLUFFTON PARKWAY
BEAUFORT COUNTY, SOUTH CAROLINA

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Prepared by:

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FINAL SUBMITTAL
JULY 2007

CONCLUSIONS AND RECOMMENDATIONS

The Bluffton Parkway is proposed to provide a 4-lane divided roadway through Southern Beaufort County and is intended to provide an alternative route for traffic as opposed to US 278 and also allow access to planned development which would otherwise access US 278.

This report has been prepared to analyze the entire length of the Parkway and concentrate on the last segment needed to complete the Parkway (Phase 5A) which is planned to extend from Burnt Church Road east to US 278. In addition, this report also reviews a potential alternative alignment to the current Phase 3 segment of the Parkway which would result in a four-legged intersection opposite Phase 4 of the Parkway and extend to Buck Island Road. This would result in Phase 3 of the Parkway to serve as a connector between the Bluffton Parkway and the Buckwalter Parkway serving traffic generated by development along this connector and service traffic to/from SC 46.

ACCESS MANAGEMENT STRATEGY

The importance of the Bluffton Parkway as an east/west carrier of traffic is immense. As an alternative to the principal arterial of US 278, this arterial will serve as localized access for development as well as provide for external through traffic orientated to/from Hilton Head Island. Maintaining the integrity of this roadway at acceptable service levels will allow this facility to serve the expected future traffic volumes while providing for planned locations of access to serve both existing and future development.

The access management plan for this facility is one that does not have to be as stringent as the US 278 plan however, the plan should address separation of signalized intersections as well as location of full-movement intersections in the proximity of signalized intersections.

As the access management strategy is developed, the important factor to note is to maintain adequate separation between intersections (especially signalized intersections) so that the corridor is not over burdened with frequent stop and go traffic. Major intersections along the corridor that will require signalization (or similar traffic control i.e. a round-a-bout) are as follows:

1. SC 170;
2. Hampton Parkway;
3. Buckwalter Parkway (Phase 5B);
4. Buck Island Road;
5. Simmonsville Road;
6. SC 46;
7. Burnt Church Road;
8. Foreman Hill Road/Malphrus Road;
9. Buckingham Plantation Drive; and
10. US 278.

Addition intersections along the Parkway are certain however, these major intersections should not be inhibited due to intersections that are to close for prudent operations. It is initially suggested that no signalized intersection should be located within a ½-mile (approx. 2,650-feet) of any of these major intersections. Unsignalized full-movement intersections should be separated by ¼-mile (approx. 1,400-feet) and right-turn

in/right-turn out access points should maintain a minimum of 600 to 800-feet which will allow the provision for an unimpeded deceleration lane.

Access to corner lots at intersections (signalized or unsignalized) can typically provide challenges as it relates to desire of the user. Shared access drives, right-in/right-out access drives, service roadways/connectivity or a combination of these should be considered when reviewing access proposals.

TRAFFIC STUDY

SC 170
WIDENING PROJECT

BEAUFORT COUNTY,
SOUTH CAROLINA

J – 19891.402

FEBRUARY 2008

THOMAS & HUTTON ENGINEERING CO.

SAVANNAH, GEORGIA • BRUNSWICK, GEORGIA
CHARLESTON, SOUTH CAROLINA • MYRTLE BEACH, SOUTH CAROLINA

EXECUTIVE SUMMARY

SC 170 (Okatie Highway) is a principal arterial that serves as the primary connector route between the northern and southern portions of Beaufort County. The County's Comprehensive Plan identified SC 170 as a project with committed funding for widening and intersection improvements to address future travel demands on the corridor. This study recommends improvements to the SC 170 corridor.

The SC 46 / SC 170 intersection was recently reconstructed as a multilane roundabout. As part of that project, SC 170 was widened to a four-lane divided section for approximately 2,000 feet north of the intersection. The currently proposed widening project would begin where SC 170 transitions back to 2 lanes. The northern project limit is the Tidewatch Drive/Sergeant William Jasper intersection.

Morning and afternoon peak hour turning movement counts were obtained at nine intersections within the project area. Capacity analysis indicates four of the intersections are currently operating at or exceeding capacity. 24-hour bi-directional tube counts were also collected at several locations; current daily volumes north of the US 278 interchange were approximately 30,000 vehicles per day and approximately 16,500 vehicles per day south of the US 278 interchange.

Base Year (2010) and Design Year (2030) volume projections were made using historical data, previous traffic studies, and the County's Travel Demand Model. Based on the regional modeling, volumes north of the US 278 interchange are anticipated to be greater than 50,000 vehicles per day. Volumes on sections south of the Bluffton Parkway could reach as high as 40,000 vehicles per day.

This report includes specific recommendations for the major intersections along the corridor. General recommendations include:

- Widening SC 170 to a four lane divided section from the project's southern terminus to the US 278 Westbound Ramp intersection (approximately 4.3 miles).
- Widening SC 170 to a six lane divided section from the US 278 Ramp northward to the end of the project (approximately 1.2 miles).

Access control should be incorporated into the anticipated design; a preliminary access management plan is included. This preliminary access management plan was based on previously approved PUD documents where feasible. A potential extension of the Bluffton Parkway to the west is also included as an attached exhibit. Although the location and timing of an extension to the west is uncertain, preliminary sketches of potential alignments are provided. Initially the SC 170/ Bluffton Parkway intersection is envisioned as a full-access signalized intersection. However, as traffic volumes increase and the area to the west develops, a grade separated interchange may be needed to accommodate future volumes.

Should funding of the project be limited, it is suggested that the project be constructed in phases with the following priorities (depending on development along the corridor, these priorities may change in the future):

Phase 1 – Roadway widening and intersection improvements from US 278 to Bluffton Parkway (approximately 2.2 miles). Completing this section first could aid in the use of the Bluffton

Parkway as an alternative to US 278. Providing additional capacity between US 278 and the recently constructed Bluffton Parkway could help make this route an attractive detour to through traffic between Hilton Head Island and I-95 (along with the other Bluffton Parkway improvements currently being planned).

Phase 2 – Roadway widening and intersection improvements between Bluffton Pkwy and SC 46 (approximately 1.8 miles). According to the Beaufort County 2025 model, this section of roadway is forecasted to see the highest amount of growth by 2030. Depending on the pace of development on some of the surrounding tracts, this section might be less critical in the immediate term than the section north of Bluffton Parkway.

Phase 3 – Roadway widening and intersection improvements between US 278 and Tidewatch Drive (approximately 1.5 miles). This portion of the roadway is already a multi-lane facility. As commercial development occurs in this area the need for improvements to the existing section will increase. Access management on this section of roadway may have a significant impact to the future level of service on this section of roadway.

DENNIS CORPORATION

TRAFFIC STUDY

conducted for the

Widening of SC-802

Section A:
Lady's Island Drive – Ribaut Road to US-21 Sea Island Pkwy

Section B:
Savannah Hwy – SC-170 Robert Smalls Pkwy to SC-280 Parris Island Gtwy

in

BEAUFORT COUNTY, SOUTH CAROLINA

Submitted:

MARCH 2008

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1. Introduction

Two section of SC 802 in Beaufort County plan to be widened to accommodate the existing traffic and anticipated growth in the area. Two sections have been identified for this project and are shown in **Figure 1**. Section A is 2.5 miles in length, with the endpoints of US 21 (Ribaut Road) and US 21/SC 802 (Sea Island Parkway). Section B is 1.7 miles in length, with the endpoints of SC 170 (Robert Smalls Parkway) and SC 280 (Parris Island Gateway). Beaufort County recently selected an alignment for the US 21/SC 802 Connector that will relieve traffic volumes at the SC 802 and US 21 Business intersection. For the purposes of this analysis, it was assumed that the connector will be constructed by the assumed buildout year of this project, 2010. It was also assumed that the Connector will intersect SC 802 at Hazel Farm Road. The Connector alignment information and traffic projections were obtained from the June 2006 report produced by Kimley-Horn and Associates, Inc. and utilized in this study.

Dennis Corporation was part of the team selected to design the widening of SC 802. This report summarizes the intersection analyses conducted to determine the optimal intersection layouts, traffic signal needs, and timings. The signal timings utilized in this report may not be the actual timings implemented in the field.

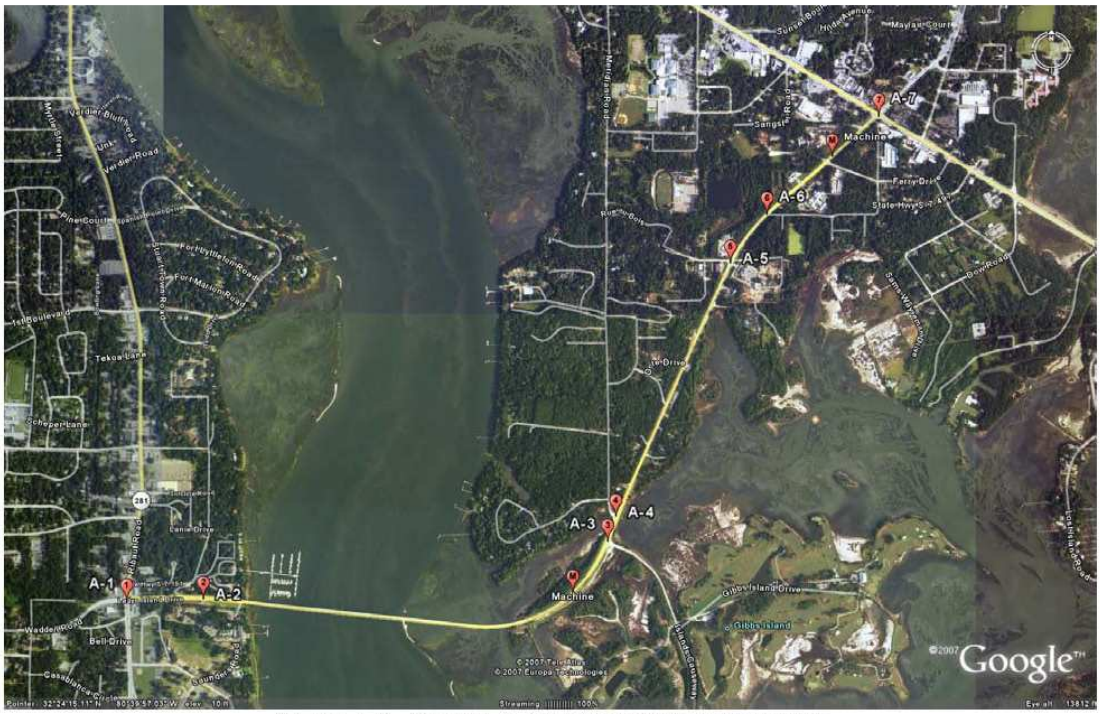


Figure 1.A. Section A Overview (© Google Earth)

Figure 1.B. Section B Overview (© Google Earth)

2. Existing Conditions

A total of eleven intersections were selected for detailed analysis along the two sections, including the endpoints. Section A contained seven intersections and Section B contained four intersections. Field visits were conducted to determine the existing lane configuration and traffic signal phasing. The studied intersections and their existing lane configurations are shown in **Figures 2.A and 2.B**.

Intersection turning movement counts and 48-hour counts were collected on Wednesday, August 29th and Thursday August 30th, 2007 at the locations shown in Figures 1.A and 1.B. The locations designated by an 'M' in these figures are locations where the 48-hour traffic volumes were measured with road tubes. Local schools were in session at the time of data collection. The intersection turning movement data was collected from 6:30am-9:00am, 11:00am-1:00pm, 2:30pm-6:00pm at all of the study intersections except Hazel Farm Road/SC 802 Connector and SC 802/Sea Island Parkway. Turning movement data for these two intersections were obtained or estimated from the Kimley-Horn study. The existing turning movement data that was used for this analysis is summarized in **Figures 3.A and 3.B**. The count data is provided in Appendix A (turning movements) and Appendix B (48-hour).

5. Projected Future Conditions

AADT data were obtained from SCDOT for numerous stations within and near the study area (see map in Appendix H). The annual AADT estimates for each station between 1996 and 2006 are shown in **Table 4**. This information was used for establishing average annual growth rates for projecting future traffic conditions. It can be seen that the average annual growth rates ranged from -1% to +5% over that time period.

Table 4. SCDOT AADT Count Station Data

	Ladys Island	Ladys Island	Sea Island	Sea Island	Grober Hill Rd	Savannah Hwy	Parris Isl Gwy
Year	**219**	**223**	**137**	**139**	**537**	**215**	**195**
1996	14,600	6,600	15,500	13,600	N/A	6,400	10,700
1997	15,400	6,500	16,400	13,900	1,700	6,600	11,000
1998	15,800	6,800	16,600	14,700	1,500	6,700	11,300
1999	17,600	7,200	16,800	15,000	1,600	6,900	12,400
2000	18,700	7,400	17,200	15,500	1,700	7,700	13,400
2001	19,300	7,620	17,300	15,500	1,300	8,400	14,600
2002	21,000	16,300	17,700	17,400	1,100	10,000	16,000
2003	20,800	16,400	19,000	18,600	1,100	10,500	16,300
2004	23,000	17,200	20,900	21,500	1,350	10,400	20,000
2005	22,600	18,800	19,300	20,200	1,350	10,300	18,100
2006	23,300	19,400	19,900	20,800	1,600	10,900	18,700
Avg. Annual Growth	**4%**	**2%***	**2%**	**4%**	**-1%**	**5%**	**5%**

* 2002-2006

In addition to the historical AADT information obtained from SCDOT, Beaufort County provided traffic projections for 2015 and 2025 based on scenarios programmed in their planning model that incorporated the widening of SC 802 and the addition of the SC 802/US 21 Connector. The model projections are provided in Appendix I.

This data was used to project the future traffic volumes in 2010 (anticipated buildout year of SC 802 widening and SC 802/US 21 Connector) and 2025. These volumes are shown in **Figures 5.A and 5.B** (2010) and **Figures 6.A and 6.B** (2025).

6. Recommended Improvements

Based on the projected volumes, Synchro and SimTraffic software was used to identify the intersection improvements that balanced the objectives of optimal LOS and minimizing the amount of impact on nearby businesses and residences via right-of-way acquisition. Furthermore, improvements were primarily recommended on SC 802 only at the intersections at the endpoints of each segment. The final improvement recommendations are depicted in **Figure 7.A and 7.B** and summarized below.

- A-1. Lady's Island Drive at Ribaut Road
  - Northbound: Add an additional right-turn bay to provide dual right-turn movements
- A-2: Lady's Island Drive at Riverwind Drive
  - Widen SC 802 and maintain eastbound-westbound left-turn bays.
- A-3/A-4: Lady's Island Drive at Islands Causeway and Meridian Road
  - Signalize both intersections
  - Widen SC 802 and maintain existing left-turn bays and right-turn bays
  - Northbound left-turn on SC 802 at Meridian Road will accommodate U-turns
- A-5: Lady's Island Drive at Rue Du Bois
  - Widen SC 802 and provide northbound-southbound left-turn and right-turn bays
- A-6: Lady's Island Drive at Hazel Farm Road/SC 802 Connector
  - Signalize intersection
  - Westbound: Construct two left-turn lanes and one right-turn bay
  - Northbound: Construct a right-turn bay.
  - Southbound: Construct a left-turn bay
- A-7: Lady's Island Drive at Sea Island Parkway
  - Northbound: Convert right-turn only lane to shared thru/right-turn lane (pavement marking and signage)

- B-1: Savannah Highway at Robert Smalls Parkway
  - Convert northbound right-turn movement from yield condition to a continuous movement
- B-2: Savannah Highway at Grober Hill Road
  - Re-align intersection as shown in **Figure 7.Cb**
- B-3: Savannah Highway at Jefferson Street
  - Widen SC 802 and provide eastbound left-turn bay
- B-4: Savannah Highway at Parris Island Gateway
  - Signalize intersection
  - Northbound: Construct additional left-turn bay (to be operated as protected only left-turn)
  - Eastbound: Construct additional right-turn lane to provide dual right-turn movements (to be operated as permitted/overlap right-turn)
  - Remove downstream acceleration lane on southbound SC 802 (see Appendix J for discussion about the incorporation of an auxiliary lane on SC 802)

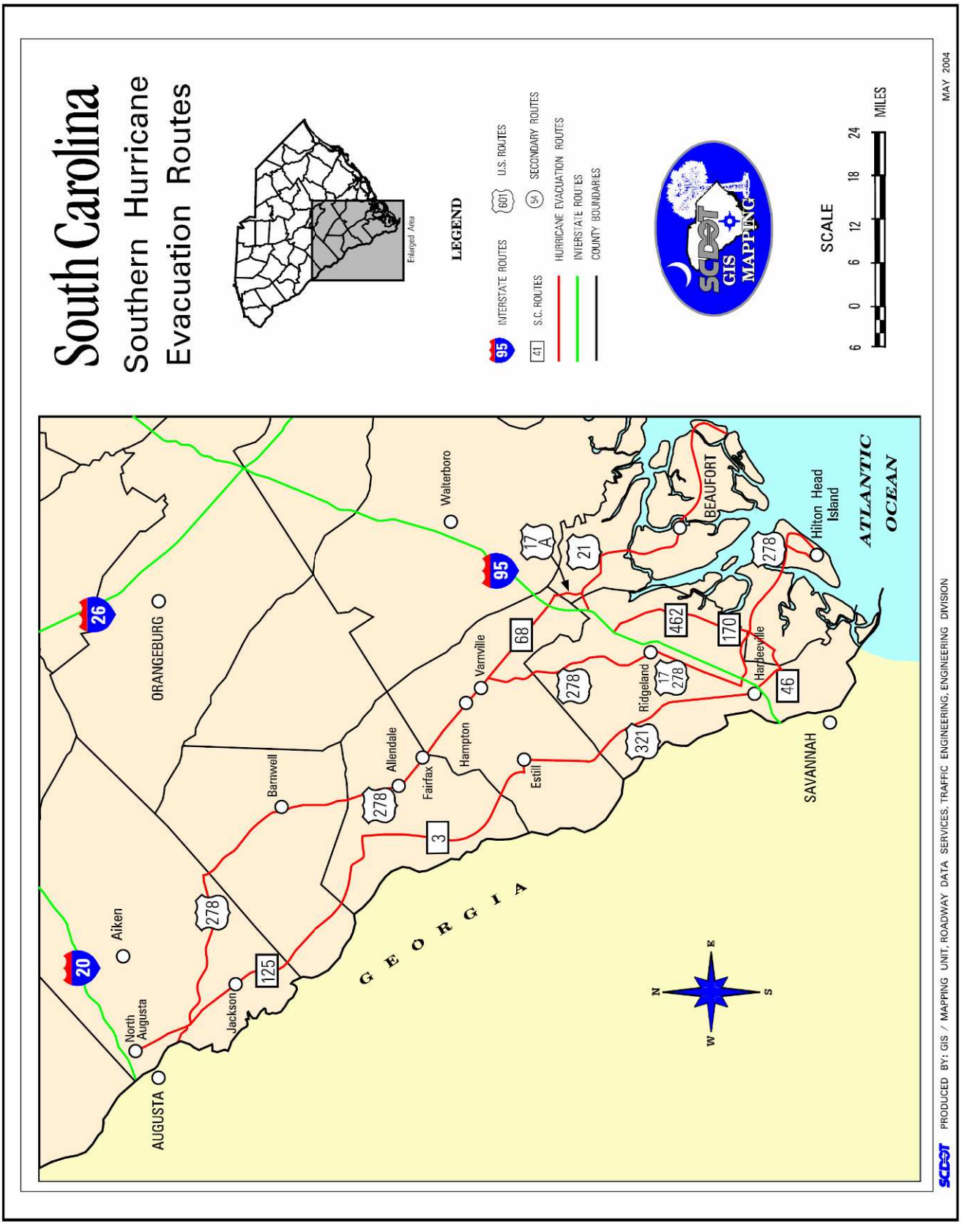
8. Summary

This report summarizes the existing conditions and recommended improvements to the intersections along the SC 802 corridor that were targeted for improvements in conjunction with the proposed widening of the mainline. This effort included the analysis of existing volumes, traffic signal warrants, crash data, planning model output, and historical AADT. Based on this analysis, intersection improvements were recommended to maintain an acceptable level-of-service for both the overall intersection (for signalized intersections) and the individual movements, where feasible. The attached Appendices contain data, memos, and software output that was utilized to complete this analysis.

Respectfully submitted by:

Andrew P. Nichols, Ph.D., P.E.

APPENDIX 6 - HURRICANE EVACUATION PLAN



Hilton Head Island and Beaufort Areas

Hilton Head Island...

Hilton Head Island evacuees will use both the William Hilton Parkway (US 278 Business) and the Cross Island Parkway toll facility (US 278).

As these two roads merge, a third lane will be formed by reversing flow on the inside eastbound lane of US 278. This lane will carry the traffic from the toll facility.

When US 278 reaches I-95, lane assignments will be as follows:

1. The right lane on westbound US 278 will exit to I-95 northbound.
2. The left lane on US 278 westbound will continue on US 278 to Hampton and eventually North Augusta.
3. The reversed lane will take SC 170 to SC 46 to US 321 then to SC 3 to SC 125 and onto North Augusta.

Should a third lane not be necessary, then both lanes on US 278 will be routed to I-95 with the right lane to I-95 north, and the left lane continues on US 278.

Under certain conditions, US 278 will be converted to four lanes westbound from the Cross Island Parkway to SC 170, where one lane will be directed onto SC 170 westbound to Hardeeville. The remaining three lanes on US 278 will continue toward I-95.

I-95 southbound - Access to I-95 southbound is available, but severe congestion may be encountered.

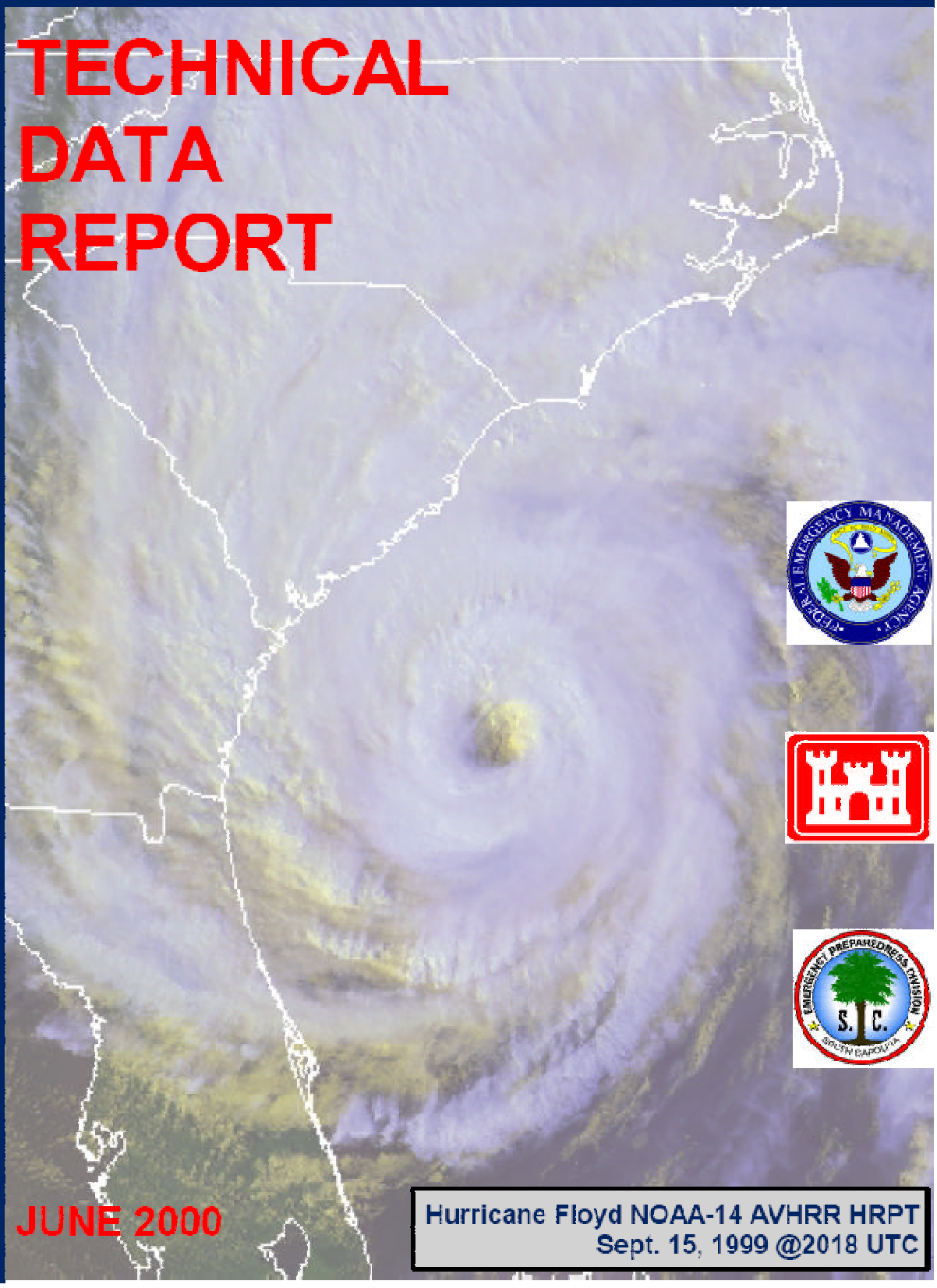
Beaufort...

Evacuees will use the two present northbound lanes on US 21. These lanes will be turned onto US 17 south to I-95 at Exit 33 (Point South) where the left lane will go to I-95 south and the right lane to I-95 north.

Under certain conditions, a third northbound lane will be formed by reversing flow on the inside southbound lane of US 21 at SC 280. This lane will carry the traffic from SC 280. Also, as conditions warrant, US 21 may be converted to four lanes northbound from SC 280. Both of the above schemes will end at US 17, Gardens Corner. In either case, motorists will be given instructions through signs and highway advisory radio.

South Carolina Hurricane Evacuation Restudy

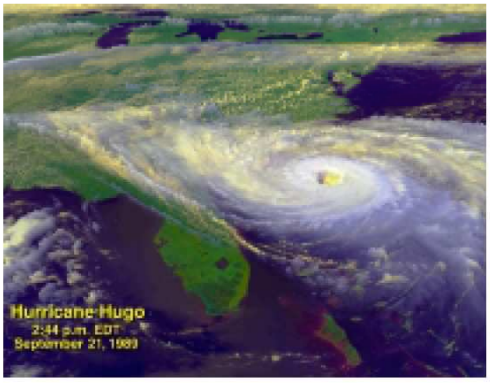
TECHNICAL DATA REPORT



South Carolina Hurricane Evacuation Restudy Technical Data Report

CHAPTER ONE - INTRODUCTION

1.1 STUDY PURPOSE



The purpose of this Hurricane Evacuation Study is to provide emergency management officials with information that could assist them in hurricane evacuation decision-making. The technical data presented in this report can be used by County and State Agencies to supplement their hurricane evacuation plans and operational procedures in response to future hurricane threats.

1.2 FUNDING

The Study was funded by the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (USACE). The State of South Carolina's Emergency Preparedness Division along with local community officials and agencies provided valuable data and coordination throughout the study at their own expense.

1.3 AUTHORITY

The authority for the U.S. Army Corps of Engineers' participation in this study is Section 206 of the Flood Control Act of 1960 (Public Law 86-645). The Federal Emergency Management Agency's participation is authorized by the Disaster Relief Act of 1974 (Public Law 93-288). These laws authorize the allocation of resources for planning activities related to hurricane preparedness.

1.4 DESCRIPTION OF STUDY AREA

1.4.1. Geography

The South Carolina study area is shown in Figure 1-1. The study area includes the coastal counties of Jasper, Beaufort, Colleton, Charleston, Georgetown, and Horry. The inland counties are Hampton, Dorchester, and Berkeley. Due to the transportation analysis, other counties were included as required. Coastal South Carolina reflects three geographical areas: the long concave strand stretching from the North Carolina state line south to Winyah Bay; the Santee River delta and barrier islands of Cape Romain-Bulls Bay; and the sea islands of the central and southern coast. While physiographically different, these three areas share two commonalities. All are more or less low-lying and all are separated from the mainland by wide expanses of salt marshes, estuaries, tide-influenced rivers, and/or belts of rivers and marshes paralleling the coastline. South Carolina has approximately 190 miles of open coastline, but its numerous, bays, estuaries, inlets, and rivers create an actual shoreline of over 3000 miles. Most of the shoreline has beautiful white sand beaches with shallow clean waters. Excellent roads across the entire coastal area along with moderate weather conditions has made it an outstanding scenic and tourist attraction and a very desirable place to live.

Behind the barrier islands and beaches is a complex system of creeks, estuaries, tidal rivers and thousand of acres of salt marshes, whose vast expanses are broken occasionally by hummocks of varying sizes. All along the coast a series of cuts and channels tie rivers, sounds, and bays into the Intracoastal Waterway. Inland the marshes and hummocks gradually give way to the terrestrial environment of the coastal plain. The outer coastal plain (to 80 miles inland and less than 100 feet above sea level) is marked by extensive freshwater swamps grading into the coastal salt marshes. South Carolina's northern coastline in the Grand Strand is fronted by a smooth hard shore cut by a few small inlets. The lower coast is fringed by sea islands and salt marshes.

Tides are higher – the range between high and low tide levels greater – in the lower coastal around the Beaufort area than along the Grand Strand. This is significant only in terms of awareness of probabilities for increased flooding along South Carolina's southern coast should a hurricane strike during normal high tides or spring tides. Mean tide range is about 3.4 feet above Mean Low Water (MLW) at the entrance to Port Royal Sound (lower South Carolina coast), 2.7 feet above MLW at the entrance to Charleston Harbor (central South Carolina coast), and 2.3 feet above MLW at the entrance to Murrells Inlet (upper South Carolina coast).

1.4.2. Geology and Soils.

The study area is located in the Atlantic Coastal Plain of South Carolina, which extends from the Fall Line to the present-day coast. The Fall Line is defined by an eroded, winding boundary between the exposed rocks of the Piedmont province on the northwest side of the line and the younger sediments of the Coastal Plain to the southeast. The Fall Line geologically splits the state, trending in a southwesterly direction from Chesterfield County on the north side of state to Edgefield County on the southeast side of the state. Stream gradients change dramatically across this line.

The geologic profile of the Coastal Plain generally consists of pre-Meozic crystalline rocks and sedimentary rocks lying within buried basins from the Triassic and Jurassic periods and overlain by sediments ranging from Upper Cretaceous to recent Quaternary. The Atlantic Ocean has covered nearly all of the Coastal Plain during the geologic past. Arches and basins are featured in the surface of the basement rock lying beneath the Coastal Plain sediments causing the formation of both embayments and protruding landforms that are aligned perpendicular to the coastline. Much of the Coastal Plain in South Carolina lies within the Charleston embayment, which is located between two major arches or upwarps. To the north is the Cape Fear arch near the South Carolina-North Carolina border and to the south is the Yamacraw arch near the South Carolina-Georgia border. Coastal Plain sediments are ordinarily thicker at the embayments and thinner over the arches.

Coastal Plain sediments were deposited during periods of fluctuation in sea level. During periods of relatively higher sea levels, deposition of marine and shoreline sediments occurred. Conversely, during periods when the sea level fell, the coastline receded to the east, the Coastal Plain eroded, and streams became entrenched. The younger results of this action are along the present-day coast and the older ones are inland at progressively higher elevations toward the fall line. Coastal Plain sediments include fluvial, marginal marine and marine sediments, which were deposited during these transgressive-repressive cycles.

The Atlantic Coastal Plain is divided into inner, middle, and outer portions. The inner Coastal Plain lies next to the Fall Line and slopes toward the Atlantic Ocean. The general topography of the Inner Coastal Plain is characterized by numerous, deeply eroded stream channels which has an elevation greater than 290 ft National Geodetic Vertical Datum of 1929 (NGVD). The Orangeburg scarp cuts across the Inner Coastal Plain in South Carolina, marking a boundary between the inner and middle portions of the Coastal Plain. This scarp was formed by wave erosion during a higher sea level period. The surface of the Middle Coastal Plain lies between about elevation 100 and elevation 290 and has been eroded by streams, but to a somewhat lesser degree than the Inner Coastal Plain. The Outer Coastal Plain lies below about elevation 100, and is low, relatively flat, sloping gently seaward. It consists of a series of terraces formed by

partially filled backbarrier, barrier island, and shallow marine shelf deposits. The modern shoreline along the northern portion of the coast can be characterized as embayed having extensive barrier beaches, and cut by estuaries extending across the Coastal Plain sometimes reaching into the Fall Line. The southern portion of the South Carolina shoreline is characterized by the presence of sea islands, and having a smoother coastline and smaller estuaries lacking the extensive barrier beaches present in the northern section. Soils of the modern barrier islands are primarily Holocene sands. Pleistocene sediments, interbedded sands and clays of backbarrier and barrier origin, comprise the remainder of the Outer Coastal Plain

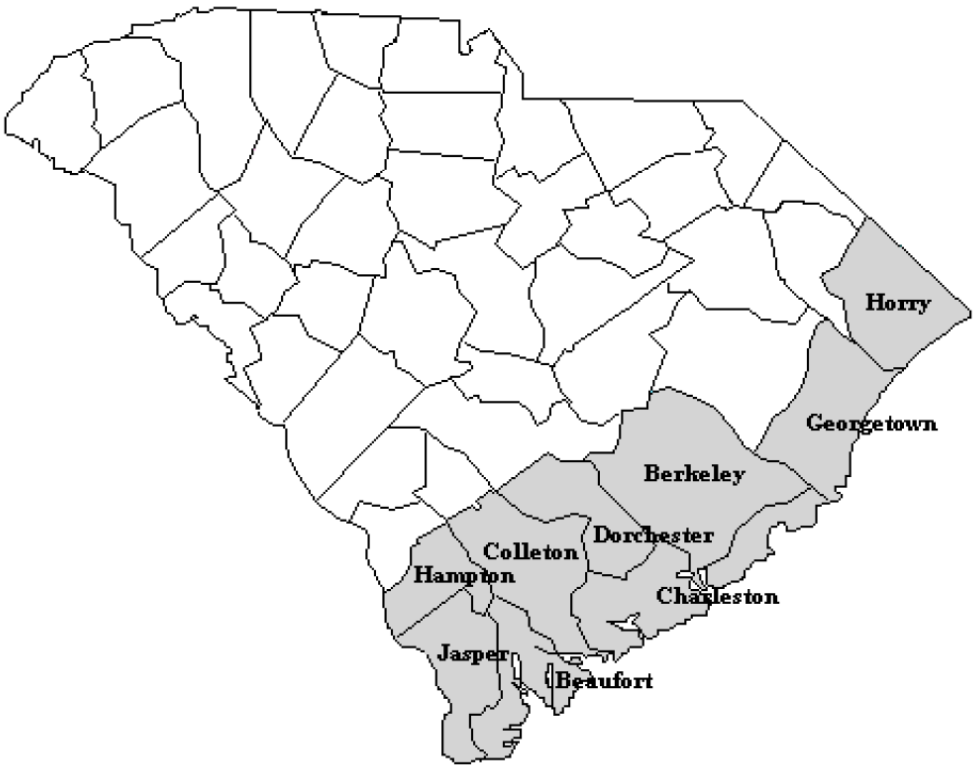


Figure 1-1 General Map of the Study Area

1.4.3. Bathymetry

Shallow water close to shore, tends to increase the magnitude of hurricane-induced storm surge, therefore the depth of water offshore (bathymetry) is extremely important. Off the Grand Strand Area in Horry County (upper South Carolina coast) the 20-foot water depth is about 2,000 to 3,000 feet offshore, the 30-foot water depth is about 3 miles offshore, and the 60-foot depth is about 19 miles out. As you move south toward Charleston (central South Carolina coast) these depths of 20-foot and 30-foot depths get farther offshore. The 20-foot water depth is about 1 to 2 miles offshore, the 30-foot water depth is about 3 to 4 miles offshore and the 60-foot depth remains about 19 miles out. In the

area around Beaufort and Hilton Head (lower South Carolina coast) these depths are fairly consistent with the depths off of Charleston.

The lower and central South Carolina coastline is banded with barrier islands which divide a number of sounds and bays from the Atlantic Ocean. These sounds and bays are also relatively shallow with maximum depths to about 20 to 40 feet in Port Royal Sound and St Helena Sound, 1 to 5 feet in Sewee and Bulls Bay, 10 to 20 feet in Winyah Bay, and 1 to 5 feet in Mud Bay.

1.4.4. Population

The study area is generally rural with most of the population concentrating along the coastal areas. The following table shows the estimated population for the study area counties for the years 1990 to 2000. The estimated growth rate from 1990 to 2000 is also shown. The population figures were obtained from the South Carolina State Budget and Control Board, Office of Research and Statistics.

Table 1-1 Population Characteristics For the South Carolina Study Area Counties

COUNTY NAME	1990 Population	Estimated Population Year 2000	1990-2000 Growth as a Percent
Beaufort	86,425	109,200	26.4 %
Berkeley	128,776	149,100	15.83 %
Charleston	295,041	311,700	5.6 %
Colleton	34,377	38,600	12.3 %
Dorchester	83,060	97,800	17.7 %
Georgetown	46,302	53,700	16 %
Hampton	18,191	19,700	8.3 %
Horry	144,053	199,700	38.6 %
Jasper	15,487	18,200	17.5 %

1.5 HISTORICAL HURRICANE ACTIVITY

1.5.1. General

Hurricanes are a classification of tropical cyclones which are defined by the National Weather Service as nonfrontal, low pressure synoptic scale (large scale) systems that develop over tropical or subtropical waters and have a definite organized circulation. The classification of tropical cyclones into tropical depressions, tropical storms, or hurricanes depends upon the speed of the sustained (1-minute average) surface winds near the center of the system. Tropical depressions are $\leq$ 33 knots (38 mph), tropical storms are 34 to 63 knots (37-74 mph) inclusive, and hurricanes are $\geq$ 64 knots (75 mph).

The geographical areas affected by tropical cyclones are referred to as tropical cyclone basins. The Atlantic tropical cyclone basin is one of six in the world and includes much of the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The official Atlantic hurricane season begins on June 1 and extends through November 30 of each year; however, occasional tropical cyclones can occur outside of this period.

Early season tropical cyclones are almost exclusively confined to the western Caribbean and the Gulf of Mexico. However, by the end of June or early July, the area of formation gradually shifts eastward, with a slight decline in the overall frequency of storms. By late July, the frequency begins to slowly increase, and the area of formation shifts still farther eastward. By late August, tropical cyclones form over a broad area which extends eastward to near the Cape Verde Islands off the coast of Africa. The period from about August 20 through September 15 produces the most severe hurricanes, many of which travel across the entire Atlantic Ocean. After mid-September, the frequency begins to decline and the formative area retreats westward. By early October, the area of maximum occurrence returns to the western Caribbean. In November, the frequency of tropical cyclone occurrence further declines.

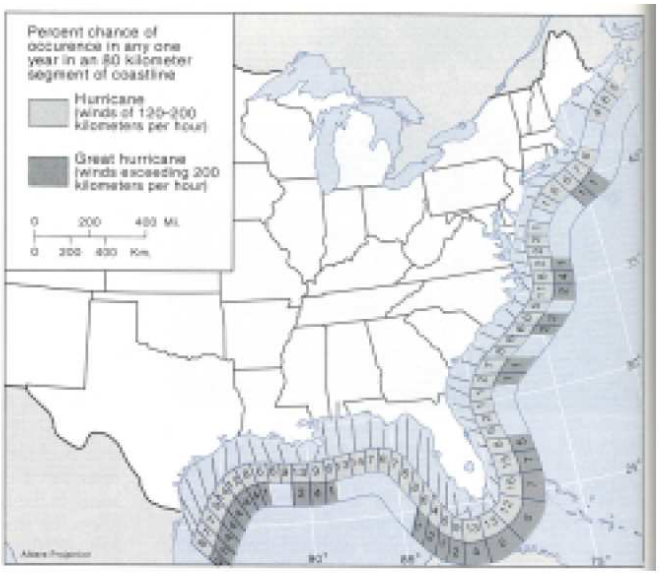
1.5.2. Atlantic Tropical Cyclone Basin

Through the research efforts of the National Climate Center in cooperation with the National Hurricane Center, records of tropical cyclone occurrences within the Atlantic tropical cyclone basin have been compiled dating back to 1871. Although other researchers have compiled fragmentary data concerning tropical cyclones within this basin back to the late fifteenth century, the years from 1871 to the present represent the complete period of the development of meteorology and organized weather services in the United States. For the 120-year period from 1871 through 1990, about 1000 tropical cyclones have occurred within the Atlantic tropical cyclone basin. Data for the years 1871 through 1885 do not allow accurate determinations of the intensities of the storms

occurring during those years; because the National Hurricane Center only maintains detailed computer files of the Atlantic tropical cyclone tracks back to 1886. Of the 889 known Atlantic tropical cyclones of at least tropical storm intensity occurring during the period 1886 through 1990, 519 (58%) are known to have reached hurricane intensity.

1.5.3. Historical Hurricanes in South Carolina

Between 1900 and 1999, 14 tropical cyclones of hurricane intensity made direct hits on the South Carolina Coastline. Of these 14 storms, 4 were major storms (3, 4, and 5 by Saffir/Simpson category). Since 1900, no category 5 hurricane has hit South Carolina; there has been two category 4's (Hugo, 1989 and Hazel, 1954); and two category 3's (Gracie, 1959 and Sept.17, 1945). Storms were not formally named before 1950. It is possible that the "Great Storm of 1893" which struck the southern coast in August of that year was at least a category 4 storm, but there is no way of knowing since accurate measures of tropical cyclone intensity are not available before 1900.



In the colonial period, tropical storms and hurricanes were known as "September gales" probably because the ones people remembered and wrote about were those which damage or destroyed crops just before they were to be harvested. Historical accounts of some of these events are presented below.

One that struck "Charles Town" September 25, 1686 was "wonderfully horrid and distructive…corne is all beaten down, and lyes rotting on the ground… Aboundance of our hoggs and cattle were killed in the Tempest by the falls of trees…" The writer goes on to say that the storm also prevented a Spanish assault upon Charles Town by destroying one of their galleys and killing the Commander in chief.

In Autumn of 1700, "a dreadful hurricane happened at Charleston Town which did great damage and threatened the total destruction of the Town, the lands of which it is built being low and level and not many feet above high water mark, the swelling sea rushed in

with amazing impetuosity, and obliged the inhabitants to fly for shelter…" A ship, Rising Sun, out of Glasgow and filled with settlers had made port just prior to the storm's landfall. It was dashed to pieces and all on board perished.

Of a storm which passed inland along the coast September 7-9, 1854, Adele Pettigru Allston wrote from Pawleys Island, "The tide was higher than has been known since the Storm of 1822. Harvest had just commenced and the damage to the crops is immense. From Waverly to Pee Dee not a bank nor any appearance of land was to be seen…(just) one rolling, dashing Sea, and the water was Salt as the Sea."

By 1893, major population centers could be telegraphically alerted to storms moving along the coast, but there were no warning for the sea islands and other isolated areas.

The "Great Storm of 1893" struck the south coast at high tide, pushing an enormous storm surge ahead of it, creating a "tidal wave" that swept and submerged whole islands. Maximum winds in the Beaufort area were reported at 125 mph; those in Charleston at 120 mph. Water from the first wave probably stacked up in the marshes, held there by the winds until the next high tide, which was after the storm had passed. Lowered barometric pressure and the amount of "stacked" water caused destruction equal to that of a "tidal wave." At least 2000 people lost their lives, and an estimated 20,000-30,000 were left homeless and with no means of subsistence.

Charleston Battery – Hurricane of 1911

Hazel, (October, 1954) and Gracie, (September, 1959), were the most memorable storms of the 50's. Hazel, A category 4 storm, made landfall near Little River, South Carolina with 106 mph winds and tides up to 16.9 feet. One person was killed and damage was estimated at $ 1.7 billion.**

Gracie, a category 3 hurricane made landfall at St. Helena Island, and continued north-northwest maintaining hurricane strength for more than a hundred miles inland. Damage of disaster proportions occurred along the coast from Beaufort to Charleston. Heavy rains caused flooding through much of the state, crop damage was severe, but there was no loss of life.

The most recent memorable storm was Hurricane Hugo. Hugo struck Charleston, South Carolina on September 21, 1989 as a category 4 storm. Hugo ranked as the eleventh most intense hurricane at time of landfall to strike the United States this century and is rated as the second costliest hurricane with over $8.5 billion** in damages. Hugo's storm surge was the highest ever recorded on the East Coast and exceeded 20 feet NGVD just north of Charleston. The total number of deaths associated with Hugo is 82.

**Adjusted to 1996 dollars on basis of U.S. Dept. of Commerce Implicit Price Deflator for Construction.

1.6 MAJOR ANALYSES

The South Carolina Hurricane Evacuation Study consists of several related analyses that develop technical data concerning hurricane hazards, vulnerability of the population, public response to evacuation advisories, timing of evacuations, and sheltering needs for various hurricane threat situations. The major analyses are briefly summarized in the following paragraphs. Detailed descriptions of the analyses and the methodologies of each are contained in subsequent chapters of this report.

1.6.1. Hazards Analysis

The Hazards Analysis determines the timing and magnitude of wind and storm surge hazards that can be expected from hurricanes of various categories, tracks, and forward speeds. The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) numerical models were used by the National Hurricane Center to compute surge heights. Three SLOSH models were used (Wilmington, Charleston, and Savannah). Hazards from freshwater flooding are based on the Flood Insurance Rate Maps. The Hazards Analysis is presented in more detail in Chapter Two.

1.6.2. Vulnerability Analysis

Utilizing the results of the Hazards Analysis, the Vulnerability Analysis identifies those areas, populations, and facilities that are vulnerable to specific hazards under a variety of hurricane threats. Inundation maps were produced and evacuation scenarios were developed. Hurricane evacuation zones were delineated for the each of the nine counties in the study area. Population data were used to determine the vulnerable population within each evacuation zone. In areas of potential inundation, critical facilities were identified, such as family care homes, nursing homes, and hospitals. Further discussion on all aspects of the Vulnerability Analysis is provided in Chapter Three.

1.6.3. Behavioral Analysis

This analysis determines the expected response of the population threatened by various hurricane events in terms of the percentage expected to evacuate, probable destinations of evacuees, public shelter use, and utilization of available vehicles. The methodology employed to develop the behavioral data relied on discussions concerning expected behavioral response with emergency management staff in each county, review of past behavioral studies as a part of various hurricane planning efforts conducted by U.S. Army Corps of Engineers, and FEMA and behavioral research by Hazards Management Group for the region; particularly behavioral data collected for the 1996 Bertha/Fran responses in Horry County. A thorough presentation of the Behavioral Studies can be found in Chapter Four.

1.6.4. Shelter Analysis

The Shelter Analysis presents an inventory of pre-designated public shelter facilities, capacities of the shelters, vulnerability of shelters to storm surge flooding, and shelter demand for each county. Shelter inventories were furnished by emergency management offices in each county. Shelter demands were estimated from behavioral analysis data. Chapter Five contains additional information on the Shelter Analysis.

1.6.5. Transportation Analysis

The principal purpose of the Transportation Analysis is to determine the time required to evacuate the threatened population (clearance times) under a variety of hurricane situations and to evaluate traffic control measures that could improve the flow of evacuating traffic. Transportation computer modeling techniques developed to simulate hurricane evacuation traffic patterns were used to conduct this analysis. To provide a better estimate of where these people will travel to, behavioral studies were made to

estimate what portion of the evacuees will go to other inland counties or seek safe haven in Georgia or other destinations. Complete details on the Transportation Analysis is presented in Chapter Six.

1.7 COORDINATION

A comprehensive coordination program was established for the South Carolina Hurricane Evacuation Restudy that included state and local emergency management officials and representatives from other organizations having direct responsibilities in hurricane emergencies.

South Carolina Hurricane Evacuation Restudy Technical Data Report

CHAPTER SIX – TRANSPORTATION ANALYSIS

6.1 INTRODUCTION

With a number of memorable hurricane threats and strikes, including Hurricanes Hugo in 1989, Bertha and Fran in 1996, and Floyd in 1999, the emergency preparedness officials in South Carolina continue to fine tune their preparedness for more active hurricane seasons in the early 21st century. The area faces a significant storm surge inundation potential and is extremely vulnerable to freshwater flooding in low-lying inland areas. Urban population centers in Beaufort, Charleston, Georgetown and Myrtle Beach, as well as many inland cities and towns are susceptible to severe hurricane force winds well before a system decays after landfall. The attraction of the area as a premier tourist destination during hurricane season complicates the hurricane threat and resulting response.

For future hurricane threats, South Carolina faces evacuations of vulnerable population who have gained first-hand evacuation experience and a limited road network that provides westbound roadway capacity for evacuation movements. The difficulties for evacuees will be during peak tourist seasons where inland hotel/motel space is used up and where many out-of-county evacuees try to load the road network in a short period of time. Simultaneous evacuations of the Florida, Georgia and North Carolina coast will make such evacuations even more of a challenge.

During a hurricane evacuation effort for South Carolina, a significant number of vehicles will have to be moved across the local and regional road network. The magnitude of evacuating vehicles will vary depending upon the intensity of the hurricane, publicity and warnings given about the storm, and certain behavioral response characteristics of the vulnerable population. During a typical evacuation, vehicles enter the road network at different times depending on the evacuees' response relative to an evacuation order or storm advisory. Conversely, vehicles leave the road network depending on both the planned destinations of evacuees and the availability of acceptable destinations such as public shelters, hotel/motel units and friend's or relative's homes in non-surge prone areas. Vehicles move across the road network from trip origin to destination at a speed dependent on the rate of traffic loadings on various roadway segments and the ability of the segments to handle a certain volume of vehicles each hour. Estimates of evacuation clearance times for the study area must include the effects of evacuation traffic generated

by neighboring counties and states. For a more detailed account of all transportation analysis activities not addressed in this document, refer to Appendix F- South Carolina Hurricane Evacuation Restudy Transportation Analysis Transportation Model Support Document that is printed separately and available through the Charleston District Corps of Engineers.

6.2 ANALYSIS OBJECTIVES AND SCOPE

Recognizing the importance of updating hurricane evacuation clearance times for South Carolina, the U.S. Army Corps of Engineers, Charleston District, contracted Post, Buckley, Schuh and Jernigan, Inc.(PBS&J) to perform the necessary tasks. The major objectives of the update were as follows:

1. Work with the state and counties to develop traffic evacuation zones and scenarios to be used for transportation modeling and clearance time calculations for each county.

2. Quantify the population and dwelling units in each zone and quantify the potential evacuation population for each scenario.

3. Identify the existing evacuation roadway network noting improvements that have been made since the hurricane evacuation study was completed in the mid 1980's by the U.S. Army Corps of Engineers.

4. Determine the hurricane evacuation clearance times for each county and storm scenario for a projected Year 2000 base year applied to the primary evacuation routes designated by the SCDOT for the 1999 hurricane season. (A future year 2005 scenario was also specified in the original scope but population/dwelling unit forecasts were largely unavailable for the Year 2005)

5. Determine and document regional evacuation traffic that is expected to cross county and state lines so that more meaningful operational planning can take place.

6. Identify local and regional bottlenecks/critical roadway segments and where applicable, recommend general traffic control strategies.

7. Develop zone and road network graphics in an ESRI ArcInfo/ArcView usable format.

8. Using the zone graphic for each county, develop GIS graphics displaying:
    - Permanent occupied dwelling units by evacuation zone
    - Mobile home units by evacuation zone

- Seasonal dwelling units by evacuation zone
- Evacuating people by evacuation zone by scenario
- Public shelter demand by evacuation zone by scenario

9. Using the evacuation road network graphic for each county, develop GIS graphics displaying:
   - Directional service volume per roadway segment
   - Evacuation traffic congestion by roadway segment by scenario

10. Deliver GIS digital files and graphics to the state, Corps and counties, as requested.

11. Develop a simplistic abbreviated "model" in a spreadsheet format that can be used by the state, to modify clearance times based on land use and system changes.

6.3 COORDINATION AND REVIEW ACTIVITIES

A critical element in performing the study tasks was the coordination with the staff of each county, the State of South Carolina and the U.S. Army Corps of Engineers, Charleston District. Meetings began in December of 1997 to coordinate the various technical inputs to the analysis and to review graphics and evacuation statistics developed in the study. The state and counties were provided with draft data throughout the process so that final results would be more credible and usable. The state and several counties have invested considerable time to develop the permanent and tourist related dwelling unit database used for this analysis. Extensive coordination efforts took place in the summer of 1999 to develop evacuation zone systems acceptable to the state and counties, describable to the public, and responsive to newly revised SLOSH mapping that came available in the spring of 1999.

6.4 EVACUATION TRAVEL PATTERNS

The movements associated with hurricane evacuation have been identified for the purposes of this analysis by five general patterns as follows:

A. **In-County Origins to In-County Destinations**. Trips made from primarily storm surge vulnerable areas and mobile home units in an individual county to destinations within the same county, such as public shelters, hotel and motel units, churches, and friends or relatives outside the storm surge vulnerable areas.

B. **In-County Origins to Out-of-County Destinations**. Trips made that originate in an individual county but have destinations in other counties of the study area or outside

the study area entirely. This is a significant category for the South Carolina Region as many coastal evacuees seek safe destinations.

C. **Out-of-County Origins to In-County Destinations**. Trips made as in category A that enter an individual county from other counties in the study area.

D. **Out-of-County Origins to Out-of-County Destinations**. Trips passing through an individual jurisdiction while traveling from one county in the study area to another or outside the study area entirely.

E. **Background Traffic**. Trips made by persons preparing for the arrival of hurricane conditions; these trips are primarily shopping trips to gather supplies. In the coastal South Carolina area, trips from work to home to assist the family in evacuation could impact evacuation of coastal evacuees. Background traffic can also include transit vehicles (vans/buses) used to pick up evacuees without personal transportation.

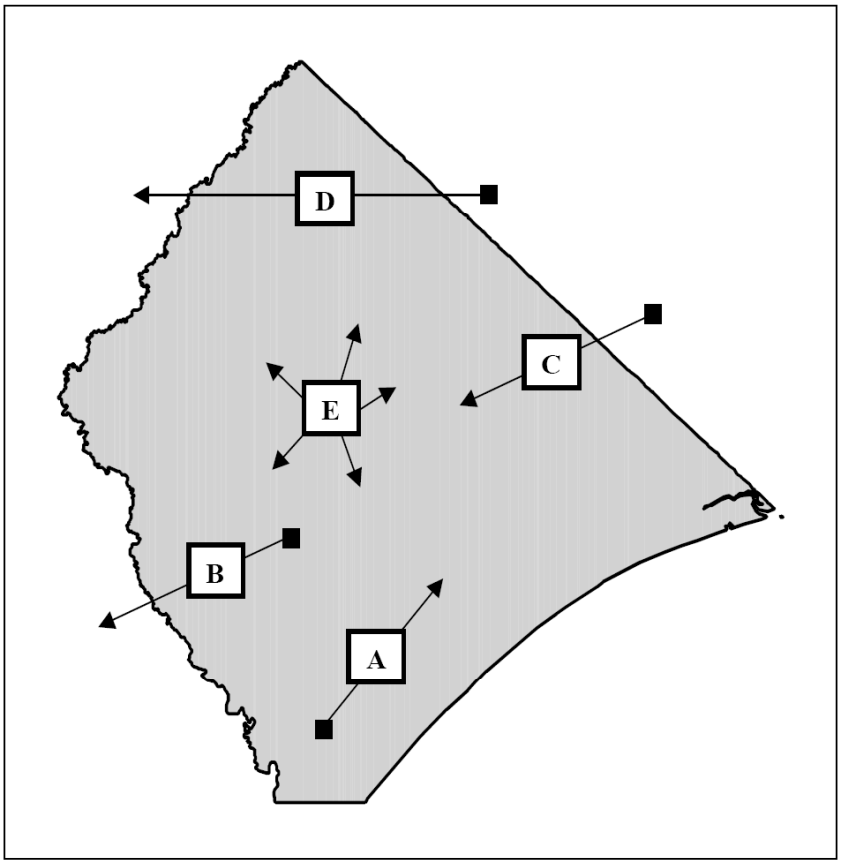


Figure 6-1 Evacuation Travel Patterns

Figure 6-1 graphically depicts these traffic movement patterns associated with hurricane evacuation situations in the coastal South Carolina Region (Horry County Example). It is important to recognize that three of the five defined patterns involve traffic movement patterns generated outside of one county's boundaries. It is evident that, depending on the assumed storm track, these inter-county movements can and do result in a number of regional traffic impacts. During the transportation analysis task, these movements were quantified to facilitate estimation of demand for roadway segment and resulting clearance times.

6.5 TRANSPORTATION ANALYSIS AND INPUT ASSUMPTIONS

The hurricane evacuation transportation modeling performed for the study area required a number of important data inputs and assumptions regarding anticipated evacuation behavior. All hurricanes differ from one another in some respect. Therefore, it is necessary to set forth clear assumptions about storm characteristics and evacuees' expected response before this type of transportation modeling could begin. Not only does a storm vary in its track, intensity and size, but also in the way it is perceived by residents in potentially vulnerable areas. These factors can cause a wide variance in the behavior of the vulnerable population. Even the time of day at which a storm makes landfall influences the parameters of an evacuation response.

The hurricane evacuation transportation analysis results in clearance times based on a set of assumed conditions and behavioral responses. It is likely that an actual storm will differ from a simulated storm for which clearance times are calculated in this report. Therefore, a sensitivity analysis was performed during the transportation modeling. Those variables having the greatest influence on clearance time were identified and then varied to establish the logical range within which the actual input assumption values might fall.

Key input assumptions guiding the transportation analysis are grouped into four areas:

A. Clearance Time Modeling Zones
B. Housing and Population Data
C. Behavioral Characteristics of the Evacuating Population
D. Roadway Network Assumptions

6.5.1. Clearance Time Modeling Zones

The first building block of the study was the development of a zone system for the transportation modeling. Hurricane evacuation studies focus on dwelling units within the potential storm surge flooded areas of a county and inland mobile homes which would be vulnerable to hurricane force winds. Figures 3-1 through 3-8 from Chapter 3 illustrate the zone systems developed for the analysis for the coastal counties. The zone boundaries were set up to relate to well known manmade or natural features, Traffic Analysis Zone (TAZ)/census boundaries, roadways and revised SLOSH storm surge mapping that came available in the spring of 1999.

One of the foremost challenges for the study, was describing who should evacuate in a way that is succinct and meaningful to the public and yet is responsive to anticipated storm surge limits for varying categories of hurricanes. One of several key startup tasks of the transportation analysis for the South Carolina Hurricane Evacuation Restudy was to work with the counties to delineate a general zone system that transportation modeling/clearance time calculations can be based upon. Meetings were held in early December 1997 and continued through February 1998 to focus on this issue. The state, Corps and counties were present at the meetings. While adjustments needed to be made to initial zone systems by September 1999, all counties had cooperated and agreed to a zone system which could be used for study purposes and which could be used in some format during the hurricane season for evacuating the public. Appendix A provides a verbal description of the evacuation zones for each county.

The evacuation zone systems described in Appendix A were set up to meet the following major objectives:

- Be describable over radio/TV media to the public
- Be based upon easily identifiable roadway or natural features for boundary identification
- Relate to storm surge limits based on the most recent SLOSH model runs
- In hard copy, allow coastal county residents to determine if their home is in a storm surge vulnerable evacuation area
- Be usable for transportation modeling/clearance time calculations
- Be related to census/traffic analysis zone boundaries for population and dwelling unit tabulations and calculation of vulnerable populations

6.5.2. Housing and Population Data

To develop the number of housing units and socioeconomic parameters for each evacuation zone, a variety of Year 2000 projections and 1990 Census data were assembled. This data was supplemented by current year mobile home and permanent occupied dwelling unit data provided by each county. Table 3-2 from Chapter 3 summarizes this data for each county. Many local planning departments and building departments contributed the best available counts of mobile homes and long range planning documents. Regional planning groups, such as the Waccamaw Regional Planning Council and the Low Country Council of Governments, provided population projections and copies of recent transportation studies. The State EPD gathered census data and mapping as well as key data items from the South Carolina Department Of Transportation (SCDOT). The resulting database for this hurricane study was one of the cleanest and best developed compared to other studies around the country. The Transportation Model Support Document (under separate cover) provides the data by clearance time modeling zone. Chapter 3 – Vulnerability Analysis contains figures with county maps depicting permanent occupied dwelling units, mobile home units, conglomerate mobile homes, seasonal dwelling units, and evacuation population.

6.5.3. Behavioral Characteristics of the Evacuating Population

Section 4.2 from Chapter 4 summarizes the key behavioral concepts and assumptions used in the study. The Transportation Model Support Document provides all of the specific parameters used for each zone and county for all scenarios.

6.5.4 Roadway Network Assumptions

A final group of assumptions used for input to the transportation analysis is related to the roadway system chosen for the evacuation network and traffic control measures considered for traffic movement. Although the assumptions developed for the transportation analysis are general, the efforts at state, county and municipal levels regarding traffic control and roadway selection must be quite detailed. In heavily urbanized areas, like Charleston and Myrtle Beach, many intersections will be controlled by existing traffic signals. However, as resources permit, traffic control officers will be stationed at bottlenecks identified in this study as well as other local locations of concern. Detailed law enforcement assignments to major bottlenecks involves extensive coordination among local and state officials. The State of South Carolina has already prepared a traffic control annex to the state hurricane plan, which makes the agency assignments to specific intersections. These traffic control points must be manned during a major evacuation and are listed in the most current South Carolina State Hurricane Plan.

Primary evacuation routes modeled in this study were those provided by the state for the 1999 hurricane season. As this study is being published, the South Carolina Department of Transportation (SCDOT) is evaluating and changing several of the designated primary routes. Traffic control points and assigned responsibilities are also being modified to reflect lessons learned during the Hurricane Floyd evacuation. (For example, SCDOT and South Carolina Highway Patrol (SCHP) will route Dorchester Road traffic onto S-22 and then to US 78 in Dorchester County for the 2000 hurricane season. US Highway 78 through Summerville was also added as a route this year.) However, the changes being discussed and implemented should not significantly change the clearance times developed in the study due to the location of the identified bottlenecks and origins of traffic. The changes will help the flow of traffic on secondary routes and the study already assumed that a portion of the coastal counties' traffic would use the secondary routes.

In choosing roadways to be used for the evacuation network, effort was made to include road facilities with sufficient elevations, little or no adjacent tree coverage, substantial shoulder width and surface, and roadways already contained in existing hurricane evacuation plans. In an area such as coastal South Carolina, where there are urban and rural low lying streets that flood in heavy rainfall events, these criteria are difficult, if not impossible, to meet.

In order to determine the routing of evacuation, a representation of the roadway system was developed. A "link-node" system was developed to identify roadway sections. Nodes are used to identify the intersection of two roadways or changes in roadway characteristics. Links are the roadway segments as defined by the nodes when connected. Each link is identified by a letter designation. Figures 6-2 through 6-9 illustrate the coded evacuation network with link names and zone connections to the links shown by open circles and dashed lines.

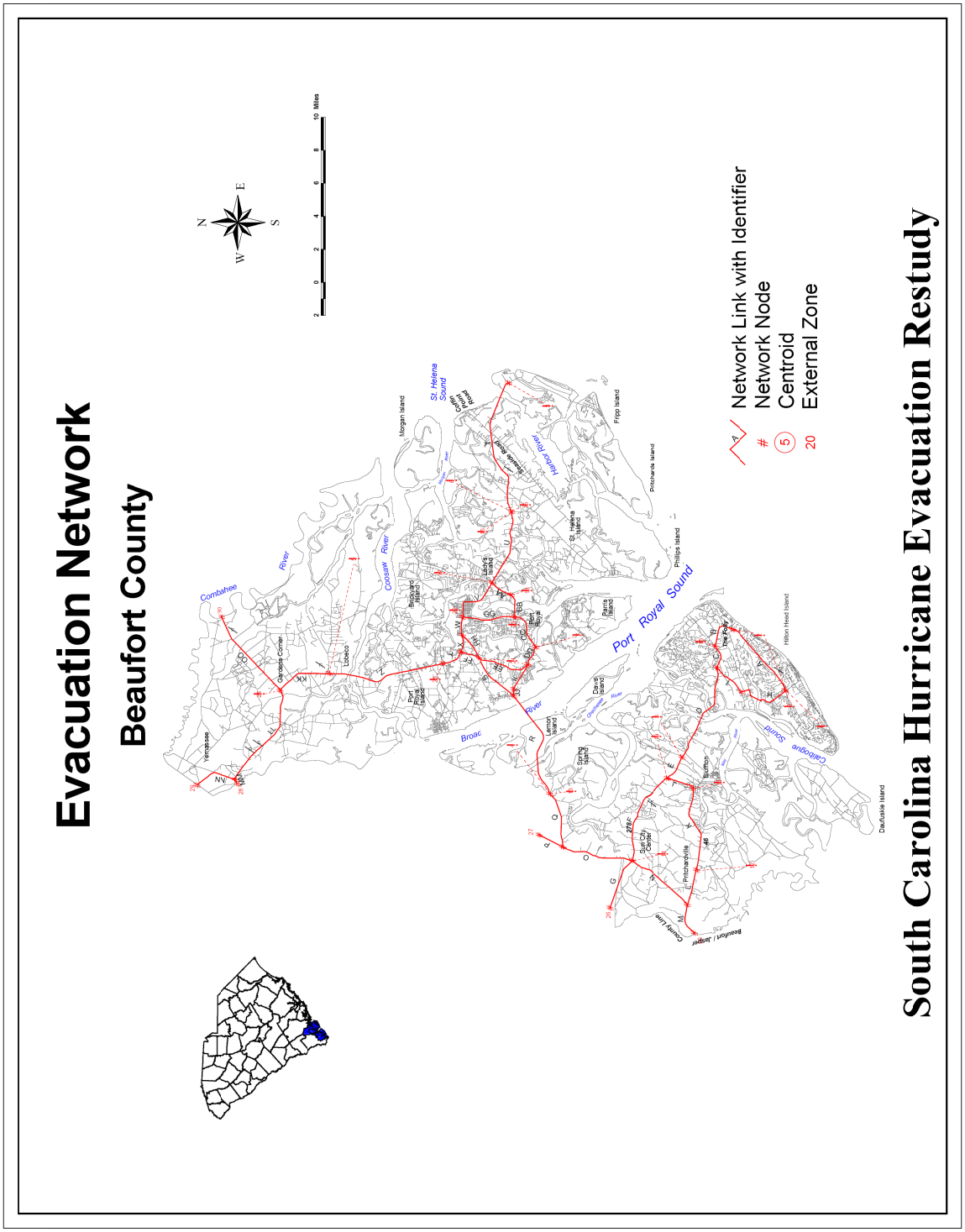


Figure 6-8. Evacuation Network – Beaufort County

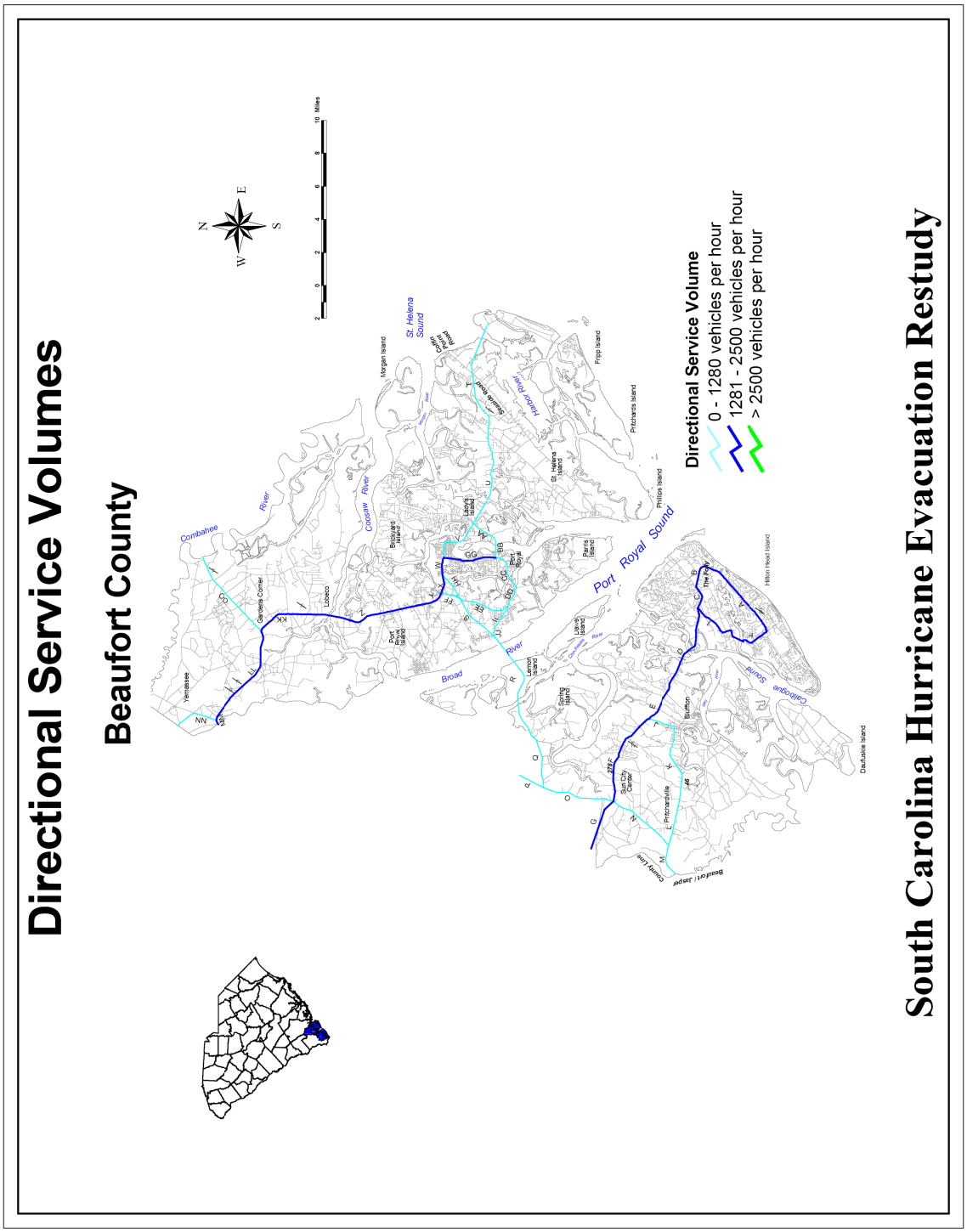


Figure 6-16. Directional Service Volumes, Beaufort County

Once the links and nodes were established for the evacuation routes, directional traffic service volumes at Level of Service D were established for each link for the Year 2000 scenario based upon the primary evacuation routes designated by the SCDOT for the 1999 hurricane season. This was accomplished by ascertaining number of lanes and facility type, through information from the SCDOT and "field checks"/updating. Tables were then used to specify a directional, level of service D service volume based on link characteristics. Figures 6-10 through 6-17 show the Year 2000 scenario directional service volumes and number of lanes for the evacuation clearance time analysis.

Important assumptions concerning the evacuation road network for the analysis, which must be mentioned, are:

- The evacuation of all vehicles will occur prior to the arrival of sustained tropical storm winds (39 mph) and storm inundation of evacuation routes

- Provisions will be made for the removal of vehicles in distress on the network through aggressive incident management and agreements worked out with tow truck operators

- Signal timings will be "actuated" to provide the most green time for westbound movements away from the coast

- The SCDOT will be contacted to "lock down" draw bridges once evacuation orders or advisories are issued

Traffic control points listed in the state's traffic control annex to the state hurricane plan will be manned and actively managed

6.6 CLEARANCE TIME MODEL APPLICATION / SYSTEM FORECASTS

Application of the transportation modeling methodology for hurricane evacuations, using inputs and assumptions discussed in Chapter 3, produced several key data items and forecasts for hurricane evacuation planning and preparedness. Completion of the transportation modeling for the Year 2000 scenario produced the following:

- Evacuating people and vehicle statistics by evacuation zone by storm scenario
- Shelter demand and capacity considerations by scenario
- Traffic volumes and critical roadway segments by scenario
- Estimated clearance times by scenario

Although a wealth of data is produced in the transportation analysis (as provided in the Transportation Model Support Document), the items listed above are the most critical outputs for planning for shelter needs, anticipating bottlenecks, and defining the timing requirements of an evacuation.

6.7 Clearance Time Modeling Description

The general philosophy supporting all of the hurricane evacuation clearance time work around the country is that the analysis must be sophisticated enough to produce reliable estimates of hurricane evacuation clearance time, yet clear enough for the emergency management community to be able to understand key modeling assumptions and products. This section provides a brief overview of the analysis steps and description of the computer program framework for accomplishing the modeling steps. The key steps are as follows:

~ Development of Clearance Time Modeling Zones and Data - identifies who is vulnerable and evacuating.

~ Trip Generation - calculates how many evacuees will move by county sub area for a particular scenario

~ Trip Distribution - determines where evacuees will go

~ Development of Evacuation Road Network - addresses what are the roads that can be used for evacuation and what is the carrying capacity

- Trip Assignment - determines what route(s) evacuees will take to get from their origin to their destination.

- Calculation of Clearance Time - determines how much time it will take for all evacuees to clear the evacuation network.

Figure 6-18 illustrates the major inputs and outputs of this process. Computer programs were used to facilitate the transportation modeling work steps described above. These programs are in a Lotus for Windows environment and were developed for all ongoing hurricane work. The S.C. Restudy is the beneficiary of a brand new clearance time calculation module that was developed after Hurricane Floyd to take advantage of real time carrying capacity observations and traffic loading/queuing estimates. To facilitate the states' and counties' ability to update clearance times when large developments come on line or when road construction restricts normal flow, the state is being provided with a model spreadsheet to make these adjustments in a simplified fashion.

6.7.1. Evacuating People and Vehicles By Scenario

Using trip generation software, total evacuating people and vehicles produced by each zone were calculated and split by general destination type (trip purpose). The four general destination types are in-county public shelter, in-county hotel/motels, in-county home of a friend or relative, and out-of-county. This was accomplished for the Year 2000 scenario, for each storm intensity and for two levels of assumed tourist occupancy (for those counties where tourist occupancy was a large factor).

Table 5-1 (Chapter 5 - Shelter Analysis) shows the numbers of people estimated to leave dwelling units for each county and scenario. Numbers of people involved in an actual evacuation will most likely be less than these figures because 100 percent participation of units in storm surge vulnerable evacuated areas and all mobile homes was assumed for the scenarios. Even with door-to-door evacuation notification, it will be difficult to convince all to leave who should leave.

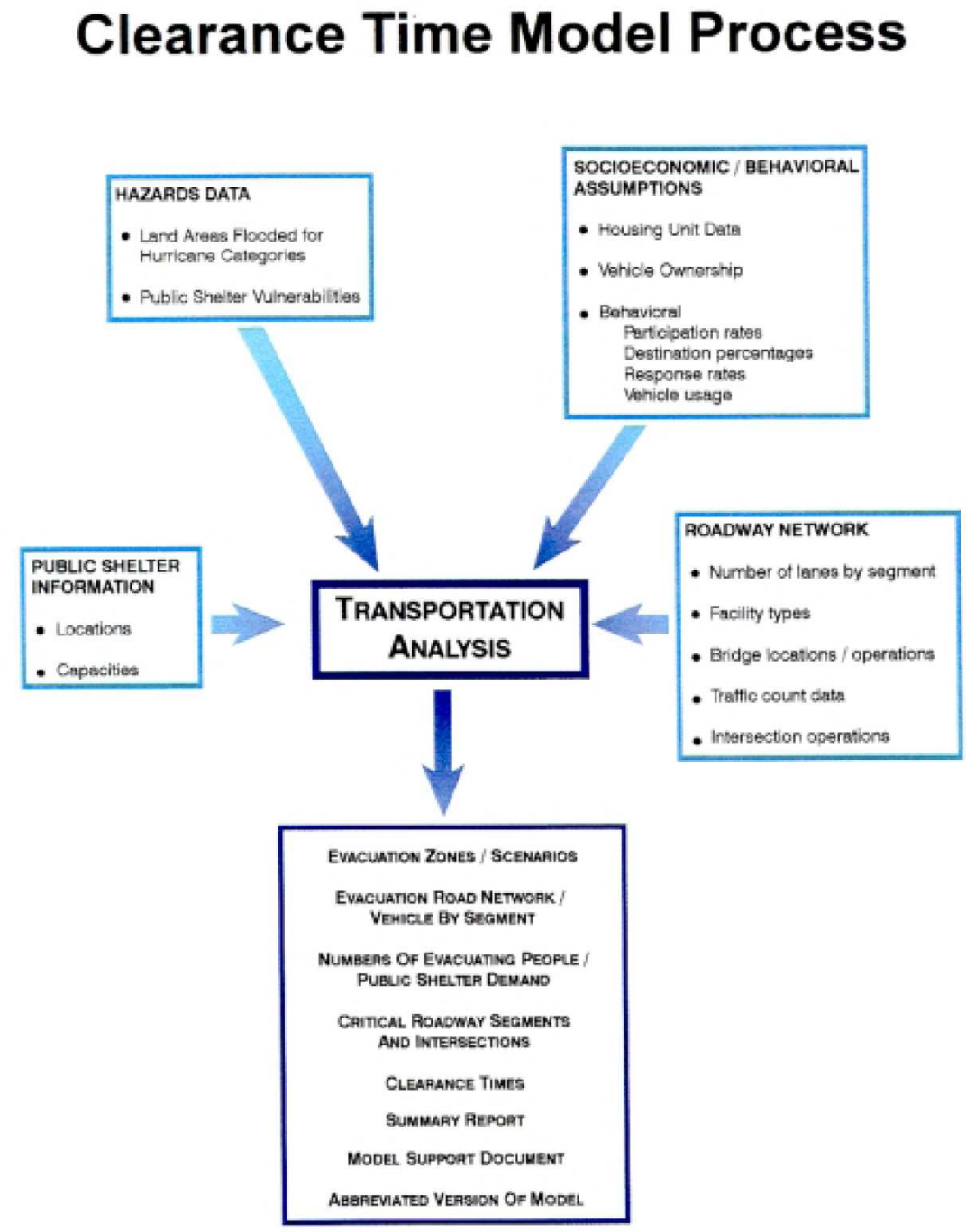


Figure 6-18. Clearance Time Modeling Process

6.7.2. Evacuation Traffic Volumes and Critical Roadway Segments

The Transportation Model Support Document Appendix provides the assigned evacuating vehicle figures by roadway segment for each Year 2000 storm scenario by county. In addition, the Appendix provides an evacuating vehicles to service volume ratio calculated for each roadway segment by scenario. Those segments with the highest evacuation vehicles to service volume ratio were considered to be critical links for evacuation under a particular scenario. These congested areas control the flow of evacuation traffic during a hurricane evacuation and are key areas for traffic control and monitoring. (These ratios should not be confused with the v/c ratios used in traffic engineering to describe Level of Service). Many of these same roadways will be carrying not only the evacuating public, but also the non-evacuating public attempting to gather supplies and fuel for homes and vehicles.

Table 6-1 lists the roadway segments in each county that will control the flow of evacuation traffic. In terms of major hurricanes, one must look at the Georgia bottlenecks noted in the table beyond the South Carolina border. Table 6-2 provides potential numbers of evacuating vehicles which could exit South Carolina and enter Georgia on I-95. Figures 6-19 through 6-26 illustrate potential evacuation traffic congestion by roadway segment by storm scenario, county and conglomerate. Congestion levels are based upon the assumption that all traffic control points will be manned and actively managed.

Table 6-1 (Continued)
CRITICAL ROADWAY LOCATIONS
SOUTHERN CONGLOMERATE COUNTIES
South Carolina Hurricane Evacuation Restudy

COASTAL

Beaufort County
(South of Broad River)

US 278 from Cross Island Parkway to Burnt Church Road
Cross Island Parkway and William Hilton Parkway interchange
Hilton Head connector I-95 interchange in Jasper County
I-16 westbound on ramp from I-95 (in Savannah)

(North of Broad River)

US 21 and Lady's Island Drive
US 21 and US 17 intersection at Garden's Corner
US 21 through Beaufort
US 21 and SC 280 intersection

Jasper County

Hilton Head connector I-95 interchange
US 278 through Ridgeland
US 17/I-95 interchange

Colleton County

Alt 17 through Walterboro
SC 64 through Walterboro
SC 174 and US 17 intersection (in Charleston County)

INLAND

US 278 through Hampton (in Hampton County)
US 278 and SC 64 intersection in Barnwell (in Barnwell County)
US 21 through Orangeburg (in Orangeburg County)
US 301 and US 278 intersection (in Allendale County)
SC 68 and US 278 intersection (in Hampton County)

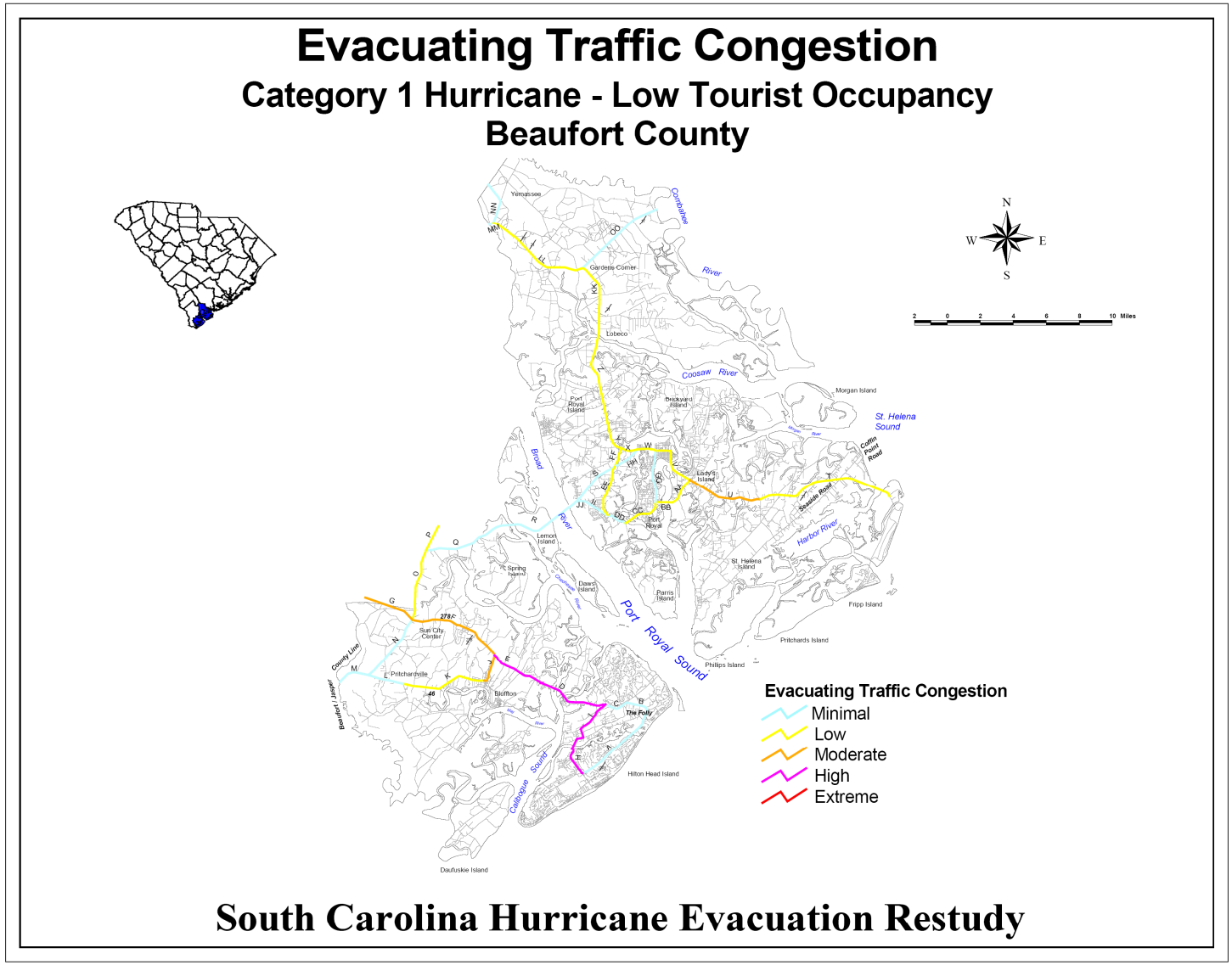


Figure 6-31. Evacuating Traffic Congestion Cat 1 Hurricane Low Tourist Occupancy, Beaufort County

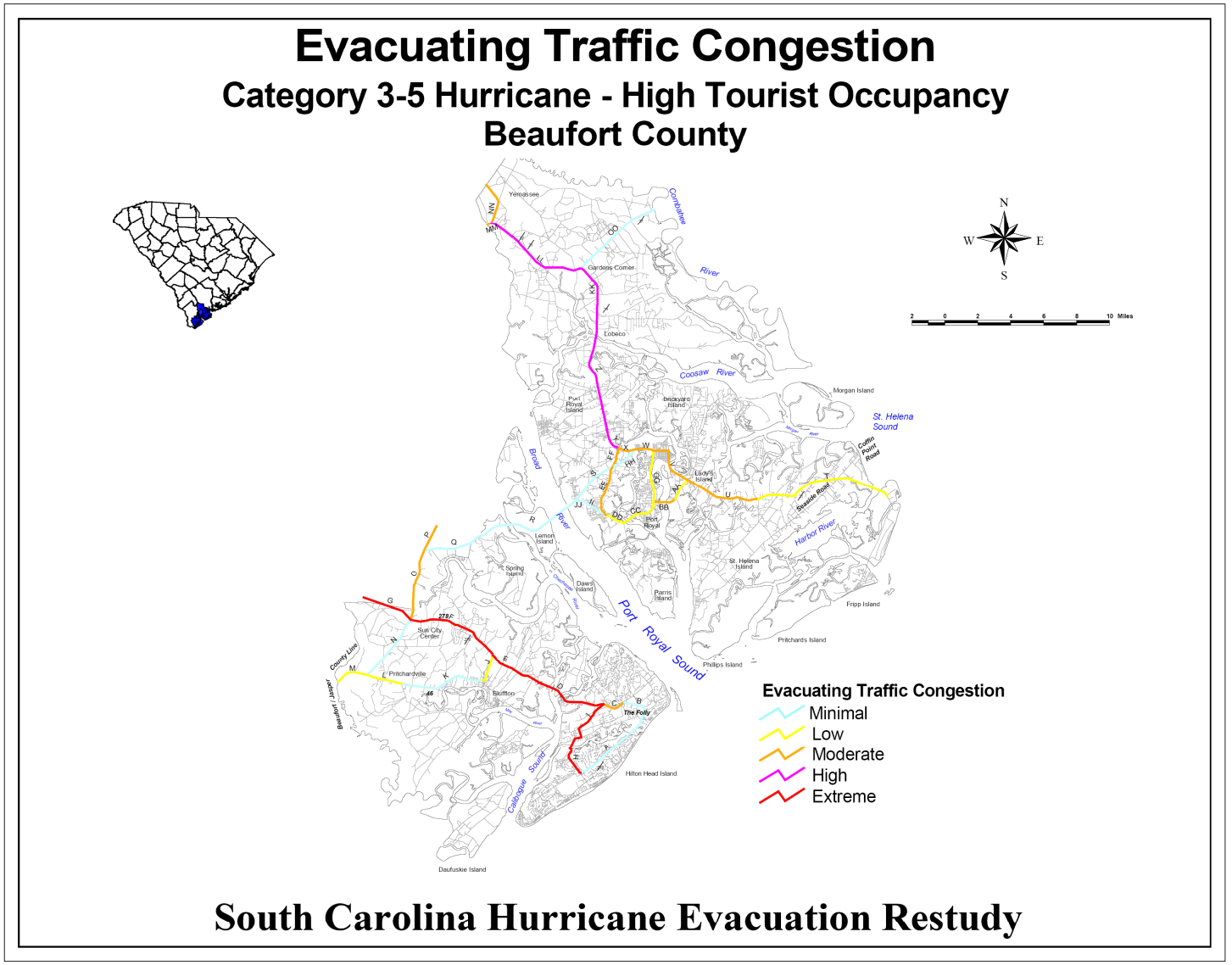
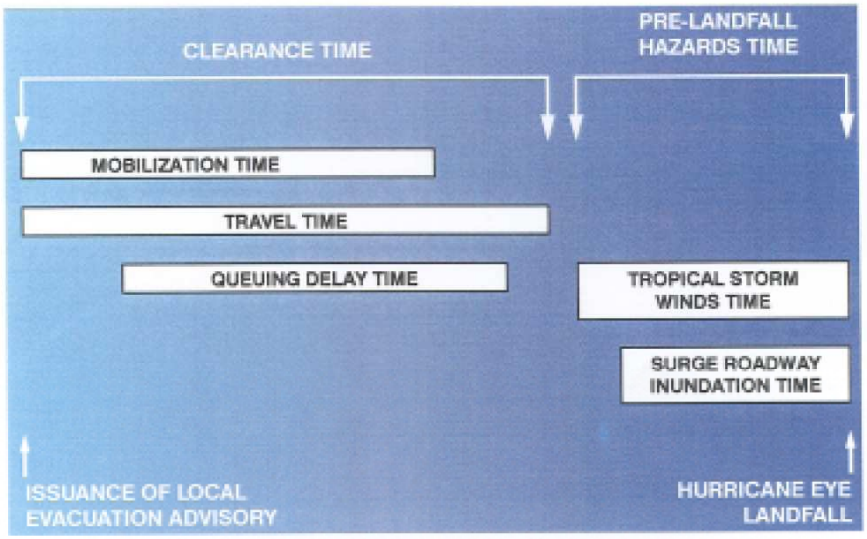


Figure 6-32. Evacuating Traffic Congestion Cat 3-5 Hurricane High Tourist Occupancy, Beaufort County

6.7.3. Estimated Evacuation Clearance Times

The most important product of the transportation analysis is the clearance times developed by storm scenario and by behavioral characteristic for each conglomerate. Clearance time is one of two major considerations involved in issuing an evacuation order or advisory. The other time aspect which must be weighed is the arrival of sustained tropical storm winds. Figure 6-33 illustrates these two timing issues of evacuation and their relation.

Figure 6-35. Components of Evacuation Time



Clearance time is the time required to clear the roadway of all vehicles evacuating in response to a hurricane situation. Clearance time begins when the first evacuating vehicle enters the road network (as defined by a hurricane evacuation behavioral response curve) and ends when the last evacuating vehicle reaches an assumed point of safety. For the South Carolina study, I-95 was the clearance time cut-off point for the northern and central conglomerates. The Allendale/Hampton County line was the clearance time cut-off point for the Southern Conglomerate. Clearance time includes the time required by evacuees to enter the road network (referred to as mobilization time) and the time spent by evacuees traveling along the road network due to traffic congestion (referred to as queuing delay time). Clearance time does not relate to the time any one vehicle spends traveling on the road network and does not include time needed for local officials to assemble and make a decision to evacuate.

Table 6-3 represents the hurricane evacuation clearance times developed for each conglomerate for the Year 2000 storm scenario. Several hundred clearance time runs were accomplished based on differing intensity of hurricanes, evacuation area assumptions, rapidity of evacuees' response, and differing tourist seasons. Clearance times generally fall below 24 hours for most all of the evacuation scenarios. However, due to the limited road network and large numbers of tourists and permanent residents who would have to evacuate in the northern conglomerate, times could potentially exceed 30 hours for a Category 4-5 hurricane, high tourist occupancy scenario.

Due to the location of the controlling bottlenecks for clearance time calculations in each conglomerate (US Highway 501 out of Myrtle Beach, I-26 out of Charleston, and US Highway 278 off Hilton Head Island) one or more conglomerates' evacuation traffic does nothing to an adjacent conglomerates' clearance time situation. For the southern and northern conglomerates, clearance times are largely a function of how well bottlenecks near the coast are processing evacuation traffic and whether inland traffic control points are manned. For the central conglomerate, the bottleneck controlling time extends further inland (I-26 at I-95) and is influenced by many different sources of evacuation traffic. The clearance evacuation times to be used when one or more conglomerate evacuates is the longest time for each conglomerate based upon their own individual clearance time and the track/forward speed of the storm relative to their area's location. In addition, traffic produced by inland county mobile homes does little to impact congestion levels on inland evacuation routes. Inland traffic assignments reflect the tendency for inland mobile homes to evacuate within the county.

Previous evacuations in South Carolina for Hurricanes Hugo, Bertha, Fran and Floyd confirm these observations and model results. Clearance times reflect the effects of adjacent county traffic impacts in each conglomerate and assume that consistent evacuation decisions will be made and coordinated between adjacent local jurisdictions and directed by state officials.

A new feature of the clearance time calculation module is that of looking at queuing occurring for people leaving at different points throughout an evacuation. Travel times became quite lengthy for evacuees who left in the middle of the Floyd evacuation. This was due to the rapid loading of the highway network and the sheer volume of evacuees participating in response to a potential Category 4-5 hurricane.

For the northern conglomerate, worst household commute times will be 2½ to 6 hours in a Category 1-2 hurricane when there is a low tourist occupancy. For a Category 1-2 hurricane with a high tourist occupancy, these times will be in the 10½ to 14 hours for worst household commute times. The shorter household

commute times result from a longer loading of the highway network, whereas the longest household commute times result from the rapid response/quick loading of the road network. For a Category 5 scenario with a high tourist occupancy, worst household commute times could be as high as 19 to 23 hours. Even with the reverse lane operation on US 501, households leaving during the middle of the evacuation could have an 11 to 15 hour commute.

For the central conglomerate, worst household commute times will be 1½ to 4¾ hours in a Category 1 hurricane where there is low tourist occupancy. For a Category 1 hurricane with a high tourist occupancy, these times will be in the 2 to 6¼ hours for worst household commute times. For a Category 4-5 scenario with high tourist occupancy, worst household commute times could be as high as 13½ to 18 hours. Even with the reverse lane operation on I-26, households leaving during the middle of the evacuation could have a 4 to 8½ hour commute. In light of Floyd data and "stories", these numbers seem to be valid.