Acknowledgements

NCDOT gratefully acknowledges the commitment, cooperation, and professional contributions of the following:

North Carolina Department of Transportation
Secretary **Lyndo Tippett**

Alpesh G. Patel, *Project Manager*

Board of Transportation

- Stan M. White
- Marvin K. Blount, III*
- Cameron (Cam) W. McRae*
- Lanny T. Wilson
- Louis W. Sewell, Jr.
- Thomas A. Betts, Jr.
- Kenneth Spaulding
- Nina S. Szlosberg
- D. M. Campbell, Jr.
- J. Douglas Galyon
- G. R. Kindley
- Nancy W. Dunn**
- Andrew M. Perkins, Jr.*
- Marion A. Cowell, Jr.*
- Larry S. Helms
- Arnold Lakey
- Robert (Bob) A. Collier, Jr.*
- Alan Thornburg
- Conrad Burrell

Statewide Transportation Plan Senior Management Team:

- Susan Coward
- Steve Varnedoe
- Calvin Leggett
- John Sullivan
- Mike Bruff
- Debbie Barbour
- Len Sanderson
- Roberto Canales
- Greg Thorpe
- Mark Foster

NCDOT Staff Contributions from:

- Division of Highways

Divisions of:

- Public Transportation
- Rail
- Ferry
- Bicycle and Pedestrian Transportation
- Aviation

Additional Contributions from:

- NC State Ports Authority
- Federal Highway Administration (NC Division)

Consultant:

- Wilbur Smith Associates

***** Statewide Transportation Plan Committee

** Chair, Statewide Transportation Plan Committee

Table of Contents

List of Tables

List of Figures

Executive Summary

The North Carolina Department of Transportation (NCDOT) is committed to supporting a safe and integrated transportation system that enhances the well-being of the state. Over a four-year process from 2000-2004, NCDOT took a "first step" in better understanding the challenges, needs, and resources required to provide such a transportation system for a growing and economically diverse state. Starting in 2001, NCDOT first identified a 25-year infrastructure estimate (to the year 2025, in 2001 dollars) of both transportation needs ($84 billion) and available revenue ($55 billion) that was the basis for a multi-year public policy conversation with NC's citizens and stakeholders on establishing transportation priorities. This effort culminated in the adoption and recommendation of a new, long-term investment policy highlighted in the Statewide Transportation Plan in September 2004.

Since the approval of the 2004 Statewide Transportation Plan (STP), multi-modal transportation needs have changed due to:

- The continued aging of the system (i.e., stress on pavements, shorter lifecycle of bridges, etc.);
- Growth in population;
- Growth in vehicle miles traveled (VMT);
- Changes in land-use patterns;
- Increased gasoline/diesel prices;
- Increased use of hybrid vehicles; and
- Construction cost inflation and significant increases in energy costs reducing the purchasing power of motor fuel taxes.

Since 2003, North Carolina has experienced unprecedented construction cost increases. Construction prices for concrete, steel, and asphalt have increased by 45 percent, making it more costly for NCDOT to complete needed projects. In addition, construction costs are expected to continue to rise in the near future.

The right investment mix to address preservation, maintenance, modernization and expansion of the transportation system is required if NCDOT wants to build upon the efforts of the 2004 STP recommendations and address the updated information in the report. Finding ways to maximize operational efficiency, leveraging the use of technology, and seeking to be strategic with how and where transportation dollars are invested create safety, congestion relief and mobility benefits (across all modes) that are paramount to managing North Carolina's sizeable transportation system. The purchasing power of revenue from user fees such as the motor fuels tax is declining, which has major implications on the NCDOT transportation capital program. In many ways, the transportation system is the lifeblood of the North Carolina economy and an important component of quality of life for all residents.

System Needs

Over the past year, NCDOT staff has worked to update the multi-modal transportation needs and determine future transportation revenues to 2030. Overall, the multi-modal transportation investment needs identified in the 2006 STP Mid-Cycle update total $124 billion (in 2005 dollars) compared to $84 billion from the 2004 STP. This is an increase of $40 billion, or 48 percent. The 2006 STP Mid-Cycle update also identified the following:

- Highway needs (roadways, bridges and intelligent transportation systems (ITS) needs) have increased by 43 percent;
- Public transportation needs have increased by 68 percent;
- Passenger and freight rail needs have increased by 20 percent;
- Ferry needs have increased by 28 percent;
- Bicycle and pedestrian needs have increased by 47 percent; and
- Aviation needs have increased by 69 percent.

The highway transportation needs are categorized in the 2006 STP Mid-Cycle update by:

- North Carolina Multi-modal Investment Network (NCMIN);
  - Statewide;
  - Regional; and
  - Subregional.

- Improvement Type;
  - Expansion;
  - Modernization;
  - Preservation; and
  - Maintenance.
- The 14 NCDOT Divisions[1];
- Backlog (existing) and Accruing (future)[2];
- Five Funding Periods;
  - 2006-2010;
  - 2011-2015;
  - 2016-2020;
  - 2021-2025; and
  - 2026-2030.

The following provides a summary of the $124 billion transportation investment needs identified in the 2006 STP Mid-Cycle update:

- 42 percent are on the Statewide Tier;
- 15 percent are on the Regional Tier;
- 43 percent are on the Subregional Tier;
- 38 percent are expansion needs;
- 23 percent are modernization needs;
- 39 percent are preservation and maintenance needs;
- 31 percent are backlog needs; and
- 69 percent are accruing needs.

[1] Non-highway needs are not categorized by NCDOT Division.
[2] All non-highway needs are considered accruing needs.

Chapter 1. Introduction

The Federal government requires that each state develop, maintain, and update a Statewide Transportation Plan (STP). These requirements are outlined in 23 CFR 450.212 and 450.214. Within NCDOT, the Transportation Planning Branch (TPB) is responsible for preparing the STP. The goals for this 2006 STP Mid-Cycle update are the same as those identified in the 2004 STP.

This technical report describes the current needs associated with updating the existing highway system, bridges, and the non-highway needs in North Carolina, as well as projected future needs to the year 2030. A variety of analysis techniques were used to develop a comprehensive assessment of needs related to North Carolina's roadway and bridge network and the non-highway modes. The following sections describe the current highway system and non-highway modes in North Carolina and explain the current and future highway, bridge and non-highway improvement needs.

Preserving, modernizing, expanding and maintaining the second largest transportation system in the nation is no simple task. During the next 25 years, multi-modal transportation needs in North Carolina, total $124 billion.

- Over 137,000 lane miles of roadway will have preservation and maintenance needs totaling $32.2 billion or 26 percent;
- Over 30,000 lane miles of roadway and over 11,000 bridges will have modernization needs totaling $26.7 billion or 22 percent;
- Over 26,000 lane miles of roadway will have expansion needs totaling $38.4 billion or 31 percent; and
- Non-highway mode needs total $26.1 billion or 21 percent.

Analyzing the total needs by the North Carolina Multi-modal Investment Network (NCMIN) Tiers reveals that:

- $52.0 billion or 42 percent are on the Statewide Tier;
- $18.6 billion or 15 percent on the Regional Tier; and
- $52.8 billion or 43 percent on the Subregional Tier.

A total of $97.4 billion of needs were identified on North Carolina highways (including roadways, bridges and ITS).

- Preservation and maintenance needs total $32.2 billion or 33 percent;
- Expansion needs total $38.4 billion or 39 percent; and
- Modernization needs total $26.7 billion or 39 percent.

Analyzing the total highway needs by NCMIN Tiers reveals that:

- $47.7 billion or 49 percent are on the Statewide Tier;
- $11.2 billion or 12 percent are on the Regional Tier; and
- $38.4 billion or 39 percent are on the Subregional Tier.

The greatest Statewide Tier need is expansion ($33.8 billion) compared to modernization on the Regional Tier ($4.8 billion) and preservation on the Subregional Tier ($23.6 billion).

A total of $26.1 billion of non-highway needs (public transportation, passenger rail, freight rail, ferry, aviation and bicycle and pedestrian systems) were identified.

- Preservation and maintenance needs represent 59 percent;
- Expansion needs represent 34 percent; and
- Modernization needs represent 7 percent.

Analyzing the total non-highway needs by NCMIN Tiers reveals that:

- $4.4 billion or 17 percent are on the Statewide Tier;
- $7.4 billion or 28 percent on the Regional Tier; and
- $14.3 billion or 55 percent on the Subregional Tier.

While the challenge of preserving, maintaining, modernizing and expanding a complex, multi-modal transportation system is significant, so to is the reward for making the hard choices and serious investments required to maintain the system in competitive condition. Maintaining North Carolina's transportation system results in a safer and more efficient system and these improvements support economic development opportunities throughout the state.

Chapter 2. Multi-modal Transportation Needs Comparison between 2004 STP and the 2006 STP Mid-Cycle Update

North Carolina is rapidly growing. The population grew from 5 million in 1970, to 8.5 million in 2004 and is expected to grow to over 12 million people in the next 25 years. Vehicle miles traveled (VMT) more than tripled from 30 billion in 1970 to 101 billion in 2005, and VMT is expected to increase 50 percent more by 2020 due to increases in the number of registered motor vehicles and licensed drivers, and sprawling patterns of land development. Truck freight hauled in North Carolina is projected to increase to 808 million tons by 2020, a 190 percent increase since 1998[1]. While this growth is good, it places a tremendous strain on the transportation system.

Since the 2004 STP (used 2001 data) was completed, multi-modal transportation needs have changed due to the age of the system, growth in population, VMT, and land use. Between 2000 and 2005, VMT in North Carolina has increased 13 percent on state-maintained roadways[2]. Based on NCMIN Tiers, the Statewide Tier VMT increased by 15 percent; Regional Tier VMT increased by 7 percent and the Subregional Tier VMT increased by 14 percent. These increases have added a tremendous strain to North Carolina roadways and bridges as noted in this report.

2.1 Transportation Investment Needs

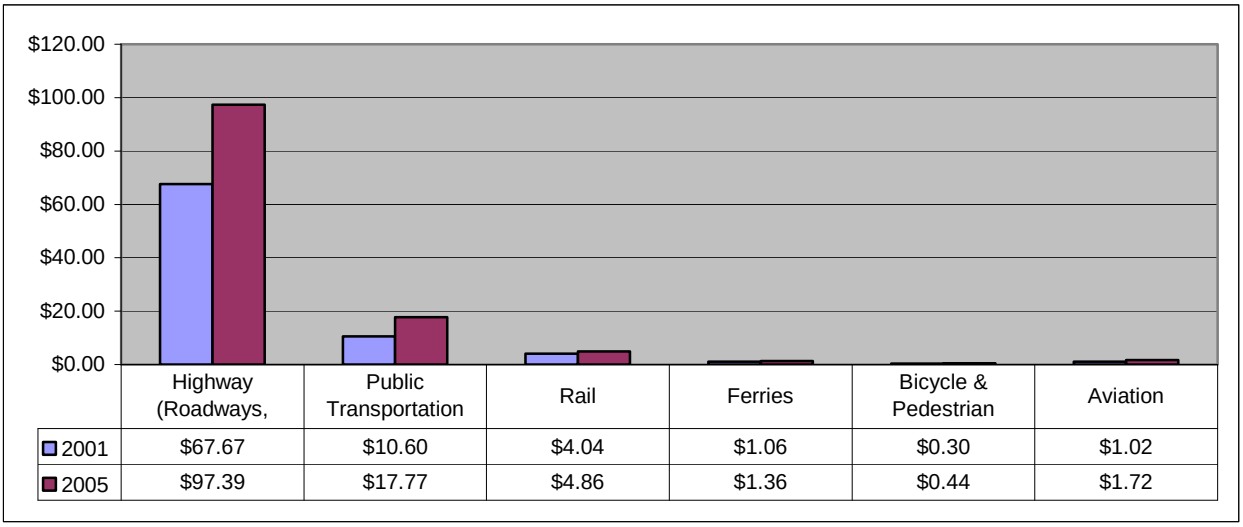
The multi-modal transportation investment needs identified in the 2006 STP Mid-Cycle update total $124 billion, which is an increase of $40 billion (48%) from the 2004 STP. As shown in **Table 1**, all multi-modal needs increased. As noted earlier, population and VMT increases are one of the main reasons for the increase in needs. However, construction cost inflation and significant increases in energy costs have reduced the purchasing power of the motor fuel tax. Over the last five years, North Carolina has realized unprecedented construction cost increases. Since 2003, construction prices for concrete, steel and asphalt have increased by 45 percent making it more costly for NCDOT to complete needed projects and construction costs are still rising. In fact, construction lettings have declined approximately 70 percent since 2002.

Figure 1 illustrates the differences in the multi-modal transportation needs between the 2004 STP and the 2006 STP Mid-Cycle Update. The large increase in highway expansion needs is attributed partially to the growth in population and VMT, but a change in how roadway capacity (how many cars a roadway can handle) is calculated occurred in 2002 and this along with factors described later in the Technical Approach produced more roadway expansion needs.

Table 1 – Multi-modal Transportation Needs Comparison between 2004 STP and the 2006 STP Mid-Cycle Update ($ in billions)

	2004 STP 2001 – 25 (Billion Dollars)	2006 Mid-Cycle Update 2005 - 30 (Billion Dollars)	Dollar Difference	Percent Change
Highway (includes ITS)	$60.77	$80.96	$20.19	33.2%
Bridges	$6.90	$16.43	$9.53	138.1%
Public Transportation	$10.60	$17.77	$7.17	67.6%
Rail	$4.04	$4.86	$0.82	20.2%
Ferries	$1.06	$1.36	$0.30	28.0%
Bicycle & Pedestrian	$0.30	$0.44	$0.14	46.7%
Aviation	$1.02	$1.72	$0.70	68.7%
TOTAL	**$84.69**	**$123.53**	**$38.84**	**45.9%**

Figure 1 – Multi-modal Transportation Needs Comparison between 2004 STP and the 2006 STP Mid-Cycle Update ($ in billions)



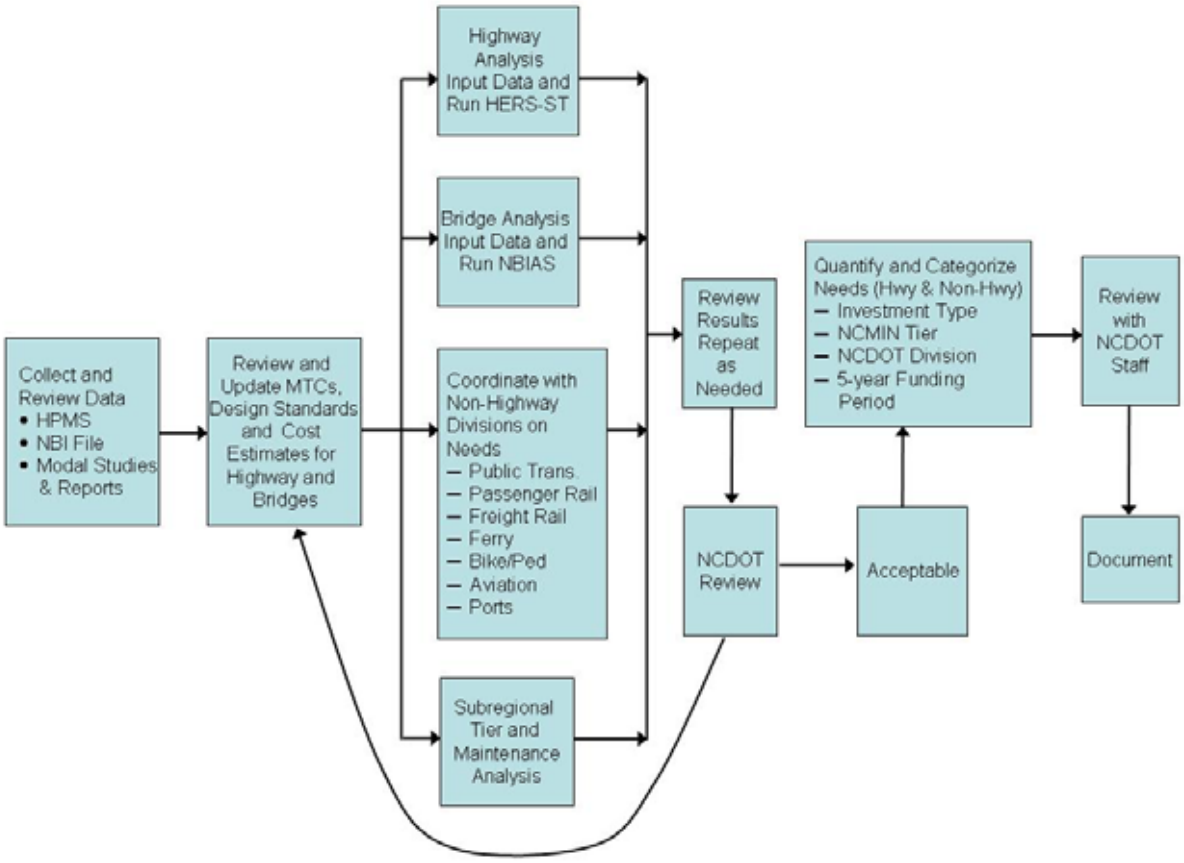
Chapter 3. Transportation System Needs

3.1 Technical Approach

The 2006 STP Mid-Cycle update was prepared using existing transportation databases maintained by NCDOT. This approach minimized the need for costly new data collection, maintained consistency with existing plans and programs, maximized the resources devoted to analysis, and supports future STP updates using these same data sources and plans.

The overall needs analysis is a very complex process and the 2006 STP Mid-Cycle update included both industry standard quantitative tools supported by FHWA, plus quantitative assessment by the consultant team and NCDOT staff. The 2006 STP Mid-Cycle update used more sophisticated analysis tools to identify highway and bridge needs than was used in the 2004 STP and this, along with other factors such as population and VMT growth, change in minimum tolerable conditions (MTCs), design standards and construction and right-of-way (ROW) cost escalation, identified needs more accurately. **Figure 2** shows a flow chart of the Technical Approach and the following sections detail the Technical Approach that was employed to complete the 2006 STP Mid-Cycle update, which identifies highway, bridge, and non-highway needs over the next 25 years.

Figure 2 - Technical Approach Flow Chart



3.2 Inventory Data

A sound technical needs analysis must be based on valid data describing important features of the transportation system. Therefore, the analysis entails substantial efforts to ensure the quality and quantity of data needed to achieve a rigorous assessment of highway needs.

- **Highway** - NCDOT maintains, on a continuous basis, inventory data for all highways under its jurisdiction. A single database was used for the study of state roadways. The Highway Performance Monitoring System (HPMS) utilizes physical and traffic characteristics, identification data and information about the pavement type, history, and present condition of all roads under state jurisdiction. The 2004 HPMS database was the starting point for the highway analysis.

- **Bridges** – As mandated by the Federal government, NCDOT maintains and regularly updates the National Bridge Inventory (NBI file), an extensive database concerning all state bridges. Bridges under state jurisdiction were analyzed to estimate bridge needs based on the 2005 NBI file. The NBI file has various bridge physical, operational and condition characteristics that can be used by bridge management systems to forecast bridge conditions and needs. The base year data in the NBI file includes an assessment of the current bridge conditions.
- **Non-Highway modes** – Public Transportation, Passenger Rail, Freight Rail, Ferry, Bicycle and Pedestrian and Aviation facilities and systems play a vital role in moving people and goods in North Carolina. The non-highway needs analysis did not utilize databases and models to identify multi-modal needs, rather the qualitative analysis included close coordination and consultation with NCDOT staff to identify future needs by North Carolina Multi-modal Investment Network (NCMIN), investment type and five-year funding periods. Most of the NCDOT non-highway Divisions recently completed detailed studies, which identify future needs. These studies and reports were reviewed and the results were coordinated with NCDOT staff and documented in the 2006 STP Mid-Cycle update.

3.3 Technical Methodology

During the 2006 STP Mid-Cycle update process, two new analytical tools were used to identify existing and future highway and bridge needs. The new tools are fully described in this section and *both analysis tools flag deficiencies and identify an improvement type based upon a prescribed NCDOT design standard that is based on unit cost per mile (highway) or unit cost per square foot (bridge) of improvement, which provides a dollar value of need.*

3.3.1 Highway Tool

In determining North Carolina highway needs, emphasis was placed on ensuring detailed and statistically valid data were utilized to provide credible results. Furthermore, appropriate methods and tools were employed to ensure a rigorous analytical approach yielding sound

results for quantifying and understanding needs. To meet these objectives, the highway needs analysis utilized HERS-ST – Highway Economics Requirements System – State Version.

The HERS-ST model (version 4) developed by the Federal Highway Administration (FHWA) is currently used by 20 state DOTs to assess state highway investment needs[3]. At the national level, HERS has been used by FHWA's Office of Legislation and Strategic Planning for nearly ten years to develop future National-level highway investment levels, to either improve the Nation's highway system or maintain user cost levels on the system. HERS provides cost estimates for achieving economically optimal program structures. HERS can also predict system condition and user cost levels resulting from a given level of investment. These estimates provide benchmarks from which Congress considers the highway budget. In the same way, HERS-ST entails assessment of expected changes in physical system conditions, as well as economic cost behavior determining highway economic requirements at the state level. The analysis is based on an application of engineering, economic and statistical methods to a standard sample of HPMS data. Since HERS-ST does not capture new roadway location, urban loops and railroad and highway grade crossings needs, these needs were identified by examining the NCDOT 2007-2013 State Transportation Improvement Program (STIP).

3.3.2 Traffic Growth Rates

As noted earlier, the HPMS database used in the 2006 STP Mid-Cycle update is based on the 2004 FHWA submittal. Since the 2006 STP Mid-Cycle update base year is 2005, the HPMS sample section average annual daily traffic (AADT) needed to be updated from 2004 to 2005. To accomplish this, NCDOT provided HPMS sample sections submitted to FHWA from the year 2000 to 2004. Using these samples, compound annualized growth rates (CAGR) were computed for each roadway functional classification and applied to the 2004 HPMS sample segments by functional class to arrive at estimated 2005 AADT.

Compound annual growth rate is a well-documented method of assessing the average growth of a value over time. To calculate CAGR, one must solve the equation:

[3] Ten other state DOTs are currently evaluating using HERS-ST in identifying their highway needs.

$$r = (E / B)^{(1 / T)} - 1$$

where r = percentage annual growth rate

where E = the ending value, in this case 2004 AADT is used.

where B = the beginning value, in this case 2000 AADT is used.

where T = the time passed in years, in this case 5 years have passed.

Example: Estimating 2005 AADT for Rural Interstates

E = 39,207

B = 36,499

T = 5

$r = (39{,}207 / 36{,}499)^{(1 / 5)} - 1$

r = 0.014417515

r = 1.4417515%

Annual AADT one year growth (2004 to 2005) = 39,207 x 0.014417515

Annual AADT one year growth = 565

2005 Rural Interstate estimated AADT = 39,207 + 565

2005 Rural Interstate estimated AADT = 39,772

As shown in **Table 2**, the estimated 2005 AADT were determined for the remaining functional classifications used in the HERS-ST analysis. Regardless of length, the growth rates were applied by functional class for all HPMS sample segments (3,664 or 2.5%) to estimate 2005 AADT before needs were analyzed in HERS-ST.

Table 2 – Estimated 2005 AADT

Functional Class	Average AADT Per Segment (Standard Sample) 2000	2001	2002	2003	2004	Compound Annual Growth Factor (2000-2004)	Estimated 2005 AADT
Rural Interstate	36,499	37,741	38,903	38,206	39,207	*1.014417515*	39,772
Rural Principal Arterial	12,476	12,711	13,076	13,383	13,799	*1.020358092*	14,080
Rural Minor Arterial	7,711	7,991	8,184	8,304	8,396	*1.017172419*	8,540
Rual Major Collector	4,419	4,557	4,709	4,745	4,786	*1.016110811*	4,863
Urban Interstate	72,884	74,451	76,348	75,567	77,410	*1.012120064*	78,348
Urban Freeway	35,583	36,923	36,731	37,373	37,857	*1.012464950*	38,329
Urban Principal Arterial	19,083	19,472	19,804	19,636	19,956	*1.008978333*	20,135
Urban Minor Arterial	10,271	10,473	10,538	10,571	10,687	*1.007965334*	10,772
Urban Collector	5,072	5,240	5,250	5,254	5,315	*1.009410095*	5,365

3.3.3 Highway Methodology

The process to analyze highways using HERS-ST began with NCDOT staff determining the minimum tolerable conditions (MTCs), which identified highway needs and determining design standards, which identified the condition of the roadway after improvement. NCDOT staff also provided improvement costs and ROW costs per mile for each HERS-ST improvement type by functional classification, based on historical costs. The MTCs, design standards and improvement plus ROW cost tables were updated based on these changes and imported into HERS-ST. *HERS-ST was programmed to provide full engineering needs analysis, over a 25-year period, so the final results provided actual highway needs not withstanding budget levels.*

The sample HPMS database, which consists of approximately 2.5 percent of state-maintained roadways was provided by NCDOT and is consistent with other state DOTs sample sizes. The HPMS sample was representative of the Statewide and Regional Tiers, which is described more fully later in this section, but the database was inconclusive when determining the needs of Subregional Tier roadways. *Subregional Tier roadway needs were identified through coordination with NCDOT staff and a trend analysis using the HPMS database and the NCDOT Existing Mileage by Type of Road Tables NC 600 SR and NC 700 SM.* HPMS database improvements have been identified and once integrated in future HPMS submittals by NCDOT staff, it is anticipated that HERS-ST will be used to identify Subregional Tier needs in future STP updates. *In addition, NCDOT staff decided to use the highway maintenance needs derived from the 2006 NCDOT Annual Maintenance Report because they were more accurate than needs*

identified in HERS-ST. The dollars in this report were discounted 10 percent to establish 2005 dollars. The maintenance needs provided by NCDOT included Statewide Programs, such as weigh stations, rest area renovation, traffic signal optimization and replacement, etc; and Routine Maintenance, such as rest area maintenance, snow and ice control, roadway lighting, unpaved road maintenance, etc. Intelligent Transportation System (ITS) needs were provided by NCDOT staff and while included in the total highway needs, ITS needs are examined further in the 2006 STP Mid-Cycle update.

In order to identify highway needs, inventory data using the North Carolina HPMS database were compared to MTCs considered acceptable by NCDOT. MTCs are based on judgment regarding levels at which congestion, safety risk, physical and structural deterioration are expected to adversely affect system performance and the public interest. Facilities falling below the specified MTC's in any given funding period are understood as needs for improvement in the time horizon of the plan. Design standards provide engineering details on how the facility should be improved once a need is identified. **Tables 3 and 4** provide the MTC's and design standards, respectively, used during the 2006 STP Mid-Cycle update. MTCs are defined for different types of facilities based on their functional classification, traffic volume, and location (as defined by terrain and rural/urban characteristics). *Any roadway condition below a specified "minimum tolerable" criterion is classified as a deficiency or need.* Existing deficiencies (backlog in 2005) are identified under these criteria, as are accruing (future) needs expected to emerge to the year 2030, given assumptions about physical deterioration, changing system conditions and traffic growth. National default MTCs were used for the volume-to-capacity (V/C) ratio; however all other MTCs and design standards were provided by NCDOT staff.

Table 3 - Minimum Tolerable Conditions

Roadway Type/ Functional Class Group	Terrain	PSR (1)	Lane Width (Feet)	V/C Ratio (2)	Right Shoulder Width (Feet)
Rural Interstate	Flat	3.3	12.0	0.7	8
	Rolling	3.3	12.0	0.8	8
	Mountainous	3.3	12.0	0.9	8
Rural Principal Arterial (AADT > 6,000)	Flat	3.0	11.0	0.7	8
	Rolling	3.0	11.0	0.8	8
	Mountainous	3.0	11.0	0.9	8
Rural Principal Arterial (AADT < 6,000)	Flat	3.0	11.0	0.7	4
	Rolling	3.0	11.0	0.8	4
	Mountainous	3.0	11.0	0.9	4
Rural Minor Arterial (AADT > 2,000)	Flat	3.0	11.0	0.7	4
	Rolling	3.0	11.0	0.8	4
	Mountainous	3.0	11.0	0.9	4
Rural Minor Arterial (AADT < 2,000)	Flat	2.8	11.0	0.7	2
	Rolling	2.8	11.0	0.8	2
	Mountainous	2.8	11.0	0.9	2
Rural Major Collector (AADT > 1,000)	Flat	3.0	11.0	0.7	2
	Rolling	3.0	11.0	0.8	2
	Mountainous	3.0	11.0	0.9	2
Rural Major Collector (AADT > 400)	Flat	2.8	11.0	0.95	2
	Rolling	2.8	11.0	0.95	2
	Mountainous	2.8	11.0	0.95	2
Rural Major Collector (AADT < 400)	Flat	2.5	10.0	1.0	2
	Rolling	2.5	10.0	1.0	2
	Mountainous	2.5	10.0	1.0	2
Urban Roads	Interstate	3.3	12.0	0.9	8
	Freeway	3.0	12.0	0.9	8
	Principal Arterial	3.0	11.0	0.9	4
	Minor Arterial	3.0	11.0	0.9	2
	Collector	2.8	11.0	0.9	2

Notes:
(1) PSR = Present Serviceability Rating
(2) V/C Ratio = Volume to Capacity Ratio. National default value was used in this analysis

Table 4 – Design Standards

Roadway Type/ Functional Class Group	Terrain	PSR	Lane Width (Feet)	Right Shoulder Width (Feet)
Rural Interstate	Flat	5	12	12
	Rolling	5	12	10
	Mountainous	5	12	8
Rural Principal Arterial (AADT > 6,000)	Flat	5	11	10
	Rolling	5	11	10
	Mountainous	5	11	8
Rural Principal Arterial (AADT < 6,000)	Flat	5	11	10
	Rolling	5	11	10
	Mountainous	5	11	8
Rural Minor Arterial (AADT > 2,000)	Flat	5	11	8
	Rolling	5	11	8
	Mountainous	5	11	8
Rural Minor Arterial (AADT < 2,000)	Flat	5	11	8
	Rolling	5	11	8
	Mountainous	5	11	6
Rural Major Collector (AADT > 1,000)	Flat	5	11	8
	Rolling	5	11	8
	Mountainous	5	11	6
Rural Major Collector (AADT > 400)	Flat	5	11	4
	Rolling	5	11	4
	Mountainous	5	11	4
Rural Major Collector (AADT < 400)	Flat	5	10	2
	Rolling	5	10	2
	Mountainous	5	10	2
Urban Roads	Interstate	5	12	10
	Freeway	5	12	10
	Principal Arterial	5	11	10
	Minor Arterial	5	11	9
	Collector	5	11	8

3.3.4 Bridge Tool

Like the highway analysis, the bridge analysis was conducted using modeling techniques to provide a complete assessment of needs related to bridges in North Carolina. The NBI file is a compilation of data supplied by the state DOTs to the FHWA as required by the National Bridge Inspection Standards for bridges located on public roads. NCDOT is responsible for conducting bridge inspections and preparing the NBI in North Carolina.

A separate software package and model – National Bridge Investment Analysis System (NBIAS) – used the NBI file to determine statewide bridge improvement and replacement needs. *Overall bridge maintenance needs were determined by reviewing the 2006 Annual Maintenance Report, which was used because it was determined by NCDOT staff that the internal derived needs were more accurate than identified in NBIAS.*

NBIAS helps forecast bridge performance on more than 50 measures of effectiveness over a multi-year period. A bridge replacement need is recognized when one of three conditions is met:

- Bridge has an improvement need that is considered infeasible for the structure's design type;
- Bridge has multiple improvement needs; or
- Benefit/ cost ratio for replacement is greater than that for improvement.

The NBIAS is similar to the HERS-ST in that it is a time–based model used for estimating future improvement needs. However, because the HERS-ST does not address bridges, the NBIAS model fills this void and estimates improvement needs for existing bridges. Like HERS-ST, the *NBIAS model uses a set of minimum tolerable conditions to determine when improvements are necessary and a set of design standards to determine the costs associated with the needed improvements.* These parameters were specified by input from NCDOT staff, so that actual practices were reflected in the analysis.

3.3.5 Bridge Methodology

The process to analyze bridges began with verifying the number of bridges and the corresponding bridge data. The NBI file, provided by NCDOT, contains only state-maintained bridges and culverts on various roadway functional classifications. The improvement cost estimations were removed from the NBI file before the file was loaded into the FHWA bridge program NBIAS so existing and future bridge improvement costs could be determined by the updated unit cost information input to NBIAS. *NCDOT staff, in consultation with FHWA NC Division bridge staff, agreed to use $232 per square foot to replace a bridge in NBIAS.* NCDOT and FHWA Division staff reviewed the default NBIAS MTCs and design standards, and determined that the defaults reflected North Carolina bridge policies adequately. To perform a full engineering needs analysis, a $1 billion per year budget was programmed in NBIAS. A sufficiency rating replacement rule of 40 percent was also applied to capture all bridges that fell below this standard automatically each year. NBIAS was programmed to identify the most economical solution to the bridge deficiencies and not allow borrowing from other funding years. This analysis provided a realistic examination of bridge needs in North Carolina over the next 25 years. The bridge maintenance needs provided in this report include Reoccurring Programs, such as culverts, bridge inspections, approach slabs, etc.; and Performance Based Activities, such as railings, bridge decks, expansion joints and superstructures and substructures. Total cost for these maintenance programs are provided, but the number of bridges are not included in the Annual Maintenance Report and thus are not reported in the 2006 STP Mid-Cycle update.

3.3.6 Non-Highway Methodology

As noted earlier, no technical tools were used to develop the non-highway needs. The non-highway needs were captured by reviewing existing specific modal studies and reports completed by NCDOT and NCDOT staff categorized multi-modal needs by NCMIN Tier, investment type and five-year funding periods.

3.3.7 New Roadway and Bridge Methodology

HERS-ST and NBIAS do not identify new location roadway and bridge needs. To capture these needs, the NCDOT 2007-2013 STIP was examined to account for the following needs:

- New location roadways;
- Urban loops;
- New roadway bridges; and
- New railroad and highway grade crossings.

To identify each of these needs, specific programmed STIP projects were identified. NCDOT staff reviewed each project before it was included as a need in the 2006 STP Mid-Cycle update. Once these needs were identified, they were categorized by NCMIN Tier, five-year funding period and NCDOT Division.

3.4 Need Categories

To assist NCDOT decision-making, highway, bridge and non-highway needs are categorized by NCMIN Tier, investment type and five-year funding periods. This provides detailed needs information, which identifies where the needs are located, the type of needs and when the needs should be addressed.

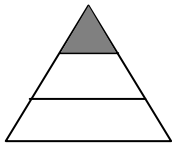
The "needs" that were examined include the following types of improvements:

- Existing roadway network preservation;
- Bridge preservation;
- Existing network modernization;
- Bridge widening, rehabilitation, and replacement;
- Railroad / highway grade crossings;
- Existing roadway capacity expansion;
- Bridge expansion;
- New location roadway needs; and
- Completion of the urban loops system.

3.4.1 North Carolina Multi-modal Investment Network (NCMIN)

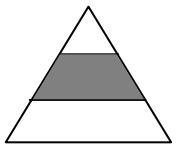
The North Carolina Multi-modal Investment Network (NCMIN) is a tool to organize, manage, and analyze facilities in the transportation system as one broad network. The NCMIN was developed during the 2004 STP and, for comparison purposes, the 2006 STP Mid-Cycle update

identifies needs for each of the three tiers. Some transportation facilities serve statewide movements, while others serve Regional or more localized (subregional) movements. Each type of facility is important and the NCMIN represents a way to acknowledge the different functions of each type of facility.



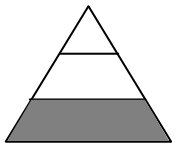
The Statewide Tier includes facilities in each mode that provide the most statewide benefits and satisfy statewide criteria: those that serve long-distance trips, connect regional centers, have the highest usage, and provide mostly a mobility function (as opposed to a land access function).

Example Routes: I-40, I-95, US 501, US 421, US 158 US 74, and US



The Regional Tier connects major population centers and serves a mixture of functions. Some of the Regional Tier facilities can be viewed as serving statewide transportation criteria, but they usually provide an unmistakable localized function. They are equally important to a particular region of the State and provide some land access.

Example Routes: US 301, US 21, US 15, NC 801, and NC 109.



The Subregional Tier facilities serve localized movements. They provide more of an access function than mobility and are typically of a higher interest to cities and counties than the state. The State would have responsibility for many of these facilities, but the State's interest would be small. Therefore, state investment probably would focus on maintenance/preservation as opposed to expansion.

The NCMIN also allows NCDOT to identify which transportation resources are most critical for the efficient movement of passengers and freight across all modes. Logically, the NCDOT has primary interest in those facilities that move freight and passengers on a statewide or regional basis; that is, longer trips between major metropolitan areas or regions, through-state traffic, or trips serving intermodal terminals.

All transportation facilities are included in the NCMIN. Each facility is classified into one of three tiers; each tier has distinct features that define how facilities function, the type of travel they serve, and other measures like connectivity and usage. The Statewide Tier has the fewest facilities, the Regional Tier has more facilities, and the Subregional Tier has the most facilities. The NCMIN is a planning tool. It does not represent a recommended State-owned transportation system, nor is it intended to identify limits on future State investments.

Determining roadway needs by NCMIN Tier began with the use of GIS. The road segments were coded to overlay on a cataloged road shapefile produced during the 2004 STP. Most roadways corresponded to this overlay and their NCMIN Tier was easily identified. However, some roadway segments from the HPMS database were more problematic in identifying their NCMIN Tier. For these roadway segments, the NCMIN Tier designation criteria were used to determine NCMIN Tier classification. The NCMIN designation criteria were applied to the entire HPMS database to obtain a NCMIN Tier classification for any road without a grouping, as well as to check NCMIN Tiers identified by using GIS. Any discrepancies between the GIS and the designation criteria was flagged and manually reviewed. Once the final NCMIN Tier classification was determined, the HPMS database was divided into three separate databases based on NCMIN Tiers. Each database was separately analyzed by HERS-ST to determine the percentage it represented of the entire system HERS-ST run based on all segments. Since the Subregional Tier was not represented adequately in the HPMS database, a trend analysis was completed using the HPMS database and the NCDOT Existing Mileage by Type of Road Tables NC 600 SR and NC 700 SM. Once the modernization and preservation needs were identified, unit costs were updated by NCDOT staff and were used to determine the overall needs on the Subregional Tier.

Determining bridge needs by NCMIN Tier was completed similar to the roadway needs discussed above. The bridge point locations were compared to the GIS road layer and coded with a corresponding NCMIN Tier. A similar NCMIN designation criterion was applied to the bridges in a second task. At this point, all bridges had a NCMIN Tier classification and any discrepancies were reviewed on an individual basis. The NCMIN Tier code was entered into an

existing NBI field that would not jeopardize the NBIAS results and the entire revised NBI file was analyzed in NBIAS. The final NBIAS results were then easily segmented into the three NCMIN Tiers.

3.4.2 Investment Type

HERS-ST defines nine types of roadway improvements. For summary purposes, these improvements are grouped into the four categories of Preservation, Maintenance, Modernization and Expansion, as shown in **Table 5** on the next page. Roadway and bridge maintenance needs were derived from the 2006 Annual Maintenance Report.

Table 5 - Roadway Improvement Type

HERS-ST Roadway Improvements	Improvement Category	Improvement Type
Reconstruction - High-Cost Lanes	Major Widening	Expansion
Reconstruction - Normal-Cost Lanes	Major Widening	Expansion
Reconstruction - Widen Lanes	Minor Widening	Modernization
Reconstruction	Reconstruction	Modernization
Resurface - High-Cost Lanes	Major Widening	Expansion
Resurface - Normal-Cost Lanes	Major Widening	Expansion
Resurface - Widen Lanes	Minor Widening	Modernization
Resurface - Shoulder Improvements	Reconstruction	Modernization
Resurface	Resurfacing	Preservation

Based on the types of deficiencies and the years in which the deficiencies occur, improvements required to resolve deficiencies are identified as needs. Existing deficiencies account for the base year 2005 "backlog" needs (i.e., the deficiency already exists in 2005), while those which address future deficiencies are denoted as "accruing" needs (2006 to 2030). Improvements were based on standards identified by NCDOT for each functional classification, the traffic volume it will serve 25 years in the future (design-year), and its location characteristics.

The 2006 STP Mid-Cycle update highway, bridge and non-highway needs are classified into one of four improvement type categories:

Preservation – Activities that protect the infrastructure and extend service life such as:

Roadway resurfacing;	**Minor bridge deck repairs;**
Pavement markings;	**Transit bus replacement;**
Signal maintenance;	**Maintenance facility repairs/upgrades;**
Guardrail/joint replacement;	**Intelligent Transportation Systems (ITS)**
Bridge painting;	**components;**
Bridge expansion joint replacement;	**Ferry boats replacements; and**
Airport obstruction removal;	**Terminal repairs.**

Modernization– Improvements related to upgrading the safety, functionality, and overall operational efficiency of a facility or service without adding major physical capacity:

Minor widening of narrow lanes;	**New runway approach lighting system;**
Bridge widening, rehabilitation, and	**Railroad/highway grade crossings, track**
replacement;	**and signal upgrades; and**
Access management / traffic flow /safety	**Most ITS improvements.**
improvements;	

Expansion – Activities focused on adding capacity or new facilities/services, including:

Adding new highway lanes;	**Runway pavement strengthening;**
Reconstruction with more lanes;	**Facilities for new regional rail or bus rapid**
New highways;	**transit; and**
New transit vehicles and related equipment;	**New passenger rail sets (and signals, track,**
New airport construction;	**yard facilities, stations, new ferry service**
Runway lengthening;	**including boats and terminals).**

Maintenance – Activities focused on regular, routine roadway, ITS and bridge treatments that sustain the highway's condition (mowing, lighting, shoulder/guardrail repair, patching, IMAP etc.). Roadway and bridge maintenance needs are identified from the 2006 Annual Maintenance

Report. Maintenance applies only to the highway mode because similar "sustaining" activities for non-highway modes are classified as preservation improvements.

3.4.3 NCDOT Divisions

There are 14 NCDOT Divisions in the state and identifying highway and bridge needs by division will reveal specific geographic conditions and needs. Segmenting needs by the 14 NCDOT Divisions occurred differently for roadways and bridges. Both the HPMS database and the NBI file have county information contained in one of its fields. For bridge results, the NBI file was processed using Microsoft Access to determine the number of bridges by NCMIN Tier and NCDOT Division. The total dollar amounts within each NCMIN Tier were then proportionally subtracted out based on the number of bridges in that tier for each division.

To determine NCDOT Division roadway needs, the "unexpanded" improvement totals from the HPMS sample within HERS were separated into improvement types and further categorized by each funding period and division within the HPMS database. Each of the 14-segmented totals was expanded and normalized based on the total improvement and lane mile figures from the overall HERS-ST results. The improvement types were grouped into the reporting categories for comparison and planning purposes. *This method provided a representation of the improvements needed within each division for all five funding periods.*

3.4.4 Backlog and Accruing Needs

Another critical aspect of the needs assessment process is identifying between backlog (existing) and accruing (future) needs. The 2006 STP Mid-Cycle update provides detailed backlog information for highways and bridges, however non-highway backlog needs for were not reported by NCDOT staff because these types of existing needs are difficult to measure.

The backlog portions of the highway and bridge analyses were obtained in different ways. HERS-ST (version 4.0)[4] does not directly report backlog needs (miles improved and improvement costs) in its output. Determining roadway backlog needs required manual

[4] HERS-ST version 4.1, which was released in January 2007, does report backlog needs.

calculations. This was completed by comparing the initial conditions report and the condition report after the first funding period (2005 to 2010). This analysis determined the proportion of the total improvement costs from the first funding period that actually belong in the backlog (existing 2005 deficiency). HERS-ST is programmed to complete all backlog needs within the first funding period (five-year) time frame. Thus, determining roadway backlog needs only applies to the first funding period of improvement costs and lane miles improved.

NBIAS provided bridge backlog needs (number of bridges and improvement costs) in its output so the bridge backlog needs could easily be subtracted from the total needs and reported.

3.4.5 Five-Year Funding Period

The 2006 STP Mid-Cycle update identifies multi-modal transportation needs over a 25-year planning horizon (2005 to 2030). To assist the decision-making process, needs were segmented into the following five distinct funding periods:

- 2006 to 2010;
- 2011 to 2015;
- 2016 to 2020:
- 2021 to 2025; and
- 2026 to 2030.

Since HERS-ST and NBIAS are time sensitive models, highway and bridge needs were segmented into the five funding periods based on the models output. Segmenting needs into these five funding periods provides information of when certain needs will arise and allows NCDOT an opportunity to prepare to address these needs, rather than reacting once the needs occur. Non-highway and ITS needs were divided into the five funding periods based on information provided by NCDOT staff. Needs identified through examining the 2007-2013 STIP, such as new location roadways, urban loops, bridge expansion, were included based upon available programming year information.

3.5 Estimating Improvement Costs

Estimating improvement costs is extremely important to ensure an accurate dollar estimate is provided to cover the cost of improving the need to the design standards established by NCDOT. The cost of each selected highway improvement shown in **Table 6** was estimated using unit costs provided by NCDOT staff that reflect market rate for materials, recent cost escalation factors, quarterly reports, and composite practices in North Carolina for each functional class of highway. Since 2003, construction prices in North Carolina have increased by 45 percent due to the increased market rate for materials. Unit costs used in the 2006 STP Mid-Cycle update are reported in constant 2005 dollars and reflect these increases.

Table 6 – Unit Cost by Improvement Types ($ in thousands)

$ in thousands/mile			Reconstruction		Resurface		Shoulder	Add Lanes		Alignment	
			Lane Widening	Pavement	Lane Widening	Pavement	Improvements	Normal Cost	High Cost	Normal Cost	High Cost
Rural	Interstate	Flat	$1,322	$533	$968	$189	$35	$1,555	$1,960	$1,960	$8,071
		Rolling	$1,537	$547	$1,153	$202	$58	$1,759	$2,463	$2,463	$8,529
		Mountainous	$2,063	$633	$1,624	$223	$89	$2,441	$5,579	$3,139	$9,591
	Principal Arterials	Flat	$1,124	$465	$849	$166	$26	$1,345	$1,741	$1,741	$7,123
		Rolling	$1,330	$479	$1,022	$184	$43	$1,526	$2,129	$2,129	$7,626
		Mountainous	$1,504	$543	$1,159	$202	$67	$1,797	$5,045	$9,647	$9,647
	Minor Arterials	Flat	$787	$392	$548	$137	$28	$964	$1,275	$1,275	$6,403
		Rolling	$967	$423	$705	$148	$42	$1,143	$1,658	$1,658	$7,327
		Mountainous	$1,312	$484	$1,015	$163	$63	$1,579	$4,629	$8,576	$8,576
	Major Collectors	Flat	$787	$392	$547	$136	$28	$964	$1,240	$1,240	$6,203
		Rolling	$913	$398	$662	$144	$37	$1,050	$1,551	$1,551	$7,099
		Mountainous	$1,237	$451	$957	$157	$59	$1,423	$4,246	$7,974	$7,974
Urban	Interstates/ Expressways	Small Urban	$2,919	$1,527	$2,451	$370	$68	$3,480	$10,564	$6,524	$15,465
		Small Urbanized	$3,084	$1,540	$2,511	$438	$90	$3,737	$11,477	$7,063	$17,295
		Large Urbanized	$4,495	$2,521	$3,498	$588	$339	$5,774	$21,459	$11,340	$32,419
	Principal Arterials	Small Urban	$2,490	$995	$2,235	$238	$53	$2,819	$7,434	$4,802	$10,486
		Small Urbanized	$2,593	$1,006	$2,291	$282	$70	$2,969	$7,970	$5,118	$11,566
		Large Urbanized	$3,268	$1,475	$2,881	$354	$227	$3,874	$11,193	$6,304	$13,171
	Arterials/ Collectors	Small Urban	$1,792	$877	$1,601	$204	$45	$2,079	$6,059	$3,790	$9,395
		Small Urbanized	$1,853	$887	$1,611	$231	$55	$2,163	$6,356	$3,965	$10,462
		Large Urbanized	$2,313	$1,187	$2,011	$284	$149	$2,795	$8,609	$5,294	$11,631

Bridge costs were computed by NBIAS and NCDOT staff in coordination with FHWA NC Division bridge staff, reviewed the default NBIAS improvement costs and determined that the national defaults reflected North Carolina bridge costs adequately expect for bridge replacement. As mentioned earlier, NCDOT and NC Division bridge staff agreed to use $232 per square foot to replace a bridge in NBIAS.

3.6 Estimating Right-of-Way Costs

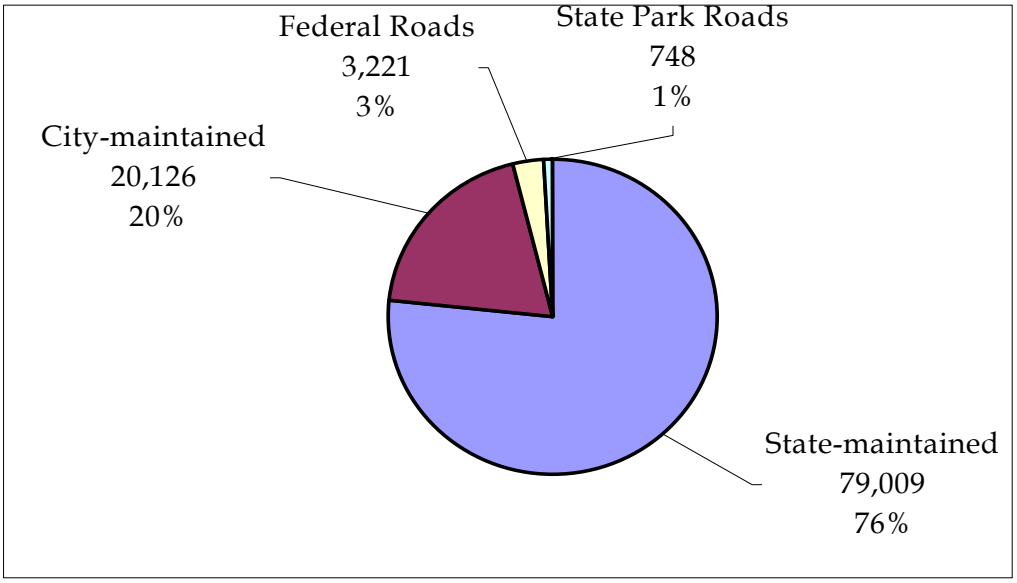
The cost of acquiring ROW for roadway projects is significant. The ROW costs used in the 2006 STP Mid-Cycle update are reflective of historical North Carolina ROW costs and recent inflation factors. To ensure reliable costs were used, NCDOT staff provided ROW costs from a variety of recent projects and geographic differences throughout the state. The costs were analyzed and then updated in HERS-ST to ensure costs accurately reflected the cost of acquiring ROW for each roadway improvement identified in HERS-ST. NCDOT staff approved ROW costs, which are based on a per mile basis.

Chapter 4. Highways, Bridges and ITS

4.1 Existing Highway Conditions

There are 103,104 total centerline miles of public roadway in North Carolina (**Figure 3**). Of this total, NCDOT maintains 79,009 centerline miles of roadway, making the North Carolina system the second-largest state-maintained roadway network in the U.S. Over three-quarters of the public roadways in North Carolina is owned and maintained by NCDOT[5], with most of the remaining mileage maintained by municipalities. The majority (82%) of state-maintained roadways are classified as secondary routes, high order facilities (NC, U.S. and Interstates) account for only 18 percent of the centerline mileage maintained by NCDOT (**Figure 4**). The vast majority (93%) of the state-maintained roadway mileage is paved, though there is a significant amount (7%) of unpaved mileage in rural areas (**Figure 5**). NCDOT also maintains 13,629 total bridges and nine (9) ITS Statewide Strategic Deployment areas.

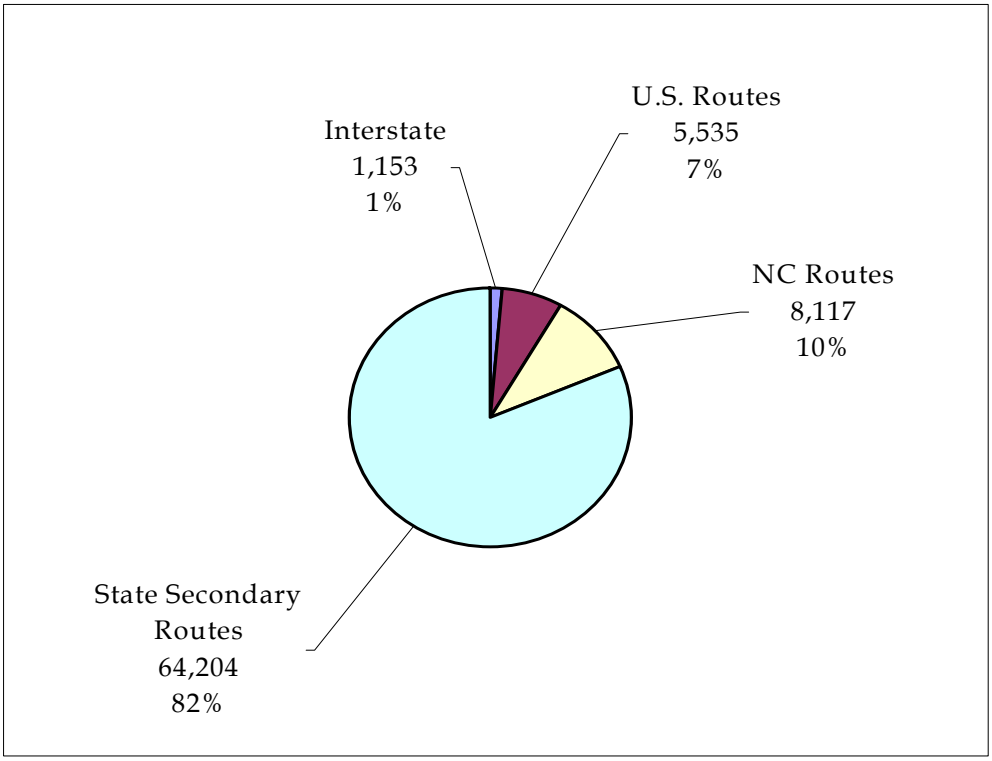
Figure 3 – Ownership of Roadway Network
TOTAL CENTERLINE MILES = 103,104



Source: NCDOT

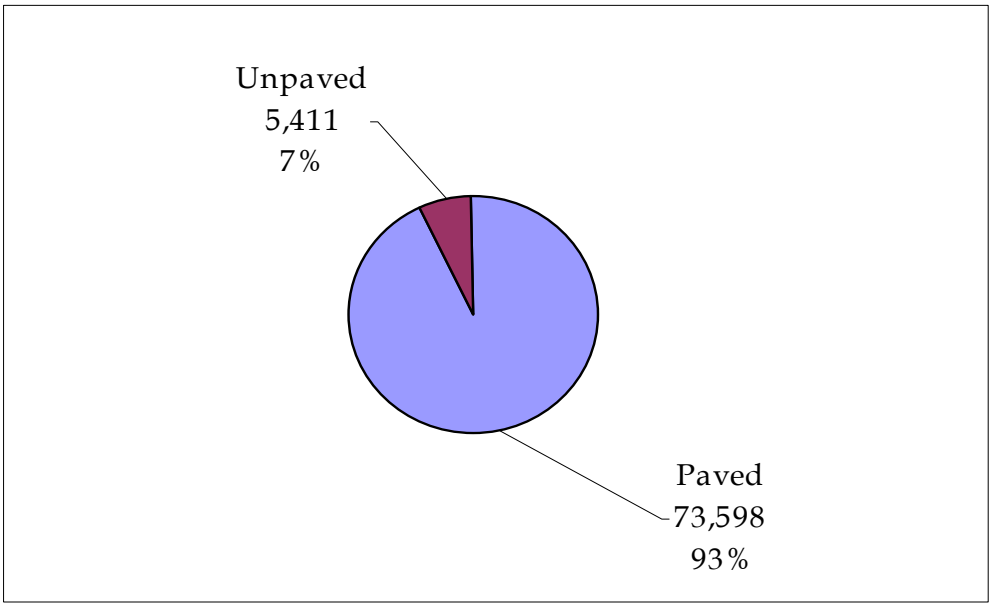
[5] The 2006 STP Mid-Cycle Update analyzes 79,009 centerline miles maintained by NCDOT.

Figure 4 – State-Maintained Roads by Route Designation
TOTAL CENTERLINE MILES = 79,009



Source: NCDOT

Figure 5 – State-Maintained Paved and Unpaved Roadways
TOTAL CENTERLINE MILES = 79,009



Source: NCDOT

4.2 Highway Needs by Improvement Type

Preserving, maintaining, modernizing, and expanding the second largest transportation system in the nation is no simple task. As shown in **Figure 6,** on the next page, over the next 25 years, a total of $97.4 billion in highway (includes ITS) and bridge needs have been identified through this planning process.

- Nearly 137,000 lane miles of roadway will have preservation needs totaling $14.6 billion;
- Nearly 30,000 lane miles of roadway and over 11,000 bridges will have modernization needs totaling $26.8 billion;
- Over 26,000 lane miles of roadway will have expansion needs totaling $38.4 billion; and
- Routine maintenance needs (mowing/ditch cleaning/rest area, ITS IMAP, and bridges) total $17.6 billion.

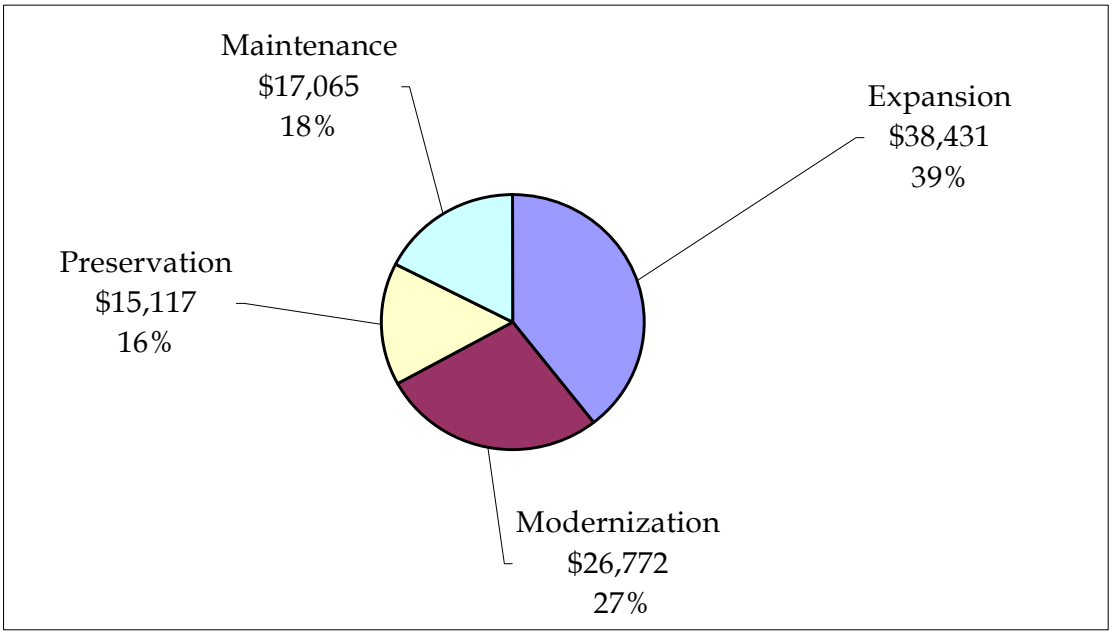
As explained earlier, the four major improvement types are expansion, modernization, preservation and maintenance. The first three improvement types for roadways and bridges are generated for the most part by HERS-ST and NBIAS respectively. The only exceptions are for new location roadways, urban loops and railroad and highway grade crossings. To identify these improvements, the NCDOT 2007 – 2013 STIP was reviewed and projects meeting these types of improvements were identified and added to the overall improvement type needs generated by HERS-ST or NBIAS. NCDOT staff also provided maintenance needs for highways and bridges and Subregional Tier needs were determined based on manual trend analysis.

Roadway maintenance consists of work activities associated with the maintenance and upkeep of the roadway. Highway and bridge maintenance needs total over $17 billion and were derived from the NCDOT Annual Maintenance Report, which divides routine roadway maintenance work activities into two separate categories:

- Recurring Programs, consists of rest area and welcome center maintenance, roadway hazard removal, traffic signal maintenance, roadway lighting, sign lighting, municipal agreements, plant beds and unpaved roads. The overall expenditures of these programs are approximately $2.8 billion.

- Performance Based activities consist of maintenance to pavements, shoulders and ditches, drainage, mowing, litter, guardrail, signs, pavement markings, vegetation, etc. The overall expenditures of these programs are approximately $10 billion.
- The Report also identified:
  - Nearly $2 billion for the Pavement Preventive Maintenance Program (New Programs);
  - $222 million for Statewide Programs, such as weigh stations;
  - $1.6 billion for Bridge maintenance;
  - $341 million for debt repayment; and
  - $197 million in maintenance backlog needs.

Figure 6 – Roadway Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $97.4 billion



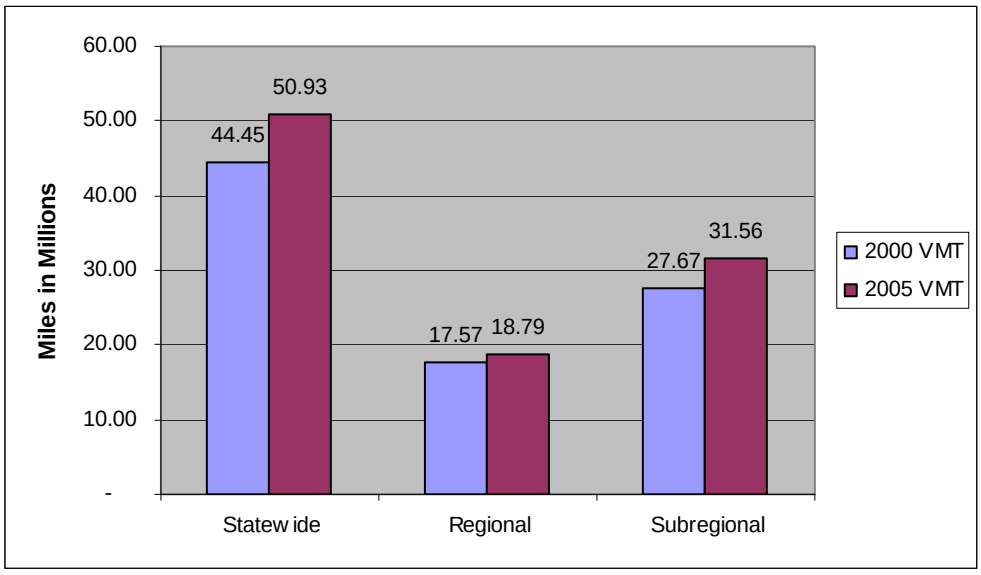
There are several reasons why the expansion needs are much greater in the 2006 STP Mid-Cycle update than previously identified in the 2004 STP. Due to changes in how the Highway Capacity Manual (HCM) defines congestion/capacity, expansion needs are much greater in the 2006 STP Mid-Cycle update than previously identified in the 2004 STP. Capacity levels

contained in the 2004 HPMS database reflect the HCM capacity level changes that were included the 2002 HPMS database. *Expansion needs also increased because a large share of North Carolina's rural principal arterials and interstates are located in urbanizing areas*, thus the volume-capacity relationship in these areas may generate more statewide rural expansion needs than would otherwise be typical for rural areas in other states.

ROW costs for rural Principal Arterials and Interstates may be more representative of urban areas than rural areas on other states, given land use pressures and densities close to "rural" highways in North Carolina. *Freight movement is projected to increase dramatically in the future and this will also place more demands on the existing highway system.*

Between 2000 and 2005, VMT in North Carolina increased 13 percent on state-maintained roadways.[6] Based on NCMIN Tiers and shown in **Figure 7**, the Statewide Tier VMT increased by 15 percent, which can be attributed to greater Interstate and Expressway travel; Regional Tier VMT increased by 7 percent and the Subregional Tier VMT increased by 14 percent, which can be attributed to more Local roadway travel. The increase in VMT was also another determinant in identifying additional capacity needs.

Figure 7 – VMT Comparison, 2000 and 2005, by NCMIN Tier



Based on these factors, lower minimum tolerable traffic levels were assigned in HERS-ST on rural Interstates and Principal Arterials, which resulted in additional rural expansion needs. Through consultation with NCDOT staff, rural ROW costs were increased between two-thirds and three-quarters the costs in urban areas and expansion needs were reported for the Statewide and Regional Tiers as "add lanes only" and "add lanes with modernization"[7] to indicate how much modernization is expected to be covered by rural expansion costs. Based on these changes, more expansion needs were identified in the 2006 STP Mid-Cycle update.

Analyzing the total highway needs shows:

- Roadway improvements represent 81 percent, or $79.4 billion;
- Bridge improvements represent 17 percent, or over $16.4 billion; and
- ITS improvements represent 2 percent, or $1.6 billion.

4.2.1 Highway Needs by NCMIN Tiers

The concept of organization by tiers (as part of the NCMIN) was developed during the 2004 STP and it is a central component of the needs analysis for highways as well as other modes in the 2006 STP Mid-Cycle update. As noted earlier in the Technical Approach section, roadways are classified into NCMIN Tiers using the following general criteria:

- **Statewide Tier:** Interstate Highways, Intrastate system, major US and NC routes based on traffic levels and connectivity, such as I-40, I-95, US 501, US 421, US 158 US 74, and US 17.
- **Regional Tier:** US, NC, and secondary routes providing regional connectivity with lower traffic levels than Statewide Tier facilities such as US 301, US 21, US 15, NC 801, and NC 109.
- **Subregional Tier:** NC routes providing limited connectivity; all remaining secondary routes.

[6] FHWA Highway Statistics. 2000 and 2005

[7] Expansion needs are reported in two HERS-ST categories: reconstruction with additional lanes and adding lanes without modernization.

As shown in **Figure 8**, approximately 82 percent or 64,800 miles of the State-maintained roadway mileage in North Carolina falls into the Subregional Tier. The remaining 18 percent is split evenly between the Regional Tier (9% or 7,349 miles) and the Statewide Tier (9% or 6,860 miles). As illustrated in **Figure 9**, the total highway needs by NCMIN Tiers shows:

- Statewide Tier improvements represent 49 percent, or $47.7 billion;
- Regional Tier improvements represent 12 percent, or $11.2 billion; and
- Subregional Tier improvements represent 39 percent, or $38.4 billion.

The greatest Statewide Tier need is expansion ($33.7 billion), the Regional Tier is modernization ($4.8 billion), and the Subregional Tier is maintenance and preservation ($23.6 billion).

Figure 8 – NCMIN Tier Roadway Mileage Breakdown
TOTAL CENTERLINE MILES = 79,009

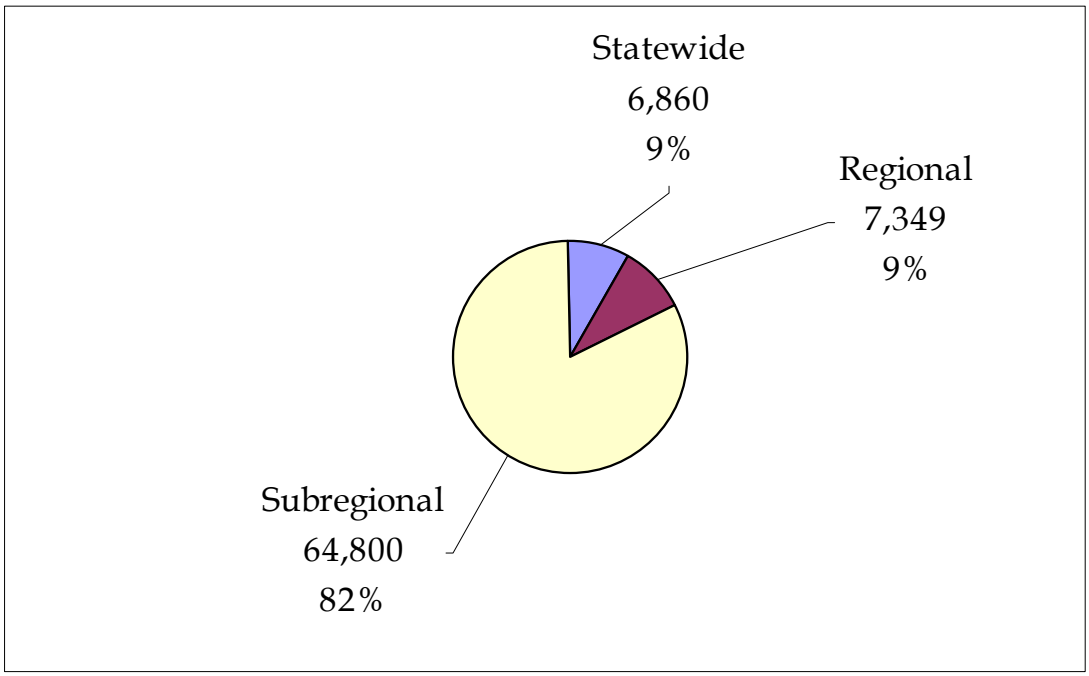
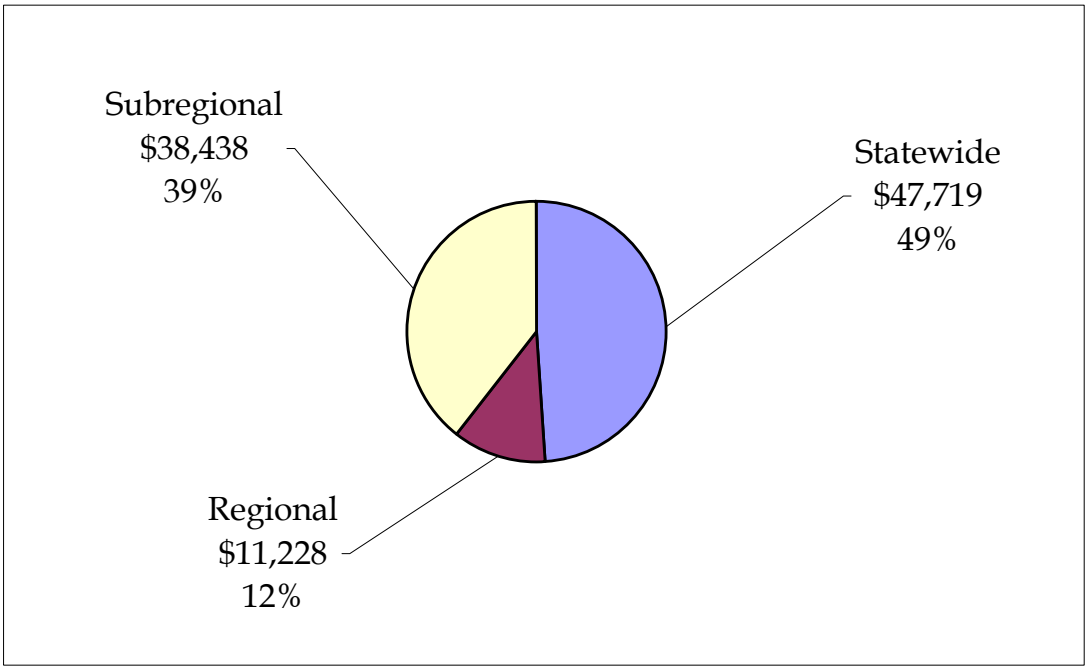


Figure 9 – Roadway Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $97.4 billion



Although the Statewide Tier contains only 9 percent of the state-maintained roadway miles, approximately 50 percent of the VMT on state-maintained roadways can be attributed to Statewide Tier roadways. Likewise, the Regional Tier contains 9 percent of the system mileage, but 15 percent of the vehicle miles traveled are on these roadways. The Subregional Tier contains 82 percent of the system mileage, but carries only 35 percent of the vehicle miles traveled.

Likewise, as the Statewide Tier represents only 9 percent of the total system mileage, almost half (49% or $47.7 billion) of the projected 25-year needs occur on these roadways. The large Subregional Tier network includes most of the remaining needs (39% or $38.4 billion), with the Regional Tier representing only 12 percent ($11.2 billion) of the needs. Just as in the 2004 STP, the needs by NCMIN Tier are similar to the percentages of VMT that occur on each tier.

4.2.1.1 Statewide Tier Needs

As shown in **Figures 10**, the total highway needs (includes bridge and ITS) associated with Statewide Tier highways total $47.7 billion. The majority of the Statewide Tier needs, in terms of

cost, are associated with expansion projects, which provide additional roadway capacity. Expansion needs are projected to cost $33.8 billion, which is 71 percent of the total Statewide Tier needs. As shown in **Figure 11**, over 20,600 lane miles of Statewide Tier roadways (49%) were identified as needing capacity improvements and 16 percent or 3,252 lane miles are on the Interstate system. Preservation needs account for over 11,000 miles (27%) of the total 42,137 miles in Statewide Tier needs and are projected to cost $2.9 billion, which is 6 percent of the total Statewide Tier needs. Modernization needs represent over 10,000 miles (24%) of projected Statewide Tier needs and are projected to cost $7.1 billion, which is 15 percent of the total Statewide Tier needs. Maintenance needs are projected to cost $3.8 billion, which is 8 percent of the total Statewide Tier needs. The maintenance dollar estimate was generated by NCDOT through review of the 2006 Annual Maintenance Report. Maintenance mileage needs are not provided in the Annual Maintenance Report as these needs occur throughout the entire system and are not directly comparable with the extent of other types of improvements.

Figure 10 – Statewide Tier Roadway Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $47.7 billion

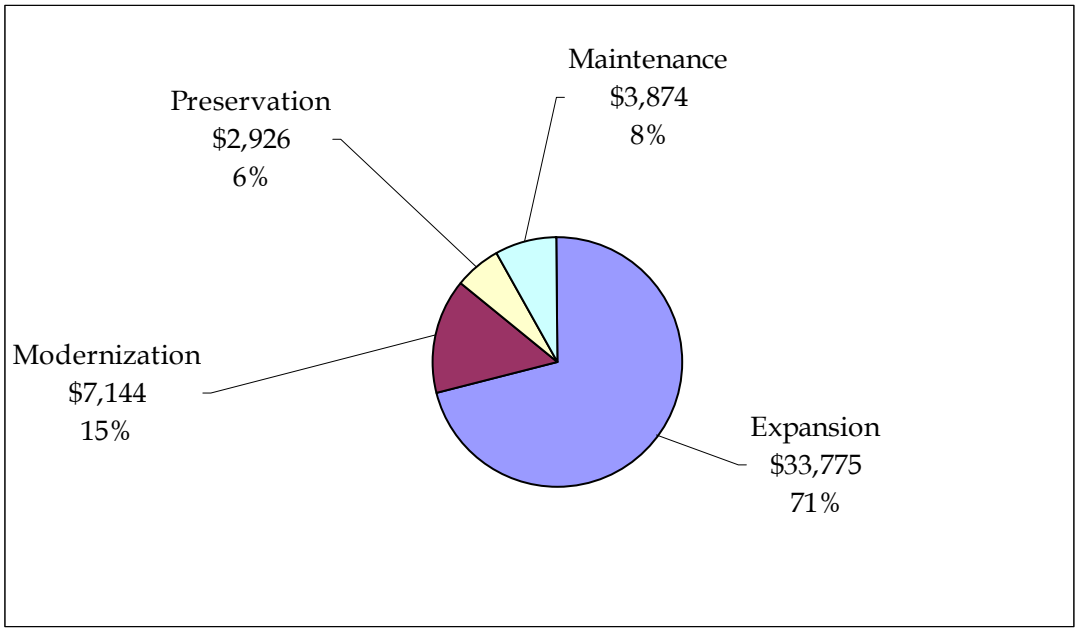
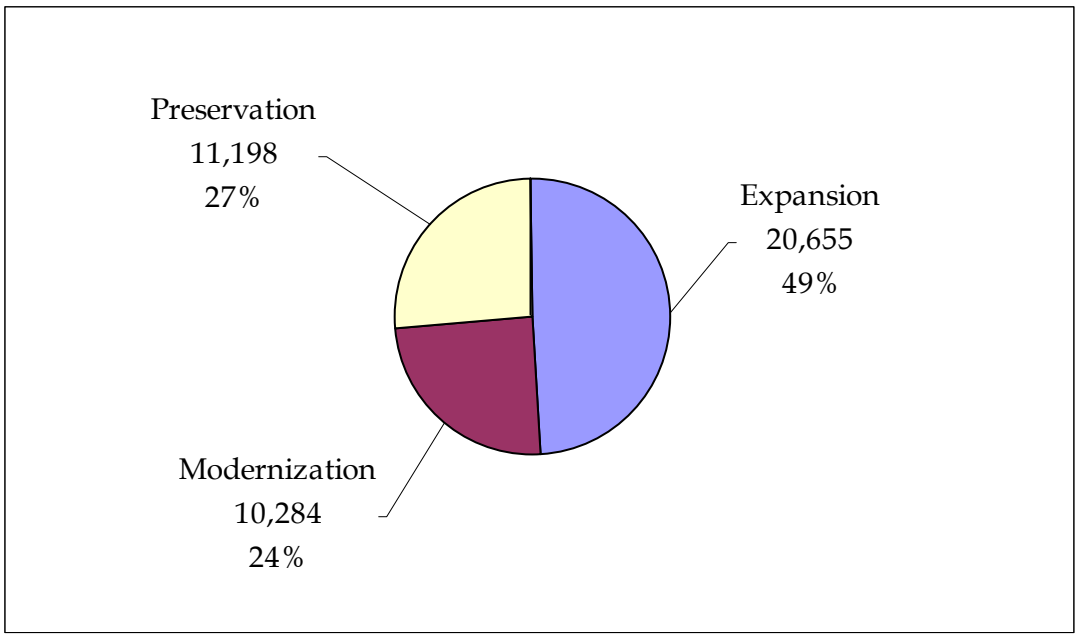


Figure 11 – Statewide Tier Roadway Needs by Improvement Type
TOTAL CENTERLINE MILES = 42,137



The majority of the preservation needs (78%) are categorized as accruing needs, indicating that the Statewide Tier highway network is generally in good condition. Approximately 2,500 miles (36%) of the 6,860-mile Statewide Tier network has preservation needs now (backlog needs). However, 8,699 miles of accruing preservation needs are projected over the next 25 years. The fact that the projected mileage associated with accruing needs is greater than the total Statewide Tier roadway mileage indicates that some roadways will require multiple resurfacing during the 25-year planning period due to high traffic volumes and the increased truck freight movement.

4.2.1.2 Regional Tier Needs

As shown in **Figure 12**, Regional Tier highway needs (includes bridges and ITS) total $11.2 billion or 12 percent of the total needs and a total of over 18,000 miles were identified. In terms of cost, modernization needs are projected to cost $4.8 billion or 43 percent, while 41 percent or $4.7 billion are categorized as expansion needs. Maintenance needs account for 13 percent or $1.5 billion, and preservation needs account for the remaining 3 percent or $282 million.

Based on miles, **Figures 13** shows that most Regional Tier needs are modernization and expansion needs. Modernization needs represent over 10,000 miles (55%) of the total 18,456 miles in Regional Tier needs, while expansion needs represent nearly 5,500 miles (30%) of the projected needs. Preservation needs represent only 3 percent of the needs in terms of cost, but 15 percent of the needs in terms of mileage.

Approximately, 650 miles of the 7,349-mile network have preservation needs now, indicating that the Regional Tier highway network is in excellent condition. However, 2,154 miles of accruing preservation needs and 4,384 miles of accruing expansion needs are projected, indicating that 88 percent of the Regional Tier roadways (some roadways may be resurfaced more than once) will undergo resurfacing or expansion before the year 2030.

Figure 12 – Regional Tier Roadway Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $11.2 billion

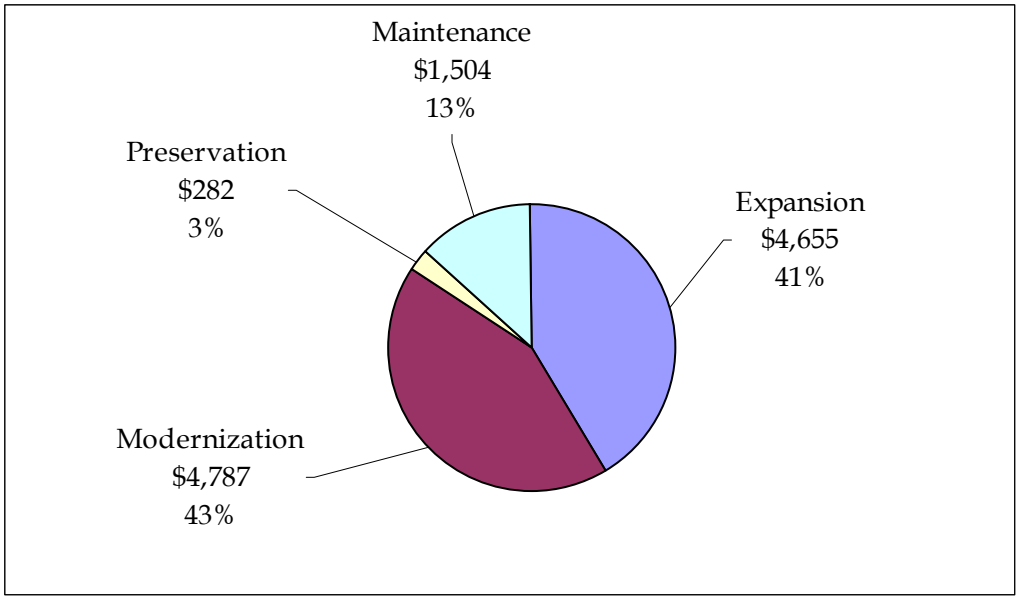
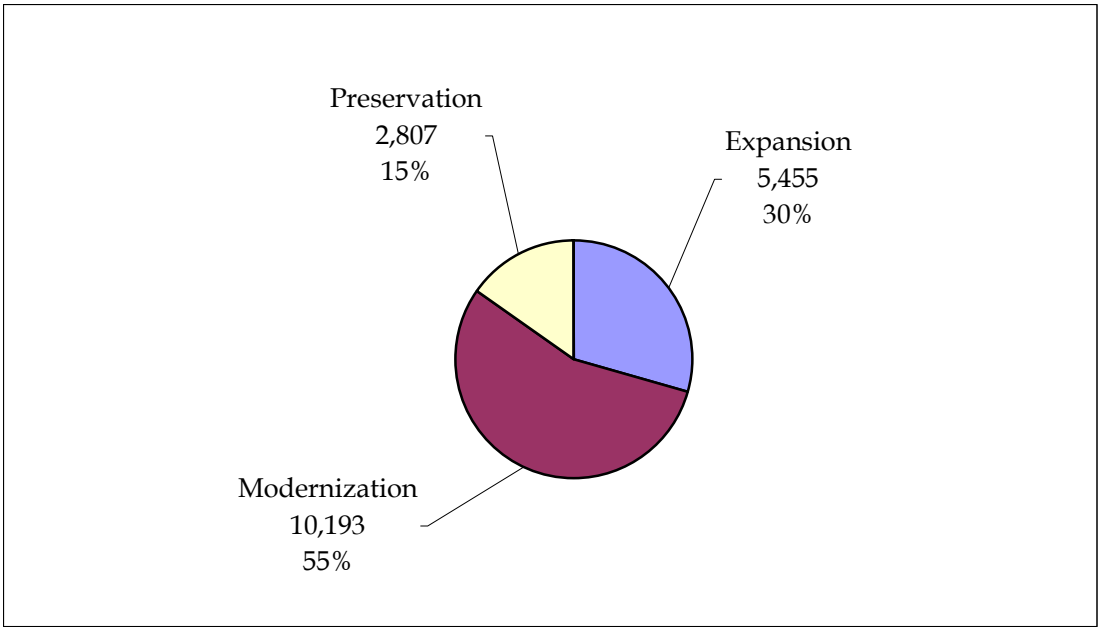


Figure 13 – Regional Tier Roadway Needs in Miles by Improvement Type
TOTAL CENTERLINE MILES = 18,456



Note: Maintenance miles are not a reported metric.

4.2.1.3 Subregional Tier Needs

As shown in **Figure 14**, the total highway needs (includes bridge and ITS) associated with the Subregional Tier total $38.4 billion.

- Modernization needs total $14.8 billion or 38 percent;
- Maintenance needs total $12.2 or 32 percent;
- Preservation needs total $11.4 billion or 30 percent; and
- No expansion needs were identified on the Subregional Tier.

Figure 15 illustrates the Subregional Tier needs classified by type of improvement. Although modernization needs are greater than preservation needs in terms of cost, the lower cost of preservation needs results in a much higher percentage of preservation needs when examined in terms of mileage (maintenance needs are not shown in terms of mileage). Preservation needs account for 123,350 or 93 percent of the total 133,239 Subregional Tier miles, but as noted above, preservation needs only account for 30 percent of the total cost.

Figure 14– Subregional Tier Roadway Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $38.4 billion

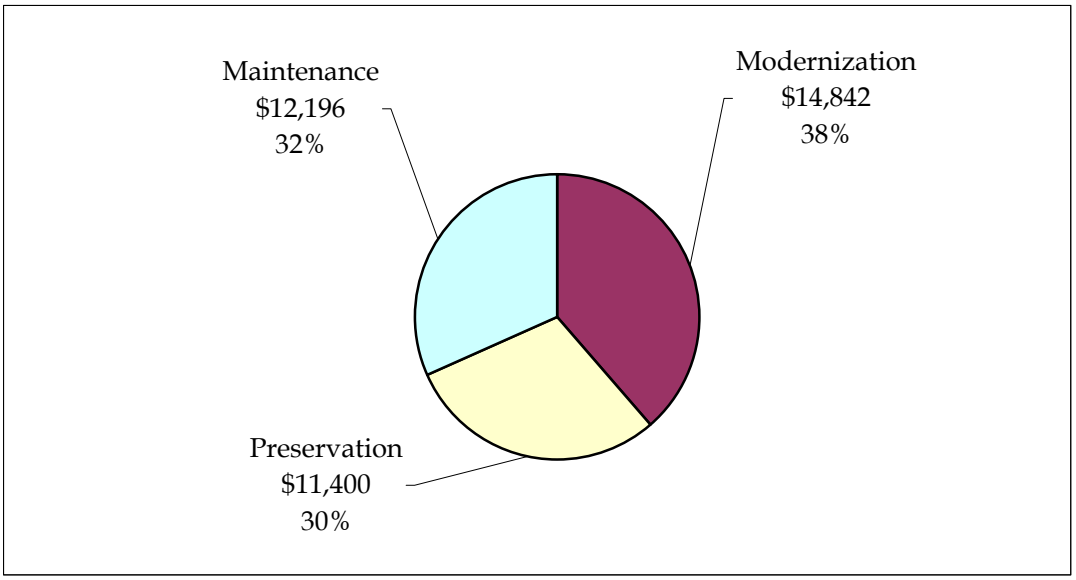
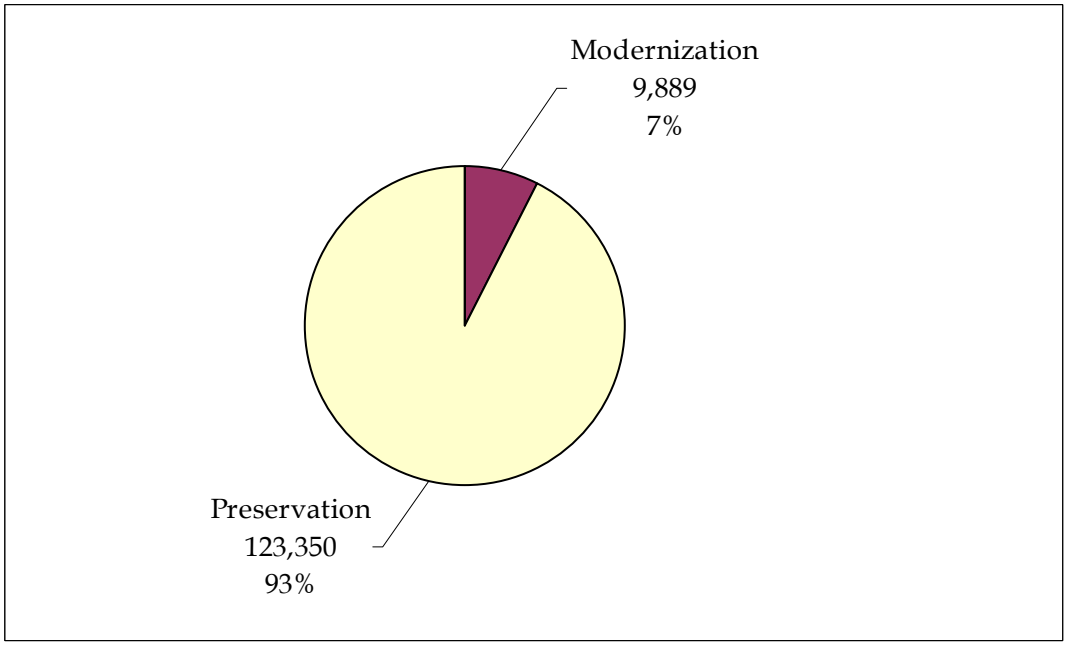


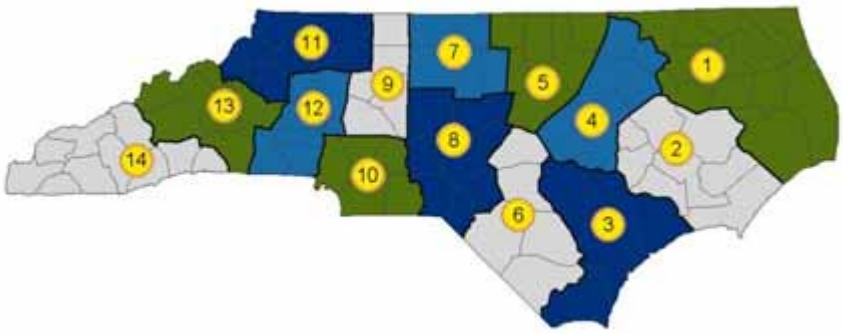
Figure 15 – Subregional Tier Roadway Mile Needs by Improvement Type
TOTAL CENTERLINE MILES = 133,239



4.2.2 NCDOT Division Needs

As shown in **Figure 16**, NCDOT has 14 Divisions that are organized by county boundaries. In this section, needs for roadways and bridges are identified by each Division. Non-highway and ITS needs were not reported by Division and thus are not represented in this section.

Figure 16 – NCDOT Divisions



Source: NCDOT

Figure 17 shows the breakdown of NCDOT Division needs by improvement type. The total of $95.8 billion is consistent with the total roadway and bridge needs reported earlier of $97.4, after removing $1.6 billion in ITS needs.

Figure 17 – Highway and Bridge Needs by Division
TOTAL DOLLARS = $95.8 billion

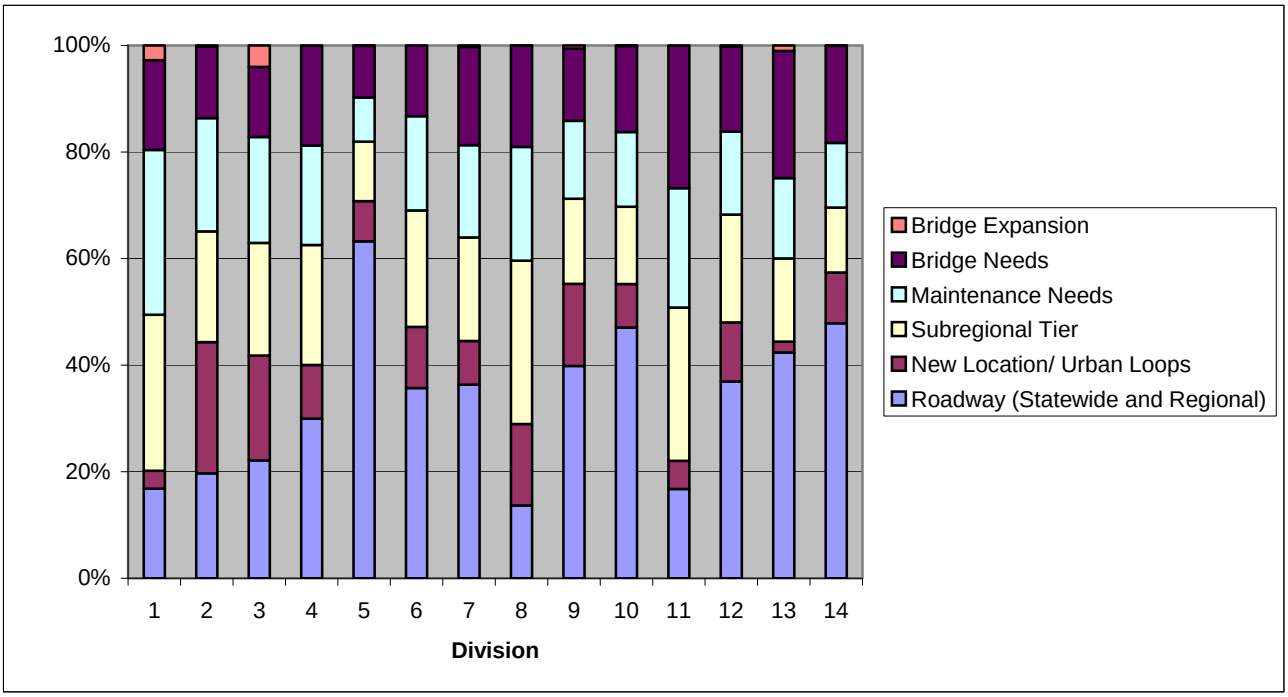
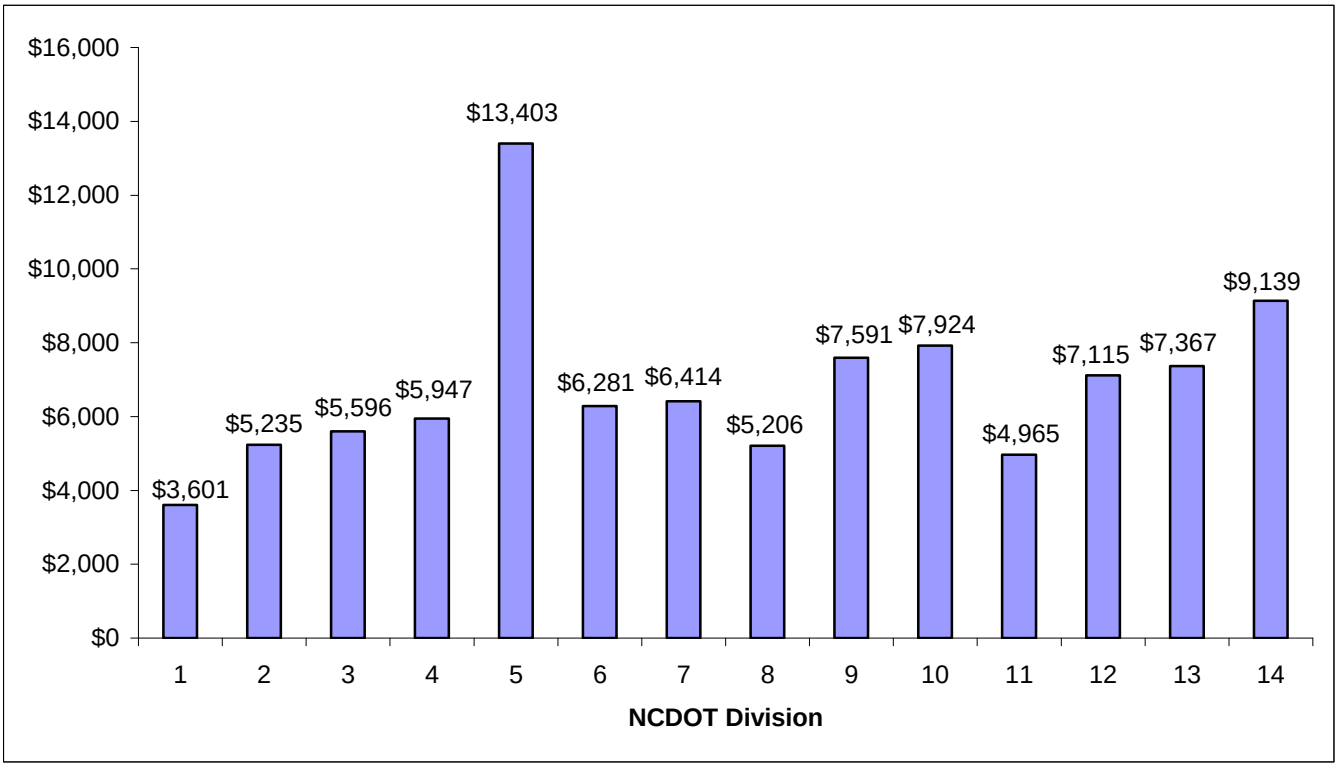


Figure 18, on the next page, shows the total $95.8 billion of needs by NCDOT Division. Division 5, serving the people of Durham, Granville, Franklin, Person, Vance, Wake and Warren Counties has the largest need ($13.4 billion, or 14%). The large amount of needs in Division 5 is associated with improving roadways and bridges in Raleigh, Durham and Chapel Hill. Division 14, serving Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Swain, Transylvania and Polk Counties has the second highest needs ($9.1 billion or 10%). Division 14 needs are associated with the high cost of expanding, modernizing, preserving and maintaining roadways in very mountainous terrain. Construction costs are 2.5 times higher in mountainous terrain than in flat/coastal terrain. Division 10, serving Anson, Cabarrus, Mecklenburg, Stanly and Union Counties, has the third highest roadway and bridge needs ($7.9 billion or 8%). Needs in Division 10 are largely associated with improving roadways and bridges in the Charlotte metropolitan area.

Figure 18 – Total Needs by Division ($ in millions)
TOTAL DOLLARS = $95.8 billion



4.2.3 Backlog and Accruing

During the development of the 2006 STP Mid-Cycle update, existing or backlog and future or accruing needs were identified. A need was considered backlog if the minimum tolerable condition was deficient before 2005 and accruing if the minimum tolerable conditions threshold was exceeded in years 2005 to 2030. **Table 7** provides a summary illustrating the backlog and accruing needs by tier for each of the categories of highway improvements for roadways, bridges and ITS. The highway needs total $97.4 billion over the next 25-years and **Figure 19** shows that $30 billion (31%) are backlog needs and the remaining $67.4 billion (69%) are accruing needs. However, in terms of mileage, backlog needs total 26 percent and accruing deficiencies represent 74 percent of the total needs as shown in **Figure 20**.

Table 7 – Backlog and Accruing Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $97.4 billion

	Statewide		Regional		Subregional		Total		
	Backlog	Accruing	Backlog	Accruing	Backlog	Accruing	Backlog	Accruing	GRAND TOTAL
Expansion	**$6,803**	**$26,973**	**$1,486**	**$3,169**	**$0**	**$0**	**$8,289**	**$30,142**	**$38,431**
New Location/ Urban Loop	$0	$10,016	$0	$0	$0	$0	$0	$10,016	$10,016
Interstate Widening	$752	$6,305	$0	$0	$0	$0	$752	$6,305	$7,057
Reconstruction with additional lanes	$106	$148	$36	$42	$0	$0	$143	$190	$332
Adding lanes without modernization	$5,945	$9,962	$1,450	$2,629	$0	$0	$7,395	$12,591	$19,986
New Bridges	$0	$500	$0	$0	$0	$0	$0	$500	$500
Intelligent Transportation Systems	$0	$41	$0	$499	$0	$0	$0	$540	$540
Modernization	**$3,388**	**$3,755**	**$2,376**	**$2,411**	**$12,469**	**$2,373**	**$18,233**	**$8,539**	**$26,772**
Widen narrow lanes / safety	$180	$401	$379	$1,025	$5,394	$0	$5,953	$1,426	$7,379
Resurface / improve shoulders	$709	$1,448	$321	$749	$0	$0	$1,030	$2,196	$3,227
Pavement reconstruction	$64	$17	$56	$94	$1,023	$0	$1,143	$112	$1,255
Bridge replacements, widening and strengthening	$2,435	$1,881	$1,620	$0	$6,052	$2,373	$10,107	$4,254	$14,361
Intelligent Transportation Systems	$0	$8	$0	$543	$0	$0	$0	$551	$551
Preservation	**$703**	**$2,732**	**$105**	**$177**	**$2,272**	**$9,128**	**$3,080**	**$12,037**	**$15,117**
Preservation - highway resurfacing	$703	$2,223	$105	$177	$848	$3,793	$1,656	$6,193	$7,849
Rural Local Roads / Secondary Roads	$0	$0	$0	$0	$1,424	$5,335	$1,424	$5,335	$6,759
Intelligent Transportation Systems	$0	$509	$0	$0	$0	$0	$0	$509	$509
Maintenance	**$88**	**$3,277**	**$49**	**$1,454**	**$260**	**$11,937**	**$397**	**$16,668**	**$17,065**
NCDOT Maintenance	$17	$2,793	$18	$1,239	$162	$11,272	$197	$15,304	$15,501
Bridge Maintenance (NCDOT) not NBIAS	$71	$484	$31	$215	$98	$665	$200	$1,364	$1,564
TOTAL	**$10,982**	**$36,737**	**$4,016**	**$7,211**	**$15,001**	**$23,438**	**$29,999**	**$67,386**	
GRAND TOTAL	**$47,719**		**$11,228**		**$38,439**		**$97,385**		**$97,385**

Figure 19 – Roadway Backlog and Accruing Needs by Dollars
TOTAL DOLLARS = $97.4 billion

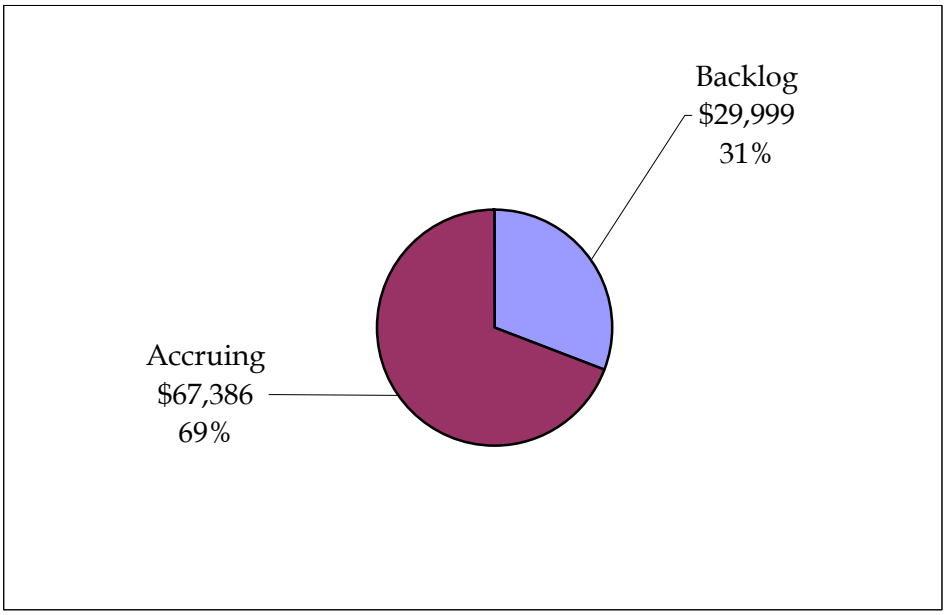


Figure 20– Roadway Backlog and Accruing Needs by Miles
TOTAL CENERTLINE LANE MILES = 193,831

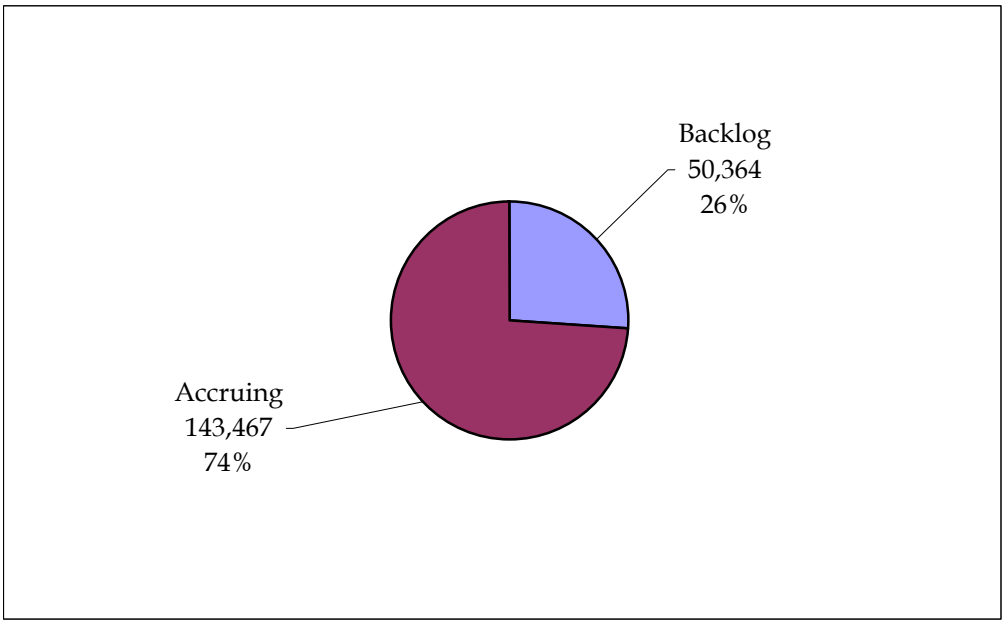


Figure 21 shows a breakdown of the backlog needs (dollars) by improvement type. Over $18 billion (61%) of modernization needs were identified followed by $8.3 billion (28%) of expansion needs, $3.1 billion (10%) of preservation needs and $397 million (1%) of maintenance needs. **Figure 22** shows a breakdown of the accruing needs (dollars) by improvement type. Over the next 25 years, $30.1 billion (45%) of expansion needs were identified followed by $16.6 billion in maintenance needs, $12 billion (18%) in preservations needs, and $8.5 billion (13%) of modernization needs.

Figure 21 – Roadway Backlog Needs by Improvement Type
TOTAL DOLLARS = $30 billion

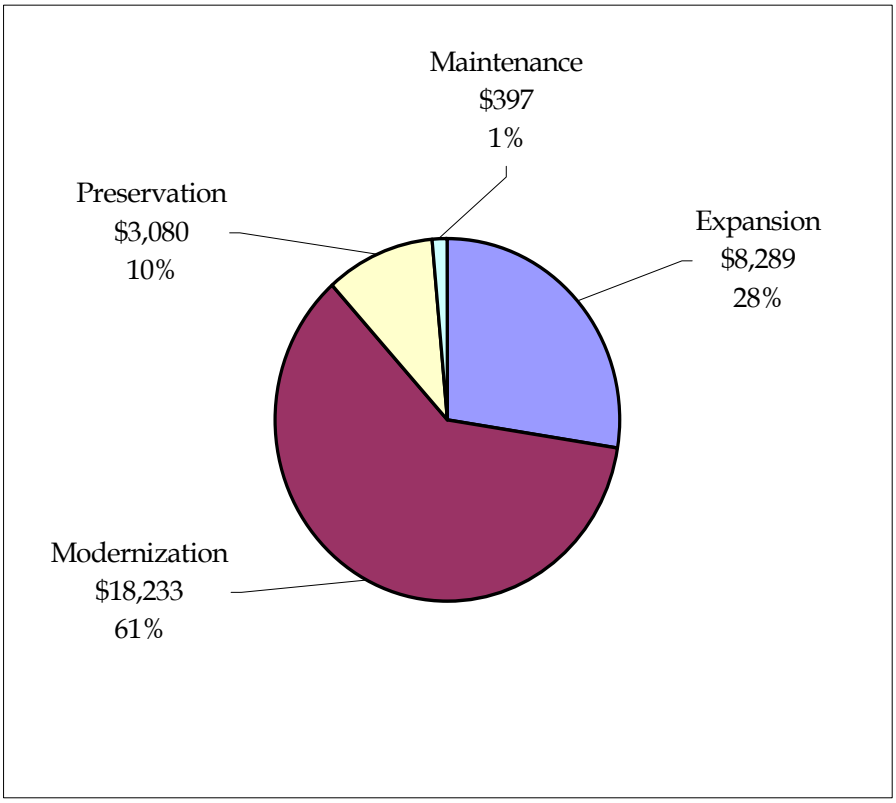
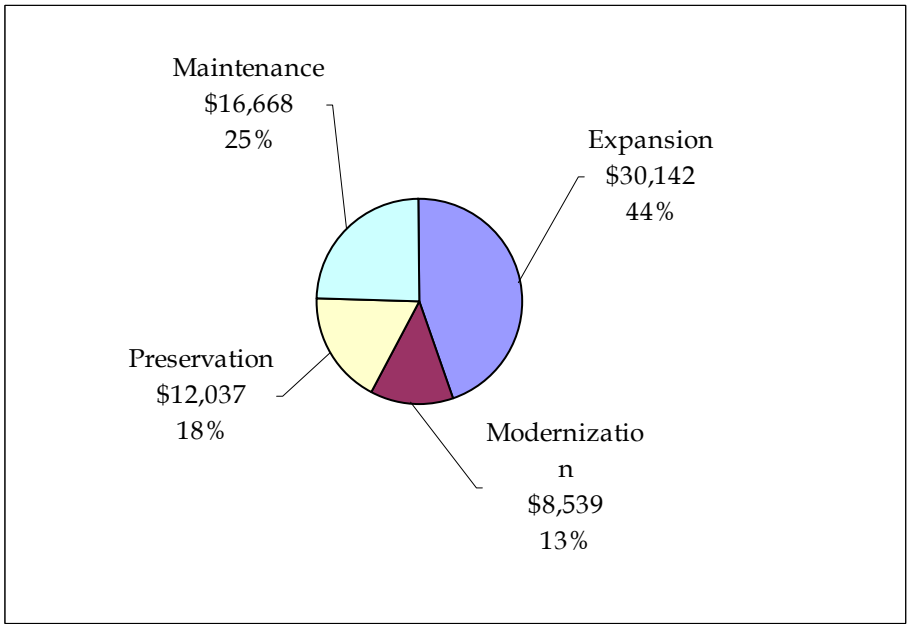
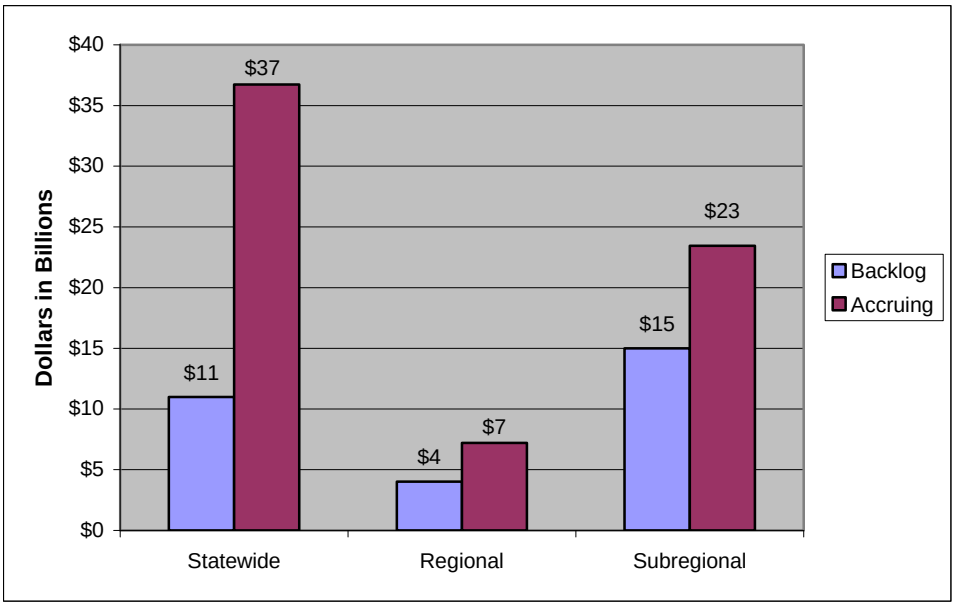


Figure 22 – Roadway Accruing Needs by Improvement Type
TOTAL DOLLARS = $67.4 billion



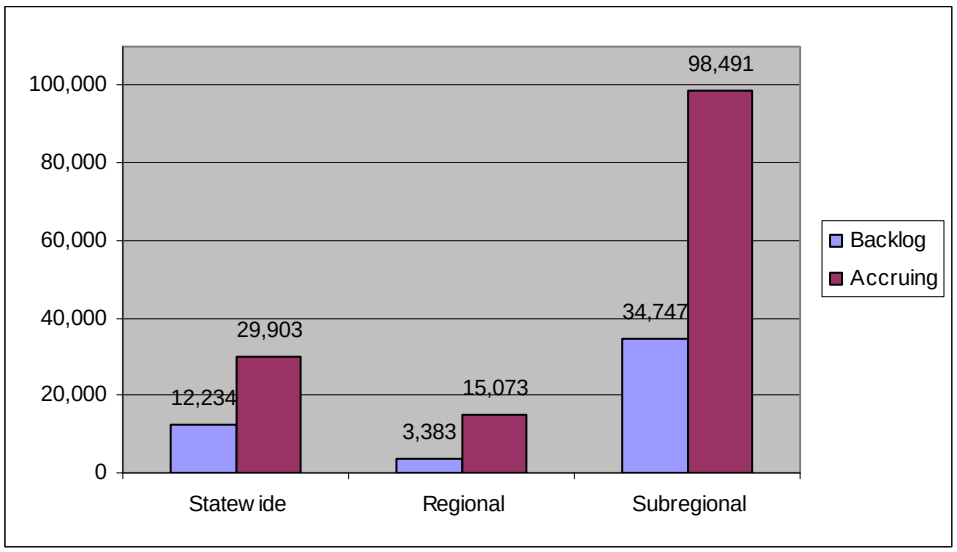
Based on NCMIN Tiers, **Figure 23** shows that $36.7 billion (77%) of the Statewide Tier needs are accruing; $7.2 billion (64%) of the Regional Tier are accruing; and $23.4 billion (61%) of the Subregional Tier needs are accruing.

Figure 23 – Total Backlog and Accruing Needs by NCMIN Tier
TOTAL DOLLARS = $97.4 billion



In terms of mileage, **Figure 24** shows a comparison between backlog and accruing needs and nearly 30,000 lane miles (71%) of the Statewide Tier needs are accruing; over 15,000 lane miles (82%) of the Regional Tier needs are accruing; and 98,491 lane miles (74%) of the Subregional Tier needs are accruing. While nearly 50 percent of the total needs, based on cost, are identified on the Statewide Tier, only 22 percent of the total needs, based on miles, are identified on the Statewide Tier. Conversely, while only 39 percent of the total needs, based on cost, are identified on the Subregional Tier, 69 percent of the total needs, based on miles, are identified on the Subregional Tier. The major difference between cost and miles between the Statewide and Subregional Tiers is that the majority of the Statewide Tier needs are more costly expansion needs, while the majority of the Subregional Tier needs are less expensive preservation needs.

Figure 24 – Total Backlog and Accruing Needs (Miles) by NCMIN
TOTAL CENTERLINE MILES = 193,831



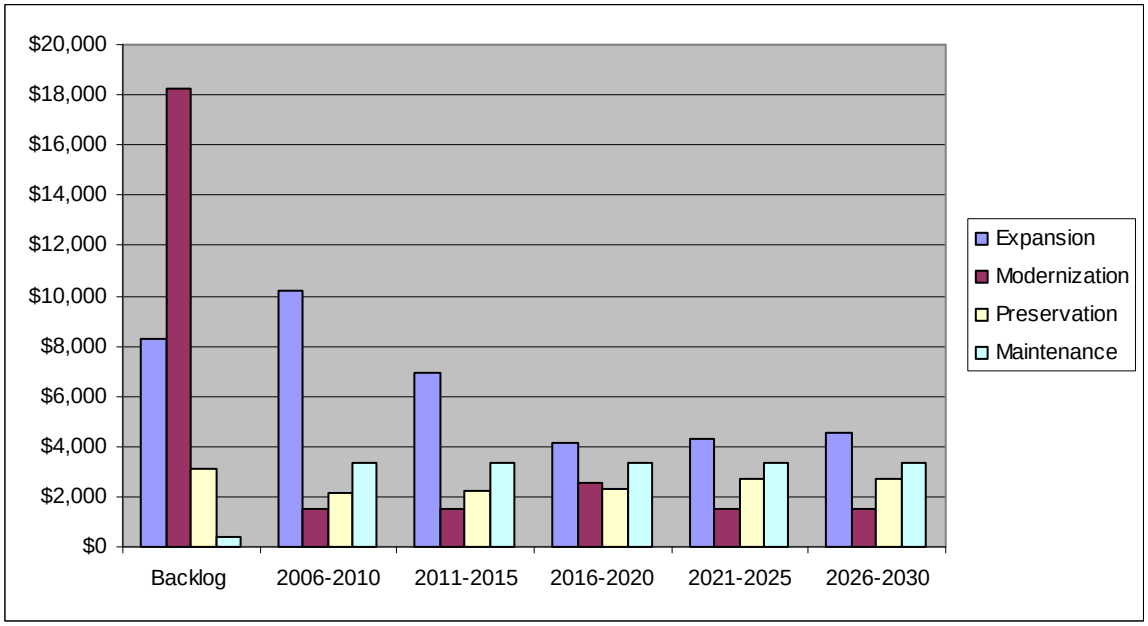
4.2.4 Five-Year Funding Periods

The 2006 STP Mid-Cycle update identifies highway and non-highway needs over a 25-year planning horizon. While the needs provide decision-makers with a comprehensive look at needs across improvement type, NCMIN Tier, and NCDOT Divisions, this section identifies needs in five-year funding periods. This analysis provides NCDOT insight into when needs will occur and the associated cost.

A total of $97.4 billion of highway needs have been identified over the 25-year planning horizon. **Figure 25** shows a break down of this total for the following funding periods by the four improvement types:

- Backlog (2005);
- 2006 to 2010;
- 2011 to 2015;
- 2016 to 2020;
- 2021 to 2025; and
- 2026 to 2030.

Figure 25 – Five-Year Funding Period by Improvement Type
TOTAL DOLLARS = $97.4 billion

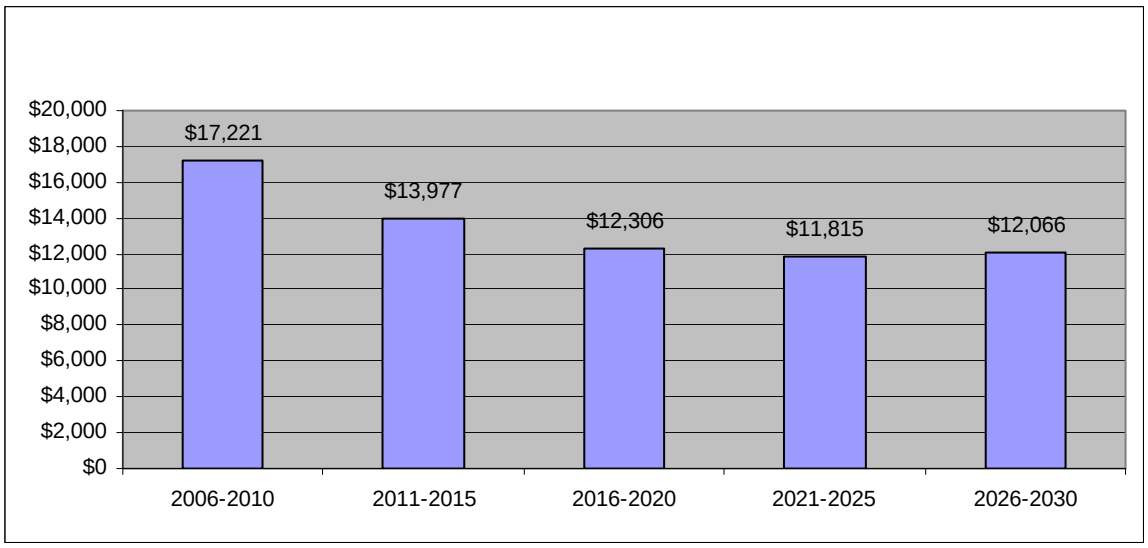


As noted in the previous section, backlog highway needs (includes bridges and ITS) total $30 billion. **Figure 26**, on the next page, shows the accruing needs, which total $67.4 billion, categorized into the five funding periods. Based on the highway and bridge analysis as well as input from NCDOT staff, funding period 2006 – 2010 has the highest amount of accruing need at $17.2 billion. During this time period, $10.2 billion (34%) are identified as expansion needs. The amounts of accruing need for the other funding periods are as follows:

- 2011 – 2015 totals $14 billion;
- 2016 – 2020 totals $12.3 billion;
- 2021 – 2025 totals $11.8 billion; and
- 2026 – 2030 totals $12 billion.

Based on improvement type, expansion are the highest needs in each of the five-funding periods. During funding period 2016 – 2020, modernization needs total $2.5 billion and the majority of these needs are due to bridge replacements or improvements, such as strengthening and widening.

Figure 26 – Five-Year Funding Periods
TOTAL DOLLARS = $67.4 billion



4.2.4.1 2006 to 2010

During the first funding period, there is a total of $17.2 billion in needs identified. The following provides a break down of those needs:

- NCMIN Tier;
  - 65 percent are on the Statewide Tier;
  - 10 percent are on the Regional Tier; and
  - 25 percent are on the Subregional Tier.
- Improvement Type;
  - 59 percent are expansion needs;
    - 20 percent are new location or urban loops;
    - 32 percent are interstate widening;
    - 45 percent are adding lanes;
    - 3 percent are new bridges;
    - 1 percent of new ITS;
  - 9 percent are modernization needs;
    - 22 percent are widen narrow lanes;
    - 54 percent are improve shoulders and resurface;

- 7 percent are pavement reconstruction;
- 11 percent are bridge replacements, widening and strengthening;
- 5 percent are ITS;

_ 12 percent are preservations needs;

- 45 percent are highway resurfacing;
- 50 percent are rural local roads / secondary roads resurfacing;
- 5 percent ITS;

_ 19 percent are maintenance needs;

- 92 percent Roadway maintenance; and
- 8 percent bridge maintenance.

4.2.4.2 2011 to 2015

During the second funding period, there is a total of $14 billion in needs identified. The following provides a break down of those needs:

- NCMIN Tier;

_ 54 percent are on the Statewide Tier;

_ 12 percent are on the Regional Tier; and

_ 34 percent are on the Subregional Tier.

- Improvement Type;

_ 49 percent are expansion needs;

- 29 percent are new location or urban loops;
- 13 percent are interstate widening;
- 1 percent are reconstruction with additional lanes;
- 53 percent are adding lanes;
- 3 percent are new bridges;
- 1 percent of new ITS ;

_ 11 percent are modernization needs;

- 31 percent are widen narrow lanes;
- 27 percent are improve shoulders and resurface;
- 39 percent are bridge replacements, widening and strengthening;

- 2 percent are ITS;

_ 16 percent are preservations needs;

- 47 percent are highway resurfacing;
- 48 percent are rural local roads / secondary roads resurfacing;
- 5 percent ITS;

_ 24 percent are maintenance needs;

- 92 percent Roadway maintenance; and
- 8 percent bridge maintenance.

4.2.4.3 2016 to 2020

During the third funding period, there is a total of $12.3 billion in needs identified. The following provides a break down of those needs:

- NCMIN Tier;

_ 46 percent are on the Statewide Tier;

_ 8 percent are on the Regional Tier; and

_ 46 percent are on the Subregional Tier.

- Improvement Type;

_ 34 percent are expansion needs;

- 48 percent are new location or urban loops;
- 13 percent are interstate widening;
- 1 percent are reconstruction with additional lanes;
- 37 percent are adding lanes;
- 1 percent of new ITS;

_ 21 percent are modernization needs;

- 7 percent are widen narrow lanes;
- 7 percent are improve shoulders and resurface;
- 82 percent are bridge replacements, widening and strengthening;
- 5 percent are ITS;

_ 19 percent are preservations needs;

- 49 percent are highway resurfacing;

- 47 percent are rural local roads / secondary roads resurfacing;
- 4 percent ITS;

_ 27 percent are maintenance needs;

- 92 percent roadway maintenance; and
- 8 percent bridge maintenance.

4.2.4.4 2021 to 2025

During the fourth funding period, there is a total of $11.8 billion in needs identified. The following provides a break down of those needs:

- NCMIN Tier;

_ 51 percent are on the Statewide Tier;

_ 12 percent are on the Regional Tier; and

_ 37 percent are on the Subregional Tier.

- Improvement Type;

_ 37 percent are expansion needs;

- 46 percent are new location or urban loops;
- 18 percent are interstate widening;
- 1 percent are reconstruction with additional lanes;
- 33 percent are adding lanes;
- 1 percent of new ITS;

_ 13 percent are modernization needs;

- 21 percent are widen narrow lanes;
- 31 percent are improve shoulders and resurface;
- 37 percent are bridge replacements, widening and strengthening;
- 12 percent are ITS;

_ 23 percent are preservations needs;

- 56 percent are highway resurfacing;
- 40 percent are rural local roads / secondary roads resurfacing;
- 4 percent ITS;

_ 28 percent are maintenance needs;

- 92 percent Roadway maintenance; and
- 8 percent bridge maintenance.

4.2.4.5 2026 to 2030

During the fifth funding period, there is a total of $12 billion in needs identified. The following provides a break down of those needs:

- NCMIN Tier;
  - 52 percent are on the Statewide Tier;
  - 12 percent are on the Regional Tier; and
  - 36 percent are on the Subregional Tier.
- Improvement Type;
  - 38 percent are expansion needs;
    - 44 percent are new location or urban loops;
    - 19 percent are interstate widening;
    - 1 percent are reconstruction with additional lanes;
    - 30 percent are adding lanes;
    - 6 percent of new ITS;
  - 12 percent are modernization needs;
    - 9 percent are widen narrow lanes;
    - 21 percent are improve shoulders and resurface;
    - 60 percent are bridge replacements, widening and strengthening;
    - 10 percent are ITS;
  - 22 percent are preservations needs;
    - 57 percent are highway resurfacing;
    - 39 percent are rural local roads / secondary roads resurfacing;
    - 4 percent ITS;
  - 28 percent are maintenance needs;
    - 92 percent roadway maintenance; and
    - 8 percent bridge maintenance.

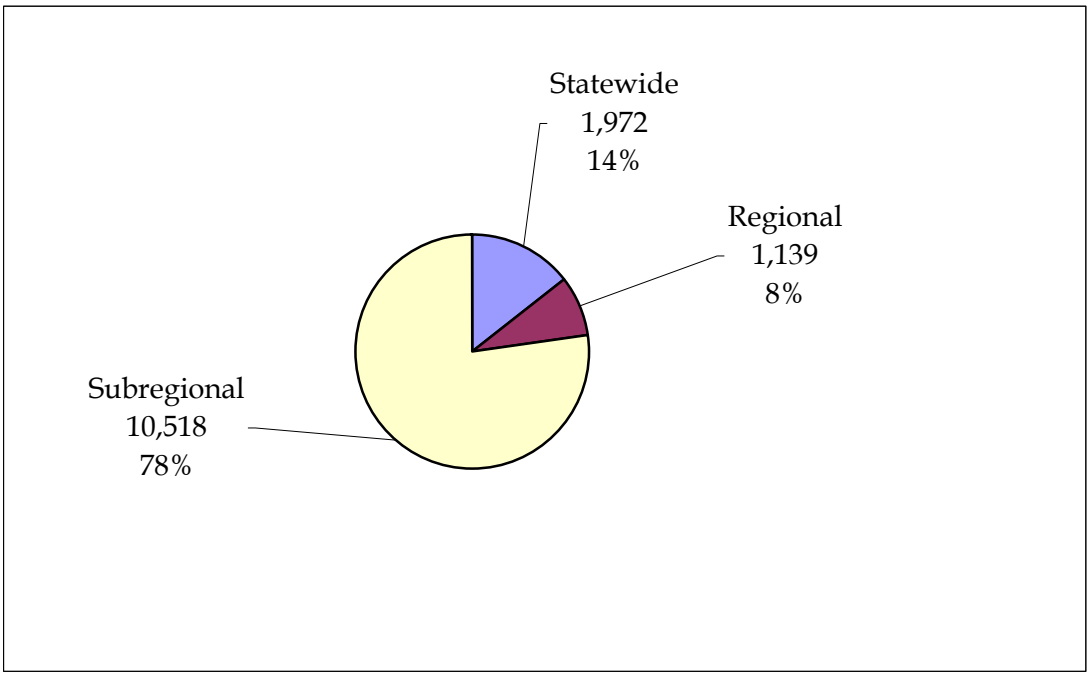
Chapter 5. Bridge Needs

Bridge needs were included in the Highway Needs section above, however since bridges play a vital role in the transportation system, bridge needs are further clarified by improvement type, NCMIN Tier, NCDOT Division, Backlog and Accruing, and five-year funding period in this section.

5.1 Existing Conditions

As shown in **Figure 27**, there are 13,629 state-maintained bridges in North Carolina with nearly 2,000 (14%) in the Statewide Tier, over 1,100 (8%) in the Regional Tier and over 10,500 (78%) in the Subregional Tier.

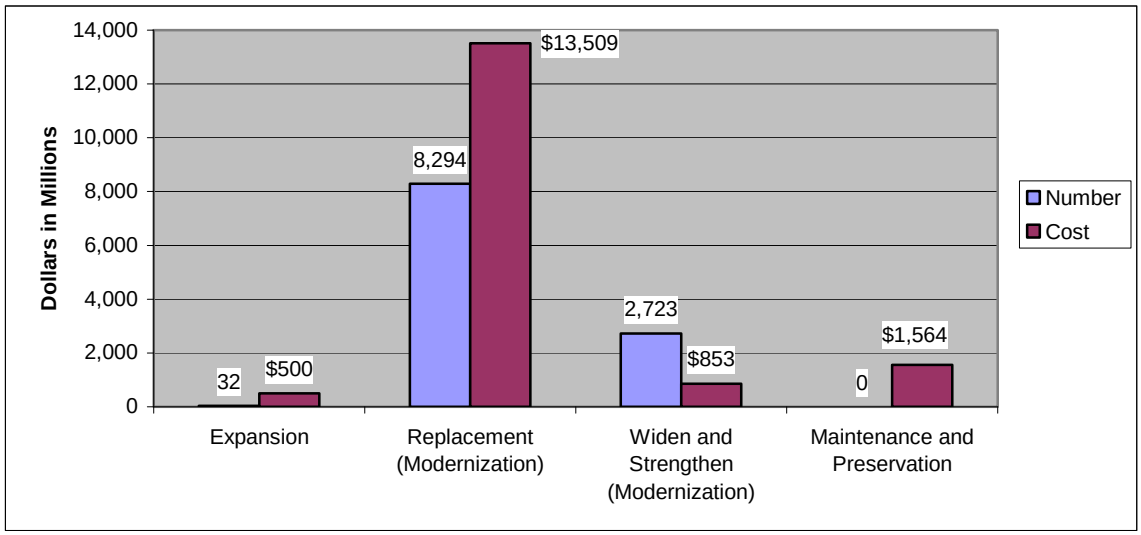
Figure 27 – Number of Bridges by NCMIN Tier
TOTAL NCDOT BRIDGES = 13,629



5.2 Bridge Needs by Improvement Types

Figure 28 shows a comparison between the number and cost of bridges by improvement type. Over the next 25 years, bridge needs total $16.4 billion and 14.4 billion (87%) and over 11,000 bridges are categorized as modernization needs, which are a combination of replacement and improvement (strengthening and widening), $1.6 billion (10%) are maintenance and preservation needs and the remaining $500 million (3%) are expansion needs. Since, NBIAS does not identify bridge expansion needs, the 2007-2013 NCDOT STIP was reviewed and 32 new bridge expansion projects, such as railroad grade separations and new river crossing bridges, were identified.

Figure 28 - Total Bridge Needs by Improvement Type
TOTAL BRIDGES = 11,049
TOTAL DOLLARS = $16.4 billion



5.2.1 Bridge Needs by NCMIN Tier

In the 25-year planning period, 11,049 state-maintained bridges (81%) will require some type of improvement. **Figure 29** shows a comparison between the number of bridge needs and the cost of bridge needs by NCMIN Tier. Ten percent (1,071 bridges) of the bridge needs will be on the Statewide Tier and since these bridges are generally wider and longer they represent 33 percent ($5.4 billion) of the total bridge need costs. Five percent (606 bridges) of the bridge needs will be on the Regional Tier and they represent 11 percent ($1.9 billion) of the total bridge need costs. The remaining 85 percent (9,372 bridges) will be on the Subregional Tier and since these bridges

are usually narrow and shorter, they represent 56 percent ($9.2 billion) of the total bridge need costs.

Figure 29 – Total Bridge Needs by NCMIN Tier
TOTAL BRIDGES = 11,049
TOTAL DOLLARS = $16.4 billion

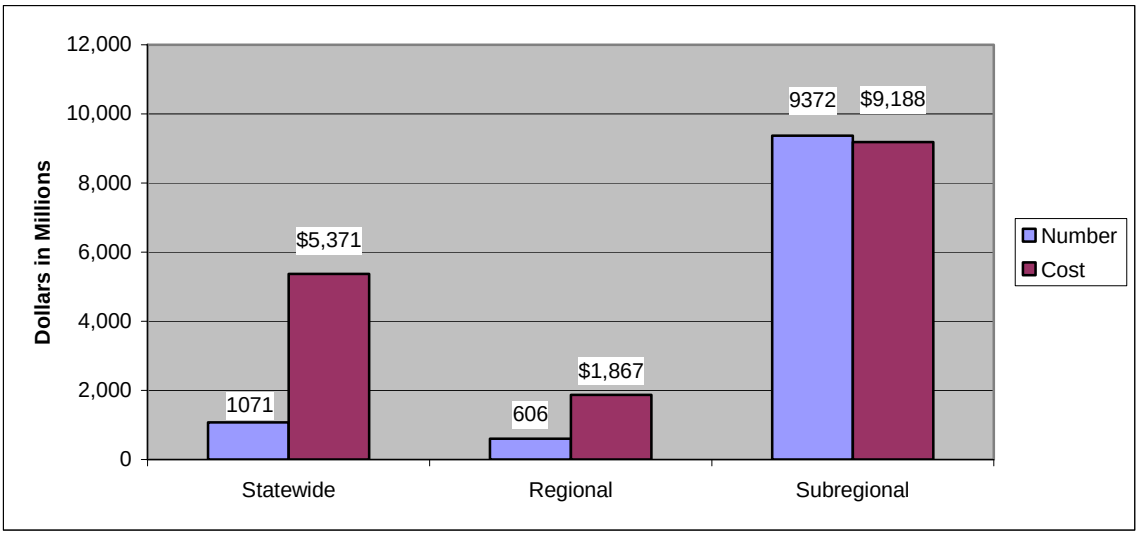
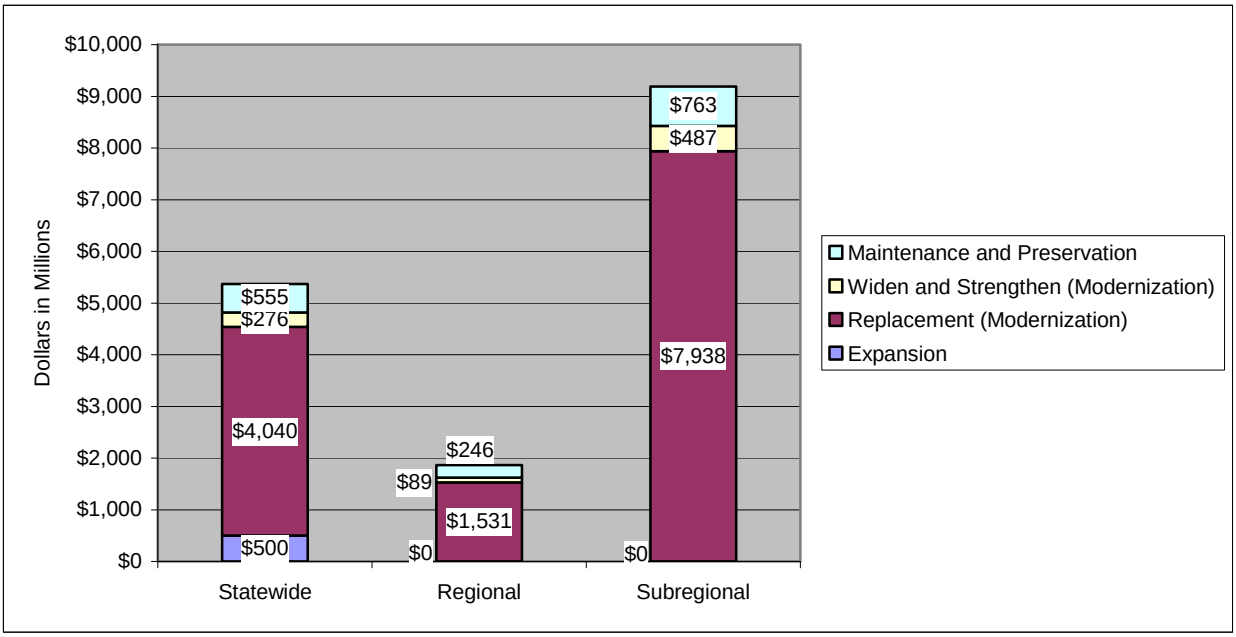


Figure 30 shows the total bridge needs by NCMIN Tier and by improvement type. Of the $5.4 billion in Statewide Tier bridge needs, $4.3 billion are modernization needs, $500 million are expansion needs and the remaining $555 million are maintenance and preservation needs. Of the $1.9 billion in Regional Tier needs, $1.6 billion are modernization needs and $246 million are maintenance and preservation needs. Of the $9.2 billion, Subregional Tier needs, $8.4 billion are modernization needs and $763 million are maintenance and preservation needs.

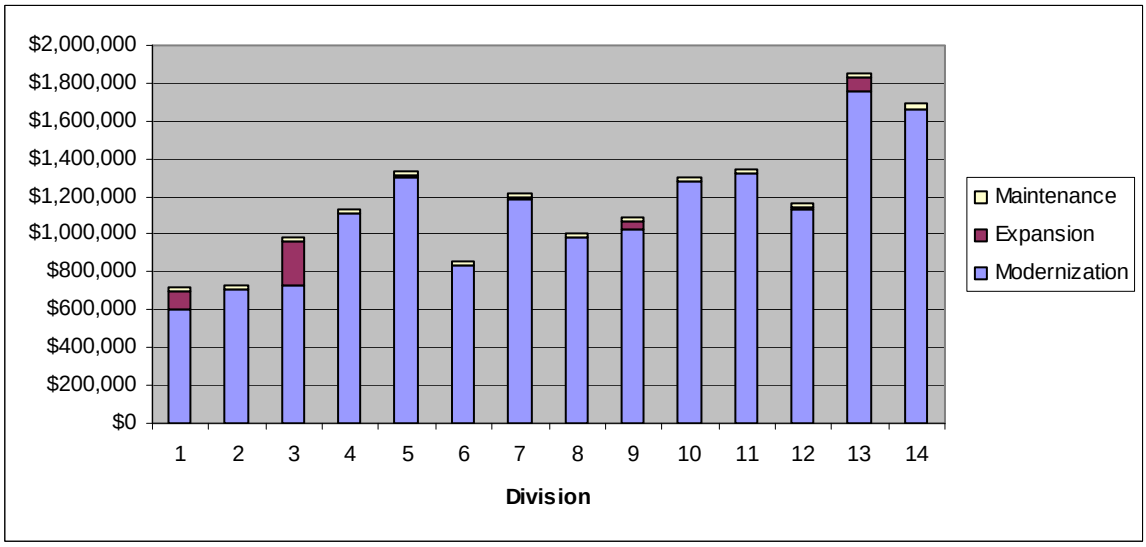
Figure 30 – Total Bridge Needs by NCMIN Tier and Improvement Type
TOTAL NEEDS = $16.4 billion



5.2.2 Bridge Needs by NCDOT Division

NCDOT has 14 Divisions that are organized by county boundaries. **Figure 31** shows the total $16.4 billion in bridge modernization, expansion and maintenance needs by each Division.

Figure 31– Bridge Needs by NCDOT Division ($ in thousands)

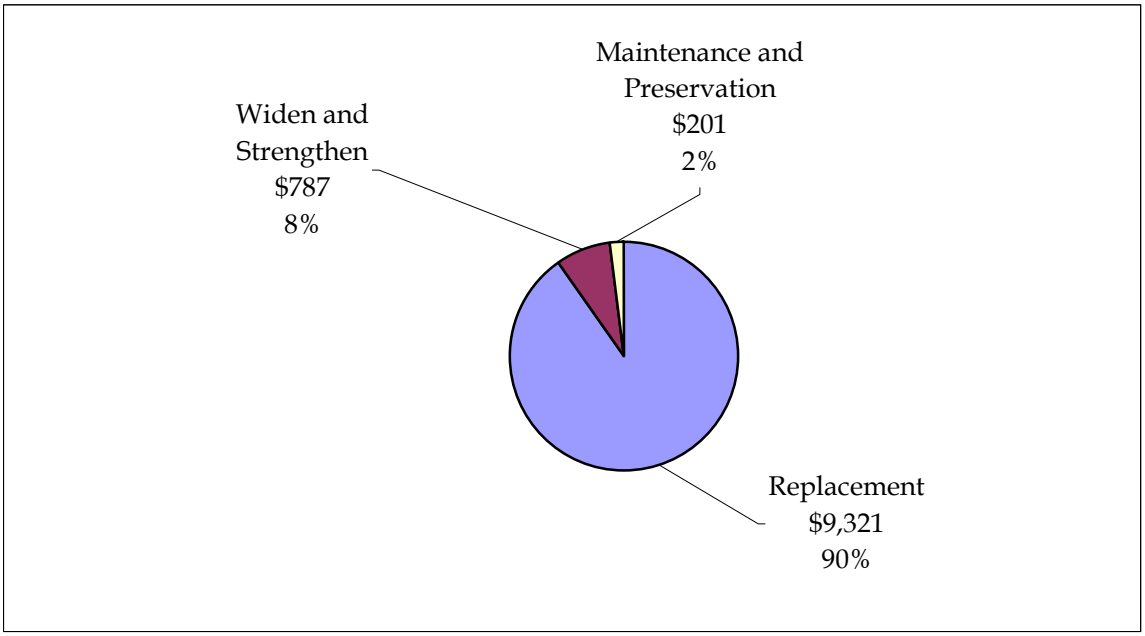


Overall, Divisions 13 and 14 have the largest bridge needs among the 14 Divisions, $1.8 and $1.7 billion respectively. The high cost of bridge improvements can be attributed to both Divisions located in very mountainous terrain. In contrast, Division 2, which is located on the coast, has a total of $732 million in bridge needs. Modernization needs, which include replacement, widening and strengthening, are by far the largest need across all Divisions. Based on consultation with NCDOT staff, $21 million of bridge maintenance needs were identified for Divisions 1 through 13 and $28.3 million for Division 14. Since NBIAS does not identify new bridges, bridge expansion needs were determined by reviewing the 2007-2013 NCDOT STIP. Based on this review, Divisions 1, 3, 9 and 13 had the most bridge expansions.

5.2.3 Backlog and Accruing Bridge Needs

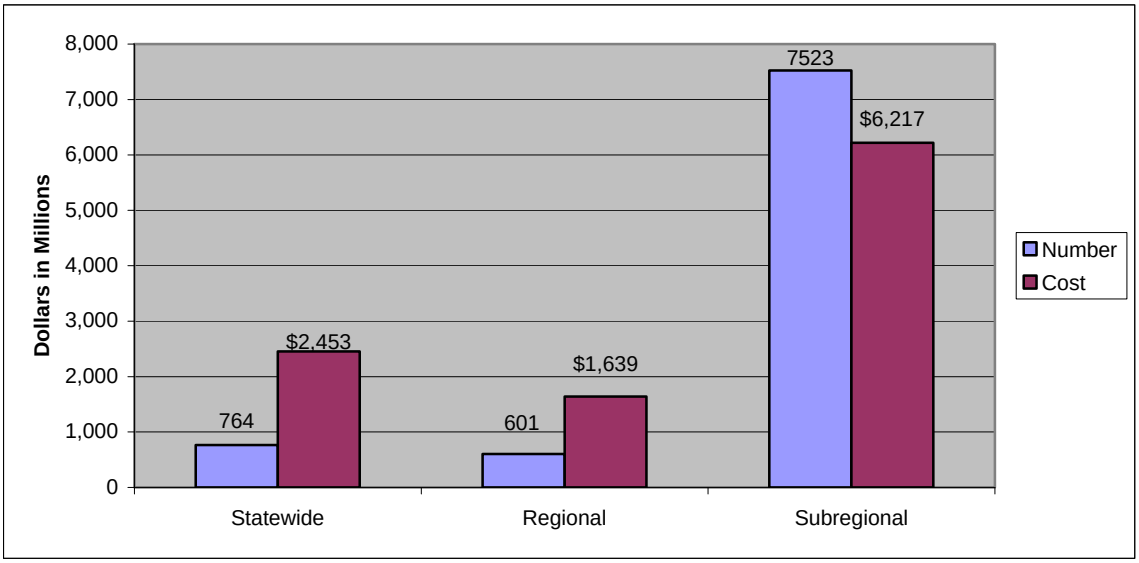
Currently (2005), there are 8,888 (65% of total state-maintained) bridges that need improvement (replacement, widening and strengthening). The cost of addressing the backlog needs total $10.3 billion. Based on cost, 98 percent of the backlog bridge needs are categorized as modernization, which include replacements, widening and strengthening, while the remaining 2 percent address maintenance and preservation needs (**Figure 32**).

Figure 32 – Backlog Bridge Needs by Improvement Type
TOTAL BRIDES = 8,888
TOTAL COST = $10.3 billion



As shown in **Figure 33**, 9 percent (764) of the backlog bridges are on the Statewide Tier, but in terms of cost it represents 24 percent ($2.5 billion); 7 percent (601) are on the Regional Tier, but in terms of cost it represents 16 percent ($1.6 billion); and 84 percent (7,523) are on the Subregional Tier, but in terms of cost it represents 60 percent ($6.1 billion).

Figure 33 - Backlog Bridge Needs by NCMIN Tier
TOTAL BRIDGES = 8,888
TOTAL DOLLARS = $10.3 billion



Figures 34 shows the number of bridge backlog improvement type needs by NCMIN Tier, while **Figure 35** illustrates the bridge backlog cost by improvement type needs for each NCMIN Tier.

- Based in number of bridges, the Subregional Tier has 10 times more bridge needs than the Statewide Tier and 12 times more bridge needs than the Regional Tier.
- Based on cost, the Subregional Tier has 2.5 times more dollars needs than Statewide Tier bridges and 4 times more needs than the Regional Tier.

Figure 34 – Backlog Bridge Needs by Improvement Type and NCMIN Tier
TOTAL BRIDGES = 8,888

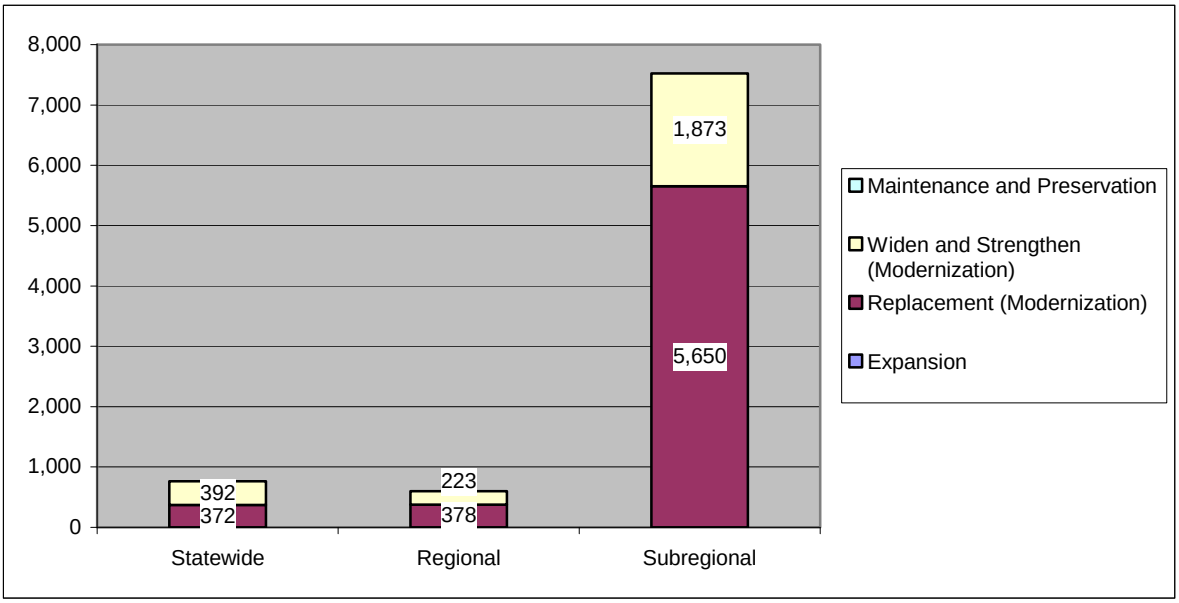
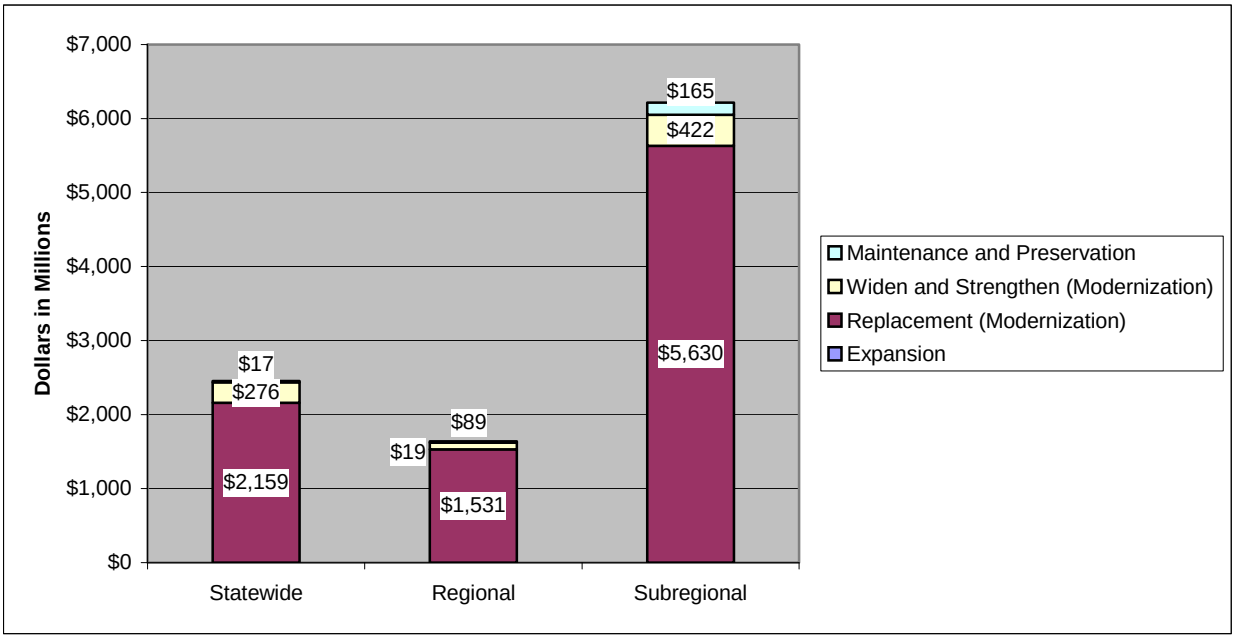


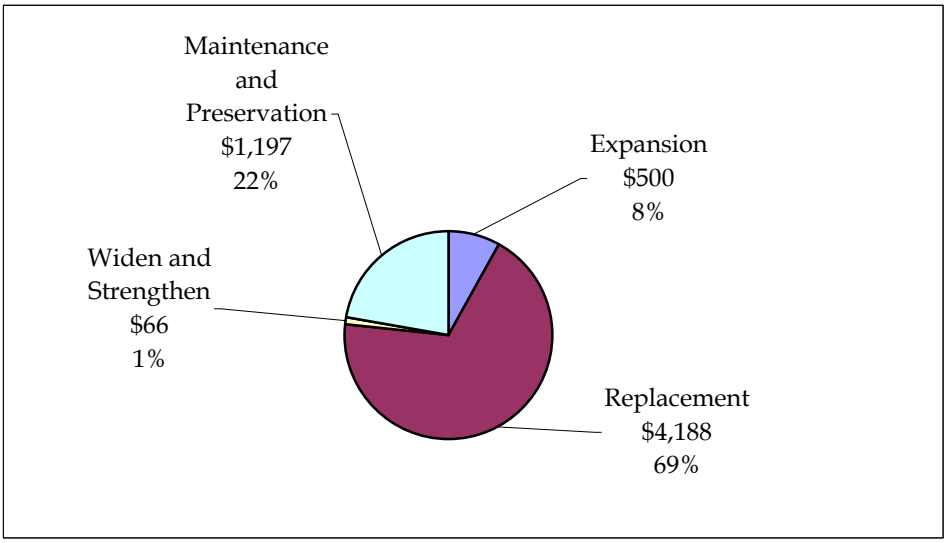
Figure 35 – Backlog Bridge Needs by Improvement Type and Tier
TOTAL DOLLARS =$10.3 billion



As shown in **Figure 36**, over the next 25 years, 70 percent (nearly $4.3 billion) of the accruing bridge needs are categorized as modernization (replacement, widen and strengthen), 22 percent

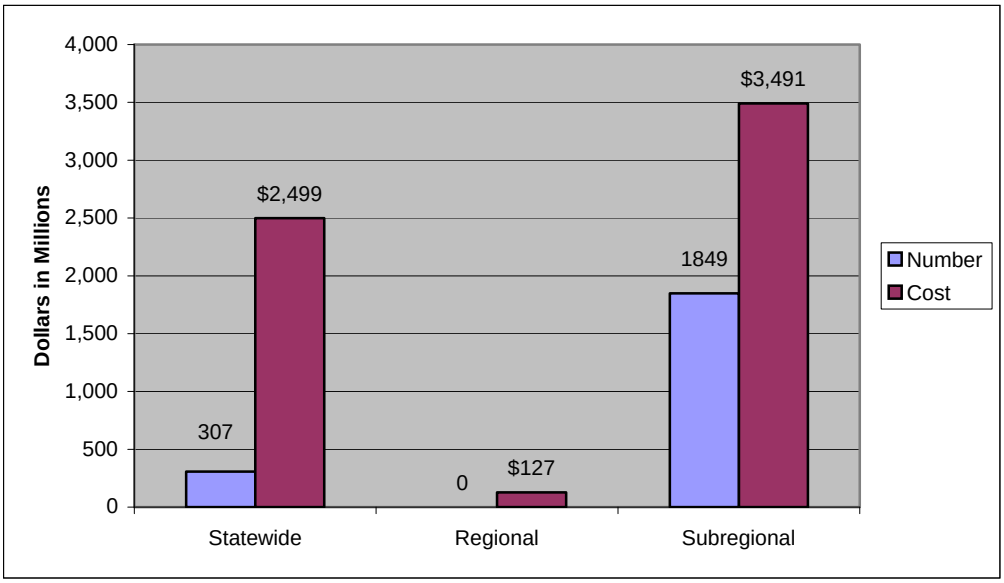
($1.2 billion) will address maintenance and preservation needs and the remaining 1 percent ($500 million) will entail expansion.

Figure 36– Accruing Bridge Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $6.1 billion



As shown in **Figure 37**, approximately 2,161 (16%) of state-maintained bridges will need improvement (replacement, widening and strengthening) over the next 25 years. The improvement costs will total $6.1 billion, with 14 percent (307) identified on the Statewide Tier and 86 percent (1,849) are on the Subregional Tier. NBIAS did not identify any future replacements, widenings, or strengthenings on Regional Tier bridges, which means that backlog improvements, as well as the existing design of the bridge, will adequately serve traffic until the year 2030. In terms of cost, 41 percent ($2.5 billion) are located on the Statewide Tier, 2 percent ($127 million) on the Regional Tier and 57 percent ($3.5 billion) on the Subregional Tier. Rather than using the NBIAS produced maintenance dollar needs for bridges, the total cost for bridge maintenance (number of bridges were not identified) was provided by NCDOT.

Figure 37 – Accruing Bridge Needs by NCMIN Tier
TOTAL BRIDGES = 2,161
TOTAL DOLLARS = $6.1 billion



Figures 38 shows the number of bridge accruing improvement type needs by NCMIN Tier, while **Figure 39** illustrates the bridge accruing cost by improvement type needs for each NCMIN Tier.

- Based in number of bridges, the Subregional Tier will have 4 times more bridge replacement needs than Statewide Tier bridges.
- Based on the cost, the Subregional Tier will have 1.2 times more dollars needs than Statewide Tier bridges.
  - 39 percent ($2.4 billion) of the total $6.1 billion bridge needs are for bridge modernization needs (replacements, widenings and strengthening) on the Subregional Tier;
  - 31 percent ($1.9 billion) are for bridge modernization needs (replacements, widenings and strengthening) on the Statewide Tier;
  - 18 percent ($1.1 billion) are for bridge maintenance and preservation needs on the Subregional Tier;
  - 2 percent ($118 million) are for bridge maintenance and preservation needs on the Statewide Tier;

- 2 percent ($127 million) are for bridge maintenance and preservation needs on the Regional Tier; and
- 8 percent ($500 million) are for bridge expansion needs on the Statewide Tier.

Figure 38 – Accruing Bridge Needs by NCMIN Tier and Improvement Type
TOTAL BRIDGES = 2,161

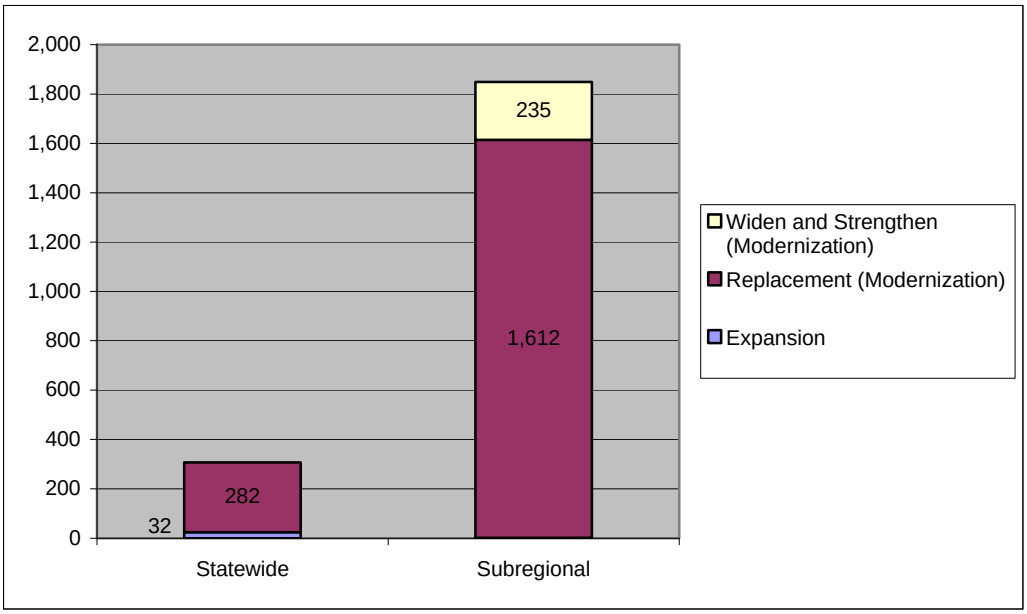
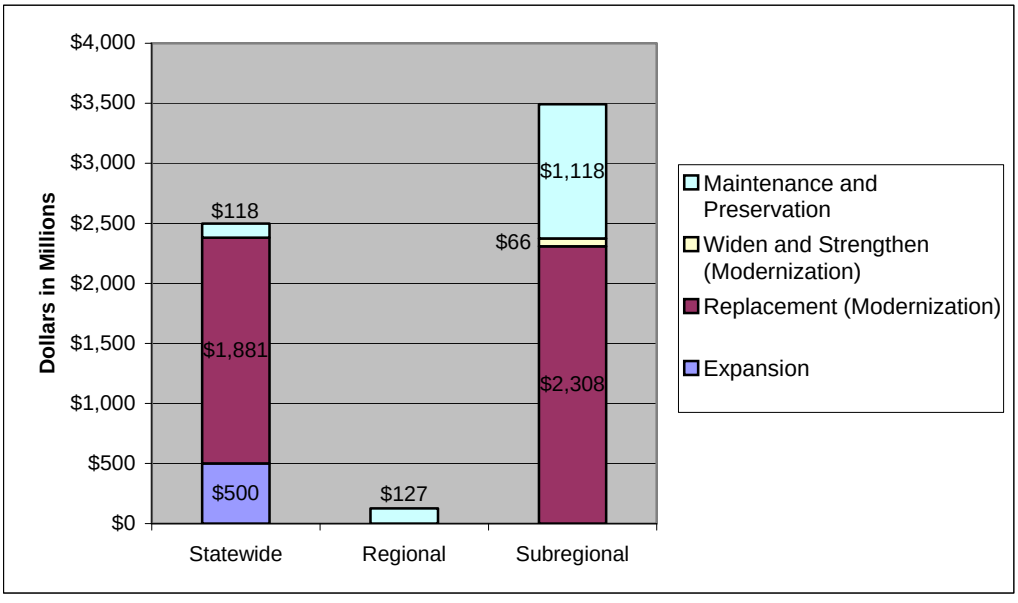


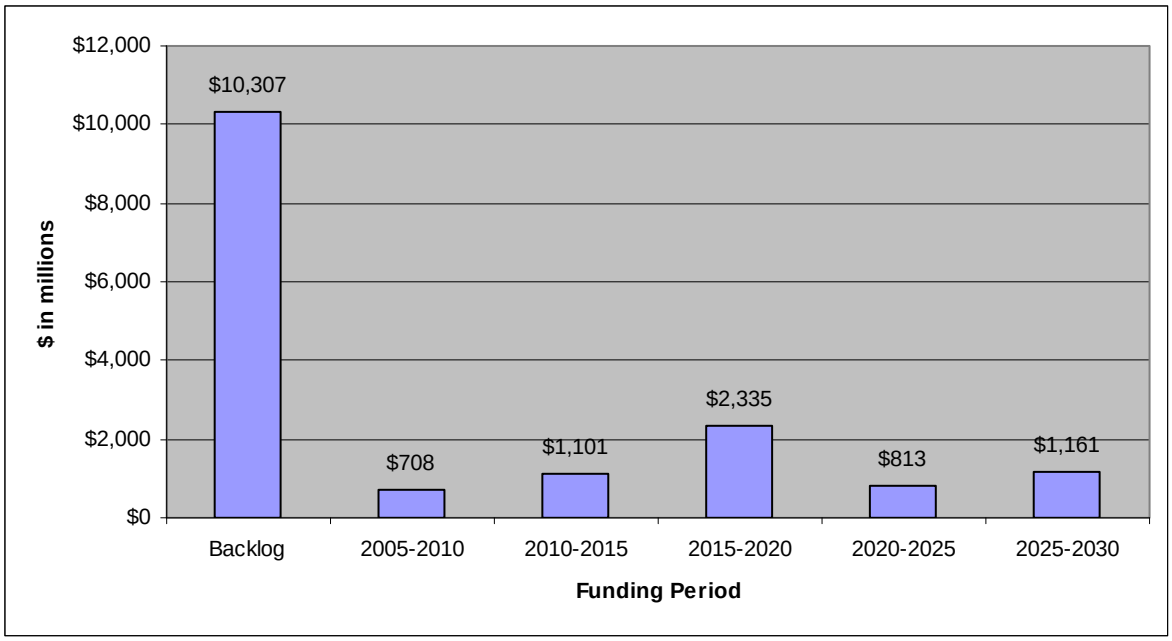
Figure 39 – Accruing Bridge Needs by NCMIN Tier and Improvement Type
TOTAL NEEDS = $6.1 billion



5.2.4 Bridge Needs by Five-Year Funding Periods

A total of $16.4 billion of bridge needs have been identified. As noted earlier in this section, $10.3 billion of the bridges needs are existing or backlog needs, while the remaining $6.1 billion are future needs. Based on the technical analysis provided by NBIAS and consultation with NCDOT and FHWA NC Division staff, **Figure 40** shows the bridges needs by backlog and the five funding periods.

Figure 40 – Five-Year Funding Period by Improvement Type
TOTAL DOLLARS = $16.4 billion



5.2.4.1 2006 to 2010

During the first funding period, there is a total of $708 million in needs identified. The following provides a break down of those needs.

- NCMIN Tier;
  - 62 percent are on the Statewide Tier;
  - 6 percent are on the Regional Tier; and
  - 32 percent are on the Subregional Tier.
- Improvement Type;
  - 37 percent are for new bridges (expansion);

- 24 percent are for replacements, widening and strengthening; and
- 39 percent are for maintenance.

5.2.4.2 2011 to 2015

During the first funding period, there is a total of $1.1 billion in needs identified. The following provides a break down of those needs.

- NCMIN Tier;
  - 37 percent are on the Statewide Tier;
  - 4 percent are on the Regional Tier; and
  - 59 percent are on the Subregional Tier.
- Improvement Type;
  - 21 percent are for new bridges (expansion);
  - 54 percent are for replacements, widening and strengthening; and
  - 25 percent are for maintenance.

5.2.4.3 2016 to 2020

During the first funding period, there is a total of $2.3 billion in needs identified. The following provides a break down of those needs.

- NCMIN Tier;
  - 31 percent are on the Statewide Tier;
  - 2 percent are on the Regional Tier; and
  - 67 percent are on the Subregional Tier.
- Improvement Type;
  - 88 percent are for replacements, widening and strengthening; and
  - 12 percent are for maintenance.

5.2.4.4 2021 to 2025

During the first funding period, there is a total of $813 million in needs identified. The following provides a break down of those needs.

- NCMIN Tier;

- 60 percent are on the Statewide Tier;
- 5 percent are on the Regional Tier; and
- 35 percent are on the Subregional Tier.

- Improvement Type;
  - 66 percent are for replacements, widening and strengthening; and
  - 34 percent are for maintenance.

5.2.4.5 2026 to 2030

During the first funding period, there is a total of $1.2 billion in needs identified. The following provides a break down of those needs.

- NCMIN Tier;
  - 69 percent are on the Statewide Tier;
  - 4 percent are on the Regional Tier; and
  - 27 percent are on the Subregional Tier.
- Improvement Type;
  - 77 percent are for replacements, widening and strengthening; and
  - 23 percent are for maintenance.

Chapter 6. Intelligent Transportation System (ITS)

6.1 Existing Conditions

Currently, there are nine ITS Statewide Strategic Deployment areas in North Carolina. Although relatively new, there are several ITS deployments that are either fully functional, in construction, or in the planning stages throughout the state. The key component in every ITS Deployment Plan was to develop a central database of traveler information to be disseminated to motorists throughout the region.

Managing traffic and public transportation with ITS technologies allows the Department and its partners to respond to congestion and incidents by alerting travelers using a variety of methods. ITS related tools assist in managing public transportation services and traffic flow in North Carolina. The hub of where the information is sent and delivered is at a Traffic Management Center (TMC). The TMC is one type of Intelligent Transportation System. Currently there are three TMC's in North Carolina located in Charlotte, Raleigh and Greensboro.

Like many other regions across the nation, many areas in North Carolina are facing a growing congestion problem. Growth in traffic volumes in many regions is outpacing new road construction, resulting in more vehicles trying to squeeze into less space. Adding lane capacity and building new highways has traditionally been the remedy for congestion. However, an alternative to traditional capacity-adding projects is integrating Intelligent Transportation Systems (ITS) solutions to improve traffic operations on existing roadways and enhance public transportation services. Capital infrastructure such as roadways, intermodal ports, airports and transit facilities are extremely vital components of North Carolina's transportation system. In order to manage these resources more efficiently, ITS solutions are being deployed statewide.

6.2 ITS Technologies

ITS can be roughly grouped into the following seven categories in North Carolina:

- Signal Systems;

- Traveler Information;
- Incident Management;
- Transportation Management Centers (TMCs);
- Commercial Vehicle Operations;
- Transit Management; and
- Emergency Management Devices.

Managing traffic and public transportation with ITS technologies allows the Department and its partners to respond to congestion and incidents by alerting travelers using a variety of methods. All of these ITS related tools assist in managing public transportation services and traffic flow in North Carolina. The hub of where the information is sent and delivered is at a TMC. The TMC is one type of Intelligent Transportation System. Currently there are three TMC's in North Carolina located in Charlotte, Raleigh and Greensboro.

North Carolina has deployed a variety of intelligent transportation systems to address some of the transportation needs outlined in the regional ITS Strategic Deployment Plans. Listed below are some of the system types that are either partially installed requiring expansion, upgrade or are currently under construction.

6.2.1 Advanced Transportation Management Systems

- Fiber-optic cables communicate information between monitoring devices and Traffic Management Centers (TMC's);
- Sensors along roadways provide average traffic speed and volume to TMC's;
- Closed-circuit cameras located along roadways, major interchanges and intersections provide live traffic flow information to TMC's;
- Roadway Weather Information Systems - allow for real-time notification to the traveling public of adverse weather conditions such as snow, ice, fog, and high winds that affect travel;
- Integration of regional/urban traffic signal systems; and

- Toll-free cellular call-in systems routed to the TMC's or the North Carolina Highway Patrol for immediate incident response.

6.2.2 Advanced Public Transportation Systems

- Bus Arrival Vehicle Information Systems;
- Transit Dispatching, Demand Forecasting, and Automatic Passenger Counting Systems;
- Rideshare Matching Software and Web Access Systems;
- Smart Card Technology; and
- Regional Transit Traveler Information Systems.

6.2.3 Advanced Traveler Information Systems

- Dynamic message signs provide motorists information on incidents, travel time, and alternate route options;
- Highway Advisory Radio (HAR) signs equipped with lights that flash when there is new traffic information; and
- Traveler Information website.

6.3 Regional ITS Multi-modal Strategic Deployment Plans

In January 2001, FHWA published a rule, and FTA published a companion policy, to implement section 5206(e) of TEA-21. This Rule/Policy seeks to foster regional integration by requiring that all ITS projects funded from the Highway Trust Fund be in conformance with the National ITS Architecture and appropriate standards. Conformance with the National ITS Architecture is defined in the final Rule/Policy as using the National Architecture to develop a regional architecture that would be tailored to address the local situation and ITS investment needs.

To meet this requirement, NCDOT retained a private Engineering firm in 1998 to assist in the development of nine Regional ITS Multi-model Strategic Deployment Plans (i.e. regional architectures).

The first step was to establish a stakeholder coalition to develop the vision and define the goals and objectives of the plan, as well as to identify any problems. The stakeholder-input process involved multiple meetings and forums with key persons and agencies.

The map in **Figure 41** shows the nine ITS Statewide Strategic Deployment areas and a summary of each is provided. Although relatively new, there are several ITS deployments that are either fully functional, in construction, or in the planning stages throughout the state. The key component in every ITS Deployment Plan was to develop a central database of traveler information to be disseminated to motorists throughout the region.

Figure 41 – Statewide ITS Strategic Deployment Plan Regional Map

Source: NCDOT

6.3.1 Asheville Region

The Asheville Region includes parts of Buncombe and Henderson Counties. Major cities in this region are Asheville, Black Mountain, Fairview, Weaverville, Woodfin, and Hendersonville. Based on stakeholder input, the ITS Strategic Deployment Plan process identified 30 transportation needs. These needs were ranked and the most pressing issues were identified, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traveler and tourist

information, and weather and road conditions were the most urgent issues. Short and long-term project plans were then determined from the needs.[8]

Asheville Region Top 10 Ranking Identified Needs:

1. Traveler Information Kiosks (at rest areas, hotels, Super K, malls, other locations);
2. Lack of real-time traffic information;
3. Lack of traveler information - via message signs;
4. Lack of pre-trip tourist information;
5. Real-time weather information, fog detection, and early warning of reduced visibility;
6. Information on construction, weather, road conditions;
7. Public transportation, pedestrian to bus, rail to bus, and bike to bus needs;
8. Improve commercial vehicle weight operations and law enforcement;
9. Communication links to TNDOT; and
10. Communications including e-mail to CVO providers, dispatchers, trucks in transit, etc.

6.3.2 Eastern (Coastal) Region

The Eastern (Coastal) Region includes the Jacksonville, Greenville and Goldsboro, Mount Olive, New Bern, Havelock, Morehead City, Newport, Kinston, Clinton, Washington, Warsaw, Tarboro. Based on stakeholder input, the ITS Strategic Deployment Plan process identified 53 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that hurricane evacuation, traveler information, and tourist information were the most urgent issues. Short- and long-term project plans were then determined from the needs.[9]

Eastern Region Top 10 Ranking Identified Needs:

1. Traffic Hot Spots and safety improvement corridors (I-95, I-40, US 70, US 17, US 64, US 264, NC 12, NC 24);

[8] Asheville Regional ITS Deployment Plan
[9] Eastern Regional ITS Deployment Plan

2. Hurricane evacuation plan and procedures;
3. Real-time weather information, fog detection, and early warning of inclement weather;
4. Dynamic Message Signs;
5. CCTV links to Web;
6. Reduce delays and secondary incidents;
7. Transit dispatching Demand Forecasting and Automatic Passenger Counting;
8. Traveler Information Kiosks;
9. Internet Traveler Information; and
10. New/revised maintenance measures for ITS technologies.

6.3.3 Fayetteville Region

The Fayetteville Region includes parts of Cumberland and Harnett Counties. Major cities in this region are Fayetteville, Fort Bragg, Hope Mills, Spring Lake, Buies Creek, Angier, and Lillington. Based on stakeholder input, the ITS Strategic Deployment Plan process identified 29 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traffic control, en-route driver information, pre-trip travel information, and route guidance were the most urgent issues. Short and long-term project plans were then determined from the needs.[10]

Fayetteville Region Top 10 Ranking Identified Needs:

1. Lack of real-time traffic information;
2. There is a need for increased interagency communication;
3. Lack of traveler information about incidents while driving;
4. Effective safety devices for work zones;
5. Truckers should have access to traffic information;
6. HARs are not as effective as they should be;
7. Emergency vehicle preemption;
8. Lack of Traveler information – DMS;

[10] Fayetteville Regional ITS Deployment Plan

9. Lack of route guidance for getting around incidents; and
10. Special Event Traffic Management.

6.3.4 Metrolina Region

The Metrolina Region includes the five county areas surrounding the city of Charlotte, NC. Cities in the Metrolina region include Charlotte, Gastonia, Concord, Kannapolis, Monroe, Matthews, Mint Hill, Mount Holly, Stanley, Cherryville, Bessemer City, Lowell, Belmont, Weddington, Wingate and Mooresville. Based on the stakeholder input, the ITS Strategic Deployment Plan process identified 32 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traffic control, public transportation management, archived data function, and pre-trip travel information were the most urgent issues. Short and long-term project plans were then determined from the needs.[11]

Metrolina Region Top 10 Ranking Identified Needs:

1. Peak hour freeway congestion;
2. Lack of high-speed communications between traffic management centers for real-time information sharing; and
3. Too few operational dynamic message signs with current traveler information.

Lack of incentives to use public transportation:

1. Poor signal progression;
2. Lengthy traffic delays and accidents caused by "rubber-necking" during incident removal;
3. Poor traffic control at major trip generators and highway access points;
4. Lack of real-time transit information, including travel times, pre-trip and at bus stops;
5. Poor bus schedule adherence and travel times; and
6. Lack of real-time transit vehicle location for schedule adherence and routing.

[11] Metrolina Regional ITS Deployment Plan

6.3.5 Piedmont Region

The Piedmont Region includes the area surrounding the cities of Asheboro, Salisbury, Pinehurst, Oxford, Henderson and Laurinburg. Based on stakeholder input, the ITS Strategic Deployment Plan process identified 73 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traveler information, truck safety, and commuter traffic were the most urgent issues. Short and long-term project plans were then determined from the needs.[12]

Piedmont Region Top 10 Ranking Identified Needs:

1. Congestion on commuter routes;
2. Congestion around large developments, major interchanges;
3. Information on conditions on alternate routes, managing traffic on local roads and streets;
4. Emissions reduction, managing peak hour traffic;
5. Real-time weather information, fog detection, and early warning of reduced visibility;
6. Regional traveler information on the Net, NCSmartLink website;
7. Information on park-and-ride, rideshare facilities;
8. Information on construction, weather, road conditions;
9. Areas prone to truck accidents; and
10. Interagency coordination and communications.

6.3.6 Triad Region

The Triad Region of North Carolina encompasses Guilford, Forsyth, Davidson and Alamance Counties, as well as part of Randolph County. Major cities in the area include Greensboro, Winston-Salem, High Point, and Burlington-Graham. This region has one of the more mature levels of existing, ITS deployment in the state, including multiple Transportation Management Centers (TMCs). Based on stakeholder input, the ITS Strategic Deployment Plan process

[12] Piedmont Regional ITS Deployment Plan

identified 36 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traffic control, public transportation management, archived data function, and pre-trip travel information were the most urgent issues. Short and long-term project plans were then determined from the needs.[13]

Triad Region Top 10 Ranking Identified Needs:

1. Lack of 24 hour, real-time alternate route information;
2. Additional DMS with current traveler information;
3. Provide real-time or near real-time video of traffic conditions;
4. Advance warning of work zones and better traffic control for work zones;
5. Improve Signal progression (including adding new signal coordination) to reduce travel time for commuters;
6. Develop additional maintenance measures for ITS technologies;
7. Arterial Congestion;
8. Lack of 24-hour, accurate, location-specific pre-trip and en-route traveler information (route guidance);
9. Lack of current and historical traffic data sharing between agencies for improved traffic management and planning; and
10. Centralized information clearinghouse with current traveler and road conditions information (weather, visibility-fog).

6.3.7 Triangle Region

The Triangle Region encompasses Wake, Durham, and Orange Counties as well as part of Johnston County. The major cities in this region are Raleigh, Cary, Garner, Apex, Wake Forest, Durham, Chapel Hill, Carrboro, and Clayton. Based on the stakeholder input, the ITS Strategic Deployment Plan process identified 65 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the

[13] Triad Regional ITS Deployment Plan

development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traffic control, public transportation management, and pre-trip travel information were the most urgent issues. Short- and long-term project plans were then determined from the needs.[14]

Triangle Region Top 10 Ranking Identified Needs:

1. Need to reduce freeway congestion;
2. Improve Signal progression (including adding new signal coordination) to reduce travel time for commuters;
3. Need improved traffic flow on freeway;
4. Too many single occupancy vehicles;
5. Need to allow transit vehicles on HOV lanes;
6. Need concentrated ITS Deployment on corridors, including traffic surveillance;
7. Need ability to monitor system flow in real-time;
8. Need access to traveler and transit information at work and public areas;
9. Need better integration of transit with other modes (school, commuter, park & ride); and
10. Increase incentives to use public transit.

6.3.8 Western Region

The Western Region includes the area surrounding the cities of Hickory, Boone, Forest City and Waynesville. Based on stakeholder input, the ITS Strategic Deployment Plan process identified 62 transportation needs. These needs were ranked by the regional transportation leaders to identify the most pressing issues, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that traveler information, truck safety, and tourist information were the most urgent issues. Short and long-term project plans were then determined from the needs.[15]

Western Region Top 10 Ranking Identified Needs:

[14] Triangle Regional ITS Deployment Plan
[15] Western Regional ITS Deployment Plan

1. Real-time weather information, fog detection, and early warning of reduced visibility;
2. Information on conditions on alternate routes;
3. Real-time, continuously, maintained traffic and roadway conditions database;
4. Closed Loop Signal Systems, other isolated signals (e.g., US 321 in Watauga and Avery Co., Bryson City, other locations);
5. Traffic Hot Spots (US 421/SR105, US 321 W. of Boone, US 421/SR105, Apts. On SR 105 Bypass, SR107/Bus. 23, SR107 to WCU, SR107 to Cashiers, etc.);
6. Information on construction, weather, road conditions;
7. Link local, regional websites to NCSmartLink;
8. Higher frequency for HAR, tourist information on HARs;
9. Balance between HARs and DMSs; and
10. Interagency coordination and communications.

6.3.9 Wilmington Region

The Wilmington Region includes parts of New Hanover, Brunswick, and Columbus Counties. Major cities in this region are Wilmington, Carolina Beach, Wrightsville Beach, Castle Hayne, Shallotte, Long Beach, and Whiteville. Based on the stakeholder input, the ITS Strategic Deployment Plan process identified 30 transportation needs. These needs were ranked and the most pressing issues were identified, which in turn, led to the development of a regional ITS deployment plan and architecture that addressed these needs. From this process, it was determined that hurricane evacuation, en-route driver information, pre-trip travel information, route guidance, and truck safety were the most urgent issues. Short and long-term project plans were then determined from the needs.[16]

Wilmington Region Top 10 Ranking Identified Needs:

1. Reversible lanes for evacuation routes;
2. Too few dynamic message signs with current traveler information;
3. Lack of traveler information;
4. Lack of traveler information through kiosks and television;

[16] Wilmington Regional ITS Deployment Plan

5. Lack of traveler information at rest areas and welcome centers;
6. Lack of automated commercial vehicle compliance enforcement, including non-point of entry locations, with weigh in motion and CCTV surveillance;
7. Slow moving trucks;
8. Need CVO transit vehicle operation status/safety monitoring devices;
9. Need to reduce number of crashes involving commercial vehicles; and
10. Need better commercial vehicles weight detection and enforcement.

6.4 I-95 Corridor

A formal plan has not been developed for this corridor. Through meetings with regional stakeholders, advanced transportation management systems and advanced public transportation management systems have been identified.

6.5 ITS Needs

As shown in **Tables 8 through 10** and **Figures 42 through 44**, the 25-year ITS needs total $1.6 billion. Due to the nature of ITS solutions, needs are only identified on Statewide and Regional NCMIN roadways. The following summarizes the ITS needs:

- Deployment plans (expansion) represent 34 percent ($540 million) of the future needs, with over 92 percent ($499 million) located on the Regional Tier.
- Replacing and upgrading systems (modernization) represent 34 percent ($551 million) of the future needs, with over 98 percent ($543 million) located on the Regional Tier.
- Operating costs (maintenance and preservation) represent 32 percent ($509 million) of the needs and 100 percent are located on the Statewide Tier.
- The Regional Tier accounts for 65 percent ($1.04 billion) of all ITS needs, with the remaining 35 percent ($558 million) on the Statewide Tier.
- The Subregional Tier does not have any ITS needs over the next 25 years.

Table 8 - 25-YEAR ITS Needs ($ millions)
TOTAL DOLLARS = $1.6 billion

Need Category	5-Year Increments					
	2005-2009	2010-2014	2015-2019	2020-2024	2025-2029	TOTAL
Capital						
Deployment Plans	$79	$61	$40	$104	$256	**$540**
Replacement/Upgrading of Systems	$74	$30	$120	$175	$152	**$551**
Subtotal Capital	$153	$91	$160	$279	$408	**$1,091**
Operating Costs	$102	$102	$102	$102	$101	**$509**
TOTAL	**$255**	**$193**	**$262**	**$381**	**$509**	**$1,600**

Figure 42– 25-Year ITS Needs
TOTAL DOLLARS = $1.6 billion

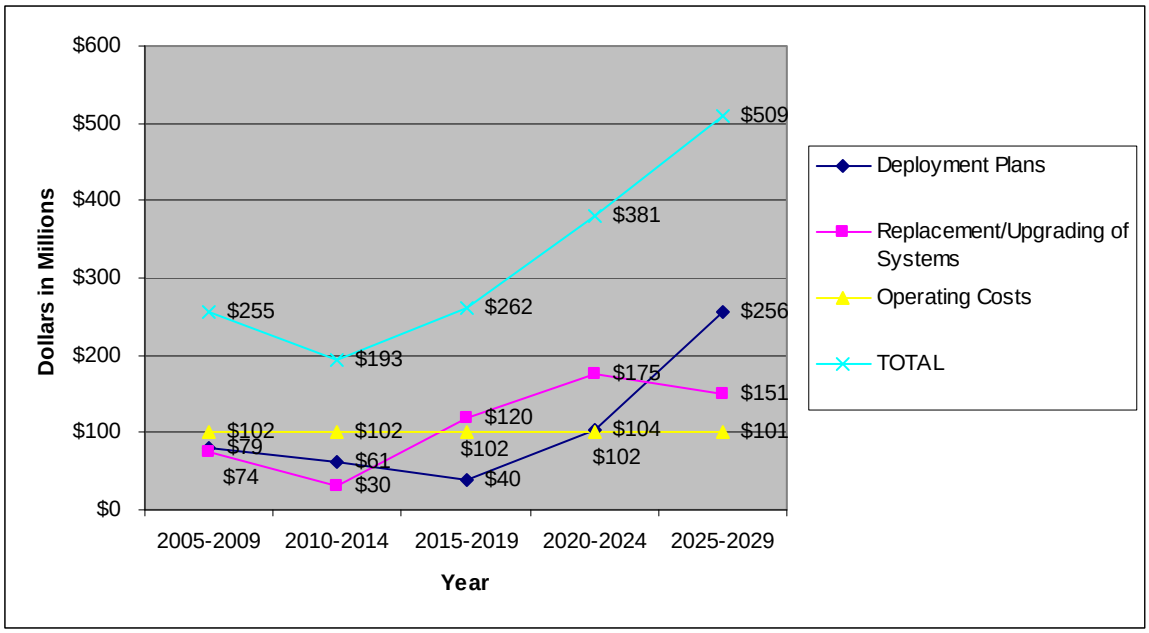


Table 9 – 25-YEAR ITS Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $1.6 billion

Need Category	NCMIN Tier			
	Statewide	Regional	Subregional	TOTAL
Capital				
Deployment Plans	$41	$499	$0	$540
Replacement/Upgrading of Systems	$8	$543	$0	$551
Subtotal Capital	**$49**	**$1,042**	**$0**	**$1,091**
Operating Costs (1) (2)	$509	$0	$0	$509
TOTAL	**$558**	**$1,042**	**$0**	**$1,600**

All O&M cost are included in the maintenance estimate from Asset Management for R-4049, which is included in the roadway needs.
R-4049 Operating Costs Total $509M and includes New Devices O&M cost, New IMAP personnel and equipment O&M cost, and New TMC Operations personnel, equipment, etc. O&M cost.

Table 10 – 25-YEAR ITS Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $1.6 billion

Need Category	Improvement Type			
	Preservation	Modernization	Expansion	TOTAL
Capital				
Deployment Plans	$0	$0	$540	$540
Replacement/Upgrading of Systems	$0	$551	$0	$551
Subtotal Capital	**$0**	**$551**	**$540**	**$1,091**
Operating Costs	$509	$0	$0	$509
TOTAL	**$509**	**$551**	**$540**	**$1,600**

Figure 43 – ITS Needs by Improvement Type
TOTAL DOLLARS = $1.6 billion

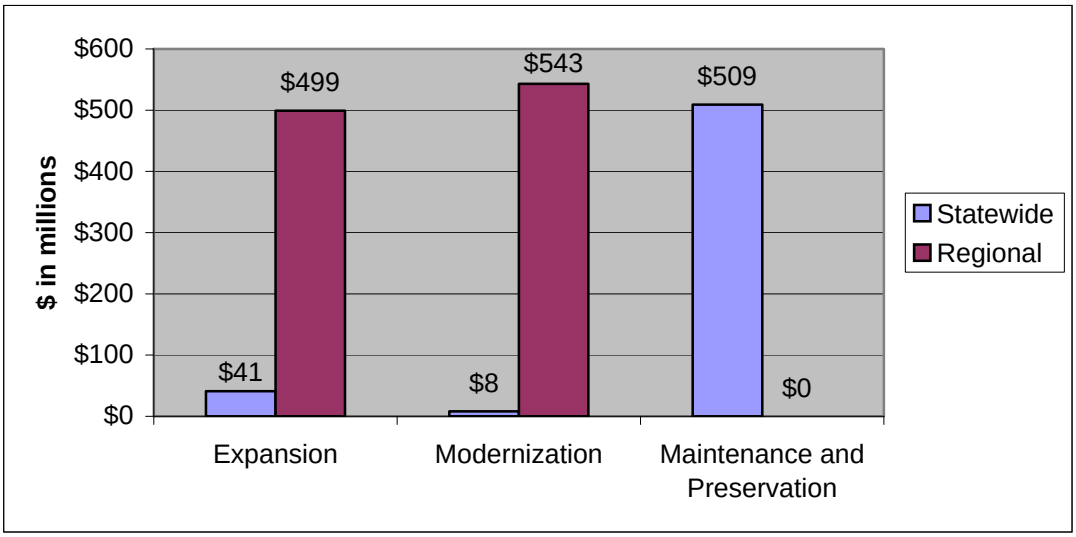
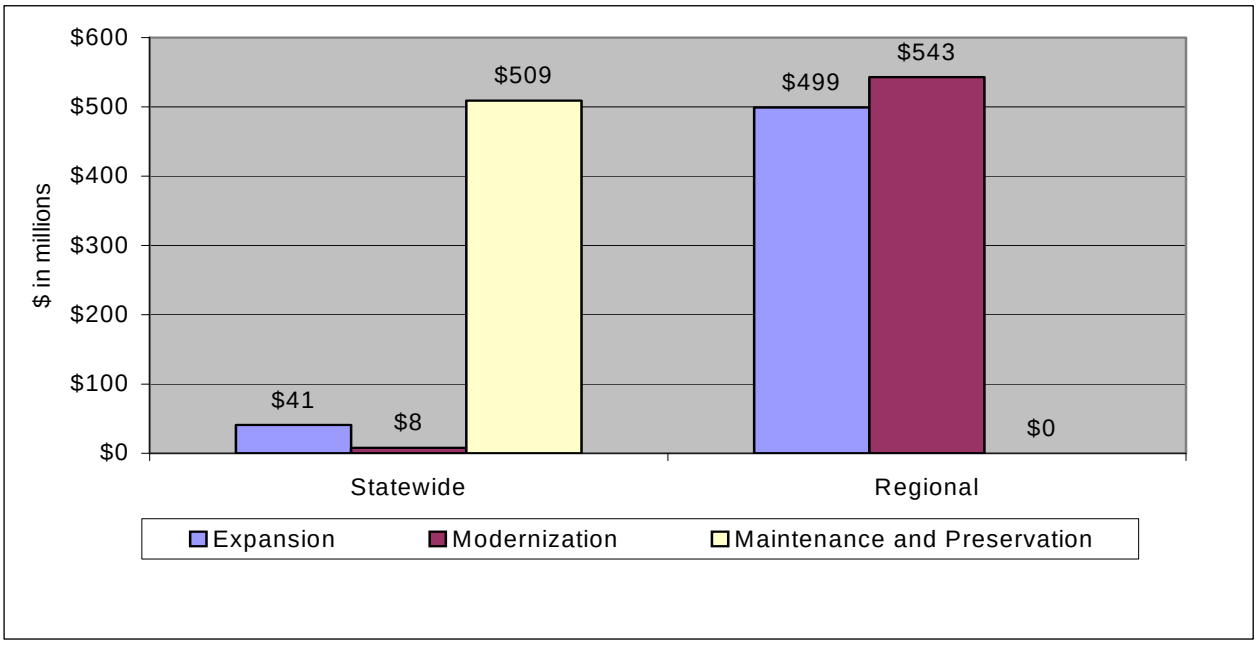


Figure 44 – Statewide and Regional Tier ITS Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $1.6 billion



Chapter 7. Non-Highway Needs

In this section, the following non-highway needs are addressed:

- Public Transportation;
- Passenger Rail;
- Freight Rail;
- Ferry;
- Bicycle and Pedestrian;
- Aviation; and
- Ports.

NCDOT staff provided future expansion, modernization and preservation needs for each of the non-highway modes, while port needs were determined through consultation with NCPA staff. Non-highway needs are categorized by NCMIN Tier and five-year funding period. Due to the lack of data, non-highway needs are not categorized by backlog and accruing and by NCDOT Division.

7.1 Public Transportation

More than 100 urban and rural public transportation systems serve millions of North Carolinians in every county. The NCDOT Public Transportation Division assists North Carolina public transit systems in providing mobility options through technical assistance and funding. The Department helps local transit agencies operate safer and more efficiently by combining limited federal and state resources with local communities and transportation providers. The actual buses, trains or vans are operated directly by local transit systems.

Many of the more than 52 million annual trips provided by public transportation systems in North Carolina serve citizens who have limited mobility caused by a variety of circumstances. Human service transportation systems work with local human service agencies to transport clients for medical, educational, employment, or recreational needs.

There are 83 community transit systems in North Carolina. They operate as either single-county systems or multi-county systems. Some community transportation systems that operate in urbanized areas receive state funding instead of federal grant funds.

The Department assists North Carolina's 17 urbanized areas and 3 of the state's small urban areas with the planning, funding and operating of public transportation services. Currently there are 22 urban, regional and small urban transit systems in these areas.

The N.C. Rural Vanpool Program began operations in FY 2001, and was originally designed to provide transportation for low-income individuals, as well as citizens who lack reliable transportation to and from work. USDOT Federal Transit Administration and state funds, along with passenger fares and employer contributions, support the service. There are currently 28 vanpool operators in North Carolina.

Public transportation services are an integral part of the overall North Carolina transportation network and serve several different statewide functions, which:

- Provide mobility to persons without access to an automobile and to those who do not drive;
- Provide important links between rural communities and metropolitan areas; and
- Reduce traffic congestion and pollution in urban and rural areas by providing an alternative to the single occupant vehicle.

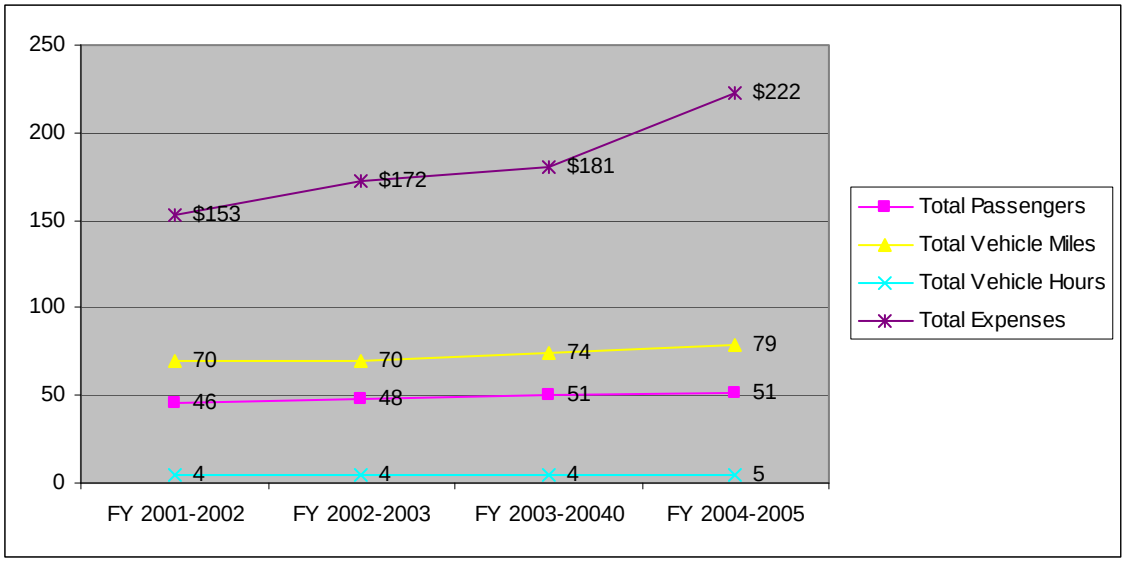
The majority of passenger travel in North Carolina takes place by automobile. However public transportation provides an important alternative for those individuals who cannot or choose not to drive or do not have access to an automobile. North Carolina is served by a variety of local, regional, and intercity public transportation services that connect people to employment centers, schools, shopping centers, government offices, medical complexes, and other destinations. In addition to these general services, North Carolina has various services for "transit-dependent" populations, such as the elderly, disabled, and economically disadvantaged.

During the mid to late 1990's, the trend for all urban and rural transit systems combined was a slight decrease. Starting in the late 1990's and continuing into the 2000's, ridership has been growing. Transit ridership statewide has increased 29 percent since 1999, due in part to the implementation of four urban transit systems in cities that were without public transportation (Cary, Concord, Goldsboro and Jacksonville), the creation of a regional transit system in the Piedmont Triad, significantly expanded service in a number of cities and fare free service initiated in Chapel Hill. The ridership growth period has coincided with the regular growth in the amount of state operating assistance for rural and urban area systems. The majority of the rural systems report that there would not have been service expansion without the additional operating assistance. The cities with existing transit systems that implemented significant service expansions include Chapel Hill, Charlotte, Durham, Greensboro and Wilmington. Many urban areas have increased the level of services, many of which now provide expanded weekend and night service. Ridership increases also have coincided with an increasing interest in transit among both elected officials and the business sector due to its role in maintaining mobility and mitigating air quality degradation, its role in supporting a positive economic development climate and its role in providing an alternative for growing numbers of elderly and disabled citizens.

Charlotte is the largest transit system in the state by far. In the late 1990's, Charlotte adopted a 2025 plan that called for significant increases in transit services as part of a comprehensive plan that included related highway and land use goals. In response to the plan, Mecklenburg County voters approved a half-percent sales tax to fund the transit service increases. Since that time, the Charlotte transit system has been expanding transit services significantly. Ridership has increased significantly also. In 2005, passengers totaled over 51 million, vehicle miles traveled totaled over 79 million, vehicle hours totaled nearly 5 million and total expenses totaled over $222 million.

Figure 45 on the next page, shows key public transportation statistics for the 105 public transportation systems in North Carolina between the years 2001 to 2005[17]. As illustrated, total passengers, total vehicle miles and total vehicle hours, grew proportionally at a rate of 12 or 13 percent. However, total expenses during the same time period grew by 45 percent.

Figure 45 – North Carolina Public Transportation Operating Statistics (units in millions)



There are currently six types of public transportation systems operating in North Carolina:

7.1.1 Human Service Transportation

Many of the more than 51 million annual trips provided by public transportation systems in North Carolina serve citizens who have limited mobility caused by a variety of circumstances. Human service transportation systems work with local human service agencies to transport clients for medical, educational, employment, or recreational needs. They do not serve the general public directly. There are currently four human service transportation systems in North Carolina.

[17] In FY 2002 – 2003, there were a total of 104 public transportation systems.

7.1.2 Community Transportation

Community transportation systems provide transportation for human service agency clients and members of the general public. Because these systems receive federal grant funds for rural transit, SAFETEA-LU requires them to offer services for general public riders, as well as human service agency clients. These systems integrate the two types of services using the same fleet of vehicles. There are 83 community transit systems in North Carolina. They operate as single-county systems or multi-county systems. Some community transportation systems that operate in urbanized area counties receive state funding instead of federal grant funds.

7.1.3 Urban Transit

Urban transit systems in North Carolina provide fixed-route and dial-a-ride services. Three urban transit systems also coordinate vanpool services. Fixed-route service typically uses buses and operates on a set schedule determined by the system's management with input from community leaders and citizens. Dial-a-ride service requires prospective riders to request service in advance by calling to schedule a specific pickup location, boarding time and destination within the system's service area. The Department assists North Carolina's 18 urbanized areas and three of the state's small urban areas with the planning, funding and operating of public transportation services. Currently there are 22 urban, regional and small urban transit systems in these areas.

In September 2003, the North Carolina Department of Administration entered into an agreement with Capital Area Transit (CAT) that would allow state employees to use transit services at no cost to the employee. Program marketing and enhancement opportunities were identified and implemented.

Chapel Hill Transit was the first system to offers free transit services. AppalCART, the transit system that serves the Town of Boone, including Appalachian State University, began offering fare free transit this fiscal year on its fixed route buses. Asheville Transit has implemented a 3-month fare free program as an incentive for residents to try transit versus driving alone.

7.1.4 Regional Transit

The Research Triangle Regional Public Transit Authority, which operates, as Triangle Transit Authority (TTA), and the Piedmont Authority for Regional Transportation (PART) currently are the only urban regional transit systems operating in North Carolina. TTA operates fixed-route bus service within the Research Triangle metropolitan region to connect Raleigh, Durham, Cary, Chapel Hill and nearby suburbs with Research Triangle Park and Raleigh-Durham International Airport. TTA also operates commuter shuttle services within Research Triangle Park and from Durham and Chapel Hill into Raleigh. TTA bus routes connect with the region's three urban transit systems operated by Raleigh, Durham and Chapel Hill. PART began operating fixed-route bus service within the Triad region in 2003, connecting transit systems in Greensboro, High Point and Winston-Salem. PART also provides service to the major medical centers in Durham and Chapel Hill.

7.1.5 Vanpool and Carpool Programs

The N.C. Rural Vanpool Program began operations in FY2001 and was originally designed to provide transportation for low-income individuals and citizens without reliable transportation to travel to work. USDOT Federal Transit Administration and state funds, along with passenger fares and employer contributions, support the service. There are currently 28 operations. Several employers subsidize the cost of the fare for carpool riders.

NCDOT funded the implementation of a web-based rideshare matching software program, ShareTheRideNC.org in FY2005. This program allows individuals to enter information online regarding their address, work location/hours, and to instantly receive a list of persons who might be potential matches for carpooling, vanpooling or biking. The software also links to transit services in the area and allows local TDM programs to generate reports. Transit systems have seen an increase in services through this unique marketing tool and the number of vanpools in operation by Charlotte Area Transit Systems, Triangle Transit Authority and the Piedmont Authority for Regional Transportation has increased substantially since fall 2005. Both Charlotte and TTA have waiting lists for vanpools.

7.1.6 Intercity Buses

Intercity bus service is one of a few remaining examples of privately owned and operated public transportation in North Carolina. The recent restructuring of service by Trailways and Greyhound over the past year has left many rural areas void of intercity bus service. These route provided connectivity to the state's urban areas. The Department provides federal and state operating assistance to the City of Asheville to operate two intercity routes (Black Mountain and Woodfin); Western Carolina Community Action, Inc. for a route that operates from Hendersonville to Asheville; and to the Piedmont Authority for Regional transportation for two routes that serve Greensboro to Boone and Mt. Airy to Winston-Salem. Four Travelers' Aid programs around the state also receive approximately $40,000 in federal funds each year to match 50 percent local funding to purchase intercity bus tickets for travelers in need.

Amtrak and state-owned intercity passenger trains and state-operated passenger ferries also compliment public transportation in many areas. These systems are discussed in other modal chapters.

7.1.7 Public Transportation Needs

As shown in the **Tables 11 through 13** and **Figures 46 through 49**, the 25-year public transportation needs total $17.8 billion. Based on improvement types, 75 percent ($13.3 billion) are maintenance and preservation needs and the remaining 25 percent ($4.5 billion) are expansion needs. Based on tiers, 72 percent ($12.8 billion) are located in the Subregional Tier and the remaining 28 percent ($5 billion) are in the Regional Tier. The Statewide Tier does not have any identified public transportation needs. Ninety percent ($4.5 billion) of the Regional Tier needs are for expansion while the remaining 10 percent ($500 million) are maintenance and preservation needs.

Existing public transportation service needs ($13.3 billion) will grow between 19 and 25 percent every five years and over the next 25 years; overall, existing public transportation needs will grow 134 percent total. Every five years, the new public transportation service needs ($4.5 billion) will fluctuate between $531 million (2015-2019) and $1.6 billion (2010-2014).

Table 11 – 25-Year Public Transportation Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $17.8 billion

Need Category	5-Year Increments					
	2005-2009	2010-2014	2015-2019	2020-2024	2025-2029	TOTAL
Existing Services						
Urban						
Capital	$336	$261	$324	$399	$496	$1,816
Operating	$871	$1,133	$1,423	$1,774	$2,215	$7,416
Total	$1,207	$1,394	$1,747	$2,173	$2,711	$9,232
Rural	$469	$607	$763	$962	$1,213	$4,014
Subtotal Existing	**$1,676**	**$2,001**	**$2,510**	**$3,135**	**$3,924**	**$13,246**
New Starts Services						
Capital	$782	$1,378	$63	$203	$18	$2,444
Operating	$30	$271	$468	$576	$733	$2,078
Subtotal New	$812	$1,649	$531	$779	$751	$4,522
TOTAL	**$2,488**	**$3,650**	**$3,041**	**$3,914**	**$4,675**	**$17,768**

Figure 46 – 25-Year Public Transportation Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $17.8 billion

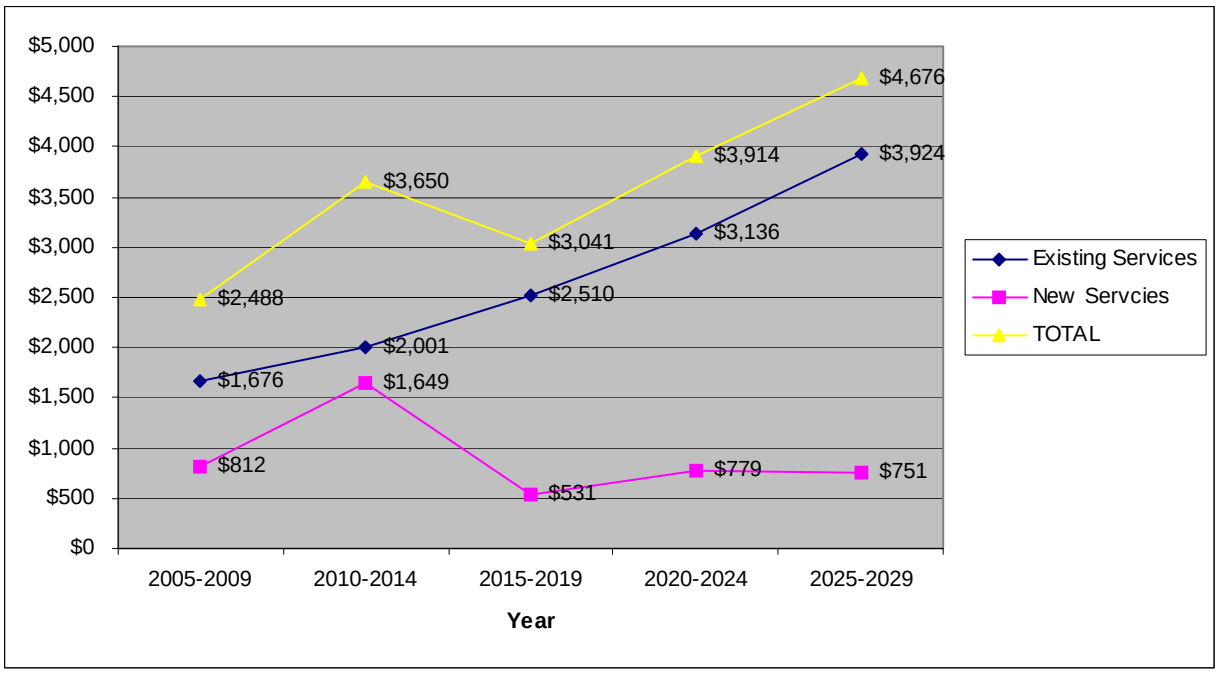


Table 12 – 25-Year Public Transportation Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $17.8 billion

Need Category	NCMIN Tier			
	Statewide	Regional	Subregional	TOTAL
Existing Services				
Urban				
Capital	$0	$0	$1,816	$,1816
Operating	$0	$0	$7,416	$7,416
Total	**$0**	**$0**	**$9,232**	**$9,232**
Rural	$0	$509	$3,506	$4,105
Subtotal Existing	**$0**	**$509**	**$12,738**	**$13,247**
New Starts				
Capital	$0	$2,445	$0	$2,445
Operating	$0	$2,077	$0	$2,077
Subtotal New	$0	**$4,522**	$0	**$4,522**
TOTAL	**$0**	**$5,031**	**$12,738**	**$17,769**

Figure 47 – 25-Year Public Transportation Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $17.8 billion

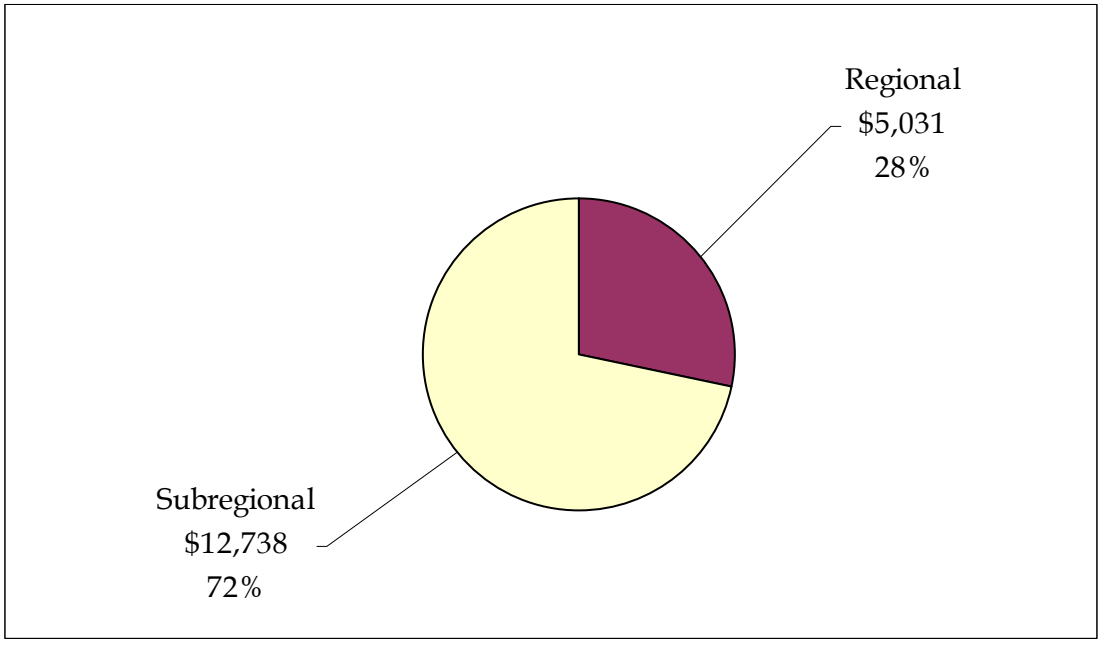


Figure 48 – Maintenance and Preservation Public Transportation Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $13.2 billion

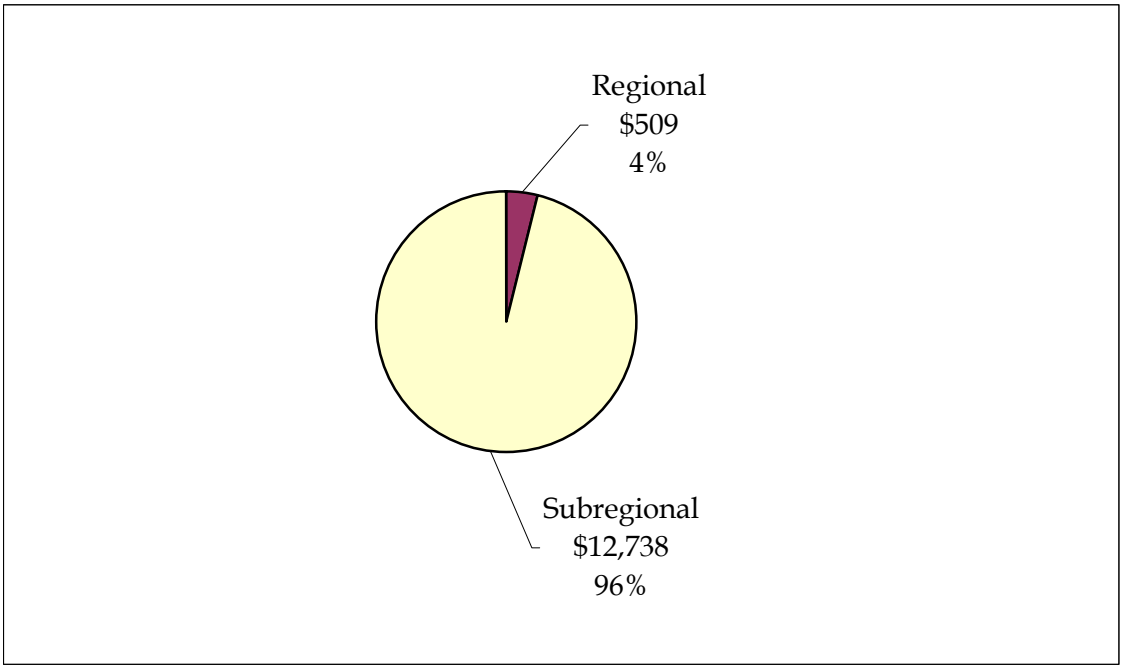
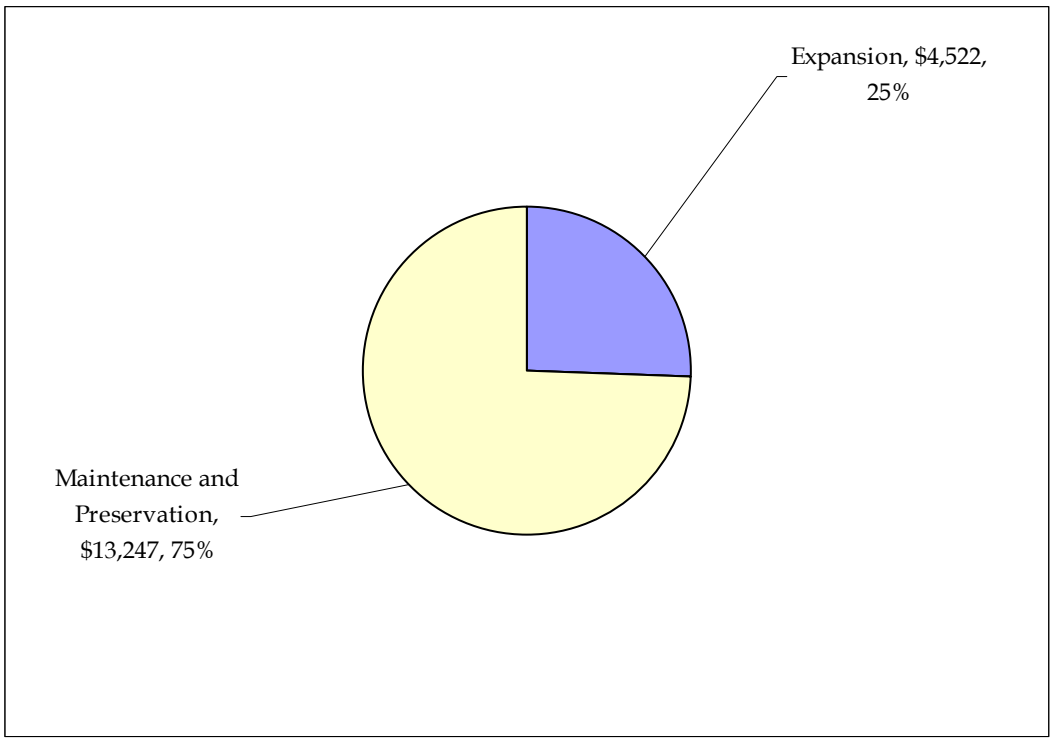


Table 13 – Public Transportation Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $17.8 billion

Need Category	Improvement Type			
	Preservation	Modernization	Expansion	TOTAL
Existing Services				
Urban				
Capital	$1,816	$0	$0	$1,816
Operating	$7,416	$0	$0	$7,416
Total	$9,232	$0	$0	$9,232
Rural	$4,015	$0	$0	$4,015
Subtotal Existing	**13,247**	**$0**	**$0**	**13,247**
New Starts Services				
Capital	$0	$0	$2,445	$2,445
Operating	$0	$0	$2,077	$2,077
Subtotal New	**$0**	**$0**	**$4,522**	**$4,522**
TOTAL	**13,247**	**$0**	**$4,522**	**17,769**

Figure 49 – Transportation Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $17.8 billion



7.2 Passenger Rail

NCDOT has long recognized the need for alternative transportation as part of a comprehensive transportation system. The state's rail policy has emphasized enhancing and growing passenger rail services, preserving existing rail lines for future use, improving infrastructure to support and enhance passenger and freight service, and extending passenger rail service in the state[18]. This policy supports the Department's Commitment "to development and improvement of its infrastructure through maximization of existing resources, and through continual process improvements." Since rail transport is more energy efficient than highway, the policy also supports the Commitment to "reducing congestion while protecting and improving the state's natural resources."[19]

[18] *Southeastern North Carolina Passenger Rail Study*
[19] *North Carolina Department of Transportation Mission and Commitment http://www.ncdot.org/about/ncdot/mission.html*

7.2.1 Existing Passenger Rail Service System

North Carolina's passenger rail facilities serve a statewide transportation function. In FY 2005, the six intercity train services (operated by Amtrak) carried 520,698 passengers. The state subsidizes two intercity routes:

- *Carolinian* – Service between Charlotte and Rocky Mount, continuing north to New York City; and
- *Piedmont* – Service between Raleigh and Charlotte with stops in Cary, Durham, Burlington, Greensboro, High Point, Salisbury, and Kannapolis.

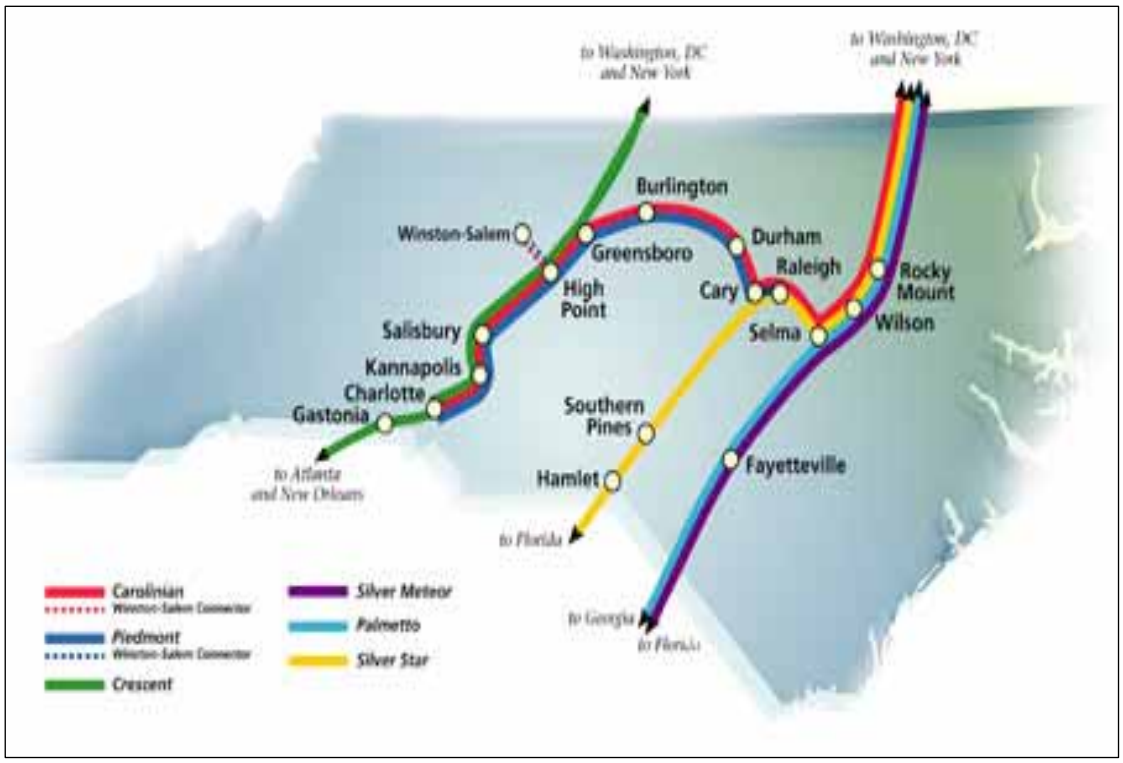
Amtrak also operates four long-distance trains in the state:

- *Crescent* – Service between New York and New Orleans with stops in Greensboro, High Point, Charlotte, and Gastonia;
- *Silver Star* – Service between New York and Miami with stops in Rocky Mount, Raleigh, Cary, Southern Pines, and Hamlet;
- *Silver Meteor* – Service between New York and Miami with stops in Rocky Mount and Fayetteville; and
- *Palmetto* – Service between New York and Miami with stops in Rocky Mount, Wilson, Selma and Fayetteville.

Figure 50 shows the Amtrak routes through North Carolina and **Figure 51** compares the 2004 and 2005 total station usage for each of the 16 North Carolina cities serviced by Amtrak. *Overall, ridership increased statewide by 7 percent between 2004 and 2005.* Southern Pines, Hamlet, Rocky Mount and High Point experienced large ridership increases at 24, 39, 49, and 68 percent respectively. *Raleigh continues to have the highest ridership among the 16 cities served by Amtrak with its 2005 ridership totaling over 115,000 passengers.*

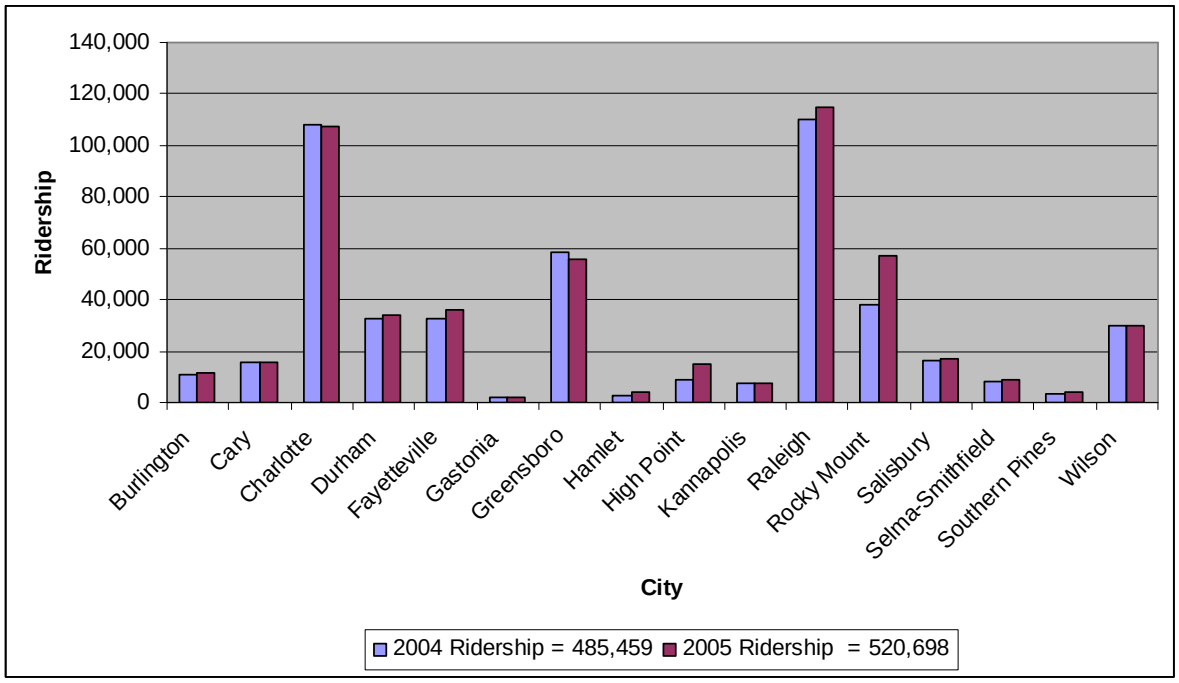
October 2005 through June 2006 ridership and revenue totals have continued to increase as gas prices climb. Ridership for the Carolinian is up 19 percent and the Piedmont totals are up 25 percent. Enhanced revenue management has increased fare-box recovery by about one-third over the period.

Figure 50 – North Carolina Amtrak Routes



Source: NCDOT Rail Division

Figure 51 – Amtrak 2004 and 2005 Ridership by City



Source: Amtrak

Amtrak operates the *Piedmont* between Charlotte and Raleigh under contract with the state of North Carolina. The state also contracts with Amtrak to operate the *Carolinian*. In late 2004, the *Carolinian* was re-equipped with newly renovated Capstone train sets. In addition, between 30 and 45 minutes was cut from the total trip length due to the elimination of mail and express service and track improvements over the state-owned North Carolina Railroad between Selma and Charlotte.

7.2.2 Station Improvements Program

The State of North Carolina, in partnership with Amtrak, has taken the initiative to rebuild many of its historic train stations. The station improvements program is funded with a combination of federal, state, and local funds. The station improvement program has spurred significant economic development and revitalization of areas around the stations, as well as preserving an important part of North Carolina's history. The average return on investment for station projects was evaluated in a study in June of 2003. Of the seven stations analyzed, the study determined that the average return on station investments was $1.47 for each dollar invested.

Below are some examples of station improvement and enhancements in the past five years:

- Cary: A new platform, funded by the state and town, allowed the *Silver Star* to stop in Cary starting in April 2006. This was an addition to the existing *Carolinian* and *Piedmont* service available in Cary.
- Greensboro: The 1927 Southern Railway station in downtown Greensboro, closed since 1979, has reopened for passenger services as the J. Douglas Galyon Depot, serving passenger rail and local and intercity bus passengers. The project was completed in October 2005, and now serves six Amtrak intercity trains daily.
- Hamlet: The former Seaboard station, built in 1900, was rededicated on October 29, 2004, completing an extensive relocation and restoration project.
- High Point: The High Point passenger station was restored by the City of High Point and reopened for passenger service on December 9, 2003. Southern Railway originally constructed the station in 1907.
- Kannapolis: A new, downtown, station opened December 17, 2004.

- Southern Pines: This station has been renovated to its 1948 appearance. The waiting room reopened on December 17, 2004, with the completed project dedicated on February 22, 2005.

7.2.3 Future Station Improvements

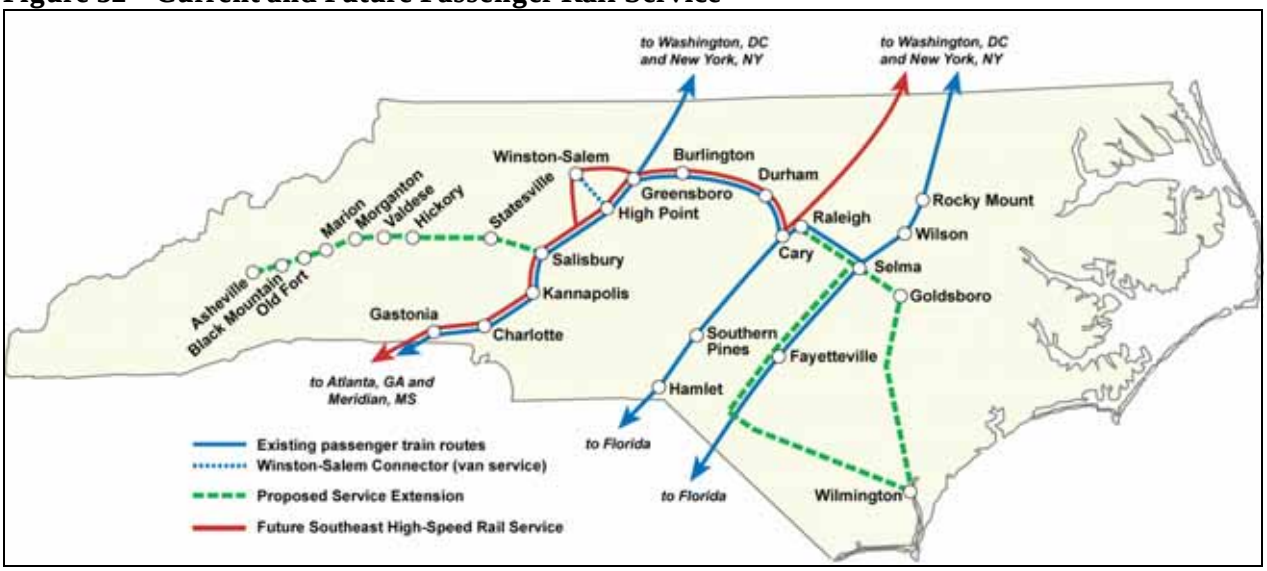
New multi-modal stations are planned for the Raleigh to Charlotte route at Raleigh, Durham, and Charlotte. All the stations are planned to house local, regional, and intercity bus services, taxis, and intercity and commuter rail services. The Charlotte Multi-modal station will be located downtown, will provide service for all the modes mentioned above, and be the main station for the Lynx light rail commuter service. The station site has attracted significant redevelopment interest in the area even before groundbreaking. In addition to the station, significant track work will be required to improve the efficiency and safety of rail lines adjacent to the station that will be carrying freight, intercity passenger and commuter rail services.

7.2.4 Future Rail Passenger Service[20]

As North Carolina's population and traffic grow, development of rail transportation becomes increasingly important as an alternative to auto and air transport for both freight and passengers. The Department works with local communities and host railroads to plan for future services that will meet these growing transportation needs. **Figure 52** shows the Department's future plans for passenger rail service throughout the state, as well as current service routes.

[20] http://www.bytrain.org/future/

Figure 52 – Current and Future Passenger Rail Service



Source: NCDOT Rail Division

7.2.5 High Speed Rail[21]

In 1992, the U.S. Department of Transportation designated five national high-speed rail corridors across the country. The original Southeast High Speed Rail Corridor (SEHSR) – extending from Washington, D.C. through Richmond and Raleigh to Charlotte – has been identified as the most economically viable high-speed rail corridor in the country. The USDOT has since extended the corridor to Atlanta and Macon, GA, Columbia, S.C. and Jacksonville, FL. In October 2002, the North Carolina and Virginia transportation departments completed a Tier I Environmental Impact Statement (EIS) for the Washington, DC to Charlotte, NC portion of this corridor. This study took an extensive look at potential impacts along nine possible routes and identified the preferred route. The second study phase - Tier II - includes specific analysis along the preferred route and is underway for the portion of the preferred corridor between Richmond, VA and Raleigh, NC.

The Georgia, South Carolina and North Carolina Departments of Transportation are continuing to evaluate the overall suitability and costs of developing high-speed passenger train service

between Charlotte, NC and Macon, GA. A USDOT-Volpe analysis of the feasibility for high speed is in progress.

7.2.6 Expanding Service to Southeastern North Carolina

In May 2001, the Department released results of a feasibility study that indicated interest in passenger rail service to/from Wilmington. In July 2005, the Department released the results of more detailed studies that identified costs and some needed improvements for re-establishing service to southeastern North Carolina. The study demonstrated that re-establishing passenger rail service to the southeastern part of the state was feasible and recommended implementing passenger rail service from Raleigh to Wilmington via Fayetteville and Goldsboro in phases as funding becomes available. Other recommendations included investigating the possibility of commuter service between Selma and Raleigh, and working with the North Carolina State Port Authority to define benefits and investments needed to reestablish freight service between Goldsboro and Wilmington.

7.2.7 Expanding Service to Western North Carolina

In March 2001, the Department adopted a phased plan to extend passenger rail service to Asheville and western North Carolina via Salisbury. The plan includes renovating or building train stations that incorporate other uses. Current budgetary constraints have prompted NCDOT to delay the return of passenger rail service to the mountains. In the meantime, the Department will continue to work with communities on station renovations and rail safety improvements.

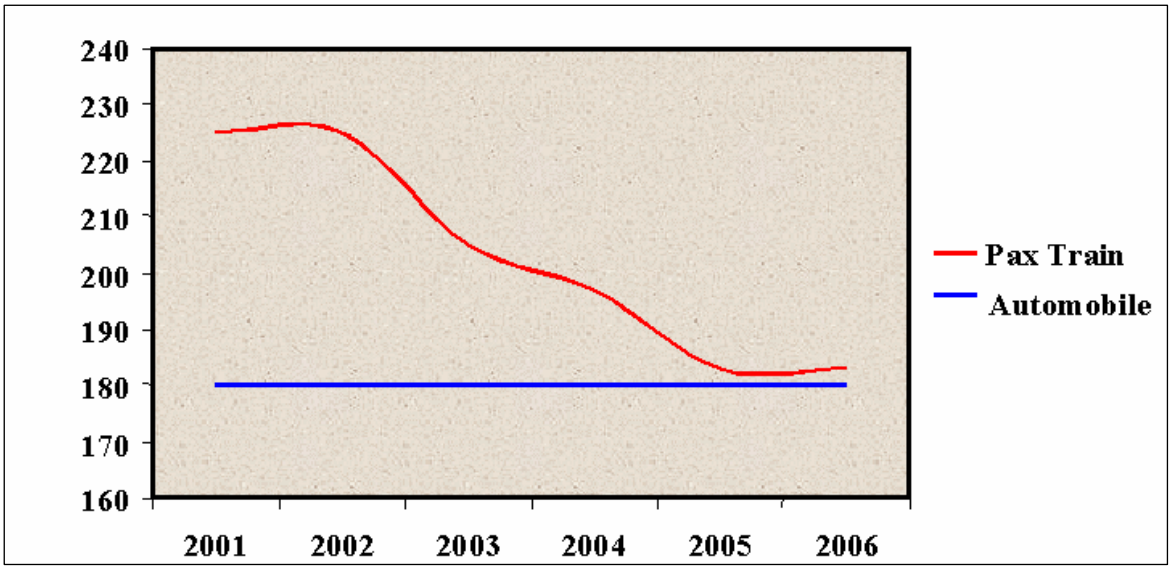
7.2.7.1 Improving Travel Time

To reduce travel time for both freight and passenger trains along the existing passenger rail corridor, the Department has partnered with the North Carolina Railroad and Norfolk Southern to improve the busy Raleigh to Charlotte rail corridor. Construction began in 2001 to modify portions of track and install a new train control system. Projects consisting of lengthening and adding passing sidings, straightening and banking curves, closing crossings, building bridges at crossings, adding double track, and installing train control and crossing signals have reduced

[21] http://www.bytrain.org/highspeed/

the passenger train travel time between Raleigh and Charlotte by 30 minutes, making it car competitive, as shown in **Figure 53**.

Figure 53 – Raleigh-Charlotte Travel Time in Minutes



7.2.7.2 Commuter Services

At the local level, the Department is working with area transit authorities to plan commuter rail services for the greater Charlotte, Triangle and Triad regions.

7.2.8 Passenger Rail Needs

As shown in the **tables 14 through 16** and **figures 54 through 58**, the 25-year passenger rail needs total $4.1 billion. Existing corridor needs represent 81 percent of the future needs and 100 percent are located on the Statewide Tier. New corridor needs represent 19 percent of the future needs and 100 percent are located on the Regional Tier. The Subregional Tier does not have any passenger rail needs.

Based on improvement type, 67 percent ($2.7 billion) are expansion needs, 23 percent ($936 million) are modernization needs and the remaining 10 percent ($389 million) are maintenance and preservation needs. Based on tiers, 59 percent ($1.9 billion) of the Statewide Tier needs are for expansion, 29 percent ($936 million) for modernization and 12 percent ($389 million) for

maintenance and preservation. One-hundred percent ($778 million) of the Regional Tier needs are identified as expansion. One-hundred percent of the modernization ($936 million) and Maintenance and Preservation ($389 million) needs are located on the Statewide Tier, while 72 percent ($1.9 billion) of expansion needs are located on the Statewide Tier, while the remaining 28 percent ($778 million) are located on the Regional Tier.

Table 14 – 25-Year Passenger Rail Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $4.1 billion

	5-Year Increments					
Need Category	**2005-2009**	**2010-2014**	**2015-2019**	**2020-2024**	**2025-2029**	**TOTAL**
Existing Corridor						
Capital	$387	$1,070	$565	$397	$531	$2,950
Operating	$54	$64	$70	$70	$70	$328
Subtotal Existing	**$441**	**$1,134**	**$635**	**$467**	**$601**	**$3,278**
New Corridors						
Western NC						
Capital	$2	$85	$162	$0	$0	$249
Operating	$0	$0	$8	$20	$20	$48
Total	**$2**	**$85**	**$170**	**$20**	**$20**	**$297**
Southeastern NC						
Capital	$5	$0	$380	$0	$0	$385
Operating	$0	$0	$16	$40	$40	$96
Total	**$5**	**$0**	**$396**	**$40**	**$40**	**$481**
Other Areas in NC	$0	$0	$0	$0	$0	$0
Capital	$0	$0	$0	$0	$0	$0
Operating	$0	$0	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Subtotal New	**$7**	**$85**	**$566**	**$60**	**$60**	**$778**
TOTAL	**$448**	**$1,219**	**$1,201**	**$527**	**$661**	**$4,056**

Figure 54 – 25-Year Passenger Rail Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $4.1 billion

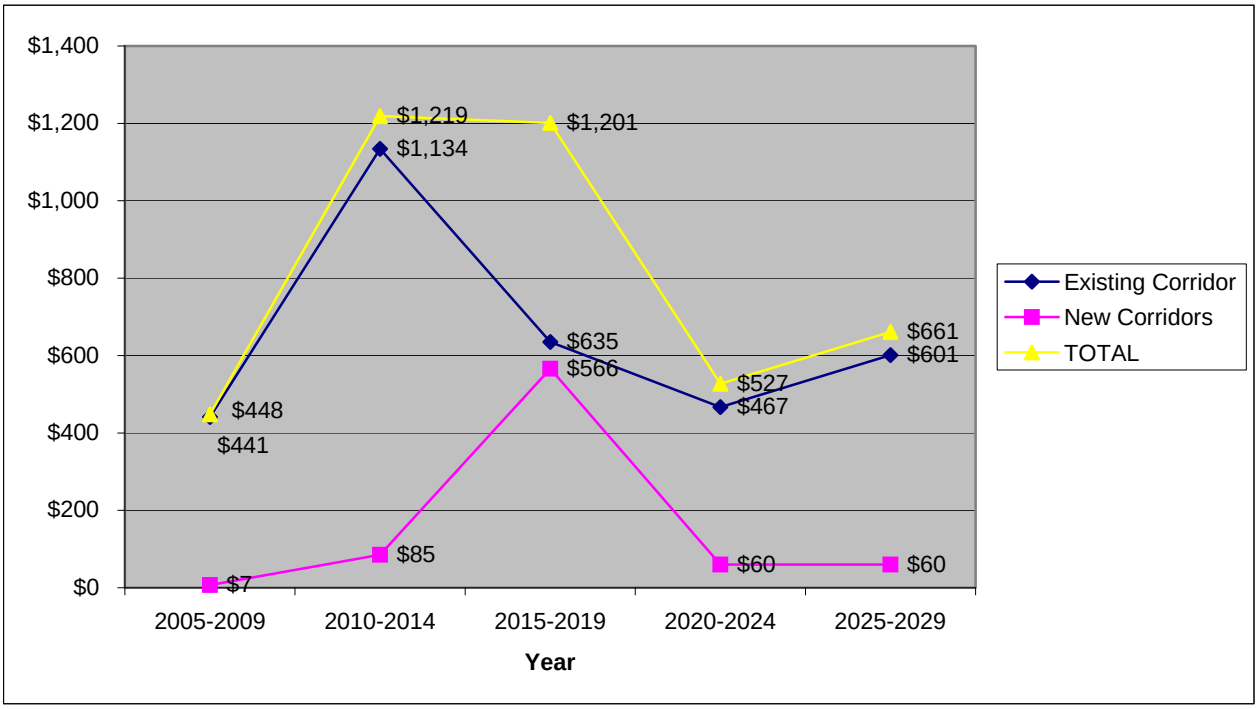


Table 15 – 25-Year Passenger Rail Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $4.1 billion

	NCMIN Tier			
Need Category	**Statewide**	**Regional**	**Subregional**	**TOTAL**
Existing Corridor				
Capital	$2,950	$0	$0	$2,950
Operating	$328	$0	$0	$328
Subtotal Existing	**$3,278**	**$0**	**$0**	**$3,278**
New Corridors				
Western NC				
Capital	$0	$249	$0	$249
Operating	$0	$48	$0	$48
Total	**$0**	**$297**	**$0**	**$297**
Southeastern NC				
Capital	$0	$385	$0	$385
Operating	$0	$96	$0	$96
Total	**$0**	**$481**	**$0**	**$481**
Other Areas in NC				
Capital	$0	$0	$0	$0
Operating	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**
Subtotal New	**$0**	**$778**	**$0**	**$778**
TOTAL	**$3,278**	**$778**	**$0**	**$4,056**

Figure 55 – 25-Year Passenger Rail Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $4.1 billion

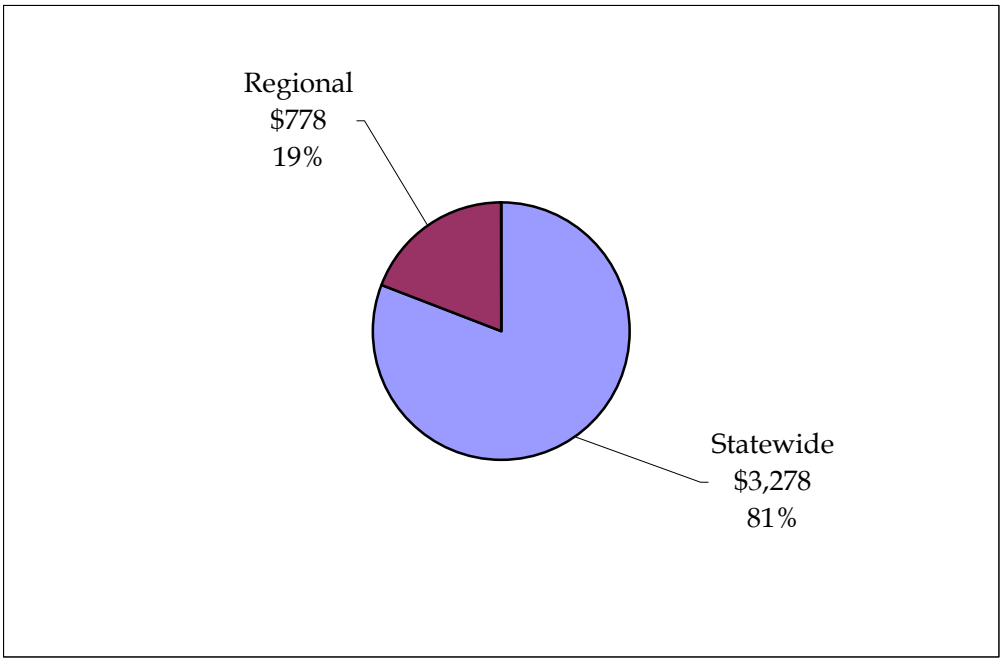


Figure 56 –Passenger Rail Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $4.1 billion

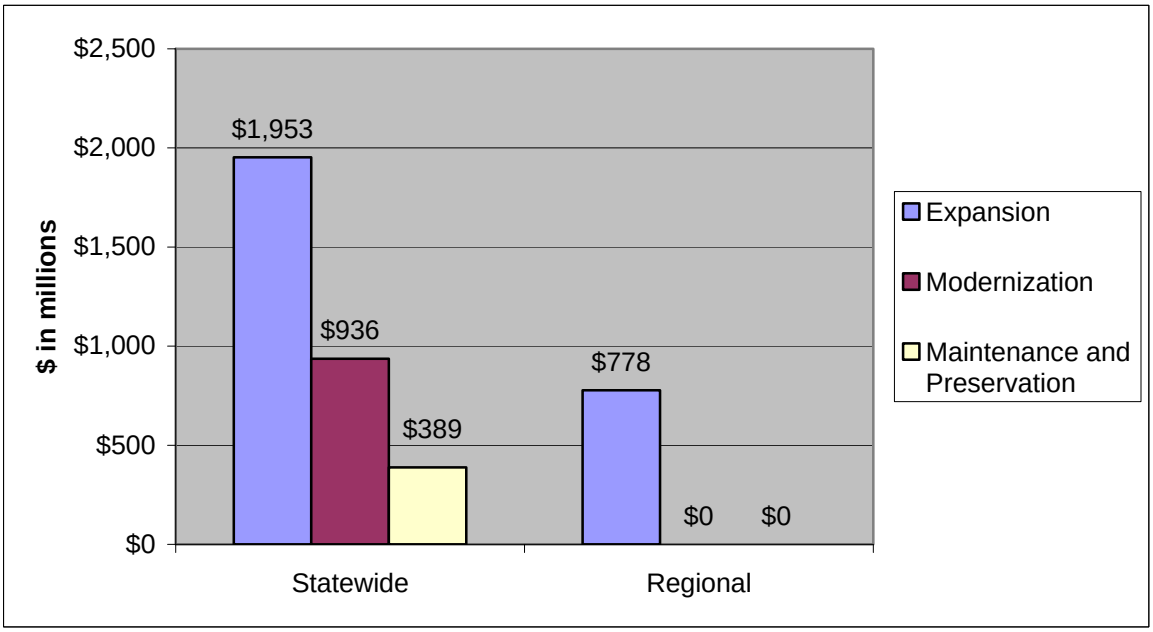


Table 16 – 25-Year Passenger Rail Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $4.1 billion

Need Category	Improvement Type			
	Preservation	Modernization	Expansion	TOTAL
Existing Corridor				
Capital	$139	$936	$1,875	$2,950
Operating	$250		$78	$328
Subtotal Existing	**$389**	**$936**	**$1,953**	**$3,278**
New Corridors				
Western NC				
Capital	$0	$0	$249	$249
Operating	$0	$0	$48	$48
Total	**$0**	**$0**	**$297**	**$297**
Southeastern NC				
Capital	$0	$0	$385	$385
Operating	$0	$0	$96	$96
Total	**$0**	**$0**	**$481**	**$481**
Other Areas in NC				
Capital	$0	$0	$0	$0
Operating	$0	$0	$0	$0
Total	$0	$0	$0	$0
Subtotal New	**$0**	**$0**	**$778**	**$778**
TOTAL	**$389**	**$936**	**$2,731**	**$4,056**

Figure 57 –Passenger Rail Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $4.1 billion

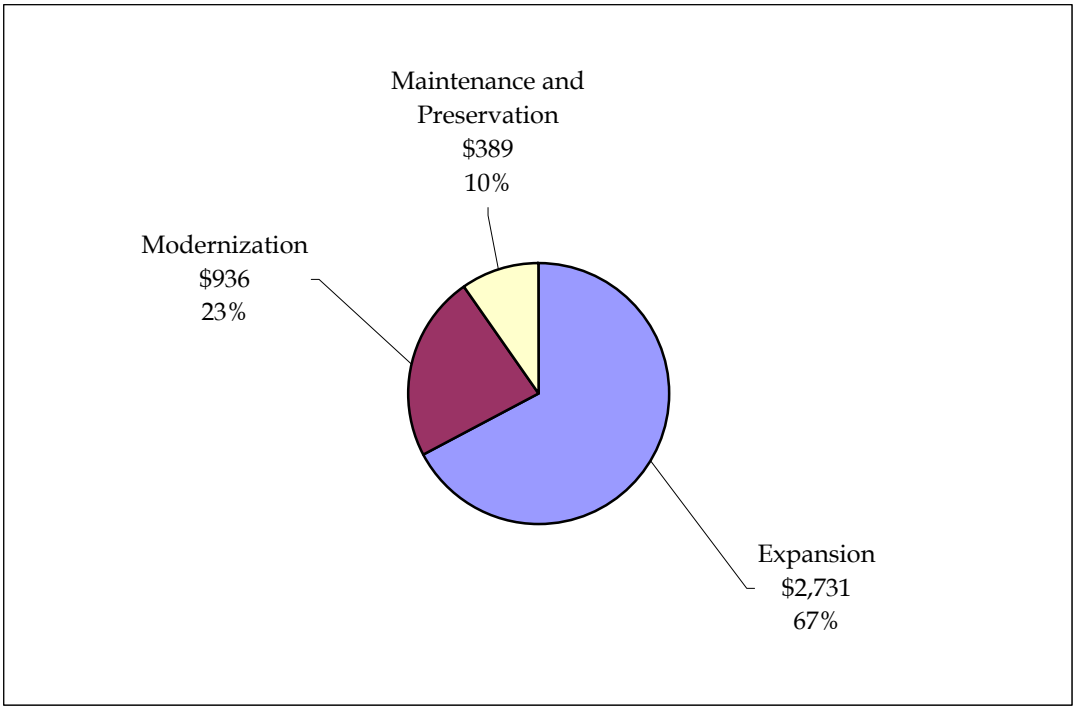
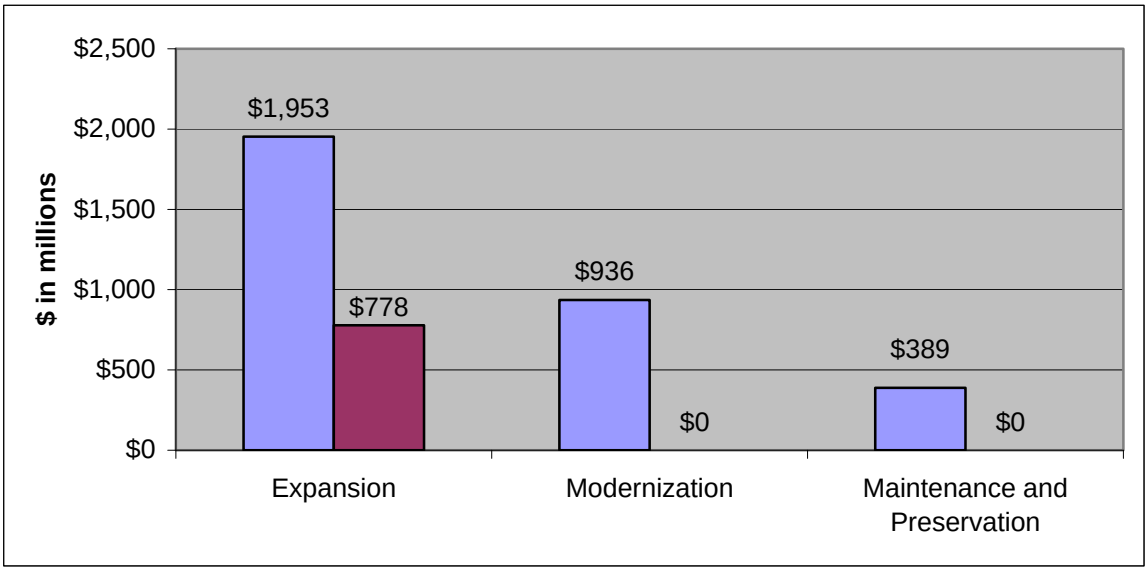


Figure 58 –Passenger Rail Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $2.7 billion



7.3 Rail Freight

Rail freight is an important component of the North Carolina transportation system and plays a vital role in economic development throughout the state. Rail provides three basic types of freight service: bulk unit train, mixed carload, and intermodal (container, trailer, and automobile). Bulk unit trains move very high volumes of a single commodity such as coal, grain, minerals, and waste. Mixed carload trains move a diverse range of commodities, including chemicals, food products, forest products, metals, auto parts, waste, and scrap. Rail mixed carload equipment includes liquid-bulk tank cars, open flatcars, hopper cars, and traditional boxcars. Intermodal trains move truck trailers and containerized goods containing finished consumer goods, refrigerated foods, parts and tools for manufacturing, raw materials, post-consumer scrap – almost any product that can be packed into a container or truck trailer. More than any other rail service, intermodal depends on partnerships with trucking companies, seaports, and others in the transportation logistics chain. Each container, trailer, or set of

automobiles is an individual shipment, and there are a vast number of origins and destinations to be served[22].

The majority of the state's freight rail system is owned, operated, and maintained by the private sector. The following shows how North Carolina's rail freight system ranks among other states[23]:

- 12th in total number of railroad companies (23);
- 19th in total rail miles (3,250);
- 32nd in originated rail tons (15,549,847);
- 13th in terminated rail tons (61,158,149);
- 28th in originated rail carloads (281,064);
- 16th in terminated rail carloads (739,124);
- 28th in rail tons carried (117,172,695);
- 35th in rail carloads (1,685,859);
- 30th in freight rail employment (2,251); and
- 30th in freight rail wages ($135,864,000).

North Carolina's existing railroad network consists of 3,250[24] main line miles of track with the majority of the track owned and operated by Class I carriers. As shown in **Table 17**, CSX Corporation has track rights for 1,137 miles, while Norfolk Southern Corp. has track rights for 1,439 miles in North Carolina. Together, this represents 77 percent of the statewide rail system. There are no regional railroads in North Carolina, but there are thirteen short-line railroads and eight switching and terminal railroads, which represent 23 percent of the total North Carolina rail system.

[22] *Transportation – Investment in America – Freight-Rail Bottom Line Report*
[23] Association of American Railroads
[24] Miles operated based excluding trackage rights. Miles operated including trackage rights totals 3,338.

Table 17 – Miles of Railroad by Carrier
(Includes Trackage Rights)

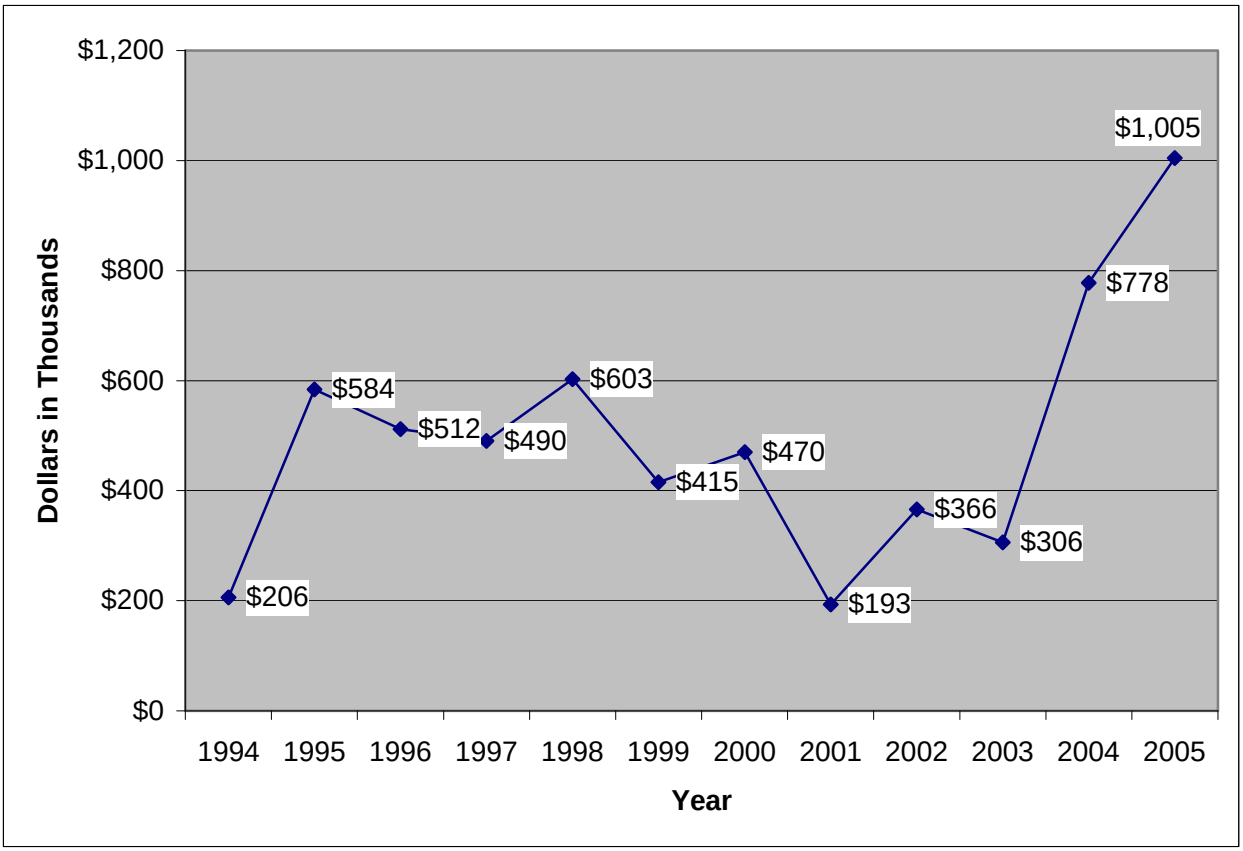
Carrier	Miles	Percent
Class I		
CSX Transportation	1,137	34.06%
Norfolk Southern Corp.	1,439	43.11%
Subtotal	*2,576*	*77.17%*
Regional		
None		
Subtotal	*0*	*0.00%*
Short-Line		
Aberdeen & Rockfish Railroad	46	1.38%
Aberdeen Carolina and Western Rwy. Co.	140	4.19%
Alexander Railroad	19	0.57%
Atlantic & Western Railway	10	0.30%
Caldwell County Railroad Co.	22	0.66%
Carolina Coastal Railway Inc.	17	0.51%
Carolina Southern Railroad Co.	37	1.11%
Chesapeake & Albemarle Railroad Co.	44	1.32%
Great Smoky Mountains Railroad Inc.	53	1.59%
Laurinburg & Southern Railroad	35	1.05%
Nash County Railroad Corp.	20	0.60%
Thermal Belt Railway	7	0.21%
Yadkin Valley Railroad Co.	93	2.79%
Subtotal	*543*	*16.27%*
Switching and Terminal		
Cape Fear Railways	16	0.48%
Carolina Rail Services LLC	3	0.09%
Clinton Terminal Railroad Co.	4	0.12%
High Point, Thomasville & Denton RR	34	1.02%
North Carolina & Virginia Railroad Co.	48	1.44%
Virginia Southern Railroad	20	0.60%
Wilmington Terminal Railroad, LP	7	0.21%
Winston-Salem Southbound Railway	87	2.61%
Subtotal	*219*	*6.56%*
Total	**3,338**	**100.00%**

Source: Association of American Railroads (2004)
Notes:

- Class I Railroads are classified as having at least $289.4 million of operating revenues in 2004.
- Regional Railroads are classified as operating 350 or more miles of road and/or with revenues of at least $40 million.
- Short-line railroads are primarily engaged in line-haul service.
- Switching and Terminal Railroads are engaged primarily in switching and/or terminal services for other railroads.

NCDOT's role in freight is generally limited to the Rail Industrial Access Program (RIAP) and the Short Line Infrastructure Assistance Program (SIAP); however the improvements made for passenger rail also provide benefits to freight movements in the state. The RIAP funds rail investments required by new or expanded business to encourage economic development. Because rail access is vital to many prospective industries, the Department began the RIAP to help ensure that companies have the railroad tracks needed to transport freight and materials. Since 1994, the RAIP program has invested more than $7 million of state funds into constructing or refurbishing tracks required by a new or expanded industry to encourage economic development. **Figure 59** shows the RIAP investments for the years 1994 to 2005.

Figure 59 – RIAP Grants Awarded by Year (1994 to 2005)



Source: NCDOT Rail Division

SIAP is a new program that assists short-line railroads with needed infrastructure improvements. Short-lines are small railroads, which were largely formed from branch lines of

Class 1 railroads that did not meet investment objectives. These railroads serve small towns and communities, and generally have deferred maintenance needs that existed when they were formed. This program provides grants on a 50 percent match basis that allows these railroads to upgrade their tracks to provide safe and reliable service to industries in more rural areas. The program awarded $1.5 million in grants in 2006.

The abandonment of rail lines in North Carolina continues to be a primary challenge for the freight rail industry, rural communities, and shippers. Over 700 miles of track have been abandoned in North Carolina since 1971. While the rate of abandonment has slowed considerably over the last 15 years, the Rail Division is concerned about potential rail abandonment and monitors freight traffic density and the status of light density lines (defined as those that carry less than three million gross ton miles per mile per year) that may be abandoned[25]. According to the Association of American Railroads, North Carolina has lost approximately 23 miles of track since 2000.

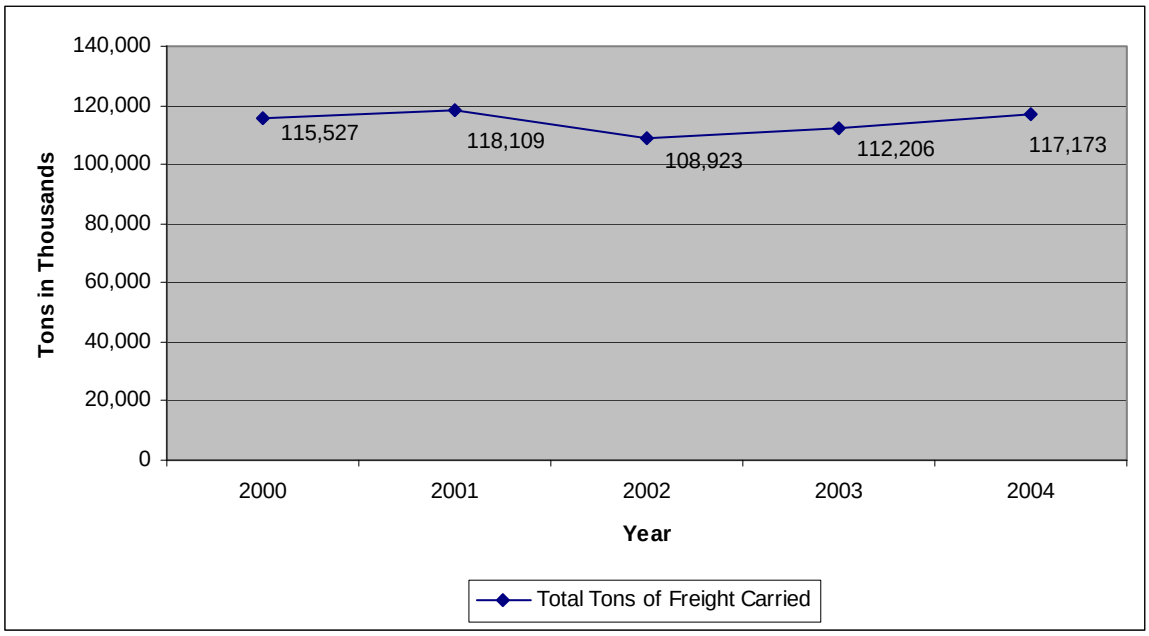
In 2004, 117 million tons originated in, terminated in, or passed through North Carolina, representing an increase of approximately 1.5 percent since 2000 **(Figure 60)**. On a parallel basis, the number of carloads increased by nearly 5 percent during the same five-year period (**Figure 61**).

Maintaining and upgrading track throughout North Carolina is vital because the tracks are critical to the long-term success of freight movement throughout the state. Over the last 5 years (2001 to 2005), the Department invested over $30 million to improve the busy Raleigh to Charlotte North Carolina Railroad corridor operated by Norfolk Southern. Improvements included adding passing sidings between Raleigh and Greensboro, adding double track segments between Greensboro and Charlotte, installing a train traffic control system, super-elevating some portions of track and straightening curves. These projects were designed to

[25] *North Carolina Rail Plan 2001*

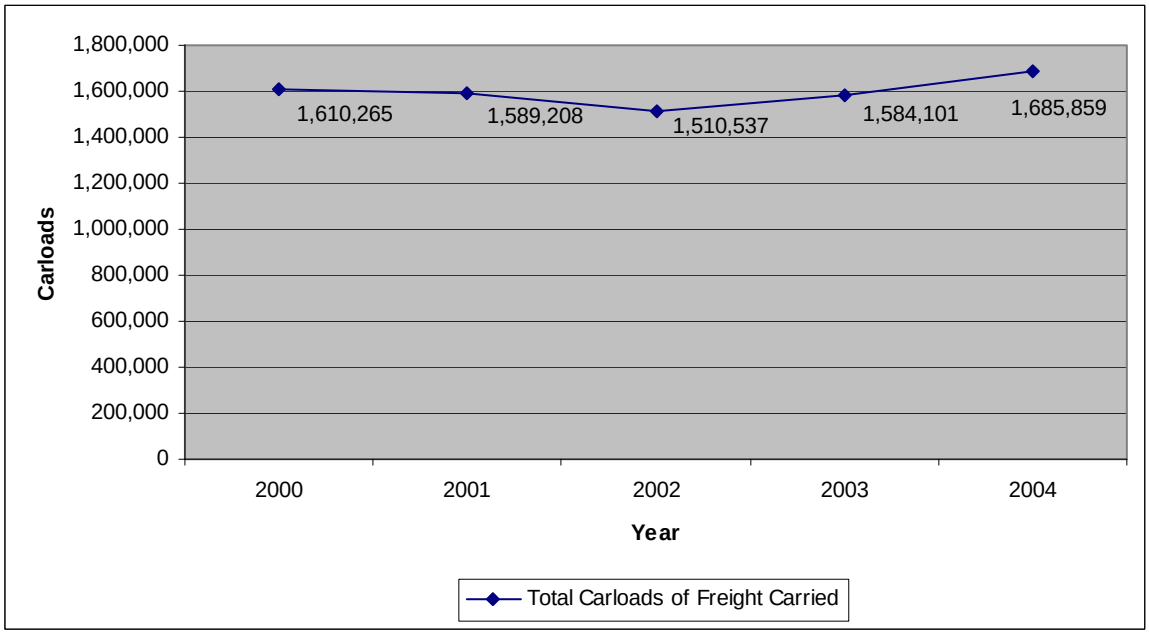
reduce travel time and improve reliability for passenger rail service but have benefited freight movements as well.

Figure 60 – Total Tons of Freight Carried, 2000 to 2004



Source: Association of American Railroads

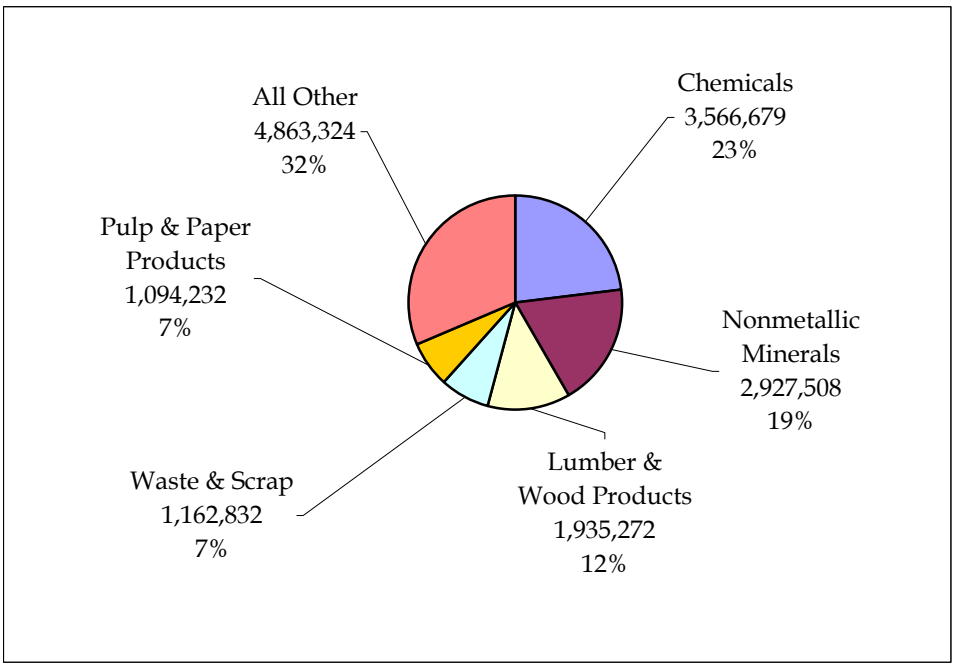
Figure 61 – Total Carloads of Freight Carried, 2000 to 2004



Source: Association of American Railroads

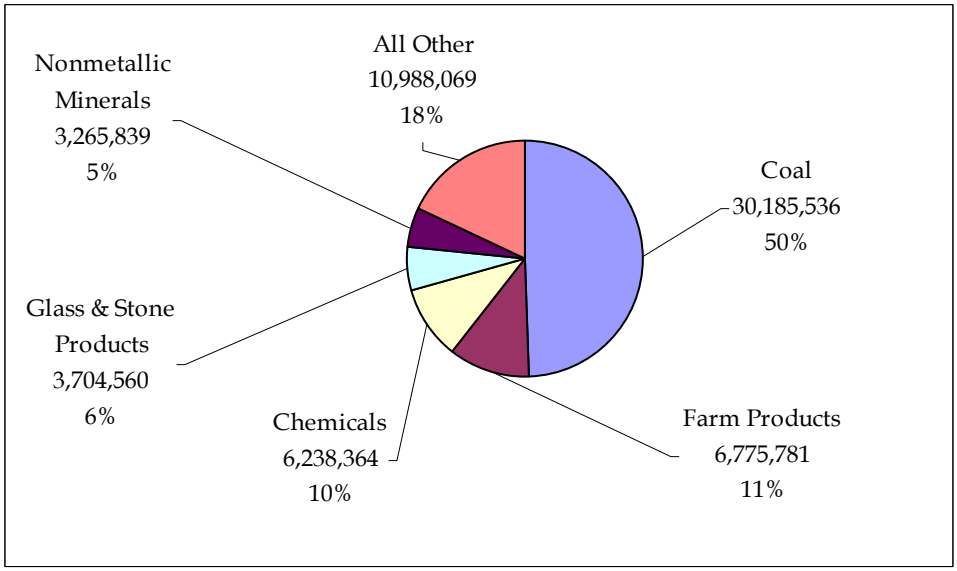
In 2004, over 15 million tons of products originated in North Carolina, while over 61 million tons terminated in North Carolina. **Figures 62** and **63** show the North Carolina originating, and terminating tons by commodity type.

Figure 62 – Originating Tons by Commodity



Source: Association of American Railroads (2004)

Figure 63 – Terminating Tons by Commodity



Source: Association of American Railroads (2004)

7.3.1 Rail Safety

NCDOT's rail safety program includes two facets, namely track and equipment inspections and the crossing safety program. Inspection of tracks and equipment is a key component of railroad safety. Working with the Federal Railroad Administration (FRA), NCDOT rail-safety inspectors are responsible for inspecting more than 3,500 miles of track and signal systems and thousands of rail cars and locomotives. It is the responsibility of the railroad operators to correct any problems and properly maintain their equipment.

The safety at rail/highway at-grade crossings is of utmost importance. The existence of heavily traveled rail corridors conflicting with the highway network can delay both highway and rail freight movements, and potentially result in personal injury.

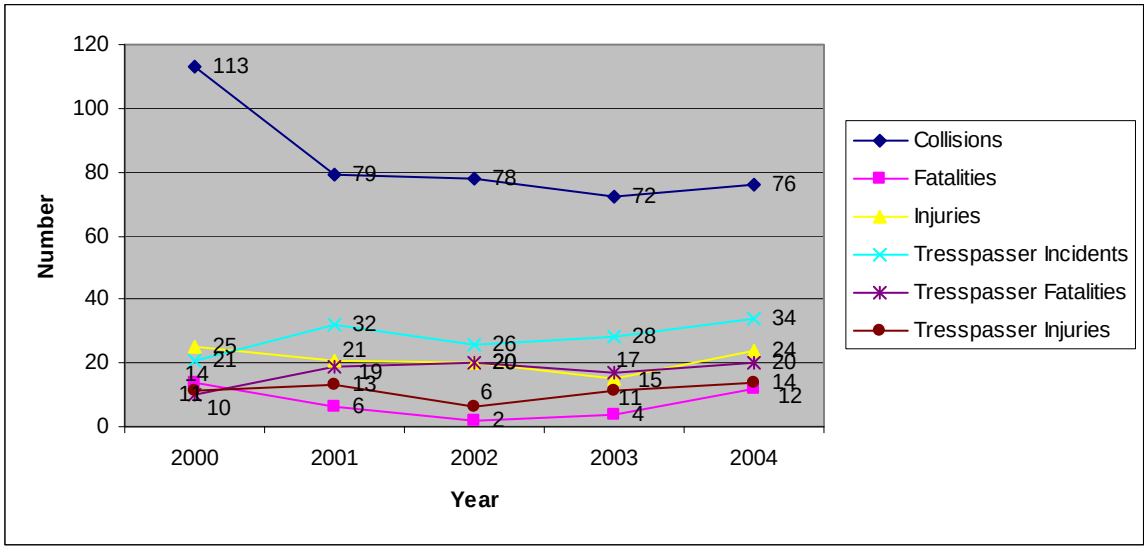
Even with increased efforts during the past decade by the Department, more than 40 percent of North Carolina's at-grade railroad-highway crossings remain unprotected by mechanical warning devices. The Department, in cooperation with the Federal Highway Administration (FHWA), is working to "signalize" those unprotected crossings. The average cost of each project is approximately $150,000.

North Carolina's railroad crossings facts:

- 4,182 public crossings statewide;
- 2,404 are equipped with protective devices;
- 1,845 with gates and flashing-light signals;
- 550 with flashing-light signals only;
- 9 with traffic-signal tie-ins only (at adjacent roadway intersections);
- 3,148 private at-grade crossing statewide;
- 53 pedestrian at-grade crossings statewide;
- 825 public grade separations statewide;
- 21 private grade separations statewide; and
- 21 pedestrian grade separations statewide.

Figure 64 shows the statewide railroad grade crossing statistics for the five-year period between 2000 and 2004. During this time period, collisions have been reduced by nearly 33 percent, fatalities reduced by 14 percent, and injuries reduced by 4 percent. These reductions can be attributed to the Department working with rail industries and communities to upgrade railroad crossings by installing safety devices and closing crossings that are unsafe or redundant. During that time, vehicle miles traveled increased by 13 percent.

Figure 64 – Railroad Grade-Crossing Statistics, 2000 to 2004



Source: NCDOT Rail Division, April 2005

7.3.2 Rail Access to Ports

As terminals, ports handle the largest amounts of freight, more than any other types of terminals combined. To handle large quantities of freight, port infrastructures jointly have to accommodate transshipment activities both on ships and on land and thus facilitate convergence between land transport and maritime systems. Rail plays a vital role in transporting goods to and from ports, and maintaining and expanding this link is critical. Re-establishing freight service and offering alternative rail routes to and from the Port of Wilmington was examined in the *Economic Feasibility Study for the Restoration of the Wallace to Castle Hayne Rail Corridor and Associated Port/Rail Improvements*. In the 1980's, 27 miles of railroad that connected Wallace and Castle Hayne were taken out of service and the tracks were removed by CSXT. To preserve the ROW of this important rail corridor, the Department

acquired the rail line from CSXT. To improve freight rail efficiency and to encourage usage, reopening the Wallace and Castle Hayne connection would provide the Port of Wilmington direct access to markets both north and west of Wilmington. The estimated cost to restore freight service, which includes rail improvements at the Port of Wilmington and connections in Goldsboro, would total $81 million.[26] The study also recommended developing dual rail carrier access to both Wilmington and Morehead City. This improvement would assist in retaining existing customers and would support attracting new customers to these two ports.

In April 2006, the North Carolina State Ports Authority purchased 600 acres for the North Carolina International Port (NCIP). The authority sees current facilities in Wilmington and Morehead City as inadequate for international trade via container ships, particularly trade with China. The NCIP is a proposed seaport that will be at this site, north of Southport, North Carolina. The proposed port is scheduled to be completed between 2014 and 2016 and will be one of the largest facilities on the U.S. East Coast. The expected port capacity will be 2 million containers a year. The dock will be 4,000 feet long, capable of accommodating four container ships at once. The total cost of building the port is expected to be $1 billion, including dredging the Cape Fear River to 50 feet deep as well as improvements to road and rail.

The Department will work with the North Carolina Ports Authority and military to secure access to the Military Ocean Terminal at Sunny Port Railroad (MOTSU RR) and upgrade it for high capacity intermodal access to the NCIP.

7.3.3 Rail Relocation

As North Carolina cities and towns grow and rail traffic increases, there are opportunities to reduce the growing conflicts between highway and rail traffic at urban crossings. The Rail Division is assisting the railroad and cities with projects to improve the efficiency of rail and highway movements, which may require a combination of crossing safety improvements and additional track for alternate routes and yards for some rail traffic.

---

[26] *Economic Feasibility Study for the Restoration of the Wallace to Castle Hayne Rail Corridor and Associated Port/Rail Improvements, February 2004*

7.3.4 Economic Development

Industries with high volumes of rail traffic are being attracted to North Carolina and are often looking for significant contributions from the state as an incentive to locate here. The rail infrastructure component of these facilities and the improvements required to upgrade the rail carrier's track (in the case of short lines) can be several million dollars. The Rail Industrial Access Program (RIAP) was designed to assist with smaller projects and does not have adequate funding to support the demands of these larger scale projects.

7.3.5 Future Rail Freight Growth

Based on the American Association of State Highway and Transportation Officials (AASHTO) *Rail-Freight Bottom Line Report*, rail is expected to grow in the U.S. from 2,009 million tons in 2000 to 2,891 million tons in 2020, an increase of 44 percent. Ton-miles are expected to grow from 1,239 billion in 2000 to 1,821 billion in 2020, an increase of 47 percent. This is an average for all rail markets, but the southern region freight tonnage is estimated to increase by 71 percent. This growth will require large investments by the Department to maintain and upgrade North Carolina's rail system.

7.3.6 Southeast Rail Operations Study (SEROps)

The Department is the lead state for a five-state rail operations study funded through the Intermodal Program Track Committee of the I-95 Corridor Coalition. The study includes Florida, Georgia, South Carolina, Virginia, and North Carolina, all of which are expected to have population growth in the 20-80 percent range between 2000 and 2030 according to the U.S. Census. They also have or are developing major seaports that will experience significant growth during that period. SEROps will emphasize the importance of rail to our region's transportation system; quantify specific improvements that can enhance system efficiency, and will provide resources and information that can influence regional and national transportation policy discussions.

7.3.7 Freight Rail Needs

As shown in the **Tables 18 through 20** and **Figures 65 and 66**, the 25-year freight rail needs total $799 million. Improvements to track used by Class I railroads represents two-thirds of the

future needs and 56 percent are located on the Subregional Tier. Short-line rail improvements represent 24 percent of the future needs, all of which are on the Subregional Tier.

Based on improvement types, 52 percent ($416 million) are expansion needs; 34 percent ($268 million) are modernization needs; and 14 percent ($115 million) are maintenance and preservation needs. Based on tiers, 71 percent ($570 million) of the needs are on the Subregional Tier while the remaining 29 percent ($229 million) are on the Regional Tier. The Statewide Tier does not have any identified freight rail needs. One-hundred percent ($229 million) of the Regional Tier needs are for expansion, while on the Subregional Tier, 66 percent ($375 million) are for expansion; 20 percent ($115 million) are for maintenance and preservation; and 14 percent ($80 million) are for modernization.

Table 18 – 25-Year Freight Rail Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $799 million

Need Category	5-Year Increments					
	2005-2009	2010-2014	2015-2019	2020-2024	2025-2029	TOTAL
Improvements to Track used by Class I railroads that are not used by passenger rail service	$108	$265	$50	$50	$50	$523
Short Line Rail Improvements	$11	$31	$48	$50	$50	$190
Annual Rail Corridor	$5	$5	$5	$5	$5	$25
Rail Industrial Access Program	$6	$9	$12	$16	$18	$61
TOTAL	**$130**	**$310**	**$115**	**$121**	**$124**	**$799**

Table 19 – 25-Year Freight Rail Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $799 million

25-YEAR FREIGHT RAIL NEEDS ($ Million)				
Need Category	NCMIN Tier			
	Statewide	Regional	Subregional	TOTAL
Improvements to Track used by Class I railroads that are not used by passenger rail service	$0	$229	$294	$523
Annual Rail Corridor Maintenance	$0	$0	$25	$25
Short Line Rail Improvements	$0	$0	$190	$190
Rail Industrial Access Program	$0	$0	$61	$61
TOTAL	**$0**	**$229**	**$570**	**$799**

Figure 65 – 25-Year Freight Rail Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $799 million

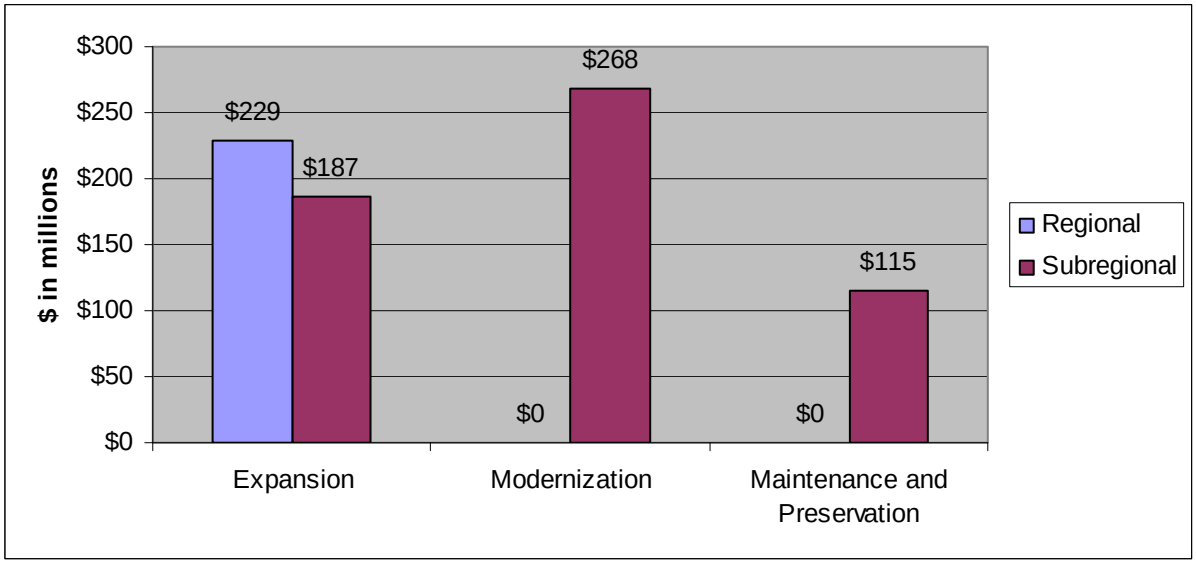
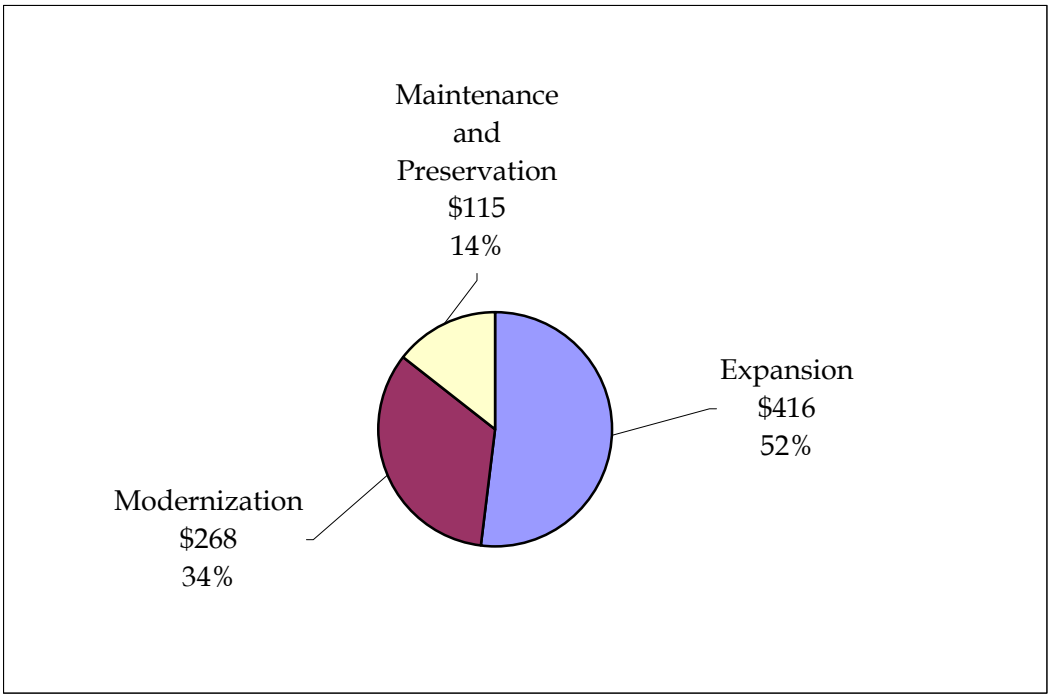


Table 20 – 25-Year Freight Rail Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $799 million

Need Category	Improvement Type			
	Preservation	Modernization	Expansion	TOTAL
Improvements to Track used by Class I railroads that are not used by passenger rail service	$0	$188	$335	$523
Annual Rail Corridor Maintenance	$25	$0	$0	$25
Short Line Rail Improvements	$90	$80	$20	$190
Rail Industrial Access Program	$0	$0	$61	$61
TOTAL	**$115**	**$268**	**$416**	**$799**

Figure 66 – Freight Rail Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $799 million



7.4 Ferries

Currently, NCDOT's Ferry Division extends over 8 routes, has 21 ferries and employs over 400 workers. The operations are supported by a full service shipyard, dredge, crane barge, tugs, barges, and other support vessels. Each year, North Carolina ferries transport over 1.1 million vehicles and in 2005, they transported more than 2.3 million passengers across five separate bodies of water - the Currituck and Pamlico sounds and the Cape Fear, Neuse and Pamlico rivers. Between 2001 and 2005, the highest passenger year was 2002 when 2.6 million total passengers were transported by ferry. Ferries also carry essential goods to water-locked communities. Many residents depend on the ferries for transportation to school, work, and other needed services. **Figure 67** shows the existing ferry routes in North Carolina.

Figure 67 – Existing Ferry Routes

Source: NCDOT

7.4.1 Existing Conditions

The majority of the ferry routes were operating at 50 to 75 percent of maximum capacity during the peak months in the year 2005. The Hatteras – Ocracoke route continues to operate at or over capacity between June and August. **Table 21** provides the crossings per day, 2005-passenger count and the fare for each ferry routes.

Table 21 – Ferry Statistics

Statewide Tier			Regional Tier	
Hatteras - Ocracoke			**Cherry Branch - Minnesott**	
Crossings per day (peak)	63		Crossings (year round)	74
2005 Passengers	891,599		2005 Passengers	467,113
Fare	FREE		Fare	FREE
Ocracoke - Swan Quarter			**Bayview - Aurora**	
Crossings per day (peak)	6		Crossings (year round)	22
2005 Passengers	22,867		2005 Passengers	118,276
Fare (for auto)	$15.00		Fare	FREE
Cedar Island - Ocracoke			**Currituck - Knotts Island**	
Crossings per day (peak)	18		Crossings (year round)	6
2005 Passengers	98,947		2005 Passengers	61,637
Fare (for auto)	$15.00		Fare	FREE
Southport - Fort Fisher			**Currituck - Corolla**	
Crossings per day (peak)	32		Crossings (year round)	N/A
2005 Passengers	495,029		2005 Passengers	N/A
Fare (for auto)	$5.00		Fare	N/A

Source: NCDOT

7.4.2 Future Conditions

In the next 10 years, the following routes are expected to exceed capacity:

- Hatteras – Ocracoke – 25 percent increase in passengers resulting in over-capacity conditions (10% - 154%) April – September; and
- Ocracoke – Swan Quarter – 48 percent increase in passengers resulting in over capacity (101%) conditions in peak month (July).

7.4.3 Ferry Needs

In the next 25 years, all existing services will need additional capacity. Of the 21 existing ferries, five are over 30 years old, two are over 40 years old and one other is over 20 years old, requiring replacement. Many of the ferry terminals will require future expansion as ridership increases. Over the next year, the Pamlico River, Hatteras, Southport, Cedar Island and Ocracoke terminals will be replaced.

As shown in **Tables 22 through 24** and **Figures 68 through 71**, the total 25-year ferry needs total nearly $1.4 billion. The needs are the subsidies (total costs less ferry toll revenue) required to

meet projected passenger demands. The cost to add capacity and improve terminal facilities (expansion) is estimated to cost $365 million and the preservation of the existing ferry system is estimated to cost $992 million over the next 25-years.

Table 22 - Ferry Needs by 5-Year increments ($ in millions)
TOTAL DOLLARS = $1.4 billion

	5-Year Increments					
Need Category	**2005-2009**	**2010-2014**	**2015-2019**	**2020-2024**	**2025-2029**	**TOTAL**
Existing Service						
Capital	$18	$56	$53	$43	$22	$192
Operating	$162	$160	$159	$156	$163	$800
Subtotal Existing	$180	$216	$212	$199	$185	$992
Expanded Service and Facilities						
Capital	$33	$28	$25	$28	$25	$139
Operating	$45	$45	$45	$45	$45	$225
Subtotal Expanded	$78	$73	$70	$73	$70	$365
TOTAL	**$258**	**$289**	**$282**	**$272**	**$255**	**$1,357**

Figure 68 – Ferry Needs by 5-Year Increments
TOTAL DOLLARS = $1.4 billion

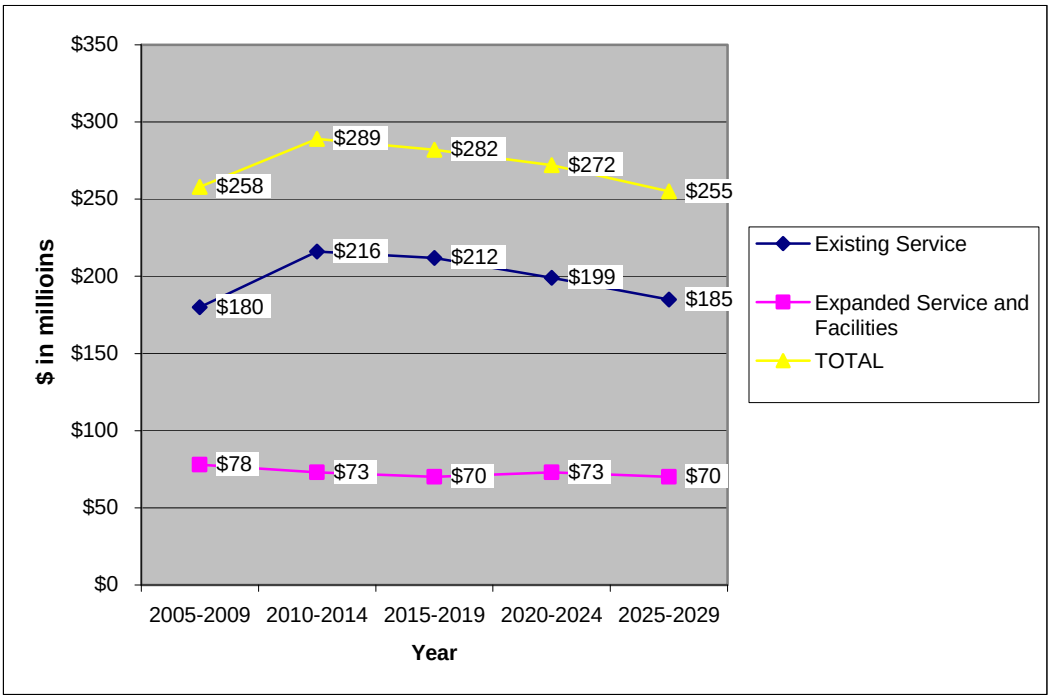


Table 23 – Ferry Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $1.4 billion

Need Category	NCMIN Tier			
	Statewide	Regional	Subregional	TOTAL
Existing Service				
Capital	$140	$52	$0	$192
Operating	$650	$150	$0	$800
Subtotal Existing	$790	$202	$0	$992
Expanded Service and Facilities				
Capital	$91	$48	$0	$139
Operating	$163	$63	$0	$226
Subtotal Expanded	$254	$111	$0	$365
TOTAL	**$1,044**	**$313**	**$0**	**$1,357**

Figure 69 – Ferry Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $1.4 billion

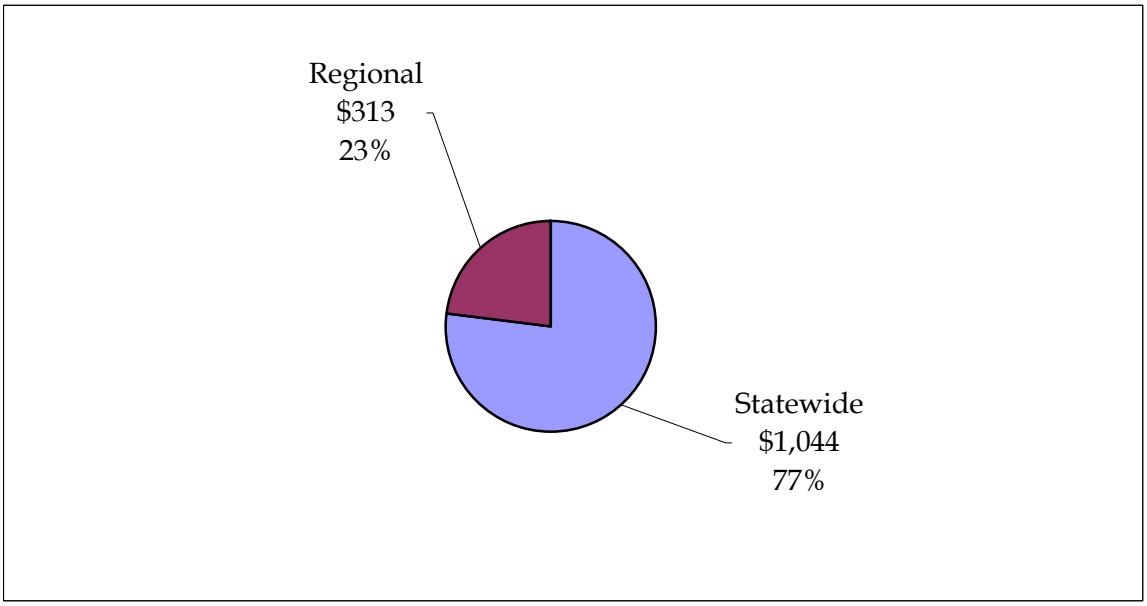


Figure 70 – Ferry Needs by Improvement Type
TOTAL DOLLARS = $1.4 billion

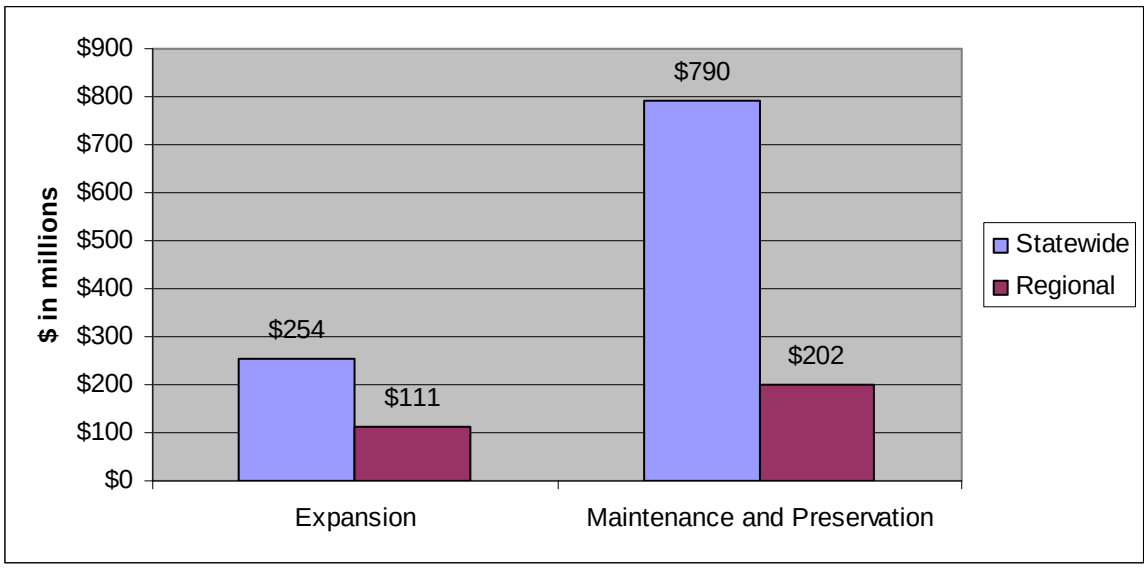
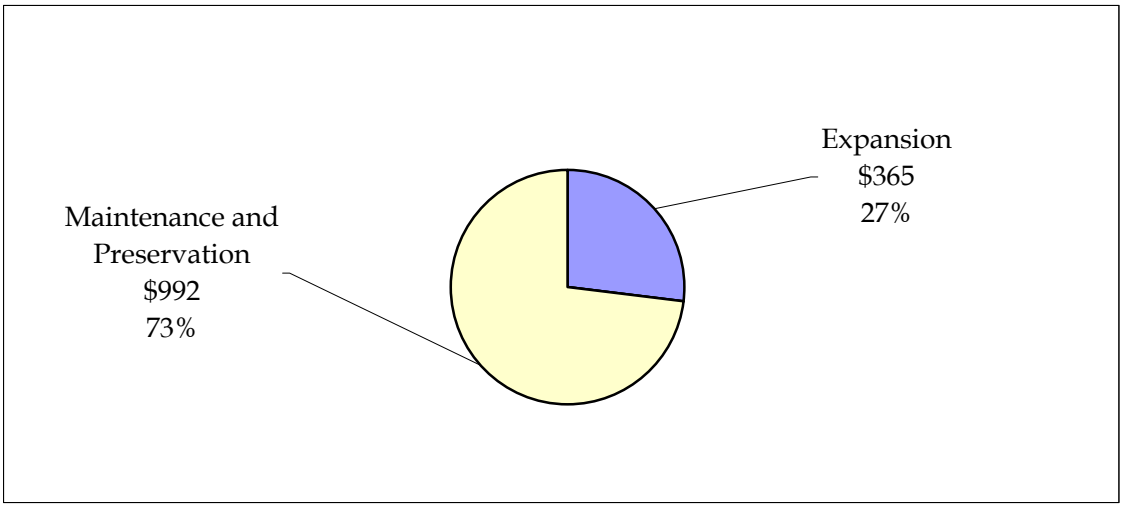


Table 24 – Ferry Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = 1.4 billion

Need Category	Improvement Type			
	Preservation	Modernization	Expansion	TOTAL
Existing Service				
Capital	$192	$0	$0	$192
Operating	$800	$0	$0	$800
Subtotal Existing	$992	$0	$0	$992
Expanded Service and Facilities				
Capital	$0	$0	$139	$139
Operating	$0	$0	$226	$226
Subtotal Expanded	$0	$0	$365	$365
TOTAL	**$992**	**$0**	**$365**	**$1,357**

Figure 71 – Ferry Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $1.4 billion



7.5 Bicycle and Pedestrian System

7.5.1 Existing Facilities

Bicyclists and pedestrians utilize both state and municipal transportation infrastructure facilities. Bicyclists normally use travel lanes, road and street shoulders, dedicated bike lanes and shared-use paths and trails. However, many bicyclists ride in the travel lanes simply because many roads do not include special bicycle facilities. Pedestrians use sidewalks and shoulders, as well as shared-use paths. Bicycles are allowed on all federal, state and secondary roads, except on freeways with full control of access. As a result, there are over 77,300 miles of state-maintained roadways on which bicyclists are permitted.

Bicycle and pedestrian planning in North Carolina is considered as part of any transportation project, not as an afterthought. Current bicycle and pedestrian Transportation Improvement Program (TIP) spending on independent projects is $6 million annually, approximately $4.8 million federal and $1.2 million state match. Additionally, the highway divisions (not Division of Bicycle and Pedestrian Transportation (DBPT)) administer approximately $1.4 million for pedestrian/sidewalk projects ($100,000/division).

The Division of Bicycle and Pedestrian Transportation anticipates the number of identified project needs to increase. In 2004, the DBPT and the Transportation Planning Branch (TPB) created an annual matching grant program – the Bicycle and Pedestrian Planning Grant Initiative – to encourage municipalities to develop comprehensive bicycle and pedestrian plans. This program was initiated in January 2004 and is currently administered through NCDOT.

To date, approximately $1.6 million has been allocated to 64 municipalities through this grant program. Funding for the program comes from an allocation first approved by the North Carolina General Assembly in 2003 in addition to federal funds earmarked specifically for bicycle and pedestrian planning through the TPB. As these and other comprehensive bicycle and pedestrian transportation plans are completed, more and more projects will be identified and placed on the needs list.

7.5.1.1 Statewide Survey on Bicycling and Walking, 2000

The DBPT is charged with improving the safety, access and mobility of bicyclists and pedestrians throughout the state. In order to learn more about these user groups, their needs, and their bicycling and walking activities, the DBPT worked with the University of North Carolina Highway Safety Research Center to gather data that would provide a "snapshot" of the status of bicycling and walking in North Carolina. Highlights of the final report, Bicycling and Walking in North Carolina: Results of a Year 2000 Survey, include the following:

- 46 percent of all North Carolina households own bicycles; 80 percent of households with four or more members own bikes.
- 72 percent of all children under 18 years and 90 percent of 5-15 year-olds ride bicycles.
- Almost 73 percent of adults who had ridden in the past 30 days ride at least once a week for fun or exercise.
- 26 percent of adult respondents had used their bikes to run errands or commute to work at least once over the past 30 days; 7 percent reported doing so daily.
- Adult bicycle riding increases with level of education and income.
- 40 percent of respondents with post college degrees had ridden in the past 12 months.
- Almost 40 percent of respondents with household incomes over $100,000 had ridden in the past 12 months.

- 66 percent of adult respondents had walked on the previous day; 44 percent had walked for 30 minutes or more.
- 20 percent of adult respondents walk as part of their daily work commute.
- Very few children walk (2%) or bike (0.8%) to school with the most frequent reason being that the school is too far away (64% of respondents).
- 75 percent of adult respondents believe their communities and the state should spend more money to improve conditions for bicycling and walking.

7.5.2 Bicycling Highways

The Department has designated a cross-state system of Bicycling Highways based on nine routes, which cover 3,000 miles. These routes generally parallel the major highways along which cyclists often wish to travel, but offer a more lightly traveled alternative than the busy major roads that are familiar to most people. The Department has developed printed guides of each route, which includes segment maps and information on terrain, road conditions, services and points of interest. The nine bike routes (BR) are:

- Carolina Connection (US BR 1);
- Mountains to Sea (NC BR 2);
- Ports of Call (NC BR 3);
- North Line Trace (NC BR 4);
- Cape Fear Run (NC BR 5);
- Piedmont Spur (NC BR 6);
- Ocracoke Option (NC BR 7);
- Southern Highlands (NC BR 8); and
- Sandhills Sector (NC BR 9).

These state-designated routes provide links between local, regional, and county bicycle route systems in many areas of the state.

7.5.3 Pedestrian Facilities

Construction of most pedestrian facilities occurs at the municipal level. However, NCDOT currently has a statewide allocation for constructing pedestrian facilities totaling $1.4 million. This total is divided equally among the state's 14 highway divisions, which each receive $100,000 annually for small-scale pedestrian improvements. The Department currently allocates $275,000 annually for the advancement of pedestrian safety. To receive maximum benefit, the

Department has focused its efforts on statewide or regional demonstration projects, initiatives, or programs to encourage pedestrian safety and to develop walkable communities.

7.5.4 Current Levels of Bicycling and Walking

The 2000 Census Commute-to-Work data was reviewed to assess the current number of North Carolinian's who bike or walk to work. Statewide, 6,840 (0.18% of residents) commuted by bicycle to work, while 74,147 (1.93% of residents) walked to work. These levels are approximately one-half and two-thirds lower, respectively, of the national average. Between 1990 and 2000, total workers in North Carolina increased by 16 percent but workers who commuted to work by bicycling and walking decreased by 4 percent and 23 percent, respectively. During the same time period nationally, workers increased by nearly 12 percent and workers who commuted to work by bicycling increased by 5 percent while walking decreased by 16 percent.

The top five counties with the highest levels of bicycle commuters based on percent of population are Orange (1.85%), Hyde (1.41%), Dare (0.62%), Pamlico (0.47%) and New Hanover (0.44%). The top five counties with the highest levels of walkers based on population are Onslow (10.35%), Orange (7%), Watauga (6.16%), Chowan (5.07%) and Cumberland (4.2%). The top five counties with the highest number of bicycle commuters are Orange (1,124), Wake (643), Mecklenburg (489), Durham (396), and Guilford (364). The top five counties with the highest number of pedestrian commuters are Onslow (8,219), Cumberland (6,018), Wake (5,847), Mecklenburg (5,097) and Orange (4,263).

7.5.5 Bicycle and Pedestrian Safety

Based on NCDOT data, between 2000 and 2003 there were a total of 3,699 bicycle crashes and 9,989 pedestrian crashes reported to the Department of Motor Vehicles. The totals represent crashes where at least one person was either a bicyclist or a pedestrian. During this time period, there were a total of 662 pedestrian fatalities and 77 bicycle fatalities statewide. Over this 4-year period, both pedestrian and bicycle fatalities per year have been reduced by 8 percent and 14 percent respectively. Other key crash facts include:

Bicycle:

- 67 percent occur in urban areas;

- 17 percent occur at 4-way intersections;
- 61 percent occur along 2-lane roadways;
- 17 percent were between the ages of 31 and 40 years old;
- 7 percent resulted in a fatality;
- 11 percent resulted in a disabling injury; and
- 5 percent resulted in no injury.

Pedestrian:

- 67 percent occur in urban areas;
- 13 percent occur at public driveways;
- 47 percent occur along two-lane roadways;
- 21 percent were between the ages of 11 and 15 years old;
- 2 percent resulted in a fatality;
- 7 percent resulted in a disabling injury; and
- 7 percent resulted in no injury.

The majority of North Carolina's roads in rural areas are two-lane, with many having no paved shoulders. This presents access and safety issues on roadways with short sight distances as well as high traffic volumes, including trucks. Narrow bridges, lack of paved shoulders, rumble strips, drainage gates, railroad crossings, lack of crosswalks and pedestrian signals, are hazards and barriers to bicycle, and pedestrian users.

7.5.6 Recent Accomplishments

The Department has been on the forefront of mitigating bicycle and pedestrian hazards and has made numerous accomplishments over the last several years. In 2003, the Department received $250,000 in grants and added in $150,000 to complete Bicycle and Pedestrian Plans. An annual allocation of $400,000 is now being used to develop Bicycle and Pedestrian Plans throughout the state. To date, 64 planning grants have been awarded and one of the goals of the program is to elevate the non-motorized modes to a level where needs are identified.

A recent Economic Impact Study entitled *Pathways to Prosperity – The Economic Impact of Investments in Bicycle Facilities* concluded that bicycling tourists to the northern Outer Banks generate an economic impact of $60 million a year. This is nine times the initial one-time cost of constructing the facilities and is returned each year. Based on this conclusion, the Department is now examining ways to capitalize on this in the mountain and coastal regions of the state.

7.5.7 Bicycle and Pedestrian Needs

Bicycle and pedestrian needs are assumed from the 2001 analysis (2004 STP), since there are no quantifiable ways to measure needs due to a lack of data. As shown in **Tables 25** and **26** and **Figures 72 through 74**, the 25-year bicycle and pedestrian needs total $440 million. Bicycle needs represent 75 percent of the future needs, with over 85 percent located on the Subregional Tier. Pedestrian needs represent 25 percent of the future needs, with over 73 percent located on the Subregional Tier. All bicycle and pedestrian needs are categorized as modernization needs and combined together 9 percent are on the Statewide Tier, 9 percent are on the Regional Tier and 82 percent are on the Subregional Tier.

Table 25 – Bicycle and Pedestrian Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $440 million

	5-Year Increments					
Need Category	**2005-2009**	**2010-2014**	**2015-2019**	**2020-2024**	**2025-2029**	**TOTAL**
Bicycle Improvements	$40	$53	$66	$79	$92	**$330**
Pedestrian Improvements	$10	$16	$22	$28	$34	**$110**
TOTAL	**$50**	**$69**	**$88**	**$107**	**$126**	**$440**

Figure 72 – Bicycle and Pedestrian Needs by 5-Year Increments ($ in millions)
TOTAL DOLLARS = $440 million

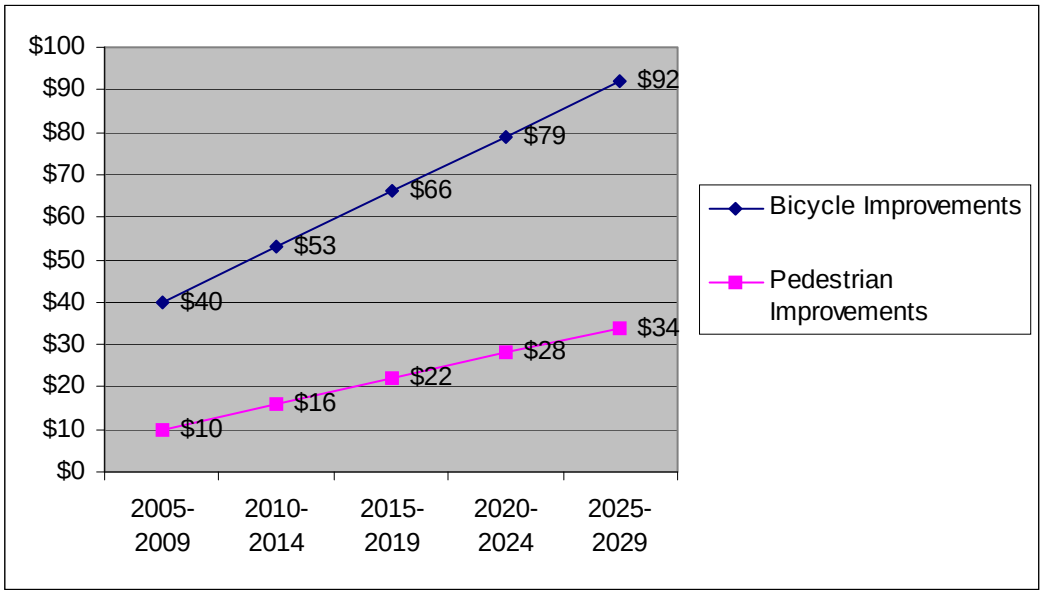


Table 26 – Bicycle and Pedestrian Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $440 million

Need Category	NCMIN Tier			
	Statewide	Regional	Subregional	TOTAL
Bicycle Improvements	$25	$25	$280	**$330**
Pedestrian Improvements	$15	$15	$80	**$110**
TOTAL	**$40**	**$40**	**$360**	**$440**

Figure 73 – Bicycle and Pedestrian Needs Comparison by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $440 million

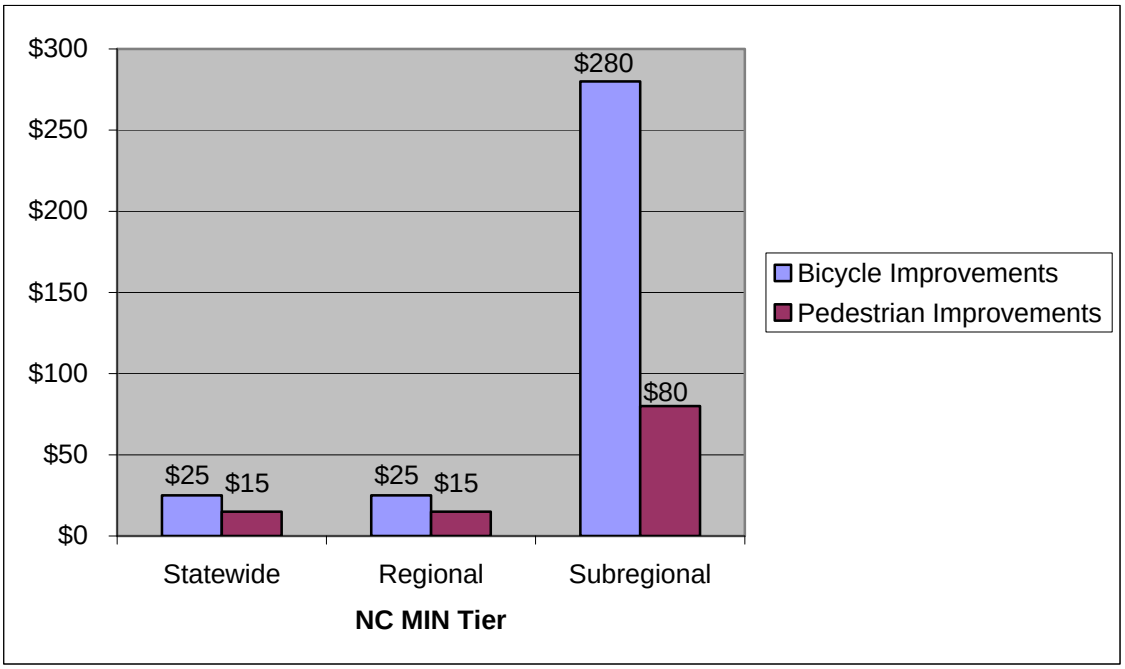
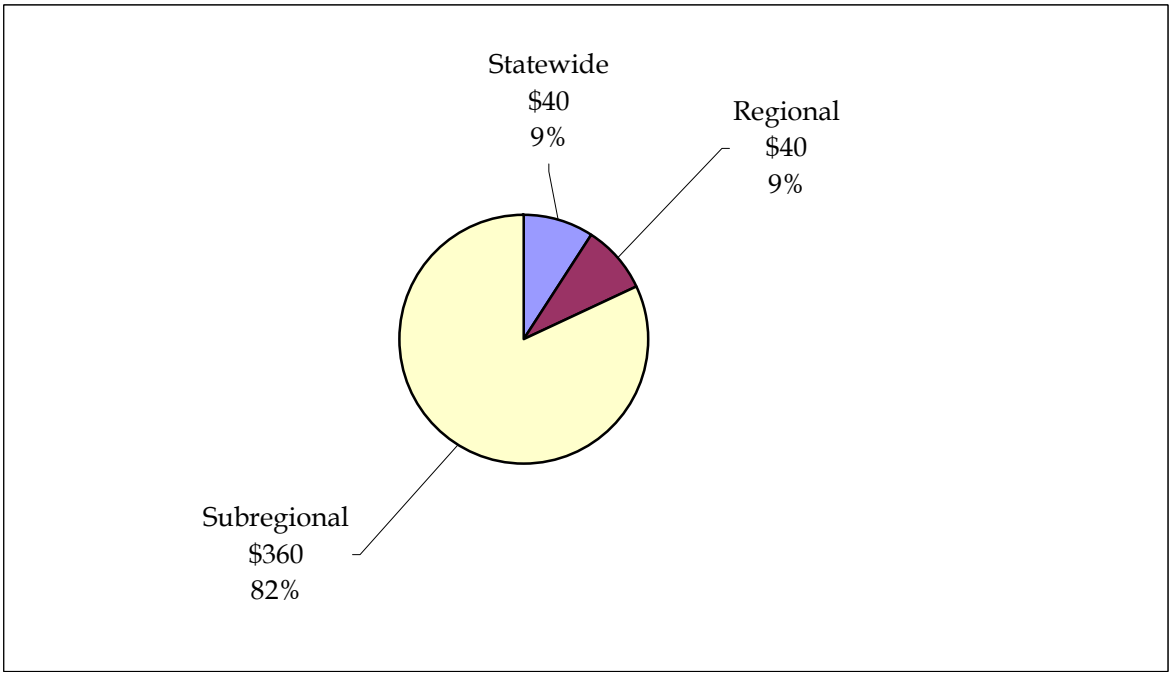


Figure 74 – Bicycle and Pedestrian Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $440 million



7.6 Aviation

7.6.1 Existing Conditions

There are 74 publicly owned, public use airports in North Carolina and 11 have scheduled service, while the remaining 63 are classified as general aviation. The NCDOT Division of Aviation administers the State Aid to Airports Program. North Carolina participates in the FAA "Block Grant Program," meaning the state has assumed responsibility for administration and distribution of FAA grants to general aviation airports. Commercial Service airports in the state deal directly with the FAA concerning their Airport Improvement Program funding.

North Carolina's most recent statewide planning study was completed in 2004. This study, referred to as the *North Carolina General Aviation Airport Development Plan* (NCGAADP), focuses on publicly owned and operated general aviation airports throughout the state. This plan evaluates the needs of the general aviation airports and sets minimum state standards for their development. Through this process, airport needs were identified and prioritized for statewide system development.

7.6.2 Aviation System Plan

The NCGAADP, administered by the Division of Aviation, maximizes the limited financial resources available and prioritizes all capital improvements and maintenance needs at eligible airports throughout the state. A strong emphasis is placed on safety, future needs, and promoting economic growth. The plan classifies the airports based on economic development parameters from the NC Department of Commerce; the preliminary analysis shows three classifications – red, blue, green. The results of data collected in the development and updating of this plan will be utilized to seek additional future federal and state funds for projects.

7.6.3 Aviation Economic Impact

An Economic Impact Study of Aviation was conducted by the Division in 2006. The study, encompassing all 74 publicly owned airports in the state, identified economic impacts of at least $9.5 billion annually statewide. General aviation is the fastest growing element of aviation in the state, with annual economic impacts exceeding $1.8 billion statewide, compared with annual results of $168 million from a similar study done in 1995. Since September 11, 2001, North

Carolina has experienced a dramatic increase in general aviation business and corporate travel due to delays and inconvenience associated primarily with security issues at commercial service airports. The local general aviation airports are becoming much more vital for their communities to attract new business and industry, and increases in funding will help meet these needs. The advent of Very Light Jet (VLJ) aircraft, growth in fractional ownership of business aircraft, availability of on-demand air taxi services and continued advancement in satellite-based navigational equipment point to further growth in the general aviation sector.

The new Rural Airport Development Program was created in 2006 to assist airports that are located in more economically challenged areas of the state. Funding is provided to rural airports for capital improvement projects that will aid in industry recruitment and attracting business aviation users.

7.6.4 Aviation Needs

As shown in **Figures 75 through 78**, the 25-year aviation needs total $1.7 billion with 60 percent located on the Regional Tier and the remaining 40 percent on the Subregional Tier.

- Aviation expansion needs, such as new airport construction, and runway lengthening and pavement strengthening, represent 42 percent of the future needs, with 63 and 37 percent located on the Regional and Subregional Tiers, respectively.
- Modernization needs, such as new runway approach lighting systems and land acquisition of runway projection zones represent 15 percent of the future needs, with 56 and 44 percent located on the Regional and Subregional Tiers, respectively.
- Preservation and maintenance needs, such as facility, runway and taxiway maintenance and airport obstruction removal, represent 43 percent of the future needs, with 59 and 41 percent located on the Regional and Subregional Tiers, respectively.

Figure 75 – Aviation Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $1.7 billion

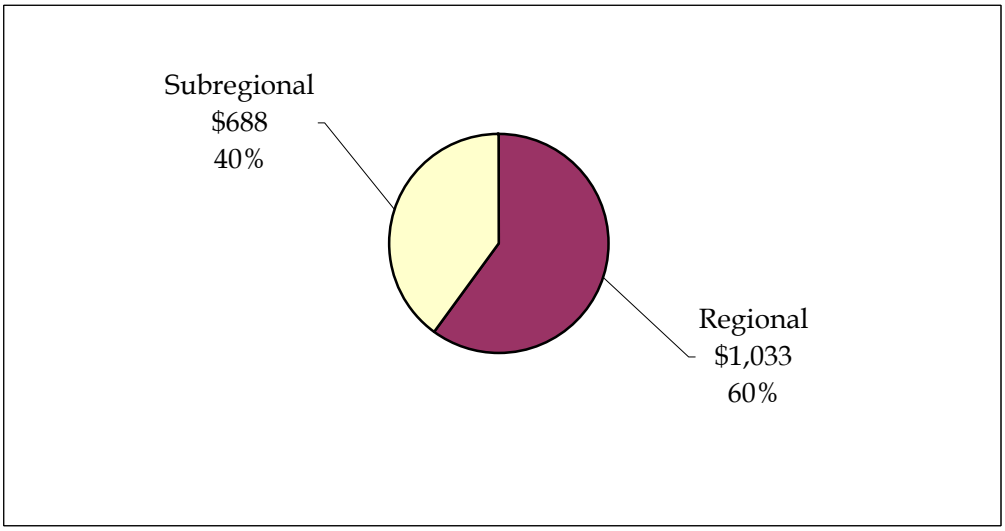


Figure 76 –Aviation Needs by NCMIN Tier ($ in millions)
TOTAL DOLLARS = $1.7 billion

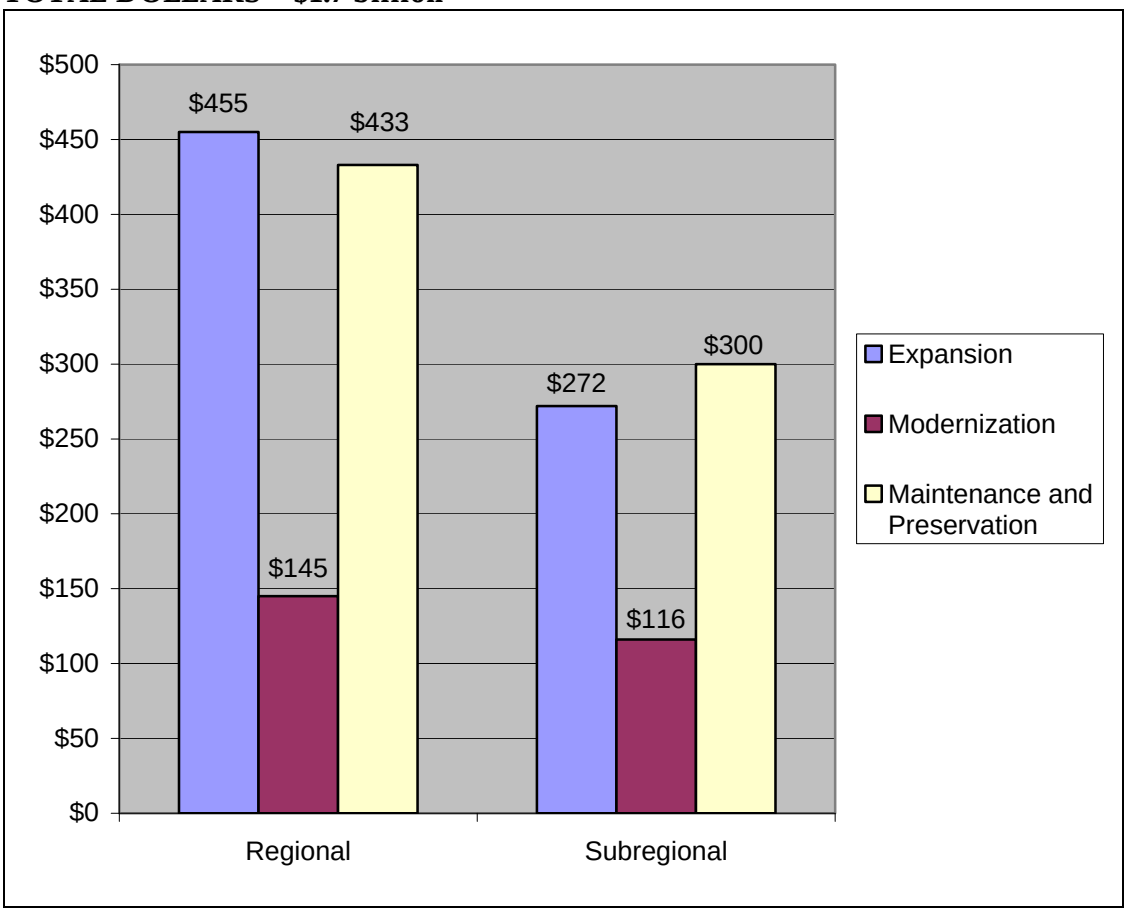


Figure 77 – Aviation Needs by Improvement Type ($ in millions)
TOTAL DOLLARS = $1.7 billion

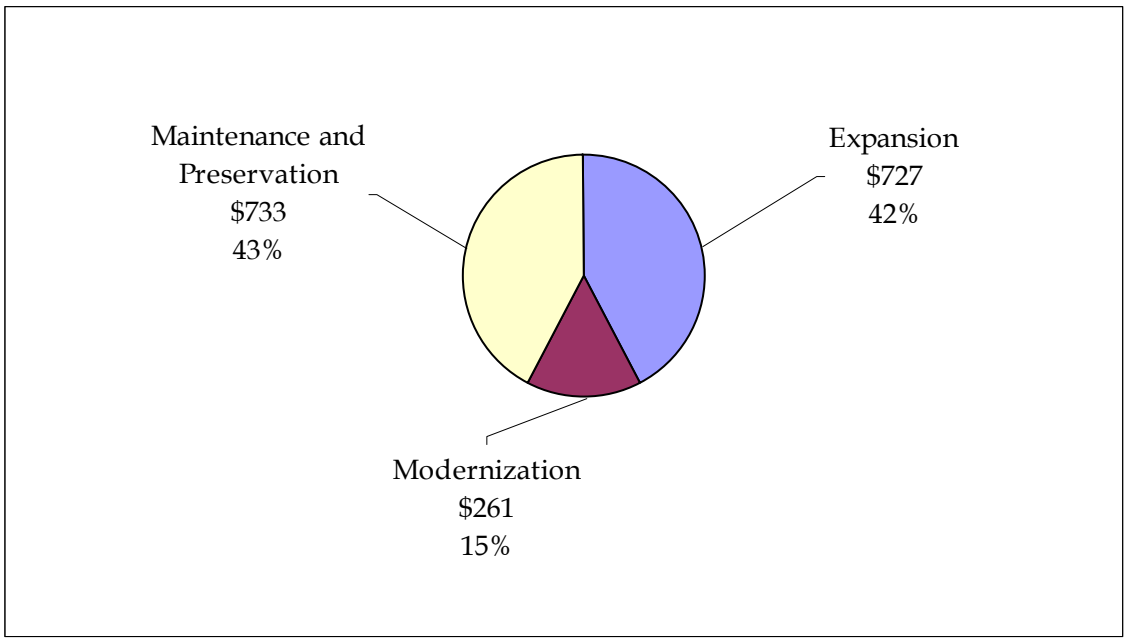
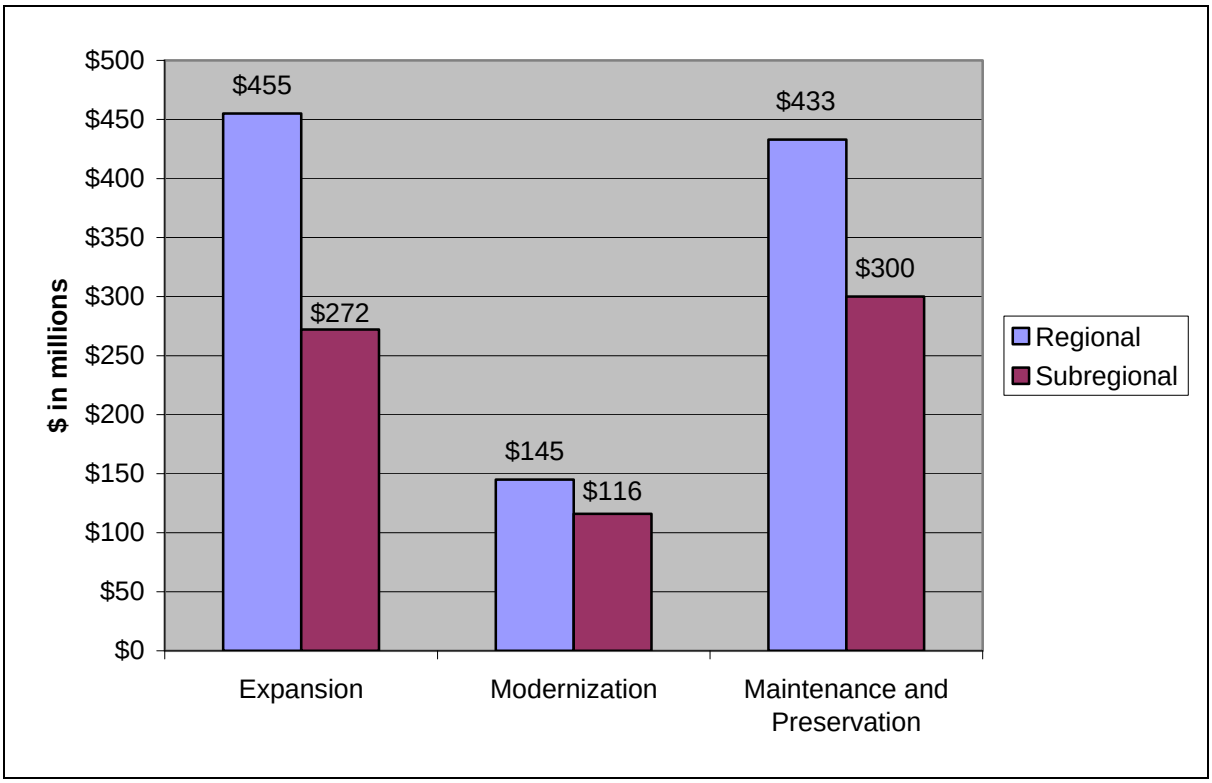


Figure 78 – Aviation Needs by Improvement Type
TOTAL DOLLARS = $1.7 billion



Security continues to be at the forefront of aviation concerns throughout the state. Due to these concerns at the larger airports, there is significant movement to and increase in utilization of general aviation airports across the state. The current focus of aviation security continues to be commercial service airlines, but the natural outgrowth of those programs will be increased security requirements at general aviation facilities, requiring additional funding. The impact of these programs cannot be quantified at this time, and have not been taken into account in the funding requirements outlined above. As of 2006, the state source of funding for the Division of Aviation has been moved from the General Funds to the Transportation Funds.

7.7 Ports

7.7.1 Existing Facilities

The value of deepwater ports was recognized by the North Carolina State legislature in 1945 when they created the North Carolina State Ports Authority (NCSPA). The NCSPA was charged with creating two competitive ports through the sale of revenue bonds to create a better atmosphere for the development of North Carolina industry. The General Assembly in 1949 approved the issue of $7.5 million in bonds for construction and improvement of seaports to promote trade throughout the state. Terminals equipped to handle oceangoing vessels were completed at Wilmington and Morehead City in 1952.

Today, under the jurisdiction of the Department of Commerce, the North Carolina ports system includes the Ports of Wilmington, Morehead City and the inland container consolidation centers at Charlotte (CIT) and Piedmont Triad (PTIT), all operated under the jurisdiction of the North Carolina State Ports Authority. The NCSPA receives no appropriated operating funds or dedicated capital funding, although, it has received state funding for large capital improvement and major maintenance projects.

The 2006 Economic Impact Study of the North Carolina State Port Authority performed by Martin Associates indicated that in 2005:

- 84,833 jobs in the State of North Carolina are in some way related to the maritime activity at the Port of Wilmington and the Port of Morehead City.

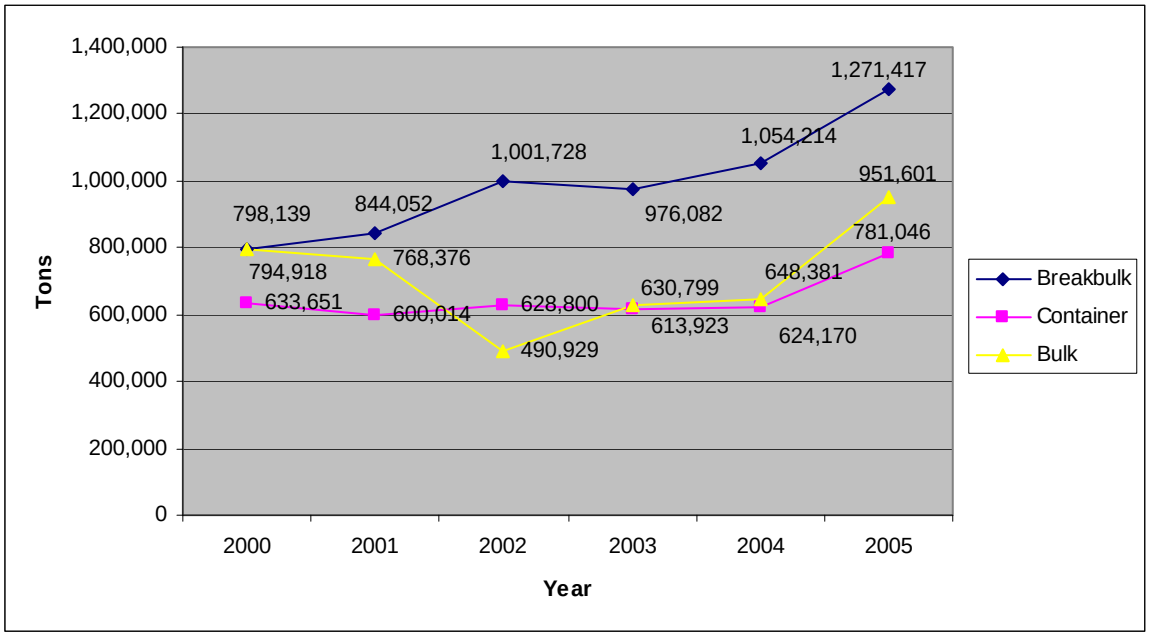
- Marine cargo and vessel activity at the public and private marine terminals generated $5.6 billion of total economic activity in North Carolina.
- Port business activity created $2.9 billion of personal wage and salary income in the state of North Carolina.
- A total of $299.2 million of state and local tax revenue was generated by maritime activity at the NCSPA public terminals at Wilmington and Morehead City, and the privately owned terminals in Wilmington. The port service providers generated $84.1 million, while the balance, $215.1 million was generated by the related port users.

North Carolina's ports generate a great deal of economic benefit throughout the state. The ports are also an integral part of the state's transportation system. In Fiscal Year 2005, 3.0 million tons of cargo was handled at the NCSPA marine terminal at Wilmington, 2.4 million tons at Morehead City, and nearly 3.0 million tons of cargo moved via the private terminals in Wilmington. The NCSPA coordinates directly with NCDOT on transportation access needs and highway needs associated with accessing North Carolina's ports are captured in the Highway and Bridge needs section.

7.7.1.1 Port of Wilmington

The port of Wilmington offers services for containerized, breakbulk Roll on/Roll off (RORO), bulk and project cargo. The port is located on the east bank of the Cape Fear River, 26 miles from the open sea. The channel depth was recently deepened to 42 feet; providing an additional 15 percent vessel capacity. The port has access to I-95, I-40, and I-140 and daily train service is provided by CSX Railways. The port has four container cranes, four gantry cranes, and cargo handling equipment. The NCSPA ordered four new 100-foot gauge cranes to be delivered in early 2007 and placed in operation in the spring of 2007. The total cargo volume for fiscal year 2005 was 3,004,064 tons; a 35 percent increase since 2000. **Figure 79** shows the total tons between 2000 and 2005 by handling type. Based on tonnage, breakbulk (unitized cargo) is traditionally the highest type handled at the Port of Wilmington, followed by bulk and container. Breakbulk cargo refers to commodities like rubber, lumber, steel and woodpulp, shipped in units such as bundles, pallets or bins. Bulk cargo is products, which flow, like fertilizer or salt.

Figure 79 – Port of Wilmington 6-Year Tonnage Trends



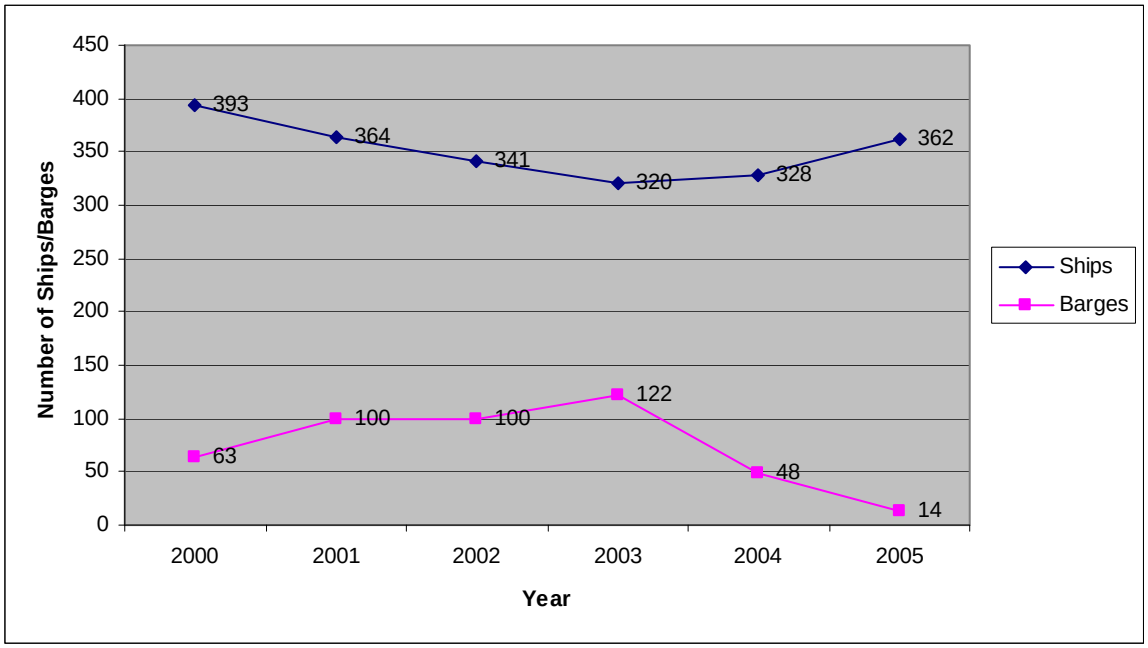
Source: North Carolina State Port Authority

In the two years since dredging to deepen the navigational channel to the docks at the Port of Wilmington was completed, the traffic at the port has increased. Breakbulk tonnage, including woodpulp, lumber and steel, increased 21 percent in fiscal 2005, which began five months after the 42-foot channel reached the Port.[27]

Figure 80 shows the six-year trend in vessels (ships and barges) accessing the Port of Wilmington and in 2005, 376 vessels accessed the port. Between 2000 and 2005, the port experienced 17 percent decrease in vessels, but ships are now larger and can carry larger cargo loads.

[27] *Stem to Stern* March 2006

Figure 80 - Port of Wilmington 6-Year Vessel Trends



Source: North Carolina State Port Authority

The primary exports from the Port of Wilmington are woodpulp, general merchandise, forest products, wood products, and chemicals. General merchandise and wood products exports have grown significantly since 2000. The primary imports are forest products, chemicals, cement, general merchandise and metal products. Since 2000, imports of forest products and cement have grown dramatically, while grain imports have subsided. The top import trading partners from the port are Germany, Colombia, Brazil, China, and Korea. The top export trading partners are Italy, Korea, China, Taiwan, and Hong Kong.

7.7.1.2 Future Port of Wilmington Expansion

The port will soon expand its container operations by 90 acres along River Road, providing additional container capacity to the port. Currently, there is a $130 million enhancement program under way that will double the capacity at the Port of Wilmington. This expansion will meet the demand of increasing container traffic and increase business and revenues at the Port over the next 10 years before the new terminal at Southport (North Carolina International Port) goes into operation. The expansion project includes:

- Four new 100-ft gauge container cranes;
- New container handling equipment;

- New terminal operating system; and
- Berth, dock and paving improvements.

Phase 1 is expected to be completed by April 2007, with the entire project complete in five years. The port will continue to serve general cargo business after new the terminal is complete.

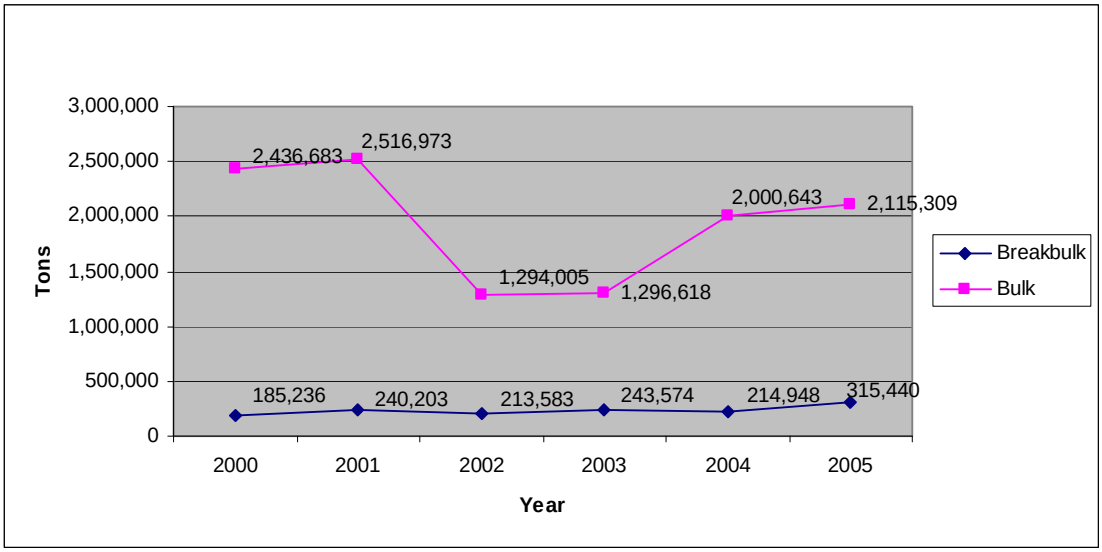
The four 100-foot gauge container cranes will join Wilmington's four existing container cranes as the linchpin of Wilmington's five-year container, terminal expansion program, which will double container handling capacity at the port's existing facility.

7.7.1.3 Port of Morehead City

The Port of Morehead City offers services for containerized, breakbulk, RORO, bulk, and project cargo. The port is located four miles from the open sea and has a channel depth of 45 feet. Rail service along the 5,521 feet of continuous wharf is provided by Norfolk Southern. There are two 115-ton gantry cranes and cargo handling equipment and a container crane equipped to handle scrap steel.

The total cargo volume for the fiscal year 2005 was 2,430,749 tons, which is a 7 percent decrease since 2000. **Figure 81** shows the total tons between 2000 and 2005 by handling type. Based on tonnage, bulk is traditionally the highest type handled at Morehead City, followed by breakbulk.

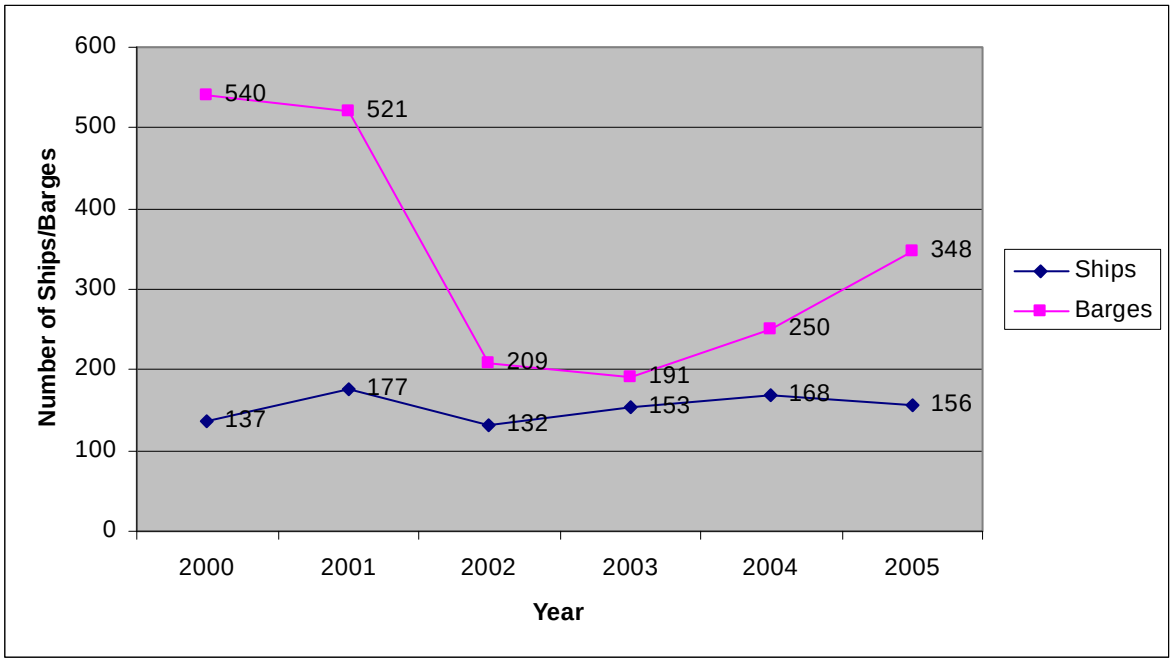
Figure 81 – Port of Morehead City 6-Year Tonnage Trends



Source: North Carolina State Port Authority

The total number of vessels accessing the port in 2005 was 504. Between 2000 and 2005, the port experienced a 26 percent decrease in vessels. While the number of ships making a call has declined, ships in general are now larger and can accommodate larger cargo loads. **Figure 82** provides the six-year trends in vessels (ships and barges).

Figure 82 – Port of Morehead City 6-Year Vessel Trends



Source: North Carolina State Port Authority

The primary exports from the Port of Morehead are phosphate, aggregate, metal products, military, and general merchandise. Historically, phosphate has been the highest export based on tonnage, at Morehead City. The primary imports are sulphur, scrap metal, rubber, asphalt, ore, mica, and schist. Since 2000, sulphur imports have grown dramatically, while ore, mica, and schist imports have subsided. The top import trading partners at the Port of Morehead are Venezuela, Indonesia, Turkey, Mexico and Brazil. The top export trading partners are China, Brazil, India, Pakistan and Argentina.

7.7.1.4 Future Port of Morehead City Expansion

The Radio Island development project is an integral component of the Ports Authority's expansion plan, which also includes a new 177,000 square foot warehouse at the Port of

Morehead City and substantial improvements to the container terminal at the Port of Wilmington.

The Authority owns approximately 250 acres on Radio Island, of which 150 acres is actually suitable for development. An Environmental Impact Study (EIS) on the property, approved in 2001, calls for construction of a marine terminal with 2,000 feet of wharf, warehouse space, and paved, open storage. The EIS also specifies dredging to bring the 45-foot-deep Morehead City navigational channel to the face of Radio Island.[28]

As the breakbulk business at the Port booms, preparations are being made to handle this type of cargo. Work is under way on a major rail rehabilitation project throughout the Morehead City terminal and across the Newport River to Radio Island. The project includes upgrades in capacity, repair and replacement of rail and switches, as well as replacement of the "frogs," highly specialized metal connectors where rail crosses another track. Rail at Morehead City includes the tracks, which allow cargo to leave the Port on Norfolk Southern trains, as well as crane rail on the docks. The project is scheduled to take about a year, finishing in the first quarter of 2007. A $3.5 million project to rehabilitate Arendell Street, from where it enters the main gate to the water's edge will be completed in the fall of 2006. The project includes not only street paving, which is needed to make access to the port safer, more comfortable, and easier on vehicles, but also open storage space away from the docks.

The Port of Morehead City and Radio Island are ideally situated to handle the bulk / breakbulk market growth and cargo displacement by other ports. Work continues to expand facilities at the port and a new terminal on Radio Island. In December 2005, the NCSPA Board also moved forward on a lease agreement for a new 177,000 square foot warehouse at the Port of Morehead City and awarded a $1 million design contract initial engineering and environmental design for the development of the port terminal on Radio Island. This project creates the basis for facilities design, and includes determining traffic flow, dredging needs, and other basic planning work.[29]

---

[28] http://www.ncports.com
[29] *Stem to Stern* February 2006

7.7.1.5 Charlotte Inland Terminal (CIT)

The inland terminal in Charlotte makes it convenient for Charlotte-region manufacturers to move goods to the state ports in Morehead City and Wilmington. The following provides a brief description of CIT[30]:

- Strategically located at the heart of manufacturing and distribution sites in the Southeast, serving the I-85 and I-77 distribution corridors;
- Provides professional "neutral" container yard operations to container carriers;
- Staging for empty and loaded containers - bonded by US Customs and Border Patrol;
- Maintenance and repair operations allowed on site;
- Real-time data management through Port of Wilmington Terminal Operating System; and
- Grounding and mounting service supports operations at Norfolk Southern and CSX Charlotte ramps.

7.7.1.6 Piedmont Triad Inland Terminal (PTIT)

The *Piedmont Triad Inland Terminal* is located near the Greensboro airport and it handles container traffic to and from the Port of Wilmington. The following provides a summary of PTIT[31]:

- Strategically located at the heart of manufacturing and distribution sites in the Southeast, serving the I-40 and I-85 corridors;
- Provides professional "neutral" container yard operations to container carriers;
- Staging for empty and loaded containers - bonded by US Customs and Border Patrol;
- Maintenance and repair operations allowed on site; and
- Real-time data management through Port of Wilmington Terminal Operating System.

7.7.2 Planned New Port

7.7.2.1 Planned North Carolina International Port

In April 2006, the NCSPA purchased 600 acres of riverfront property in Brunswick County. The new property is nine miles from the ocean, while Wilmington is 26 miles. The location, next to

[30] http://www.ncports.com
[31] http://www.ncports.com

the Military Ocean Terminal at Sunny Point, also supports Department of Defense strategic initiatives.

The NCSPA plans to build a new port terminal, the North Carolina International Port (NCIP). Building a new port terminal on the Brunswick County property also provides a better alternative, environmentally and economically than further dredging of the Cape Fear River and enlarging the Port of Wilmington footprint. Forecast growth in container traffic worldwide would require a deeper channel for Wilmington to remain competitive. Development of this facility would coincide with the projected doubling of the North American container market between now and 2015.

The new port will provide a gigantic boost to economic development. The new terminal would multiply the number of jobs already generated by the ports, both local and statewide. Major manufacturing and assembly plant site-selection criteria require proximity to deepwater port facilities with global service coverage.

The location of the NCIP also affords the opportunity to develop an industrial park for distribution centers and related operations – adding additional jobs to the local economy. Besides economic development, the region would also benefit from infrastructure improvements, particularly access to and improvements to Interstate and rail connections. The property, already zoned for heavy industrial, includes 4,000 linear feet of frontage on the Cape Fear River with highway and nearby rail access.[32]

7.7.3 Future Port Needs

In April 2006, the NCSPA Board passed a resolution asking NCDOT to move forward as soon as possible on highway and rail access to support the new NCIP on the west bank of the Cape Fear River near Southport. The main focus of the resolution is the engineering and environmental studies needed to proceed with improvements to rail and road access to the new port. The NCPA also requested NCDOT to:

[32] http://www.ncports.com

- Identify major infrastructure (road and rail) improvements to accommodate the NCIP freight movement; and
- Identify and pursue a funding strategy for providing highway and rail access to the new port, and "fast track" the project for a 2012 target completion date of the first phase of development.[33]

7.7.4 Future Cargo Growth

In Fiscal Year 2006, the NCSPA recorded record annual revenues and its largest profit in 15 years. Double-digit growth in container business and bulk cargo at the Port of Wilmington, and in breakbulk cargo at the Port of Morehead City, combined for the Authority's fourth consecutive year of growth. Growth in the container business and bulk cargo are expected to increase 14 percent in 2007 and expected to double by the year 2015.

7.7.4.1 Access Needs to the Port of Wilmington

The main access route to the Port of Wilmington from the north traverses over the Memorial Bridge, which is currently a choke point for trucks accessing the port. The North Carolina Turnpike Authority is currently studying extending I-140 9.5 miles and this improvement would include a new crossing of the Cape Fear River near the Port of Wilmington. The new crossing is called the Cape Fear Skyway and is under consideration for construction as a toll highway. The proposed Skyway Bridge would run from Carolina Beach Road at Independence Boulevard south of Wilmington over the Cape Fear River. It would then connect to US 17 through an 8-mile-long extension of Interstate 140 from its current planned end near Town Creek. The project, if officially approved, is expected to cost around $350 million. The feasibility study is due to be completed in 2006 and if approved, construction could start as early as 2009.[34]

The proposed Cape Fear Skyway, as shown in **Figure 83**, would provide improved access over the Cape Fear River from all access points. However, once the alignment is approved, additional work is required to ensure the Port of Wilmington is provided direct access to the Cape Fear Skyway. The Cape Fear Skyway has the potential to alleviate a great deal of traffic congestion within the City of Wilmington by providing a new access route to and from the port.

[33] *Stem to Stern* April 2006

Figure 83 – I-140 Extension and the Cape Fear Skyway

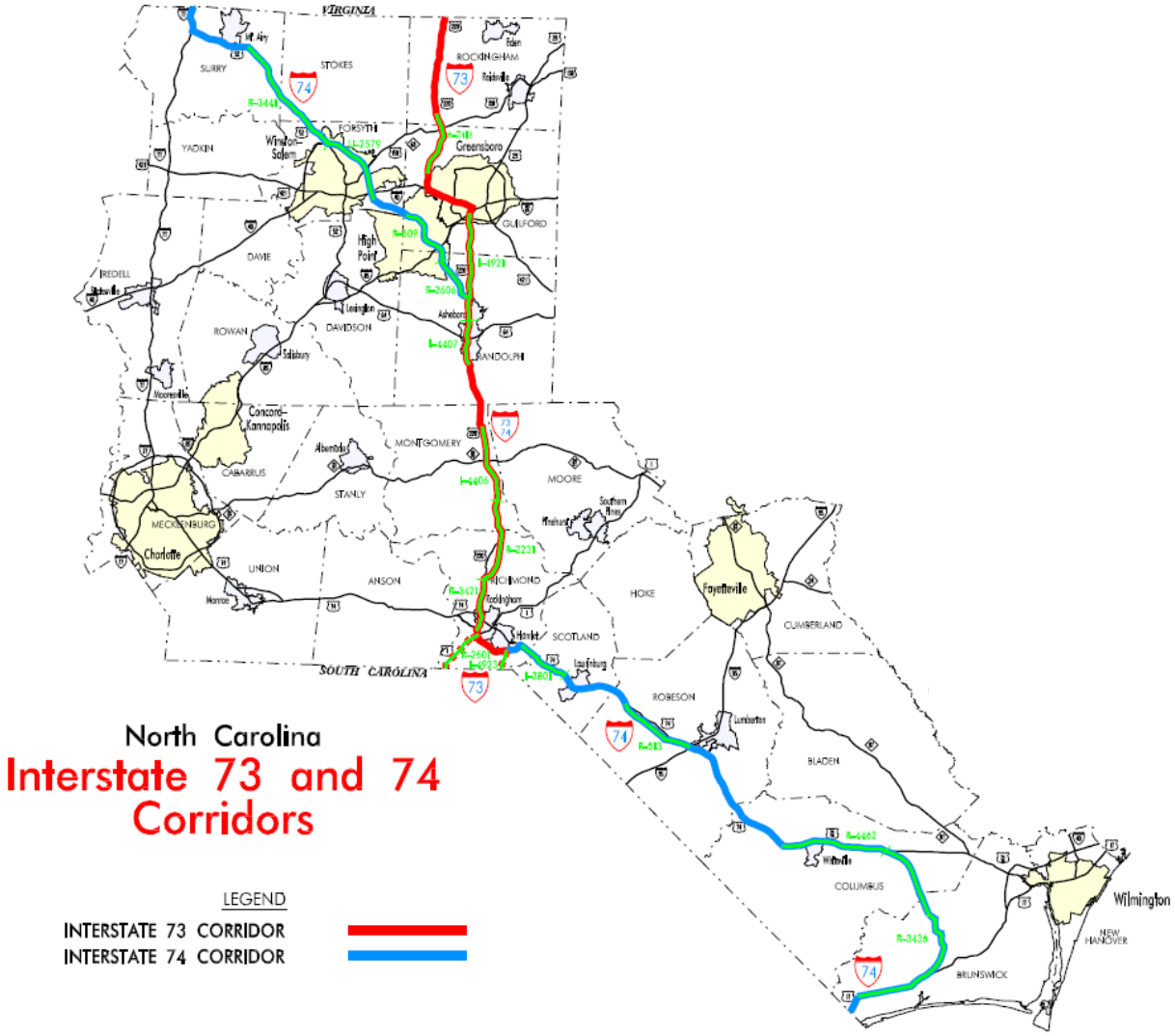
Source: NCDOT

7.7.4.2 I-73 and I-74 Improvements

NCDOT is currently working on the I-73 and I-74 corridors in the state. **Figure 84** shows the alignment of both interstates. Once the interstates are completed (as shown in on the next page), they will provide improved connectivity to the Port of Wilmington and to the new North Carolina International Port.

[34] North Carolina Turnpike Authority

Figure 84 – I-73 and I-74 Corridors



Source: NCDOT

TIP# / COUNTY	DESCRIPTION	PROJECT STATUS ** SCHEDULE	BEGIN	COMPLETE
R-3441 FORSYTH STOKES SURRY	US 52, NC 65 IN WINSTON-SALEM TO I-74 IN SURRY COUNTY	UNFUNDED PROJECT		
U-2579* FORSYTH	NORTHERN BELTWAY, US 52 TO US 311, NEW LOCATION.	PLANNING R/W CONST.	ON-GOING 2007 2010	MARCH 2006 2013 AFTER 2012
R-609 GUILFORD RANDOLPH	US 311, HIGH POINT EAST BELT, WEST OF HIGH POINT RESERVOIR TO US 311 SOUTH OF ARCHDALE. NEW LOCATION.	PLANNING R/W CONST.	COMPLETE COMPLETE ON-GOING	 2009
R-2606 RANDOLPH	US 311, SR 1920 TO US 220. NEW LOCATION.	PLANNING R/W CONST.	COMPLETE ON-GOING 2006	 2012 AFTER 2012
R-2231* MONTGOMERY RICHMOND	US 220, EMERY TO ELLERBE. NEW LOCATION.	PLANNING R/W CONST.	COMPLETE COMPLETE ON-GOING	 2006
R-3421 RICHMOND	US 220 BYPASS, I-73/74 CORRIDOR. BYPASS OF ROCKINGHAM. FOUR LANE DIVIDED FACILITY ON NEW LOCATION.	PLANNING R/W CONST.	COMPLETE AFTER 2012 AFTER 2012	 AFTER 2012 AFTER 2012
I-3801 RICHMOND SCOTLAND	UPGRADE EXISTING US 74 TO INTERSTATE STANDARDS. ROCKINGHAM-HAMLET BYPASS TO LAURINBURG BYPASS.	UNFUNDED PROJECT		
R-513* ROBESON	US 74, MAXTON BYPASS TO NC 41. NEW LOCATION.	PLANNING R/W CONST.	COMPLETE COMPLETE ON-GOING	 2008
R-4462 COLUMBUS	US 74-76, WEST OF WHITEVILLE TO THE PROPOSED US 17 WILMINGTON BYPASS.	UNFUNDED PROJECT		
R-3436 BRUNSWICK COLUMBUS	PROPOSED I-74 CORRIDOR, US 17 AT THE SOUTH CAROLINA STATE LINE IN BRUNSWICK COUNTY TO US 74-76 EAST OF WHITEVILLE IN COLUMBUS COUNTY.	FEASIBILITY STUDY REEVALUATION IN PROGRESS		
R-2413* GUILFORD ROCKINGHAM	US 220-NC 68, SR 2133 (PLEASANT RIDGE ROAD) TO US 220-NC 68. NEW LOCATION.	PLANNING R/W CONST.	COMPLETE ON-GOING 2008	 2012 AFTER 2012
I-4921 GUILFORD RANDOLPH	NORTH OF SR 1462 (WEST PRESNELL ST. EXT.) IN ASHEBORO TO I-85 IN GREENSBORO. UPGRADE TO INTERSTATE STANDARDS.	UNFUNDED PROJECT		
R-2501* RICHMOND	US 1, SOUTH CAROLINA STATE LINE TO SR 1001. WIDEN.	PLANNING R/W CONST.	ON-GOING 2006 2009	JAN 2006 AFTER 2012 AFTER 2012
I-4923 RICHMOND	US 74/I-74 (FUTURE) TO SOUTH CAROLINA STATE LINE. EXPRESSWAY ON NEW LOCATION	SCHEDULED FOR PLANNING AND ENVIRONMENTAL STUDY ONLY		
I-4406 MONTGOMERY	SOUTH OF STEEDS TO NORTH OF EMORY. WIDEN OUTSIDE SHOULDERS TEN FEET.	PLANNING R/W CONST.	ON-GOING 2008 2009	NOV 2006 2009 2010
I-4407 RANDOLPH	SOUTH OF NC 134 – US 220 BUS. TO NORTH OF SR 1462 IN ASHEBORO. SAFETY IMPROVEMENTS TO BRING FACILITY TO INTERSTATE STANDARDS.	PLANNING R/W CONST.	COMPLETE 2008 2009	 2009 2011

NOTES: R-609 IS NOT BEING BUILT TO INTERSTATE STANDARDS.

THERE ARE PORTIONS OF THE PROPOSED CORRIDORS THAT DO NOT MEET INTERSTATE STANDARDS AND DO NOT HAVE A PROJECT SCHEDULED TO IMPROVE THEM.

* INDICATES INTRASTATE PROJECT

Source: NCDOT

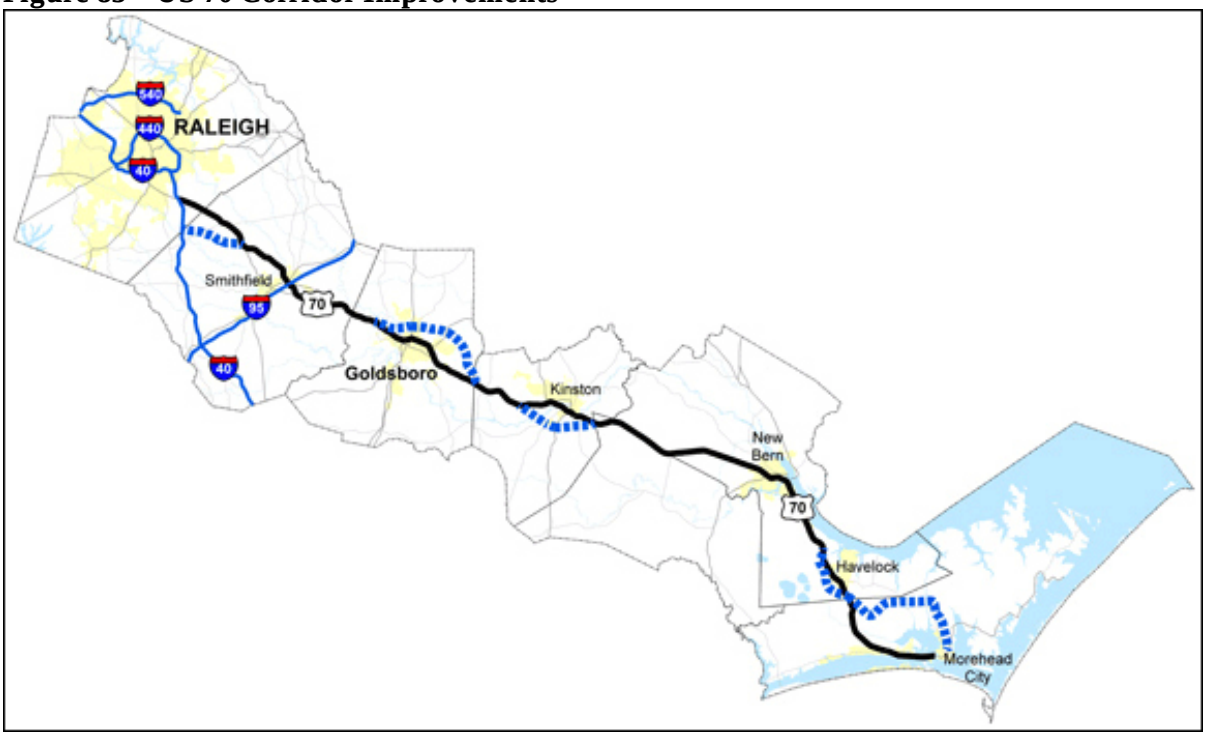
7.7.4.3 Access Needs to Port of Morehead City

US 70 is one the primary east-west corridors traversing Eastern NC. The corridor is the major facility connecting Raleigh, Smithfield, Goldsboro, Kinston, and Havelock to the Port of Morehead City. The corridor is heavily used for freight movement.

During the summer months, motorists headed to the Crystal Coast beaches frequently use the corridor. Equally important, US 70 serves as a major hurricane evacuation route in event of an oncoming storm. Traffic volumes along the corridor vary, but are highest in the Clayton and Goldsboro areas. This facility is also an important piece of multiple highway systems. The entire corridor is included in the National Highway System (NHS), the North Carolina Intrastate System, and the National Military Highway System, also known as STRAHNET. The importance of this corridor has also been recognized in the Rural Prosperity Task Force Report, as one of three corridors statewide that should be improved to assist economic development in the primarily rural areas.

As shown in **Figure 85**, NCDOT is currently undertaking multiple activities to improve passenger and freight movement along the US 70 Corridor from Raleigh to the Port at Morehead City.[35] Five bypasses around Clayton, Goldsboro, Kinston, Havelock and Morehead City are vital to ensure the efficient movement of freight well into the future.

Figure 85 – US 70 Corridor Improvements



Source: NCDOT

[35] http://www.ncdot.org/doh/preconstruct/tpb/SHC/studies/US70/Overview/

The following provides the status of each of these bypasses:[36]

Clayton Bypass
Description: I-40 to US 70-70 Business; Freeway on New Location
Length: 9.5 miles
Planning: Complete
Design: Complete
ROW Acquisition: Complete
Construction: In Progress

Goldsboro Bypass
Description: West of NC 581 to East of SR 1323; Four-Lane Freeway on New Location.
Length: 20.6 miles
Planning: Complete
Design: Complete
ROW Acquisition: In Progress
Construction: Anticipated to Begin in 2008

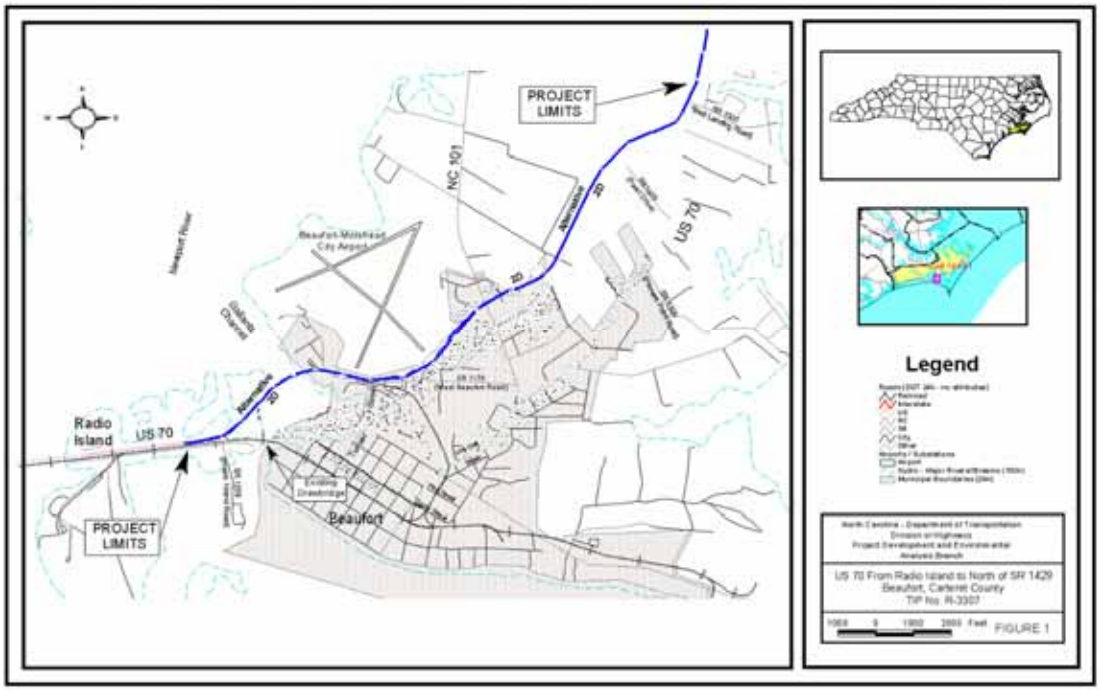
Kinston Bypass
Description: Four-Lane Freeway on New Location.
Length: 12.4 miles
Planning: Programmed for Planning and Environmental Studies Only
Design: Unfunded
ROW Acquisition: Unfunded
Construction: Unfunded

Havelock Bypass
Description: North of Pine Grove to North of the Carteret County Line; Four-Lane Freeway on New Location.
Length: 9.0 miles
Planning: In Progress
Design: In Progress
ROW Acquisition: Anticipated to Begin in 2010
Construction: Unfunded

Northern Carteret Bypass
Description: Havelock Bypass to Beaufort; Construct Multi-lane Facility.
Length: 33.1 miles
Planning: Unfunded
Design: Unfunded
ROW Acquisition: Unfunded
Construction: Unfunded

[36] NCDOT

Gallants Channel Bridge
Description: US 70 from Radio Island to North of SR 1429 Beaufort, Carteret County
Length: 2.2 miles
Planning: In Progress
Design: In Progress
ROW Acquisition: Anticipated to Begin in 2008
Construction: Unfunded



Source: NCDOT

7.7.4.4 Port Corridor Improvements

The main roadways comprising the Port corridors in North Carolina can be identified as:

- I-40 from Wilmington to Raleigh;
- US-421 from Wilmington to Greensboro;
- US-74 from Wilmington to Charlotte;
- US-17 from Wilmington to Morehead City;
- US-70 from Morehead City to Raleigh;
- I-40/I-85 from Raleigh to Greensboro; and
- I-85 from Greensboro to Charlotte.

As stated earlier, some of these roads are scheduled for significant improvement already. Improving the level of service by constructing bypasses and improving capacity in isolated areas can increase the efficiency of freight movements in North Carolina.

7.7.4.5 Critical Last Mile Needs

SR 1140 (Burnett St) from US 421 to Myers Street is identified as an official intermodal connector for the Port of Wilmington. Improving this link to the port is vital since it provides direct connectivity to the port.

7.7.4.6 Rail Access to Ports

As terminals, ports handle the largest amounts of freight, more than any other types of terminals combined. To handle large quantities of freight, port infrastructures jointly have to accommodate transshipment activities both on ships and on land and thus facilitate convergence between land transport and maritime systems. Rail plays a vital role in transporting goods to and from ports, and maintaining and expanding this link is critical. Re-establishing freight service and offering alternative rail routes to and from the Port of Wilmington was examined in the *Economic Feasibility Study for the Restoration of the Wallace to Castle Hayne Rail Corridor and Associated Port/Rail Improvements*. In the 1980's, 27 miles of railroad that connected Wallace and Castle Hayne were taken out of service and the tracks were removed by CSXT. To preserve the ROW of this important rail corridor, the Department acquired the rail line from CSXT. To improve freight rail efficiency and to encourage usage, reopening the Wallace and Castle Hayne connection would provide the Port of Wilmington direct access to markets both north and west of Wilmington. The estimated cost to restore freight service, which includes rail improvements at the Port of Wilmington and connections in Goldsboro, would total $81 million.[37] The study also recommended developing dual rail carrier access to both Wilmington and Morehead City. This improvement would assist in retaining existing customers and would support attracting new customers to these two ports.

[37] Economic Feasibility Study for the Restoration of the Wallace to Castle Hayne Rail Corridor and Associated Port/Rail Improvements, February 2004

7.7.5 NCDOT and NCSPA Coordination

The NCSPA coordinates with NCDOT on transportation access needs and for the purposes of this report, most of the highway related needs associated with accessing North Carolina's ports are captured in the Highway and Bridges needs. This section identified numerous highway related needs in accessing the Port of Wilmington, Morehead City (last-mile needs) and the new North Carolina International Port. Many of these projects listed below are already planned and programmed due to the close working relationship that exists between these two state partners.

7.7.5.1 Port of Wilmington

- Memorial Bridge;
- Front Street and Burnett Blvd access to the North Gate;
- Carolina Beach Road and Shipyard Blvd. access to the South (container) Gate;
- River Road;
  - Trucks cross back and forth with chassis;
  - Access to new River Road property; and
  - Future access on-and-off of the new Cape Fear Skyway Bridge.

7.7.5.2 Port of Morehead City

- Intersection of Arendell Street and US-70 at the General Terminal entrance;
- Intersection of Causeway Drive and US-70 at Radio Island; and
- Replacement of the railroad bridge bascule across the Newport River between the General Terminal and Radio Island.

7.7.5.3 Ports Authority Revenues

As an operating ports authority, NCSPA produces most of their revenues by providing services to customers. These services include cargo movement, land and facilities rentals, and supplemental labor. Some of the cargo movement services the ports provide include:

- Berthing space for cargo ships;
- Loading and unloading cargo to and from ships, trucks and rail cars;
- Cranes and other equipment to move cargo; and
- Temporary cargo storage.

As a primarily self-sustaining, revenue-producing state agency, the NCSPA operates much like a normal business; paying for expenses with revenues. This allows them to provide a valuable service to the state without burdening taxpayers - helping develop North Carolina's economy and promote local business growth, and creating more jobs.[38]

[38] Stem to Stern

Chapter 8. Approach for Updating the Next Statewide Transportation Plan

Over the next few years, NCDOT staff will undertake the process of updating highway, bridge, and non-highway needs across the three NCMIN Tiers. It is imperative that the following occurs prior to beginning this extensive exercise:

Critical Changes:

- The HPMS database needs to reflect more accurately the lower classified roadways that are included in the Subregional Tier. This improvement will allow HERS-ST to identify needs associated with this tier, which comprises over 80 percent of the state-maintained roadway miles.
- The HPMS database needs to include an attribute identifying the NCMIN Tier.
- Early in the process, NCDOT staff will need to update the following minimum tolerable conditions (MTCs) and other metrics before running HERS-ST and NBIAS:
  - IRI;
  - PSR;
  - Maximum PSR after construction;
  - Average PSR gain from resurfacing;
  - Maximum pavement life;
  - Surface type;
  - V/C Ratio;
  - Lane width;
  - Shoulder width;
  - Shoulder type;
  - Horizontal alignment;
  - Vertical alignment;
  - Curve and grade;
  - Maximum Number of Lanes after Widening; and
  - Pavement thickness.

- Early in the process, NCDOT staff will need to update the unit cost by rural and urban roadway functional classification for the following improvements:
  - Reconstruction;
    - Lane widening;
    - Pavement;
  - Resurfacing;
    - Lane widening;
    - Pavement;
  - Shoulder improvements;
  - Add lanes;
    - High cost;
    - Normal cost;
  - Alignment;
    - High cost;
    - Normal cost;
  - ROW; and
  - Bridge replacement.
- If the analysis year and the HPMS database year are not the same, then NCDOT staff will need to update traffic volumes (AADT) and include them in the HPMS database. To accomplish this, using the HPMS database from 4 or 5 consecutive years, compound annualized growth rates (CAGR) can be computed for each roadway functional classification and then applied to the HPMS database being used in the STP update. Compound annual growth rate was the method used in the 2006 STP update to assess the average growth of traffic (AADT) over time.
- The needs should be categorized in the following manner:
  - Expansion;
    - New Location / Urban Loop – Most recent STIP;
    - Interstate Widening – HERS-ST;
    - Reconstruction with additional lanes – HERS-ST;
    - Adding lanes without modernization – HERS-ST;

- Modernization;
  - Widen narrow lanes / safety – HERS-ST;
  - Resurface / improve shoulders – HERS-ST;
  - Pavement reconstruction – HERS-ST;
- Preservation;
  - Preservation - highway resurfacing – HERS-ST;
  - Rural Local Roads / Secondary Roads – NCDOT; and
- Maintenance – NCDOT Annual Maintenance Report.

- NCDOT staff will need to identify secondary roadway needs, which is part of the Subregional Tier not included in the HPMS database.
- NCDOT staff will need further training on HERS-ST to ensure they understand how to develop sound highway needs across all tiers.
- NCDOT staff will need further training on NBIAS to ensure they understand how to develop sound bridge needs across all tiers.
- The NBIAS results in the 2005 STP update used an annual budget of $1 billion per year. This high budget was used to get "full engineering" bridge needs. It is recommended, this same budget be used for future updates.
- NCDOT staff will need to make sure the National Bridge Inventory (NBI) file *does not* include improvement cost, since if this value is present it will be used instead of the updated costs.
- NCDOT staff will need to identify manually bridge expansion, new location and urban loops from the most recent STIP.
- Each non-highway Division will need to annually update their expansion, modernization, and preservation needs by NCMIN Tier and by five-year (Fiscal Year) funding periods.
- NCDOT staff will need to update the 25-year revenue projections:
  - Update state revenue source (motor fuel taxes, licenses and fees, investment income, and other new sources);
  - Update the level of federal-aid funding received by NCDOT for each authorization period (3% was used in the 2006 STP update); and

- Calculate total net present value of revenues.

NCDOT should consider the following items before updating the STP:

- To get a better understanding of backlog needs, it is suggested that each non-highway Division identify backlog (existing) and accruing (future) needs by improvement type (expansion, modernization, and preservation).
- NCDOT staff should provide an updated estimate of maintenance needs by NCMIN Tier and this should be added to the expansion, modernization, and preservation to get the total roadway needs.
- NCDOT should research the capacity levels input into the HPMS database to see if they changed from the 2005 HPMS database. If a capacity change is found, then this will have an impact on expansion needs.
- Consult with State, tribal, and local agencies responsible for:
  - Land use management;
  - Natural Resources;
  - Environmental Protection;
  - Conservation; and
  - Historic Preservation.
- Consider and implement projects, strategies and services that support the economic vitality of non-metropolitan areas;
- Consider safety and security improvements on the transportation system;
- Promote consistency between transportation improvements and State and local planned growth and economic development patterns; and
- Should consider coordination of planning activities between states.