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FINAL REPORT

TENNESSEE LONG-RANGE TRANSPORTATION PLAN

CHALLENGES AND OPPORTUNITIES

NOVEMBER 2005

TDOT

PLAN *Go.*

A Long-Range Multimodal Strategy

Prepared by
The PBS&J Consultant Team
in Association with HNTB

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Tennessee Long-Range Transportation Plan

Challenges and Opportunities
Final Report

November 2005

Executive Summary

ES.1. Purpose of the Report

This *Challenges and Opportunities* report defines the baseline conditions of Tennessee's transportation system and assesses the many uses and demands placed on the system. The report also examines how these demands influence travel, transportation, and development patterns in Tennessee, and it identifies trends and issues that must be considered as part of the planning process. The report provides the foundation for an informed discussion about the state's transportation future.

Two key trends emerge from the report's analysis:

- The state's population is growing and its demographic composition is changing. With population growth comes urban development and expansion, consumer demands, and an increased strain on the existing transportation infrastructure for the movement of both people and freight.

- With this growth, the existing transportation infrastructure is aging and is, in some cases, not designed to meet current levels of traffic or current safety and design standards.

ES.2. Transportation System Overview

The Tennessee Department of Transportation (TDOT) is directly responsible for, or is a service partner with some responsibility for, the following:

- The operation and maintenance of 14,150 miles of state highways
- 74,370 miles of local county roads and city streets
- 19,650 state- or locally owned bridges
- 25 public transportation systems serving 95 counties
- 19 short line and 6 major railroads that operate on 3,081 miles of track
- 1,062 miles of navigable waterways and 172 ports
- 84 airports of varying sizes
- Bicycle and pedestrian facilities throughout the state

To determine the future of the state's transportation system, TDOT works collaboratively with its regional and local partners, including Metropolitan Planning Organizations, Economic Development Districts, human resource agencies, and cities and counties.

ES.3. Demographic, Social, and Environmental Trends

The first step in planning for a strong multimodal transportation system is to understand the demographic, social, and environmental issues and trends that influence travel.

The demographic characteristics of Tennessee's population yield insight into travel behavior and transportation system use. The state's population is growing at a rate of 1 to 3 percent annually.

By 2030, Tennessee's population is expected to increase by more than 2.2 million, resulting in a population of nearly 8 million. Statewide employment is also expected to grow from 3.5 million in 2000 to more than 5 million by 2030, an increase of more than 4 percent. With population growth comes the expansion of many urban areas. Expanding urban and suburban development, and the growth of consumer demand and expansion of the state's economy, will further strain transportation systems.

The sections below summarize some of the implications related to Tennessee's changing demographic, social, and environmental characteristics.

Population and Employment Trends and Implications

- The state's population in 2000 was 5,689,283, an increase of 17 percent from 1990. From 2005 to 2030, the population is expected to increase at a rate of 1 to 3 percent annually, and is forecasted to reach nearly 8 million by 2030. Population growth will continue to place increasing demands on Tennessee's transportation system, particularly in suburban and rural areas.

- The baby boom generation (persons born between 1946 and 1964) comprises the largest population segment (35 percent) in Tennessee; those 62 years and older account for approximately 15 percent of the current population. In addition, the University of Tennessee's Center for Business and Economic Research reports that the most rapidly growing population segment through 2025 is the 65 to 69 age group for both males and females. The baby boom generation's work-related travel and economic activity will continue to place significant demands on the state's transportation system. An aging population will place increased demands on special public transportation services for medical and personal travel.

- Between 1990 and 2000, the state's population density increased from 118.3 to 138.0 people per square mile. In comparison, the national average for people per square mile is 79.6. Growth in the state's suburban areas along with rural development will result in longer peak periods, as people travel farther to reach their destinations from suburban or rural communities.

- Suburban job expansion will increase reverse commute trips, generating bi-directional peak hour freeway congestion and accentuating the need for suburban job access for workers residing in center cities.

Land Use Trends and Implications

- Because much of Tennessee's recent growth has occurred in suburban areas, commuting patterns are not only suburb-to-city, but also are increasingly suburb-to-suburb and city-to-suburb, thus creating new demands on the state's transportation system.

- Because much of the new development has been lower density, many subdivisions are designed primarily for automobile access with little regard for other modes, including public

transportation, pedestrians, and bicycles. These newer developments often do not recognize the special needs of the young, elderly, or disabled, or those without automobiles.

- Increased growth in urban and suburban areas pressures local, state, and regional planning agencies to provide transportation-related services and utilities.

Environmental Trends and Implications

- TDOT and its service partners must find a way to support local development goals and transportation demands and still meet the air quality standards established by the Environmental Protection Agency (EPA). One major trend in air quality is the promulgation of a new 8-hour standard for ozone established by EPA. Based on the new standard, 18 counties in Tennessee are in nonattainment with national ambient air quality standards for ozone. A greater burden will be placed on these 18 counties to show how they can support local development goals and transportation demands and still meet EPA air quality standards.

- If not properly considered as part of the long-range planning and design process, major environmental constraints can affect the implementation of transportation improvements.

Energy Use and Fuel Consumption Trends and Implications

- Of the state's petroleum consumption, 50 percent is used for gasoline. The Tennessee transportation system consumes 29 percent of the state's energy, and petroleum fuels 96 percent of the state's transportation sector. This heavy dependency on petroleum products is sustainable only as long as these products are readily available and affordable.

- To improve the state's energy system, the transportation sector could use more efficient vehicles, cleaner alternative energy sources, and reformulated fuels. According to the Victoria Transportation Policy Institute, if such improvements were adopted, an approximate 20 percent personal transportation energy savings could be realized.

Tourism Trends and Implications

- Tourism continues to be an important economic contributor to Tennessee's overall economy. In 2002, 38.9 million tourism-related person-trips were taken to and from Tennessee. The primary mode of transportation was the automobile, which accounted for 87 percent of the tourism-related transportation. Air passengers made up 8 percent of tourist travel, while other modes contributed the remaining 5 percent[1]. The heavy tourism has directly impacted Tennessee's transportation infrastructure.

- With economic globalization and information technology development, businesses will continue to lose their links to the specific communities in which they are located. This may result in a continued trend in employment and residential decentralization, further increasing travel on the state's highways and local road systems.

[1] *TravelScope® 2002*

Technology Trends and Implications

- Tennessee's ability to accommodate communications system conduits in transportation rights-of-way or on other properties and facilities is essential now and will be imperative in the future. It is important for the state's communications providers and TDOT to establish the institutional structures needed to enable shared right-of-way agreements.

- Technology brings an increased flexibility to work or shop from home, thus reducing the necessity of some automobile trips.

ES.4. Transportation System Trends

As Tennessee's existing transportation infrastructure ages, the state will continue to have a need to preserve and rehabilitate bridges, pavement, and other assets. Tennessee will face the challenge to provide additional roadway capacity, enhance passenger transportation, and address the growing movement of freight by aviation, rail, and waterway–all with limited funds.

Some of the key implications related to changes in Tennessee's transportation system are described below.

Highway and Bridge System Trends and Implications

- Between 1980 and 2002, annual vehicle miles of travel (VMT) on the state's roads and bridges doubled, increasing from 34 billion to 68 billion. Conversely, while the amount of travel doubled, the lane miles in the highway system increased by only 8 percent, from 172,000 to 185,000. This difference is contributing to increased traffic congestion.

- A preliminary assessment of the transportation system reveals that for current traffic conditions, capacity is reasonably sufficient in most intercity travel corridors; however, within the metropolitan areas and several corridors extending from the metropolitan areas, congestion is a growing concern. Urban areas have fewer highway lane miles than rural areas, but accommodate more vehicle travel than do rural areas, with more than 36 billion VMT. The increased travel in new suburban areas has resulted in traffic congestion in the larger metropolitan locations.

- TDOT maintains 14,150 miles of highways and 8,043 bridges on the state system. The Tennessee interstate system is in excellent condition. Of the interstate system measured for performance quality index, 97.1 percent was determined to be in excellent condition, with the remaining 2.9 percent rated in good condition. Pavement surface condition for nearly all of U.S. and state highways is in excellent or good condition. For bridges, 1,451 of the 8,043 state-maintained bridges are either structurally deficient or functionally obsolete. The good condition of Tennessee's highways and bridges allows flexibility to respond to future transportation needs rather than having to allocate a disproportionate amount of funds to maintain the existing system. The existing transportation infrastructure, however, is aging and is, in some cases, not designed to meet current levels of traffic or current safety and design standards.

- On a tonnage basis, approximately 75 percent of freight (estimated at 370 tons) transported to, from, or through Tennessee is by truck. Additionally, trucks are the only means of supply to 85 percent of the state's communities and carry approximately 80 percent of the manufactured freight transported in Tennessee. The amount of freight moved by truck continues to increase. Higher levels of truck traffic have implications on traffic congestion, safety, and the structural integrity and smooth riding surfaces of highways and bridges, and can result in increased maintenance requirements. If some growth in freight movement could be shifted to other travel modes, a positive effect on traffic congestion and required highway maintenance could be achieved.

Intelligent Transportation Systems/Information Management Trends and Implications

- Currently, intelligent transportation systems (ITS) operations in Tennessee focus primarily on travel and traffic management, commercial vehicle operations, information management, and maintenance and construction management. TDOT also provides a supporting role to public transportation and emergency management. Additional coordination is still needed to fully realize the benefits of ITS technology. Each strategic priority will require different combinations of legislative involvement, partnerships, funding levels, and internal agency staffing.

Aviation System Trends and Implications

- TDOT is working to develop an airport system that is adequate to meet Tennessee's current and future aviation needs. Challenges include maintaining a safe and reliable airport system, and, when considering system expansion, minimizing environmental impacts and non-compatible land uses.

- The Airport System Plan provides Tennessee with a plan for an effective aviation system. Each airport is now being reviewed to determine future onsite improvements necessary to implement the plan. Additionally, TDOT is evaluating improvements to airport access as part of individual site plans.

- Tennessee has six commercial service airports. Obtaining sufficient service levels and pricing from commercial operators, important to both the state's residents and businesses, often depends on a number of market-related factors and is a concern for those markets served by smaller commercial airports.

Waterway System Trends and Implications

- Tennessee has the nation's fifth largest navigable inland waterway system. The state has 1,062 miles of navigable waterways and 172 ports located along or inside its borders. Tennessee also has two direct links to seaports on the Gulf of Mexico via the Mississippi River and the Tennessee-Tombigbee waterway. These direct links offer significant international opportunities. The functions of Tennessee's waterway system include the transport of commercial and special freight as well as bulk commodities, recreation usage, and water supply. In order for Tennessee's waterways to provide a greater contribution to freight movement, the waterway system must be upgraded. Improvements include replacing

aging infrastructure at a number of major locks and dredging rivers in key locations to allow use by deeper barges. While TDOT has an interest in seeing that the waterway system functions effectively, the Tennessee Valley Authority and the U.S. Army Corps of Engineers have the primary responsibility for capital improvements to and operations of these waterways. TDOT is exploring ways to support these agencies and private operators to increase movement of freight via waterway.

Rail System Trends and Implications

- Tennessee is served by six Class I major freight railroads and 19 short line railroads, which, when combined, comprise a network of 3,081 miles of track. In 1998, 80 million tons of freight valued at $33 billion was moved by rail. In addition, freight moved by rail is expected to increase to 137 million tons by 2020. While shipment of freight over rail is a viable and growing alternative to shipment by truck, the projected growth in rail traffic raises the possibility of increased rail/vehicle conflicts, traffic delays, and noise impacts.

- While increased use of freight rail could decrease demands on Tennessee highways, it could also require increased public investment in rail-related infrastructure to add sufficient capacity. Intermodal connectors and access may also require additional investment.

Public Transportation System Trends and Implications

- Further development of other travel modes, such as public transportation, could potentially offset increases in traffic congestion. Total public transportation ridership in Tennessee in 2003 exceeded 30 million trips and, since 1998, ridership has grown by 2.3 percent. Public transportation accounts for approximately 3 percent of the total trips taken in urban areas. In past years, TDOT has provided approximately 17 percent of statewide public transportation operating costs and 11 percent of capital costs. Past funding constraints have limited the opportunity for enhancing public transportation to meet additional needs and services. It is anticipated that over the next 10 to 20 years, if funding is available and provided, increased fixed route services and newer premium services could provide cost-effective mobility solutions as our highway system capacity needs become more challenging to construct.

- In order for public transportation use to increase, it must be competitive with other transportation modes. Additionally, to increase ridership, public transportation service must be more frequent and more comfortable, provide convenient access to destinations, and offer competitive total travel times. The projected growth in rural populations will create the need for additional public transportation services in those areas.

Bicycle and Pedestrian System Trends and Implications

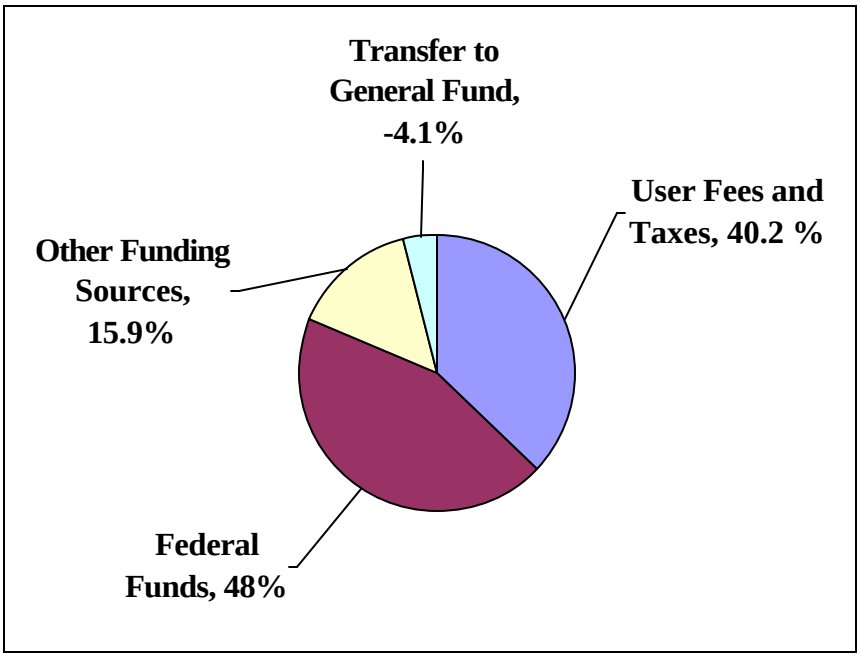
- The lack of bicycle and pedestrian facilities limits their utility as travel modes. Walking and bicycling made up about 1.6 percent of work-related trips in Tennessee in 2000, making them the second most popular forms of travel after driving. As part of the Long-Range Transportation Plan, TDOT is developing a bicycle and pedestrian plan. Improving bicycle and pedestrian facilities will require identifying fundable, feasible bicycle or pedestrian

projects that connect destinations. If bicycle or pedestrian use is to increase, new highway and land use development projects must consider the safety of bicycle and pedestrian movement.

ES.5. Financial Trends

TDOT's program is currently run on a pay-as-you-go basis. Strictly speaking, there is not a surplus or deficit, such as in other programs. The majority of the program is funded through highway user taxes and from federal funds. A portion of TDOT's budget is funded through bond authorizations in lieu of selling bonds. TDOT's FY 2004-05 budget is just over $1.6 billion. Highway user fees and federal funds account for more than 88 percent of TDOT's revenues. These revenues are derived from the sources and programs shown below.

TDOT Revenue Sources (Fiscal Year 2004-05)



Of the total TDOT budget of $1.6 billion, public transportation in the state receives $56 million from a combination of federal, state, and local funds. The combined budget for the aviation, rail, and waterway modes is nearly $45 million when federal, state, and local sources are totaled. The majority of the budget supports maintenance, equipment, physical plant, administrative functions, and highways and bridges.

Major revenue sources for TDOT's program are shown below.

Total TDOT Budget for FY 2004–05 by Major Source of Revenue

Source	Amount ($M)	Share of Total (%)
Highway User Fees and Taxes	650,400	40.2
Miscellaneous Department Revenues	28,600	1.8
Fund Balance and Reserves	12,000	0.7
Bond Authorization	159,000	9.8
Transportation Equity Fund	21,600	1.3
Federal	777,173	48.0
Local	36,872	2.3
Transfer to General Fund	-65,800	-4.1
Total	1,619,845	100.0

Source: TDOT budget documents

Chapter 5 of this report presents a preliminary list of potential future revenue sources. The expectation is that this list will be refined as the planning and review process moves forward and as the successor legislation to TEA-21 is passed.

Financial Implications

The major financial implications identified for the transportation system are summarized below.

- The continued diversion of transportation revenue to support the state's general fund obligations will exacerbate the state's challenging transportation needs.
- Increasing demand for transportation services and for transportation system operation and maintenance will require more flexibility in using available funding and accessing new sources of capital funding.
- Changes in technology and the energy supply will likely affect Tennessee's transportation revenues as gasoline consumption per unit of transportation begins to drop. These changes will create the need for new sources of transportation revenue.
- By using unissued bond authorizations, TDOT is limited in its ability to expand the program. The requirement for debt service payments constrains TDOT's cash flow. Because TDOT is managing as much bond authorization as it is, program expansion requires identifying a new revenue source. Without a new revenue source, TDOT would have to reduce the current highway program to permanently cancel the rolling window of bond authorization.

ES.6. Conclusion

This report represents a first step in the long-range planning process. The report provides a foundation for decisions that must be made on how resources could be applied over the next 25 years to best achieve and develop an integrated transportation system that serves all of Tennessee's residents and visitors. The information in this report will be used to help identify long-range goals, objectives, and performance measures. These three elements will then serve as the foundation for further analysis of transportation needs and ultimately the establishment of transportation priorities.

Contents

Figures

Tables

Exhibits
(Exhibits follow Page 6-1.)

Acronyms and Abbreviations

BTU	British thermal unit
CAA	Clean Air Act
CFR	Code of Federal Regulations
cpg	Cents per gallon
EDD	Economic Development District
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FIRE	Fire, Insurance, and Real Estate
FO	Functionally obsolete
FR	*Federal Register*
FY	Fiscal Year
GIS	Geographic information systems
HRA	Human Resource Agency
HUD	U.S. Department of Housing and Urban Development
IM	Incident management
IT	Information technology
ITS	Intelligent transportation systems
LOS	Level of service
LRTP	Long-Range Transportation Plan
mph	Miles per hour
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NBI	National Bridge Inventory
PC	Public Chapter
PQI	Performance quality index
SD	Structurally deficient
TBI	Timber Bridge Initiative
TDOT	Tennessee Department of Transportation
TEA-21	Transportation Equity Act for the 21st Century
TEF	Transportation Equity Fund
TPU	Transportation and Public Utilities
TRIMS	Tennessee Roadway Information Management System
TSPO	Tennessee State Planning Office
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
UT CBER	University of Tennessee Center for Business and Economic Research
VMT	Vehicle miles of travel

Chapter 1

Purpose of the Report

1.1. Purpose

The Tennessee Department of Transportation (TDOT) is developing a Long-Range Transportation Plan (LRTP) to provide a basis for making informed transportation decisions. The LRTP will identify Tennessee's transportation system needs to meet user expectations for the movement of both people and goods for the next 25 years. It will establish vision and policy structures, set forth strategies, provide a framework for directing investments, and identify the financial resources needed to sustain the plan's vision.

This *Challenges and Opportunities* report is the first step in the long-range planning process. This report defines the baseline conditions of Tennessee's transportation system and includes an assessment of the many uses and demands placed on the system. The report also examines how these demands influence travel and transportation patterns in Tennessee and identifies trends and issues that must be considered as part of the planning process. The report provides the foundation for an informed discussion about the state's transportation future.

1.2. Overview

While this report contains significant and detailed data, two key trends emerge from the report's analysis: (1) changes in population and (2) the impact that an aging transportation system will have on the state's ability to meet future transportation demands.

The state's population is growing and its demographic composition is changing. With population growth comes expansion of many urban areas. Expanding urban and suburban development as well as growth of consumer demand and expansion of the state's economy place increased strains on the existing transportation systems.

At the same time, the existing aging transportation infrastructure is in some cases, near obsolescence. Tennessee will continue to face the need to preserve and rehabilitate bridges, pavement, and other transportation assets while also addressing needs for additional capacity.

This report includes chapters that discuss the following topics:

- Chapter 2, Transportation System Overview
- Chapter 3, Demographic, Social, and Environmental Trends
- Chapter 4, Transportation System Trends
- Chapter 5, Financial Trends
- Chapter 6, Conclusion

Chapter 2

Transportation System Overview

Before considering the many factors that impact the transportation system, it is necessary to clearly define both the system and the agencies and organizations that will play roles in planning for the future of that system.

2.1. The Transportation System

TDOT provides and maintains a large statewide transportation system that allows travel by a variety of modes such as private vehicle, truck, bus, water, rail, or airplane. Each mode uses supporting facilities that combine to make an integrated transportation system. Tennessee's transportation system includes highways, public transportation, railroads, waterways, airports, and bicycle and pedestrian facilities. The system connects communities, retail centers, industries, businesses, recreational areas and natural features, and also supports commerce, recreation, and tourism in the state. Exhibit 1[2] shows the highway system that connects the state's larger communities. Exhibit 2 shows the locations of major truck, rail, aviation, and waterway ports or terminals. (Details on each travel mode are in Chapter 4 of this report.)

TDOT is directly responsible for, or is a service partner with, the following transportation systems:

Highways and Bridges

- 14,150 miles of state highways
  - 1,073 miles of interstate
  - 13,077 miles of state roads
- 74,370 miles of local county roads, city streets, and other jurisdictions
- 8,043 state-owned or maintained bridges
- 11,607 locally owned bridges
- 11 interstate welcome centers
- 9 truck weigh stations

Aeronautics

- 78 public use airports
- 6 commercial airports
- 110 heliports

[2] Exhibits are included at the end of this report.

Waterways

- 887 main channel miles of navigable rivers
  - Cumberland River (310 miles)
  - Mississippi River (176 miles)
  - Tennessee River (401 miles)
- Six ports along the Mississippi River

Railroads

- 19 short line railroads operating on 746 miles of track
- 6 major rail lines operating on 2,335 miles of track
- 1 passenger line operated by Amtrak on 132 miles of track along western Tennessee

Public Transportation

- 25 public transportation systems serving all 95 counties
  - 5 large metropolitan systems (metropolitan areas with populations over 200,000)
  - 6 urban systems (in metropolitan areas with populations between 50,000 and 200,000)
  - 3 trolley systems (Gatlinburg, Pigeon Forge, and Franklin)
  - 11 rural transportation systems in each Human Resource Agency (HRA) areas

Bicycles/Pedestrians

- 8,500 roadway miles with 4-foot-wide shoulders that accommodate bicycles
- 150 miles of greenways, sidewalks, and trails

2.2. Regional and Local Partners in Transportation

TDOT understands that it cannot independently determine the future of the state's entire transportation system; further, it recognizes the importance of working with other state, local, and federal agencies, Metropolitan Planning Organizations (MPO), regional planning commissions (RPC), and other local organizations, businesses, cities, and counties. Systems are in place to foster this collaborative approach to transportation decision making. TDOT's relationships with local governments, MPOs, Economic Development Districts (EDD), and HRAs are described below.

2.2.1. Metropolitan Planning Organizations

Federal law requires all urbanized areas with populations of 50,000 or more to maintain a continuing, comprehensive, and cooperative planning process, overseen by an MPO. Tennessee has 11 MPOs including Bristol, Chattanooga, Clarksville, Cleveland, Jackson, Johnson City, Kingsport, Knoxville, Lakeway (Morristown), Memphis, and Nashville. The MPO locations are shown in Exhibit 3.

MPOs have a formal role in the transportation planning process. Their executive boards, which include local elected officials and the governor, provide policy direction and develop, review, and approve transportation plans within their jurisdictions. The technical committees, which are comprised of professional transportation planners and engineers from state and local governments and other related agencies, provide planning expertise and advice to the executive boards.

Each MPO is responsible for the development of an LRTP for its own metropolitan area. The MPOs also prepare a financially constrained transportation improvement program that provides a 3- to 5-year schedule of all federally funded and regionally significant transportation projects to be implemented in the area.

2.2.2. Economic Development Districts

Tennessee has nine EDDs (see Exhibit 4) that provide for multi-county coordination and distribution of federal and state funds for development of local projects related to aging, nutrition, housing, and other public needs. These EDDs, created by the Tennessee legislature in 1965, were established to identify priority needs of local communities. Based on these needs, the EDDs work with their board members and other local citizens to develop plans to improve economic conditions in their communities. The plans define the steps needed to target and meet the most pressing economic needs and build community unity and leadership.

A critical role for the EDDs is the distribution of federal and state funds to local agencies working to meet established economic goals. The five EDDs in metropolitan areas receive funds directly from the U.S. Department of Housing and Urban Development (HUD). Funds for the rural EDDs are funneled through the Tennessee State Planning Office, which reports to HUD on the districts' expenditures and activities. Other sources of development district funds include the Department of Economic and Community Development, Human Services, the Tennessee Commission on Aging, and in some circumstances, TDOT. The Tennessee Development District Association may also request per capita dues from local government agencies, which leverage federal matching funds. Participation in this effort is nearly 100 percent.

The primary function of the EDD is economic development. Typically, transportation issues and projects have been considered only in support of economic development plans and programs.

2.2.3. Human Resource Agencies

TDOT coordinates with, and provides financial assistance to, each of the state's 11 HRAs that provide rural public transportation. These agencies provide demand response services using 7- to 15-passenger vans. The service focuses on providing basic mobility services to elderly, disabled, and low-income residents in rural areas.

2.2.4. Counties and Cities

Counties and cities in Tennessee play a vital role as service partners to TDOT in providing the transportation facilities and services necessary for an efficient transportation system. Local

programs available through TDOT are federal and state programs that improve roads and streets under local jurisdiction. These programs include the Surface Transportation Program, Congestion Mitigation and Air Quality Improvement Program, Optional Safety, Local Interstate Connectors, State Industrial Access Roads, Bridge Replacements, and Interchange Lighting. In addition, the State Aid Program provides funds to county governments to improve or rehabilitate local roads that are on the State Aid System. The Local Bridge Replacement Program is available to assist local governments with the replacement or rehabilitation of smaller deficient bridges of less than 150 feet. TDOT works with local officials to develop an annual work program listing the projects each county intends to pursue for the coming year.

Chapter 3

Demographic, Social, and Environmental Trends

This chapter documents baseline conditions and considers social, demographic, and environmental trends and issues that are likely to impact Tennessee's transportation system. The following trends, and their implications for the state's transportation system, are discussed in this chapter:

- Population and Employment
- Land Use
- Environmental
- Energy Use and Fuel Consumption
- Tourism
- Technology

3.1. Population and Employment Trends

Information on Tennessee's current population and employment levels, and their projected growth patterns, was collected to assess changes in transportation demand over the next 20 to 30 years. County-level forecasts of population and employment were obtained from the University of Tennessee Center for Business and Economic Research (UT CBER) and were available at 5-year increments through 2025. A linear regression methodology was used to extend the forecasts to 2030, the LRTP's horizon year. Statewide employment forecasts by business sector and county economic-sector data were compiled to develop future year county forecasts for Tennessee's population and employment levels.

3.1.1. Population

Population Change

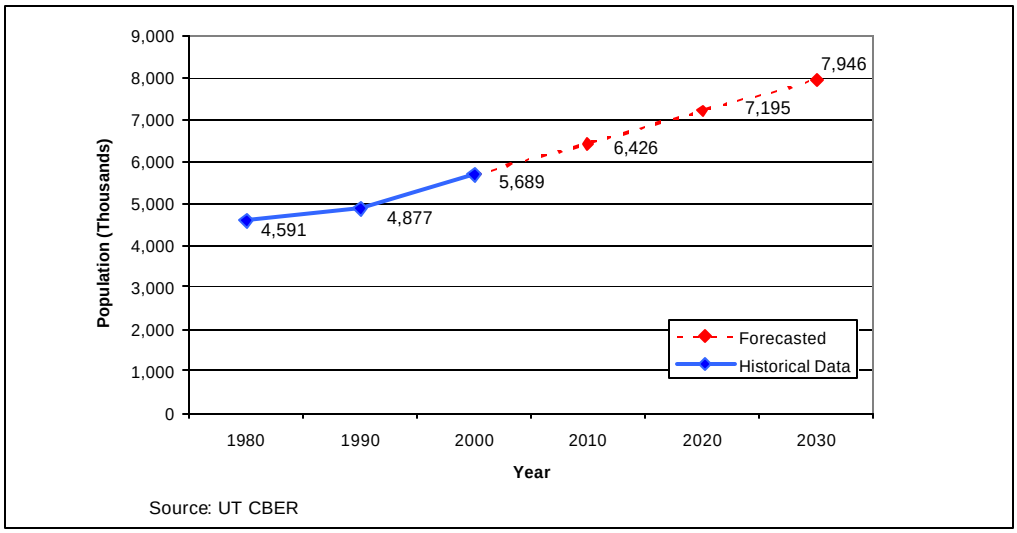
Tennessee experienced strong population growth during the 1990s, a trend that is expected to continue through 2030. A mild climate, low cost of living, scenic terrain, and a growing economy all contribute to the state's attractiveness. The projected population increase will lead to increased demands on the state's transportation system. Tennessee's population from 1980 to 2000 and forecasted population growth from 2000 to 2030 are shown in Figure 3-1.

Tennessee is the sixteenth most populous state in the nation, with a 2000 population of 5,689,283, an increase of 17 percent from 1990. This compares to 13 percent growth for the entire United States. In the last decade, Tennessee experienced the twelfth largest percentage increase and the fourteenth largest population increase in the United States. The population's increase from 1990 to 2000 is considerable, particularly compared to the 6 percent increase the previous decade. This strong population growth reflects the growth most of the southeastern states have experienced[3]. From 2005 to 2030, the population is expected to increase at a rate within a range of 1 to 3 percent annually[4], and is forecasted to reach nearly 8 million by 2030.

[3] *An Economic Report to the Governor of the State of Tennessee: On the State's Economic Outlook, January 2004*, UT CBER (http://cber.bus.utk.edu/erg/erg2004.pdf).

[4] Forecasted data from 2005-2025 were obtained from "Population Projections for the State of Tennessee" by the Tennessee Advisory Commission on Intergovernmental Relations and UT CBER. The 2030 forecast was calculated as described in the technical paper "Methodology for Population Forecast."

Figure 3-1. Tennessee Population 1980–2030



Population by county for 1990 and 2000, and the population change between 1990 and 2000, are shown in the following exhibits:

- Exhibit 5 shows the distribution of Tennessee's population by county in 1990.
- Exhibit 6 shows the distribution of Tennessee's population by county in 2000, the most recent census year.
- Exhibit 7 provides the population change by county between 1990 and 2000.

All counties in Tennessee had an increase in population from 1990 to 2000. The 14 counties in Tennessee with the greatest percentage growth (41 percent to more than 50 percent) between 1990 and 2000 were Cheatham, Cumberland, Hickman, Jefferson, Meigs, Montgomery, Robertson, Rutherford, Sevier, Stewart, Tipton, Union, Williamson, and Wilson. The most significant growth occurred in counties adjacent to urban areas and those along interstates, with the largest growth concentration in Rutherford and Williamson counties, adjacent to Nashville/Davidson County. Approximately 32 percent of the state's population lives in metropolitan areas as defined by the U.S. Census. While a wide variation in growth rates is expected for Tennessee cities and counties over the next 25 years, all counties are expected to have population growth.

Exhibit 8 shows forecasted county populations for 2030 and illustrates continued population growth in the counties near urban areas. The projected percentage increase in population growth is shown in Exhibit 9.

Of the five largest cities in Tennessee (those with populations greater than 100,000), the three with the largest projected percentage growth rates between 2000 and 2030 are:

- Clarksville (Montgomery County) 66%
- Knoxville (Knox County) 27%
- Nashville (Davidson County) 21%

For mid-sized cities (populations between 25,000 and 100,000), the cities with the largest projected growth rates are:

- Franklin (Williamson County) 99%
- Smyrna (Rutherford County) 96%
- Murfreesboro (Rutherford County) 82%
- Hendersonville (Sumner County) 59%
- Collierville (Shelby County) 40%

For smaller cities (populations between 10,000 and 25,000), the highest projected growth rates are:

- Brentwood (Williamson County) 145%
- Mount Juliet (Wilson County) 143%
- Sevierville (Sevier County) 136%
- LaVergne (Rutherford County) 106%

For small cities (populations less than 10,000), the highest projected growth rates[5] are expected in:

- Whiteville (Hardeman County) 325%
- Spring Hill (Maury County) 193%
- Gatlinburg (Sevier County) 124%
- Atoka (Tipton County) 120%
- Fairview (Williamson County) 107%

Minority Population

Tennessee's minority population accounted for 19 percent of the state's total population in 2000. As shown in Table 3-1, African-Americans consisted of 16.8 percent of the population; Hispanics, 2.2 percent; Asians, 1.2 percent; and the remainder of the minority groups totaling less than 2.5 percent. The Hispanic population, which tripled between 1990 and 2000, experienced the most significant growth rate. The Asian population increase in the same decade was the second fastest growing group in Tennessee, with 86.1 percent. Exhibit 10 shows that minority populations are heavily concentrated in west Tennessee and in larger metropolitan areas.

[5] Note that growth rates are usually higher for cities with lower populations than with higher populations because percentage changes are larger when comparing differences between low values with higher values. For example, a population increase of 1,000 is a more significant change in population for a city of 1,000 (100 percent increase) than for a city of 10,000 (10 percent increase).

Table 3-1. Tennessee's Minority Population

Race Alone or in Combination with One or More Other Races		% of Population
White	4,617,553	81.2
Black or African American	953,349	16.8
Hispanic or Latino (of any race)	123,838	2.2
Asian	68,918	1.2
American Indian and Alaska Native	39,188	0.7
Native Hawaiian and Other Pacific Islander	4,587	0.1
Other race	72,929	1.3

Note: Some categories include mixed race; therefore, percentages do not total 100.
Source: Census 2000

Age Distribution

The age distribution of Tennessee's population in 2000 is shown on Table 3-2. The baby boom generation (those persons born between 1946 and 1964) comprises the largest population segment (35 percent) in Tennessee. This generation includes people at the peak of their economic productivity. This age group's work-related travel and economic activity place significant demands on the state's transportation system.

Exhibit 11 shows the locations of higher percentages of elderly population by county, with higher percentages located in the northwest part of Tennessee and in several counties in middle and east Tennessee. Those 62 years and older account for approximately 15 percent of Tennessee's current population. However, the UT CBER report states that the most rapidly growing population segment through 2025 is the 65 to 69 age group for both males and females. The projected growth of this group is 114 percent. The numbers and locations of persons in this age category may lead to a greater need for public and special service transportation.

Table 3-2. Characteristics of Statewide Population for 2000

Category	Population	Percent
Male	2,770,275	48.7
Female	2,919,008	51.3
Under 5 years	374,880	6.6
5 to 9 years	395,813	7.0
10 to 14 years	395,155	6.9
15 to 19 years	395,184	6.9
20 to 24 years	386,345	6.8
25 to 34 years	815,901	14.3
35 to 44 years	902,527	15.9
45 to 54 years	786,916	13.8
55 to 64 years	533,251	9.4
65 to 74 years	382,852	6.7
75 to 84 years	238,994	4.2
85 years and over	81,465	1.4
Median age (years)	35.9	—
62 years and over	842,141	14.8

Source: Census 2000

Income

Another important indicator of Tennessee's demographic trends is median household income, which at $36,360 ranks Tennessee 39th among the 50 states. The United States' median household income was $41,994 in 2000. Table 3-3 shows persons below poverty level from the 2000 Census. In Tennessee, approximately 10 percent of families and 14 percent of individuals 65 years and older were below the poverty level. The highest poverty rates are found in the First Tennessee, Memphis Area, Northwest Tennessee, and Upper Cumberland EDDs, ranging between 14 and 16 percent of the total population in each EDD. Exhibit 12 highlights the percentage of the population below the poverty level by county.

Table 3-3. Persons Below Poverty Level

Poverty Status	Number		%
	All Income Levels	Below Poverty Level	Below Poverty Level
Families	1,557,620	160,717	10.3
With related children under 18 years	784,239	117,726	15.0
With related children under 5 years	299,045	55,819	18.7
65 years and over	668,071	89,985	13.5
Total: All individuals for whom poverty status is determined	5,539,896	746,789	13.5

Source: Census 2000

Not atypical, Tennessee residents spend a relatively large portion of their income on transportation. Only expenditures for housing exceed those for transportation in the typical household budget. Studies of income and travel behavior relationships support the observation that transportation is both a necessity and a discretionary good. For many lower income households, transportation spending is a necessity that consumes a significant share of total expenditures. According to the 2000 Census, transportation spending ranges from about $2,500 for the lowest income quintile to nearly $12,500 per year for households in the highest income quintile. About 94 percent of transportation spending is related to the acquisition, operation, and upkeep of private motor vehicles. The national average cost of driving a new passenger car in 2000 was 49.1 cents a mile, or $7,363 a year. This rate increased in 2004 to 56.2 cents a mile, or $8,431 a year, a 13 percent increase.

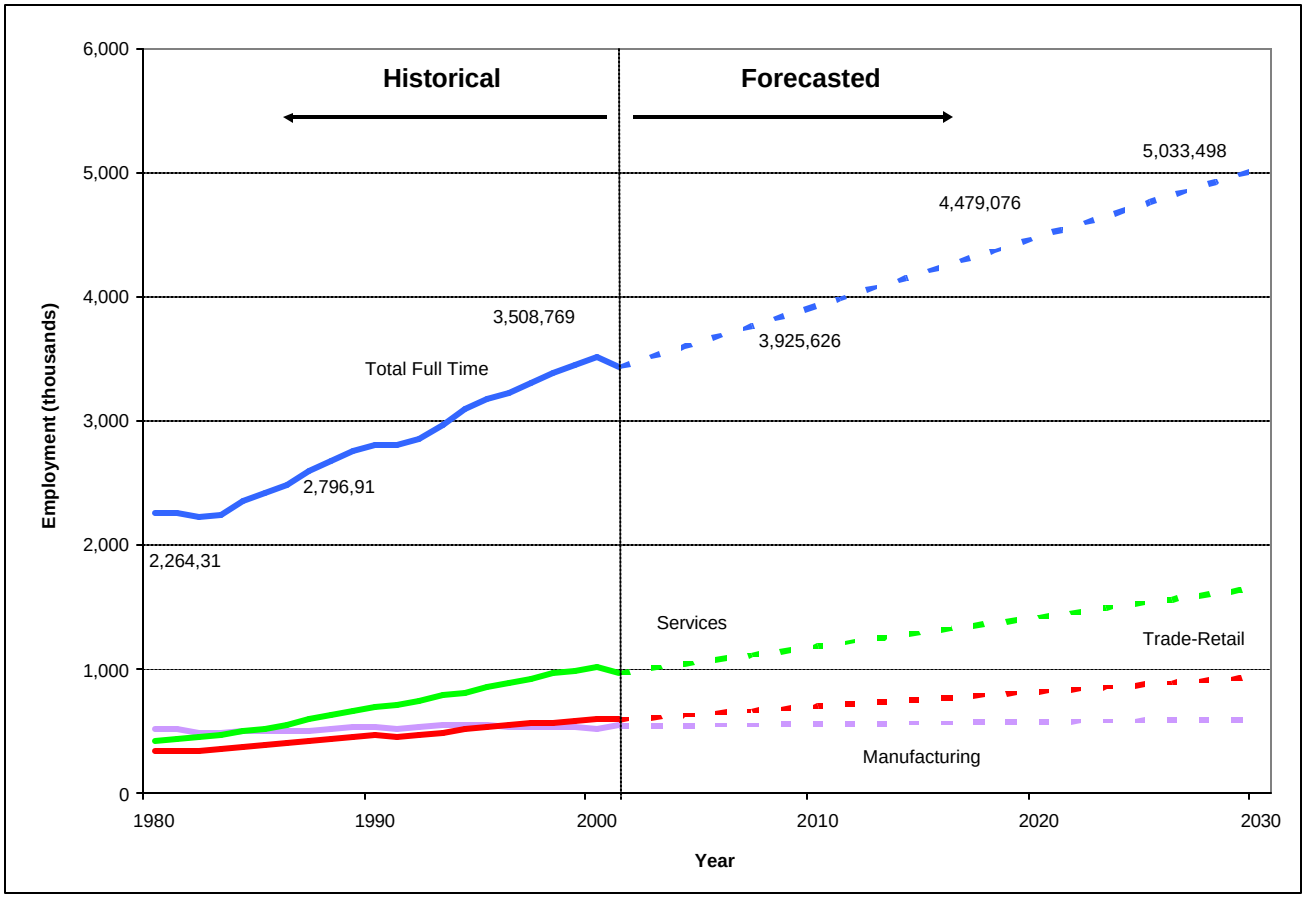
3.1.2. Employment

Tennessee's projected growth in employment is expected to lead to increased travel demands and greater mobility needs. The economic development of a region can be greatly influenced by the efficiency of its transportation system. If the system fails to provide the means for quick and convenient movement of people and goods, the region's economic growth may fail to reach its potential.

Employment Growth

Tennessee employment grew at a high rate during the 1990s and is expected to continue through 2030. Tennessee's employment from 1980 to 2000 and forecasted employment from 2000 to 2030 are shown in Figure 3-2. Tennessee's full-time employment reached 3,508,318 in 2000, an increase of 25.5 percent from 1990.

Figure 3-2. Tennessee Employment 1980–2030



Source: Census 2000

Shift to Service Sector

The national shift in employment to the service sector has also occurred in Tennessee. In the 1980s manufacturing was the dominant economic activity, followed by services and retail trade. However, by the mid 1980s, employment in services surpassed the number of employees in manufacturing. Service sector growth was led primarily by business and professional services. By the mid 1990s manufacturing employment was also surpassed by retail trade employment. The decline in manufacturing jobs in Tennessee is due solely to contraction in the nondurable goods sector[6]. Farming is another sector that has experienced a decline in employment. In 1980, farm employment was nearly 6 percent of the state's full-time workforce, but in 2000 it fell to 3 percent. By 2030 farm employment is forecasted to be only 1 percent of the workforce.

[6] In the nondurable goods sector, only the food, beverage, tobacco, and plastics and rubber sectors experienced job expansion between 1991 and 2003. Textile mills and apparel have lost a significant number of jobs. (See Chapter 2 of *An Economic Report to the Governor of the State of Tennessee: On the State's Economic Outlook, January 2004*. UT CBER.)

Geographic Distribution

County employment levels are shown for both 1990 and 2000 in Exhibits 13 and 14, respectively. Exhibit 15 shows the percent change in county employment between 1990 and 2000. The employment shifts are consistent geographically with population shifts, as most of the employment increases occurred within the metropolitan areas.

As shown in Table 3-4, projected total employment by 2030 shows services and trade-retail sectors employing a larger percentage of the non-farm private workforce than the other sectors combined (2,591,999 versus 1,819,350). 2030 forecasts by county, shown in Exhibit 16, project a continued trend of metropolitan areas offering the highest concentration of employment. The percent change in employment from 2000 to 2030 is shown in Exhibit 17. Employment for 2030 is forecasted to reach 5,033,498, a 43 percent increase from 2000.

Generally, metropolitan areas and areas along highway corridors have the largest increases in employment. The same trends that the residential population exhibit is mirrored in the service, manufacturing, trade, transportation and utilities, financial, and government industries, which serve that population.

Table 3-4. Statewide Employment Characteristics from 1980 to 2030

	Category	1980	1990	2000	2010	2020	2030
Farm		124,884	108,525	106,644	*89,311*	*77,558*	*65,805*
Non-Farm Private	Agriculture	11,256	20,320	32,022	*37,973*	*46,662*	*55,347*
	Mining	11,160	8,903	6,215	*5,414*	*5,799*	*6,606*
	Construction	112,095	148,205	212,167	*232,320*	*269,952*	*307,585*
	Manufacturing	513,465	531,889	519,777	*555,288*	*574,302*	*593,863*
	TPU	99,910	136,253	212,145	*222,951*	*263,169*	*303,387*
	Trade-Wholesale	116,054	138,947	162,455	*186,369*	*210,871*	*235,373*
	Trade-Retail	333,887	462,699	589,047	*698,696*	*817,344*	*935,992*
	FIRE	153,631	165,705	237,468	*246,970*	*282,078*	*317,193*
	Services	420,055	688,913	1,010,208	*1,182,245*	*1,419,126*	*1,656,007*
Non-Farm Government		367,921	386,552	420,621	*468,089*	*512,215*	*556,340*
	Total Employment	2,264,318	2,796,911	3,508,769	*3,925,627*	*4,479,076*	*5,033,498*

TPU: Transportation and Public Utilities; FIRE: Finance, Insurance, and Real Estate
Source: Historic data, Bureau of Economic Analysis; Forecast data, HNTB; see Employment Forecast Methodology text.

3.1.3. Population and Employment Implications

- Overall, population growth will continue to place increasing demands on Tennessee's transportation system. Tennessee's suburban and rural areas will experience greater travel because of increases in the numbers of people who live there. Determining how to balance the demands of high-growth suburban areas with the economic development needs of lower-growth rural areas and central cities will be a challenge.

- The baby boom generation's work-related travel and economic activity will continue to place significant demands on the state's transportation system. With an aging population, the

availability of special public transportation services for medical and personal travel will become increasingly important.

- Peak periods of travel may occur over longer portions of the day as people take longer to get to their destinations from suburban or rural communities. These extended peak periods could be influenced by strategies such as travel demand management that encourage flextime, working from home, and compressed workweeks.

- Suburban job expansion will increase reverse commute trips, generating bi-directional peak-hour freeway congestion and accentuating the need for suburban job access for workers residing in center cities.

3.2. Land Use Trends

Land use planning is typically the responsibility of cities and counties. However, transportation investment often influences the locations and patterns of land use development depending on locations and types of improvements to the transportation system. This section examines general development trends, opportunities to coordinate growth with transportation investments, and issues related to growth management legislation.

3.2.1. Population Density and Expanding Urban Areas

Tennessee's population density increased from 118.3 to 138.0 people per square mile between 1990 and 2000, reflecting statewide population growth. In comparison, the national population density increased from 70.3 to 79.6 people per square mile. Population density by county is shown in Exhibit 18.

New growth in suburban areas is typically constructed at lower densities than those of more established areas. Low-density land development and suburban street patterns often lack interconnectivity and have been primarily designed to support automobile use. This primary focus on automobile travel increases the burden on the transportation system. These lower density areas can be difficult to serve with public transportation, walking, or bicycling. The lack of transportation choices, combined with new growth, has contributed to increased traffic congestion.

Exhibit 19 shows urbanized areas in Tennessee[7]. Growth compels both local and state government to provide services, including transportation improvements, to these areas. Local land use decisions can significantly affect regions. New suburban growth places demands on the regional transportation system. These demands include, but are not limited to, new access points on state highways, additional lanes, and in some cases new beltways. However, new suburban areas can be developed to minimize impacts to the regional transportation system. TDOT could support local and regional plans that encourage compact development patterns, interconnected

[7] According to the Bureau of the Census' general definition, based on population and population density, an urbanized area is a land area comprising one or more central place(s) and the adjacent densely settled surrounding area (urban fringe) that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.

streets, continuous sidewalks, trails, and convenient access to public transportation. This development approach reduces dependence on automobiles, thus reducing demand on state highways and local arterials.

3.2.2. Land Use and Transportation Coordination

Land use planning is typically undertaken by local governments, while the planning, construction, and maintenance of major highways are the responsibility of TDOT. Because different organizations complete different planning activities, inconsistencies between design, land use planning, and transportation planning often occur. Opportunities exist, however, to link land use and transportation planning. Many of the designated MPOs or their member governments also serve as city, county, or regional planning agencies with direct jurisdiction over the approval of subdivision plats and zoning changes. TDOT and/or the MPOs could develop guidelines for local land use professionals as they consider where best to locate new development and how to minimize traffic impacts of new developments on the highway system.

3.2.3. Growth Policy Statute

In May 1998, the Tennessee General Assembly passed legislation that became known as Public Chapter 1101. As Tennessee's first growth policy statute, PC 1101 sets out four major objectives:

- Eliminate annexation or new incorporation out of fear.
- Establish incentives to annex or incorporate where appropriate.
- More closely match the timing of development with the provision of public services.
- Minimize urban sprawl.

PC 1101 describes the purpose of a growth plan as the "...coordinated, efficient, and orderly development of the local government and its environs that will ... best promote the public health, safety, morals, and general welfare." The goals of a growth plan related to transportation and land use include:

- Encouraging compact and contiguous development in urban and planned growth areas
- Establishing an acceptable, consistent level of public services and community facilities
- Considering other matters that relate to or form an integral part of a plan for coordinated, efficient, and orderly community development
- Providing for a variety of housing choices, including affordable housing.

The statute requires a growth plan to at least include descriptions of municipal corporate limits, urban growth boundaries, planned growth areas, and designated rural areas. The areas within each county's growth plan are defined below.

- **Urban Growth Boundaries**. The urban growth boundary identifies territory contiguous to the municipality, large enough and well located to accommodate projected high-density growth for 20 years, within which the municipality is better able to provide urban services than other municipalities.

- **Planned Growth Areas**. Counties may designate planned growth areas that meet the standards outlined above for urban growth boundaries (except for contiguity with municipal boundaries). The county must consider and report on the likelihood that one or more planned growth areas will eventually incorporate as a new municipality or be annexed by a municipality.

- **Rural Areas**. Counties may designate rural areas that are not within municipal urban growth boundaries or planned growth areas that, over the next 20 years, are to be preserved as agricultural lands, forests, recreational areas, wildlife management areas, or for uses other than high-density development, and that reflect the county's duty to manage growth and natural resources so as to minimize detrimental impacts to such areas.

The urban growth boundaries, planned growth areas, and rural areas for the counties in Tennessee are shown in Exhibit 20.

Opportunities exist to deliver transportation services and facilities in ways that are consistent with the purpose and definitions of PC 1101. Such considerations could include:

- Interchange spacing–urban spacing criteria used within the urban growth boundary; a rural criteria used elsewhere
- Location of freight facilities–located within or adjacent to an urban growth boundary
- Location of aviation facilities–located within or adjacent to an urban growth boundary
- Location of public transportation facilities, service areas, and routes–higher-density public transportation service provided within an urban growth boundary, lower-density demand-response service provided outside this boundary
- Provision of bicycle and pedestrian facilities–these facilities planned for within an urban growth boundary, with consideration given to major connector routes outside the boundary

3.2.4. Land Use Implications

- Because much of Tennessee's recent growth has occurred in suburban areas, commuting patterns are shifting from suburb-to-city to suburb-to-suburb and city-to-suburb commutes, resulting in new demands on Tennessee's transportation system.
- Because much of the newer development has been lower-density, many new subdivisions tend to be designed mainly for automobile access with little regard for other modes, including public transportation, pedestrians, and bicycles. The layouts of these land use developments often do not recognize the special travel needs of the young, elderly, or persons with disabilities, or the travel needs of those without automobiles.
- Increased growth in urban and suburban areas has pressured local, state, and regional planning agencies to provide transportation-related services and utilities to these areas. Transportation planning and land use decisions could be better linked by guidelines that could be used by local land use professionals as they consider where best to locate new development and how to minimize traffic impacts of new developments on the highway system.

3.3. Environmental Trends

Environmental issues are important in the planning and development of transportation improvements. Without appropriate prior consideration, environmental constraints and requirements can sometimes slow or stop a transportation project from being built. The sections below describe some of the major environmental issues that must be considered as a part of the long-range planning process.

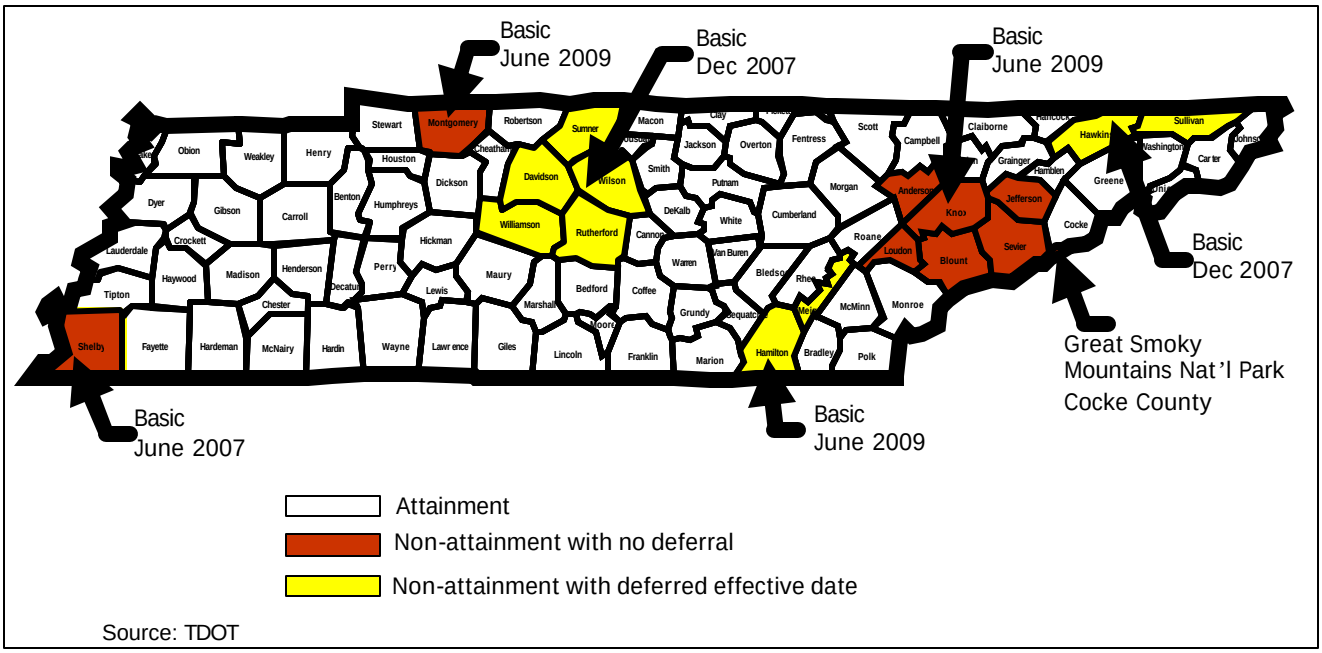
3.3.1. Air Quality

As a requirement of the Clean Air Act (CAA), the Environmental Protection Agency (EPA) maintains National Ambient Air Quality Standards (NAAQS; see 40 CFR 50) for particular pollutants (e.g., ozone, carbon monoxide, and particulate matter). The standards are meant to protect the health of all Americans and to preserve the environment. A geographic area is known as an attainment area if it meets the standards. If the area fails to meet the standards, it is designated a nonattainment area. The EPA requires that a nonattainment area develop a State Implementation Plan to bring the region into compliance with the standards it is failing to meet.

In addition to the State Implementation Plan, the area must implement transportation conformity requirements. In order to receive federal transportation funding or approval, state and local transportation agencies with plans, programs, or projects in nonattainment areas must demonstrate that they meet the conformity requirements of the CAA as set forth in the transportation conformity rule (40 CFR, Parts 51 and 93, as amended by 62 FR 43780). Transportation conformity is required for 20 years after an area is able to demonstrate compliance with the standards. During this 20-year maintenance period, the area must maintain a State Implementation Plan to ensure continued compliance with the appropriate standards.

TDOT and the metropolitan areas impacted by the conformity requirements must find a way to support local development goals and transportation demands and still meet the air quality standards established by the EPA. In April 2004, this challenge was made more difficult by a new 8-hour standard for ozone established by EPA. Based on the new standards, 12 of the 19 Tennessee counties with monitoring stations exceeded the 8-hour standard. Current air quality designations for counties in Tennessee are shown in Figure 3-3. TDOT and the MPOs will be required to complete the air quality conformity analysis required by the EPA and the FHWA. Those analyses are required for all federally funded and regionally significant projects.

Figure 3-3. Tennessee Air Quality Designations



3.3.2. Natural or Geographic Constraints

The overall goal of TDOT when implementing transportation projects is to avoid impacting environmentally sensitive areas. If such areas cannot be avoided, the goal is to minimize the impacts and to help mitigate negative impacts resulting from the transportation project. Several factors (described in FHWA technical advisory T 6640.8a) are considered when assessing impacts. Generally, these types of impacts are considered:

- Land use
- Farmland
- Social
- Relocation
- Economic
- Noise
- Water quality
- Wetland
- Floodplain
- Historical and archeological preservation
- Hazardous waste
- Visual
- Energy
- Construction
- Consideration relative to pedestrians and bicycles
- Parks or recreation areas
- Air quality
- Threatened and endangered species

Parks and recreation areas are considered in transportation projects. National parks, national forests, and major state parks are shown in Exhibit 21, which also shows the concentration of national lands located along the eastern state boundary. These sites, along with all other park facilities, are important to the state of Tennessee and should be considered in the development of major transportation projects.

3.3.3. Environmental Implications

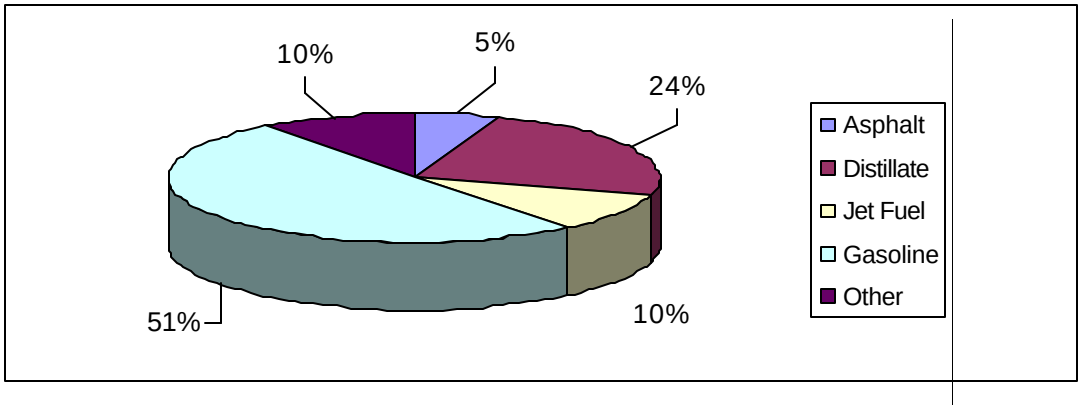
- Air quality requirements may slow or stop some road projects from being built if the project is located in an urban area that does not currently conform to current air quality standards. Air quality requirements should encourage further examination of multimodal investment strategies that could potentially reduce pollution by reducing the need for the automobile.

- Major environmental constraints, such as those discussed in Section 3.3.2, can impact the implementation of transportation improvements if not properly considered as part of the planning and design process.

3.4. Energy Use and Fuel Consumption Trends

As shown in Figure 3-4, more than 50 percent of the state's petroleum consumption is used for gasoline. Remaining petroleum consumption is in the form of distillate fuel, jet fuel, kerosene, asphalt and road oil, and various other products. On average, Tennessee residents in 2003 paid $8.60 per million British thermal units (BTU), less than the national average of $8.82[8]. Tennessee's petroleum and gasoline prices both ranked 33rd and natural gas prices ranked 17th in the nation.

Figure 3-4. Tennessee Petroleum Energy Consumption Estimates by Source (2000-2001)



Tennessee ranks 16th in the nation in consumption of transportation-related energy[9]. The transportation sector accounts for 29 percent of Tennessee's energy consumption[10]. It is the state's second largest energy consumer after the industrial sector. Almost 96 percent of the transportation sector is fueled by petroleum products, including gasoline. The remaining 4 percent is fueled primarily by natural gas.

Several state agencies currently have programs to reduce transportation-related energy consumption. TDOT, for example, operates a vanpool program as a commuting alternative for state government employees. Additionally, TDOT's Commuter Transportation Assistance Program funds several ridesharing services in metropolitan areas. TDOT also funds various

[8] Energy Information Administration, 2000 (http://www.eia.doe.gov/emeu/states/main_tn.html)
[9] Ibid.
[10] Ibid.

studies affecting transportation alternatives, including partial funding of an alternative transportation study in the Great Smoky Mountains National Park and an alternative fuel public transportation vehicle study with the Electric Vehicle Institute in Chattanooga.

3.4.1. Energy Use and Fuel Consumption Implications

- Tennessee's transportation system consumes 29 percent of the state's energy. Petroleum fuels 96 percent of the state's transportation sector. This heavy dependency on petroleum products is sustainable only as long as these products are readily available and affordable.

- To improve the state's energy system, the transportation sector could use more efficient vehicles, cleaner alternative energy sources, and reformulated fuels.

3.5. Tourism Trends

An important function of the transportation system is to provide access to and connections between Tennessee's numerous tourist destinations. In 2002, 38.9 million tourism-related person-trips were taken to and through Tennessee (see Table 3-5). These trips included pass-through day trips and overnight trips. This was a 2 percent increase over 2001 travel volume and outpaced tourism trends for national growth (+0.3 percent). In addition, Tennessee continues to rank 12th among the 48 contiguous states in total visitor volume.

The terrorist attacks on September 11, 2001, disrupted the nation's travel industry. Air travel was particularly affected by a decline in use, as were other travel-related industries such as hotels and tourist destinations. However, the information shown in Table 3-5 indicates that the number of visitor person-trips to Tennessee was actually higher in 2002 than in 2001.

During 2001, spending by domestic and international travelers in Tennessee was nearly $10.3 billion. The primary mode of transportation was the automobile, which accounted for 87 percent of tourism-related transportation. Air travelers made up 8 percent of tourist travel, while other modes contributed the remaining 5 percent[11].

Table 3-5. Visitors to Tennessee

Year	Person Trips (In Millions)	Year	Person Trips (In Millions)
2002	38.9	1998	38.4
2001	37.9	1997	40.2
2000	35.7	1996	38.8
1999	37.8	1995	38.2

Source: TravelScope® 2002

Tennessee most-often visited national parks and battlefields are Great Smoky Mountains National Park (9,366,845), Cherokee National Forest (2,500,000), Land Between the Lakes (1,748,079), Cumberland Gap National Historical Park (987,780), Fort Donelson National

[11] *TravelScope® 2002*

Battlefield (742,107), Shiloh National Military Park (553,276), Big South Fork National River and Recreation Area (514,833), Stones River National Battlefield (192,918) and Chickamauga-Chattanooga National Military Park-Point Park (101,226)[12]. Additionally, the state maintains a system of 43 state parks including numerous resort parks and recreational areas. The large volume of tourist traffic generated at these locations will add to the travel demand on the existing transportation facilities.

A study conducted by the Travel Industry Association for the Tennessee Department of Tourist Development[13] highlighted the following:

- Total Impact of Tourism-Related Travel
  - Total domestic and international travel-related spending in Tennessee, including direct and indirect spending, exceeded $16.2 billion in 2001.
  - Total payroll income from related employment was $5 billion in 2001.
  - Total travel-related employment in Tennessee, both direct and indirect, was 238,200 jobs in 2001.

- Direct Impact of Tourism-Related Travel
  - Domestic travelers in Tennessee spent nearly $9.9 billion, while international travelers spent $381 million.
  - Travel-generated employees earned nearly $2.7 billion in wage and salary income during 2001. Domestic travel spending generated nearly $2.6 billion in payroll income in 2001, while international travel spending generated nearly $111 million.
  - Employment generated directly by both domestic and international travelers' spending reached 139,300 jobs in Tennessee in 2001, 5.2 percent of the state's total non-agricultural employment. Domestic travel spending generated 133,500 jobs, while international travel spending supported 5,800 jobs.
  - Tax revenues for federal, state, and local governments in 2001 generated directly by both domestic and international travelers' spending in Tennessee totaled nearly $2.2 billion. Of this, nearly $2.1 billion was from domestic traveler spending, while $84.3 million was from international visitors.

Perhaps the most impressive contribution of travel and tourism to the Tennessee economy is the number of businesses and jobs it supports. A wide variety of jobs are supported by the travel industry.

[12] Tennessee Department of Tourist Development's Annual Report and Marketing Plan 2004-2005, pg.34.
[13] *The Economic Impact of Travel on Tennessee Counties*. 2001. A Study Prepared for the Tennessee Department of Tourist Development by the Research Department of the Travel Industry Association of America. Washington, D.C. June 2003.

3.5.1. Tourism Implications

- Tourism continues to be an important economic contributor to the state's overall economy. Tennessee's transportation system, particularly its highways and bridges, plays a critical role in the state's tourism-related economy.

- Three characteristics of the state's tourism economy deserve particular consideration: (1) while total tourism spending is significant at $10.3 billion dollars, the figure equates to a relatively small 1.9 percent of total tourism expenditures in the United States; (2) this figure contrasts with the fact that Tennessee ranked a relatively high 12th in total visitor volume; and (3) the dominant role of auto travel, which accounts for 87 percent of tourism-related transportation.

  These factors suggest that Tennessee is a pass-through state for many tourists bound for other states. The implication for the state's transportation system may be that it is assuming some of the wear-and-tear of tourism travel which is, in fact, destined for other states and other local economies.

3.6. Technology Trends

The growth in information technology (IT) has already affected the nation's transportation system. IT will have an even greater impact in the future; however, determining the impact of the digital economy remains a challenge.

The U.S.-based technology industry should continue to expand in the worldwide market. Technology has helped to create new relationships and to streamline the supply chain processes. As these changes are occurring, the roles of logistic intermediaries such as Federal Express and UPS are expanding.

Electronic commerce can reduce the influence of distance as a factor in personal and business decision making, and can alter the concept of community. People can maintain contact over long distances and have online communities with global memberships. These global markets, however, can result in companies becoming less loyal to the communities in which they are physically situated. Decentralization will enable businesses and individuals to locate in remote areas and commute less.

3.6.1. Technology Implications

- Tennessee's ability to accommodate communications system conduits in transportation rights-of-way or on other properties and facilities is essential now and will be imperative in the future. It is important for the state's communications providers and TDOT to establish the institutional structures needed to enable shared right-of-way agreements.
- With economic globalization and IT development, businesses will continue to lose their links to the specific communities in which they are located. This may result in a continued trend in employment and residential decentralization, further increasing travel on our state's highway and local road systems.

- More home-based businesses made possible by modern technologies can reduce some commuting trips.

3.7. Summary of Demographic, Social, and Environmental Trends

Demographic factors are among the most important considerations in any projection of future transportation demand. The sections above discussed baseline conditions, trends, and issues for demographic, social, and environmental factors and how they influence Tennessee's current and future transportation system. Table 3-6 summarizes the major trends and implications identified for each demographic, social, and environmental factor; it also lists the challenges and opportunities Tennessee will face for each implication.

Table 3-6. Summary of Demographic, Social, and Environmental Challenges and Opportunities

Implications	Challenges	Opportunities
Population and Employment Trends		
Overall population growth both within the state and in surrounding states will continue to make increasing demands on the state's transportation system.	Maintaining and preserving the transportation network for current and future generations. Balancing the demands of high-growth suburban areas with the economic development needs of lower-growth rural areas and central cities.	Achieve and maintain good repair on all elements of the transportation system to ensure maximum useful life. Ensure there is no backlog of deficiencies in all elements of our transportation infrastructure. Maintain the multimodal system on a normal replacement cycle. Implement a full maintenance program for all transportation and transportation-related infrastructure.
The baby boomers will continue to influence transportation needs as they work their way through middle age, remain active in the workforce, continue to drive more miles, and demand more transportation services. The availability of senior public transportation services for medical and personal travel will become increasingly important, especially during off-peak periods.	Meeting the transportation needs of a diverse population such as the elderly, low-income persons, and persons with disabilities.	Promote greater coordination between various social service agencies providing public transportation services and conventional public transportation service providers. Provide mobility for all population segments. Increase convenience of public transportation in the state. Consider providing developer incentives for building public transportation-oriented living communities.

Table 3-6. Summary of Demographic, Social, and Environmental Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Population and Employment Trends (Continued)		
Peak periods of travel may occur over longer portions of the day as people take longer to get to their destinations from suburban or rural communities and some may choose to use flextime or compressed work weeks to travel at less congested times. This will create greater demand for transportation services.	Slowing growth in VMT per capita over time. Managing congestion on the state's busiest stretches of highways. Improving the effectiveness and efficiency of the transportation system.	Reduce reliance on single-occupancy vehicles. Improve transportation system safety. Increase the use of alternative transportation modes. Implement ITS programs at selected locations to collect data and field test deployment strategies. Provide additional, affordable transportation choices. Improve reliability. Reduce travel time and delays. Increase convenience for transportation users.
Suburban job expansion will increase reverse commute trips, generating bi-directional peak-hour freeway congestion and accentuating the need for suburban job access for workers residing in center cities.	Developing a program that encourages mode choice changes and which reduces the number of commuters driving alone and increases the use of public transportation, walking, bicycling, and carpooling.	Shift individual travel choices toward alternative modes. Develop a statewide Travel Demand Management Program to reduce automobile trips.

Table 3-6. Summary of Demographic, Social, and Environmental Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Land Use Trends		
Low-density land use patterns do not recognize the special travel needs of the young, elderly, or persons with disabilities, or the travel needs of those without automobiles. This has resulted in pressure to supply utilities and transportation services to these areas.	Working with local governments to structure land development plans to minimize sprawl. Designing and coordinating transportation projects that reinforce land use plans and economic development strategies. Forming strong partnerships between local governments to assist local agencies in planning for development, thereby reducing pressures on the transportation system and lessening environmental impacts.	Preserve land for future transportation improvements. Develop a statewide transportation access management system plan. Encourage community revitalization activities around public transportation stations. Support and provide incentives for land use development policies in strategic locations that are more efficient in transportation capital and operating costs and more supportive of public transportation services. Promote public transportation-oriented development and activity center designations to increase land use mix and density. Foster joint development opportunities and public-private partnerships at major public transportation nodes. Formulate policies and funding incentives to encourage public transportation-supportive land use patterns and local support for quality public transportation service in priority locations. Establish an intergovernmental land use collaboration process. Make infrastructure decisions consistent with urban growth boundary areas.
Environmental Trends		
Air quality requirements may slow or stop some road projects from being built if the project is located in an area that does not currently conform to the allowable air quality emissions. This is also true for other major environmentally sensitive issues such as parks, wildlife refuges, and National Register of Historic Places properties, which can also impact the plan and schedule for transportation improvements.	Reducing transportation's share of total emissions. Air quality regulations have been more stringent, with 19 counties not meeting the standards. This may limit implementing transportation projects that would lead to a worsening of air quality in the counties. While the emissions per vehicle have decreased over the last 30 years, an increase in miles driven has resulted in an overall increase in the amount of discharged pollutants.	Sponsor telecommuting efforts and enhance regional commuter assistance and use of clean vehicle technology within non-attainment areas. Examine multimodal investment strategies that support clean air goals and reduce pollution.

Table 3-6. Summary of Demographic, Social, and Environmental Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Energy Use and Fuel Consumption Trends		
New transportation technologies such as alternative fuel vehicles, improved petroleum products, advanced engines, and automobile components can have a dramatic effect on the efficiency and emissions of vehicles.	Much of the energy consumed in the transportation sector is from petroleum sources. Strong reliance on petroleum-based energy puts the transportation system at risk if supply is interrupted or costs greatly increase.	Transportation techniques such as telecommuting, ITS and mass public transportation can help reduce emissions and energy use by decreasing the number of VMT. Consider greater incorporation of alternative fuels into the state's future energy use mix.
Tourism Trends		
Tourism continues to be an important economic contributor to the overall economy in Tennessee. As tourist traffic is expected to grow in the future so will the demand for travel near major tourist destinations.	Maintaining and preserving the transportation network for current and future generations. Managing congestion on the state's busiest stretches of highways through traffic and roadway monitoring, IM, traveler information, traffic management and system integration, and communication. Improving the effectiveness and efficiency of the transportation system.	Implement a full maintenance program for all transportation and transportation-related infrastructure. Improve transportation system safety. Implement ITS programs at selected locations to collect data and field test deployment strategies. Provide additional, affordable transportation choices, especially in areas where high public transportation visitation is anticipated or desired. Improve travel reliability and convenience of the transportation system service tourist destinations.
Technology Trends		
High-tech solutions will continue to evolve as tools for managing transportation systems. Tennessee's ability to accommodate communications system conduits in transportation rights-of-way or on other properties and facilities is essential now and will be imperative in the future.	Managing congestion on the state's busiest highways through traffic monitoring, IM, traveler information, traffic management, and system integration and communication. Providing the right-of-way or funding to supporting technological advances.	Home-based businesses could lessen commuter traffic during peak periods. Improvements in communication technology may reduce the need for personal travel.

Chapter 4

Transportation System Trends

Tennessee's transportation system modes include highways, airports, waterways, railroads, and pedestrian ways and bikeways. TDOT owns and operates much of the state's highway system. TDOT does not own or operate railroads, airports (with the exception of Reelfoot Lake Airport), or waterways, but rather coordinates with private rail operators, as well as the U.S. Army Corps of Engineers (USACE) and local port authorities for waterway operation. Public transportation systems and airport facilities are locally owned, but are supported by federal and state funds coordinated by TDOT. The sections below describe each transportation system component.

4.1. Highway and Bridge System

The street and highway system accommodates the majority of travel in Tennessee, with the automobile being the primary means of passenger transportation. Additionally, the trucking industry relies on highways and bridges to facilitate the efficient movement of freight throughout the state. The highway and bridge system provides an important link to aviation, rail, and waterway transportation for both passengers and freight.

The state's highway network consists of more than 88,000 miles of roads and 19,650 bridges. TDOT maintains 14,150 miles of highways and 8,043 bridges on the state system[14]. Some multilane urban interstate highways accommodate more than 100,000 daily trips, while some rural roadways accommodate fewer than 100 daily trips.

Table 4-1 shows the current lane miles per functional classification[15] in both rural and urban areas[16]. FHWA's *Highway Statistics* recorded that Tennessee's roadway system, including non-TDOT facilities, consisted of 185,701 lane miles. As expected, the majority (78 percent) of the state lane miles (144,362) lie in the rural areas. Local roads and minor collectors make up the majority of the rural roads. In comparison, 41,339 lane miles serve the state's urban areas (22 percent).

Table 4-2 provides current travel measures that indicate the level of traffic on the state highway system. Annual VMT is the sum of the miles traveled by vehicles over a calendar year. Annual VMT for rural areas was approximately 32 billion. Urban areas have fewer highway lane miles, but handle more vehicle travel than rural areas, with more than 36 billion VMT. While total volumes tend to be lower in rural areas, these highways tend to have a higher percentage of truck traffic than in urban areas (16.8 percent versus 8.0 percent). When compared to the rest of the nation (see Figure 4-1), Tennessee ranks 14th largest in the amount of total annual VMT, at more than 68 billion.

[14] The number of bridges in Tennessee considered deficient declined 27 percent, from 6,342 in 1992 to 4,606 in 2002.

[15] Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they provide, or are intended to provide. It is necessary to know the functional classification of a roadway to determine its eligibility for federal aid assistance under the Transportation Equity Act for the 21st Century of 1998 (TEA-21) and numerous other federal transportation programs. Functional classification is also used to assess the extent, condition, and performance of the region's transportation system.

[16] At the time *Highway Statistics* (2002) was published.

Table 4-1. Functional System Lane Length for 2002 (Lane Miles[1])

Rural						
Interstate	Principal Arterials	Minor Arterials	Major Collectors	Minor Collectors[2]	Local[2]	Total
3,034	5,534	7,330	10,735	22,163	95,566	144,362
Urban						
Interstate	Freeways and Expressways	Principal Arterials	Minor Arterials	Collectors	Local[2]	Total
1,799	508	4,838	5,702	3,542	24,950	41,339
					Total Lane Miles	185,701

1. May see differences from prior years; starting in 1999, number of lanes is coded for all systems except rural minor collector and rural/urban local.
2. Rural minor collector and rural/urban local functional system lane miles estimated by FHWA assuming two as the number of lanes.

Source: *Highway Statistics*, 2002. United States Department of Transportation. FHWA.

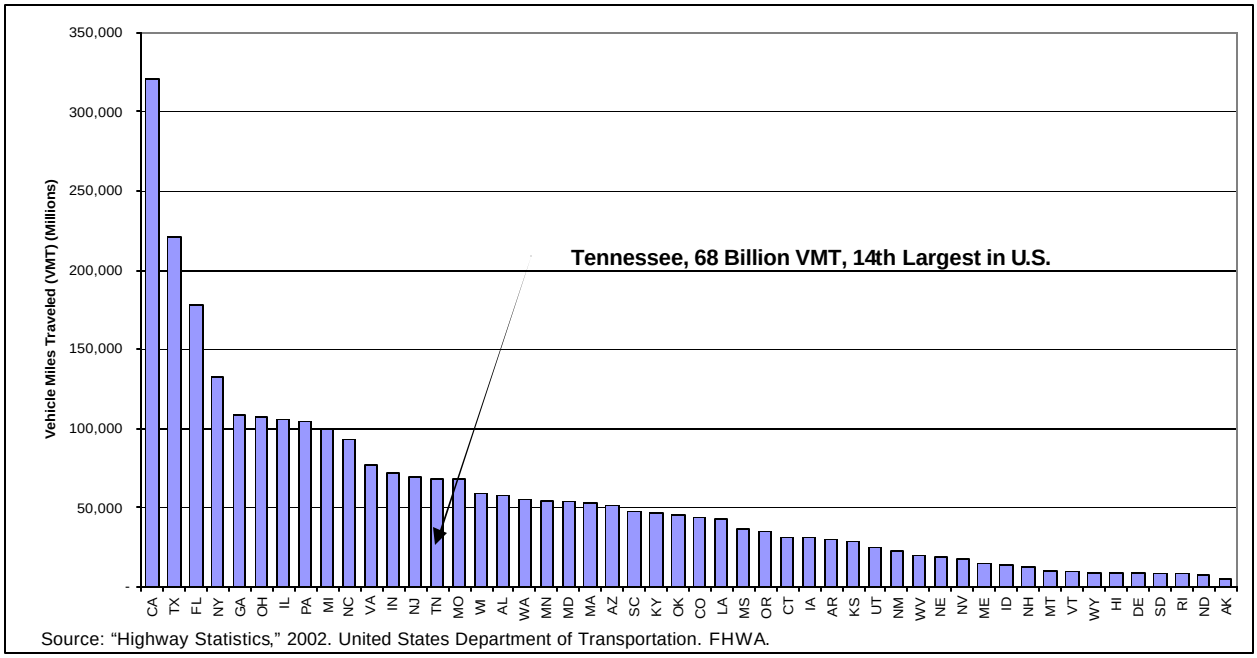
Table 4-2. Travel Measures for 2002

Annual Vehicle Miles of Travel (Billions)			
Rural		Urban	
Annual VMT	Percent Trucks[1]	Annual VMT	Percent Trucks[1]
32.068	16.8	36.161	8.0

[1] "Percent trucks" includes buses, single-unit trucks with at least two axles and six tires, plus combination trucks. Data are based on Highway Performance Monitoring System sample data reported by each state. National average is weighted on VMT.

Source: *Highway Statistics*, 2002. United States Department of Transportation, FHWA.

Figure 4-1. Vehicle Miles Traveled by State[17] (State Comparison of 2002 Total Vehicle Miles Traveled)



Source: "Highway Statistics," 2002. United States Department of Transportation. FHWA.

[17] Travel for all systems are FHWA estimates based on State-provided Highway Performance Monitoring Systems data.

TDOT has traditionally focused its activities on maintaining the safety and efficiency of this system. This requires achieving a number of key objectives, as described below.

- Road facilities should connect major destinations. The largest destinations are connected by freeways; smaller destinations are connected by other highways or arterial streets; neighborhood centers are connected by collectors; and residential areas are connected by local streets. As a statewide agency, TDOT is primarily focused on major connections, with local governments providing collector, local, and some arterial connections.
- Each highway should have sufficient capacity to adequately move traffic. Generally accepted standards suggest that traffic conditions on rural highways should be uncongested. It is recognized that in urban areas it would be unwise, and perhaps impossible, to spend the funds necessary to make all highways uncongested. However, urban freeways or highways are built to minimize high levels of traffic congestion.
- Highways must be built to specified design standards to make them as safe as possible. The standards are based upon guidelines established by the American Association of State and Highway Transportation Officials (AASHTO). While some highways pre-date AASHTO standards, new highway construction or reconstruction typically meets these standards.
- Well maintained highways and bridges are important to providing safe and efficient travel.

4.1.1. Highway System Connectivity

The Tennessee interstate highway system connects major cities within the state; it also connects major activity centers in other states with Tennessee. U.S. highways and other important state highways connect to the interstate system to provide access to the remaining communities.

4.1.2. Highway Capacity

Capacity is the measurement of the number of vehicles that a highway can carry at a specific point over a specified length of time. Roadway capacity is calculated using a number of factors such as the number of lanes, lane width, shoulder width, and roadway grade. The level of service (LOS) is a measurement of congestion that is determined by comparing actual roadway volume with roadway capacity. A grading system is used where LOS A, B, and C are typically considered uncongested. LOS D and E represent some level of congestion. LOS F represents highly congested locations.

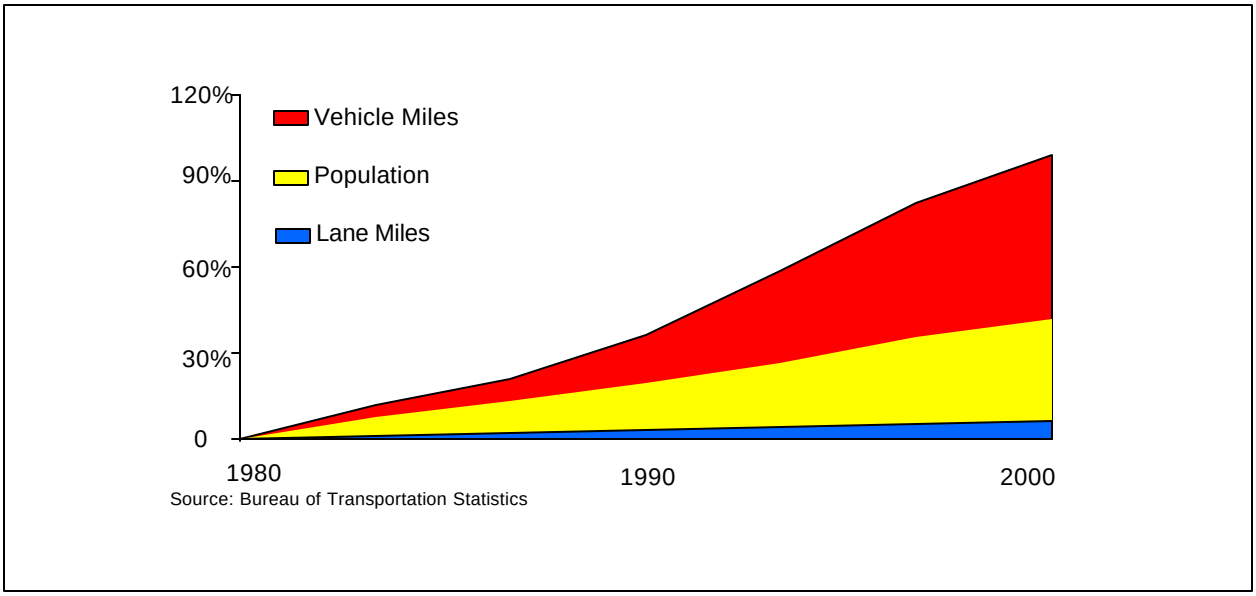
The current performance of the state highway system was examined by comparing current traffic counts with estimated capacity. The counts and capacity information were obtained from the Tennessee Roadway Information Management System (TRIMS) for 2003. Exhibit 22 shows the LOS for major connections within the state. A preliminary system assessment shows that for current traffic conditions, capacity is reasonably sufficient in most intercity travel corridors. However, within the MPOs and several corridors extending from the MPO areas, congestion is a growing concern. Some capacity deficiencies exist on the U.S. and state highway system inside small urban areas throughout the state. The challenge for TDOT is to maintain or preserve the LOS in light of anticipated growth in passenger and freight travel.

TDOT must address locations of current congestion, while also identifying and addressing locations that could become congested in the future. Because the time to identify a needed project, assess and address environmental impacts, complete design, obtain funding, and construct a roadway can take 10 years or more, traffic forecasts for up to 20 or even 30 years are made to provide an indication of what highway projects might be needed. As part of the LRTP, a statewide travel demand model is being developed. The findings from a study of transportation needs through 2030 will be presented in the highway element of the LRTP.

4.1.3. Projected Role in Transportation

Similar to national trends, the automobile will likely be the dominant means of travel in Tennessee well into the 21st century. The demand for additional roadway capacity continues to grow. As shown in Figure 4-2, increasing demand is reflected by the increase in annual VMT in Tennessee. Between 1980 and 2000, annual VMT on the state's roads and bridges has doubled, growing from 34 billion to 68 billion.

Figure 4-2. Comparison of Population, Travel, and Miles of Highway



Conversely, while the amount of travel doubled between 1980 and 2000, the amount of lane miles in the highway system increased by only 8 percent. Figure 4-2 also shows the trend of highway expansion for this period where lane miles on the state highway system have increased from 172,000 to 185,000 between 1980 and 2000.

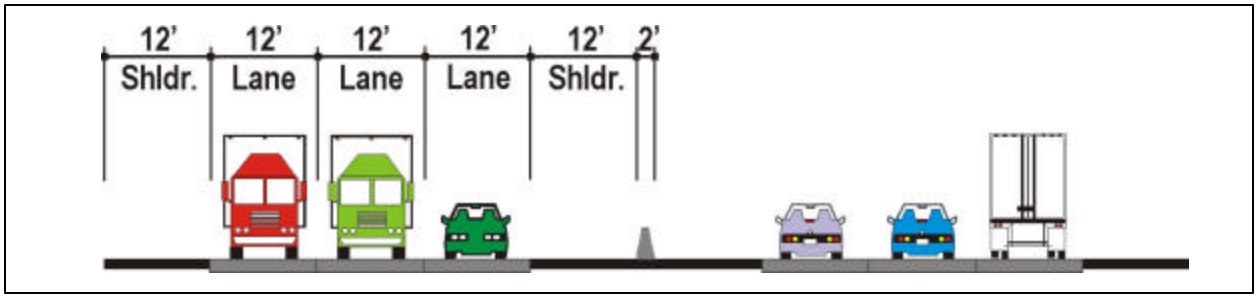
4.1.4. Highway System Standards

Over the years, TDOT has constructed highways to meet the accepted design standards at the time the project was built. Over time, these standards have been modified to provide for safer and often faster travel. Some influences affecting design changes are a continuing evolution of what type of highway provides the most efficient, safest travel movement. The impact of designing for travel speeds, in some cases above 55 mph (when speed limits were modified at the

federal level), also has influenced highway design and increased the costs of transportation projects.

The FHWA has recently modified freeway design standards. Changes include the use of 12-foot-wide shoulders (Figure 4-3) and 2-mile interchange spacing. Exceptions to these standards can be requested, however, they must receive FHWA approval. While the design characteristics of freeways and highways across the state are generally good, most do not meet the new shoulder width criteria. As freeways are reconstructed or widened, they will be updated to meet the new criteria.

Figure 4-3. Typical Section–Current Interstate Standards



4.1.5. Highway and Bridge Conditions

Highways

As shown in Figure 4-4, Tennessee's interstate system pavement is in excellent condition. Of the interstate system measured for performance quality index (PQI)[18], 97.1 percent was determined to be in excellent condition, with the remaining 2.9 percent rated in good condition. Pavement surface condition for nearly all of U.S. and state highways is in excellent or good condition. Of the Tennessee state routes measured for PQI, no condition was rated less than fair.

Bridges

Tennessee has 19,650 bridges, of which TDOT is responsible for just more than 8,000. Table 4-3 reports the condition of the state bridge inventory. Of the state-maintained bridges, 1,451 of the 8,043 are either structurally deficient (SD) or functionally obsolete (FO). Additionally, 2,615 of the 11,607 local bridges are either SD or FO.

[18] TDOT considers smoothness, distress, and rutting of the existing roadway facility using a PQI that measures from 0 to 5. The breakdown of the condition ranges are: 0 to 1 : Poor; 1 to 2.5 : Fair; 2.5 to 4 : Good; and 4 to 5 : Excellent

Figure 4-4. Performance Quality Index Distribution

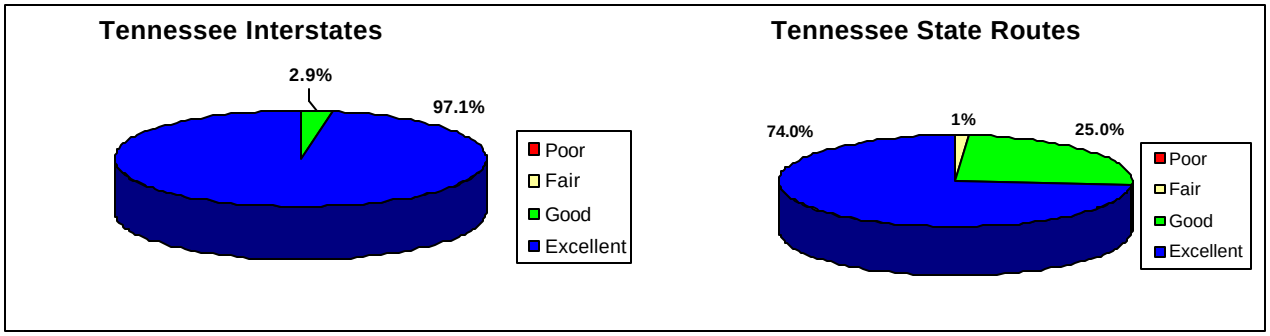


Table 4-3. 2004 Statewide Totals for Tennessee Highway Bridges

Category	Interstate	State Routes	Other State - Maintained	County	City/ Town	Misc. Owners	Totals
Total Number of Bridges	1,424	6,107	512	9,526	2,043	38	19,650
Functionally Obsolete	68	914	59	1,253	375	8	2,677
Structurally Deficient	44	347	19	838	132	9	1,389

Notes: Any structure that has a condition rating of 4 or less for the deck, superstructure, substructure, or culvert and retaining walls, or an appraisal rating of 2 or less for structural condition or waterway adequacy, will be classified as structurally deficient. Categories for functionally obsolete bridges are developed for cases where (1) the NBI criteria are met, (2) bridge roadway is less than approach roadway (NBI I47<TBI I, 507), and (3) bridge roadway is less than approach roadway and shoulders (NBI I47<TBI I, 508).
(NBI: National Bridge Inventory; TBI: Timber Bridge Initiative)

Source: TDOT

4.1.6. Movement of Freight

Freight is transported by trucks, air carriers, waterways, and rail carriers, with the trucking industry claiming the largest share of freight movement. Demand is driven by the nature of businesses and by the availability of facilities and equipment. Even when freight arrives by other modes, distribution to its final destination is usually by truck using the highway system.

On a tonnage basis, approximately 75 percent of freight (estimated at 370 tons) transported to, from, or through Tennessee is by truck. The statistics below describe the state's trucking industry.[19]

- Tennessee ranks sixth in the nation and first in the Southeast for cargo ton-miles and value of commodities carried by truck.
- The trucking industry employs 4 percent of the state's population.
- Tennessee is home to more than 10,600 for hire and private interstate trucking businesses.
- Trucks are the only means of supply to 85 percent of the state's communities.
- Trucks carry approximately 80 percent of the manufactured freight transported in Tennessee.

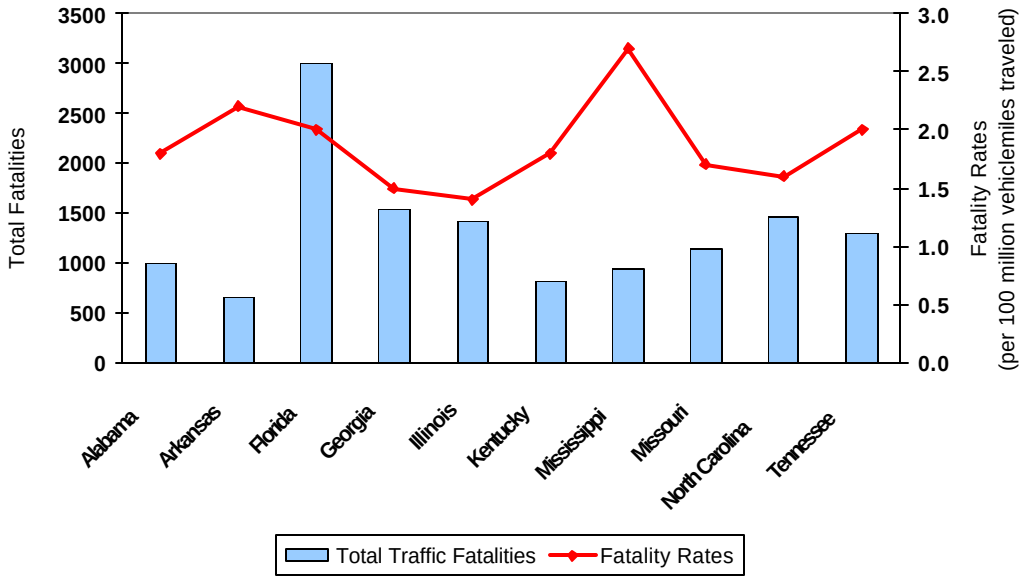
[19] Source: TNTrucking.org

4.1.7. Traffic Safety

The safe movement of people and goods is a high TDOT priority. Traffic crash data are compiled for a number of crash types. Traffic safety in Tennessee can be compared with other states from information compiled by U.S. Department of Transportation Bureau of Transportation Statistics.

Bureau data include information about traffic fatalities. Figure 4-5 shows the total number of fatalities and the rate of fatalities as compared to the miles driven for a select number of states located primarily in the Southeast or that border Tennessee. Tennessee's fatality rates are in the mid-range of this group of states.

Figure 4-5. Highway Fatality Rates and Total Traffic Fatalities (2000)

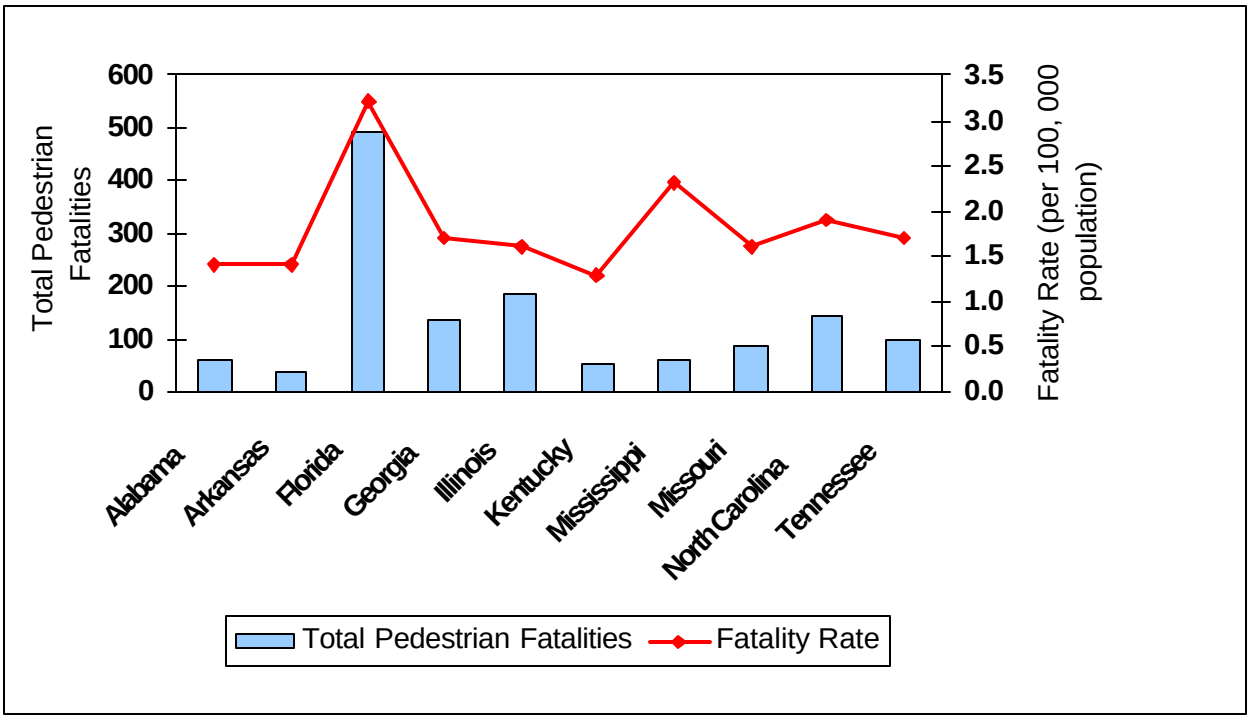


Source: Tennessee Transportation Profile, Bureau of Transportation Statistics

Figure 4-6 shows pedestrian fatality rates and total pedestrian traffic fatalities. Tennessee falls in the mid-range of comparison states on this statistic.

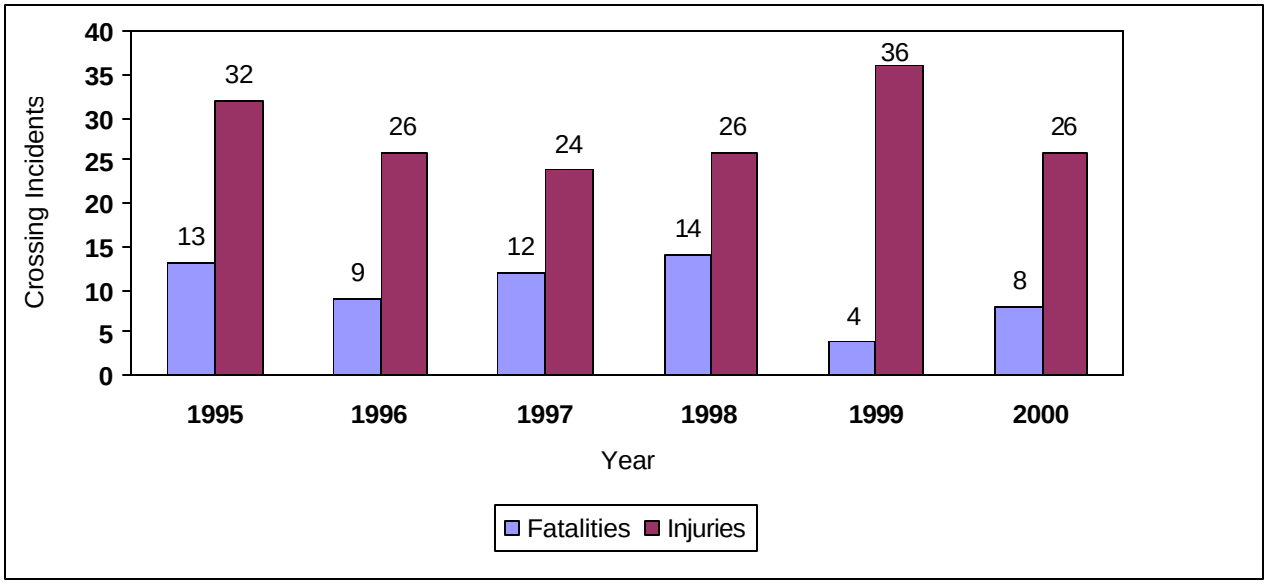
Figure 4-7 shows the number of fatalities and injury incidents resulting from at-grade railroad crossing crashes in Tennessee. The number of incidents is about 40 per year. Fatalities have decreased over the 5-year period, while injury crashes have remained fairly steady over the same period, with a high point of 36 in 1999.

Figure 4-6. Pedestrian Fatality Rates and Total Pedestrian Fatalities (2000)



Source: Tennessee Transportation Profile, Bureau of Transportation Statistics

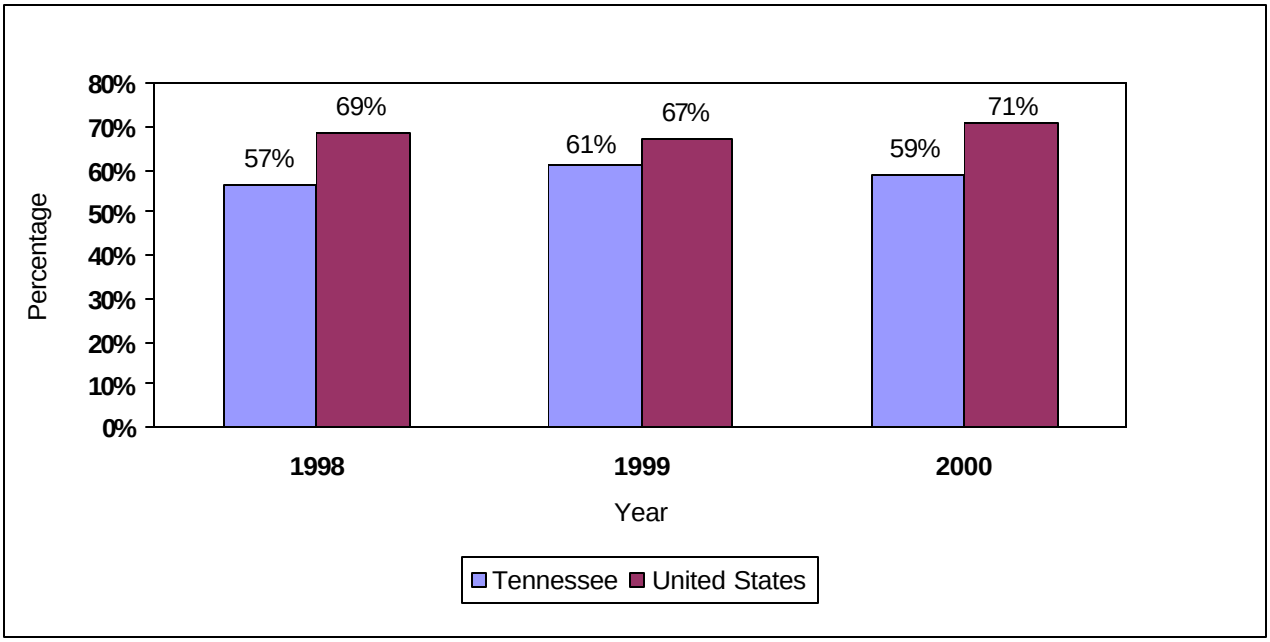
Figure 4-7. Tennessee Highway-Rail Grade Crossing Incidents (1995 to 2000)



Source: Tennessee Transportation Profile, Bureau of Transportation Statistics

Seat belts reduce injuries and fatalities resulting from crashes (Figure 4-8). Surveys taken from 1998 to 2000 show that the percentage of Tennessee drivers and passengers using seat belts is lower than the national average. Tennessee has increased its efforts to encourage seat belt use.

Figure 4-8. Tennessee Seat Belt Usage (1998 to 2000)



Source: Tennessee Transportation Profile, Bureau of Transportation Statistics

4.1.8. Highway and Bridge System Implications

- Both nationally and within Tennessee, the average annual number of miles that vehicles travel continues to grow. People drive longer distances and make more trips. Travel is growing at a much faster rate than capacity improvements to the transportation system. This differential is contributing to increased traffic congestion.
- The increased amount of travel in new suburban areas has resulted in traffic congestion in these locations.
- Higher speed limits and the desire to improve the safety of travel has led the FHWA to require more stringent design standards in the construction of future highway projects. While this is desirable, it will lead to higher project costs and possibly less flexibility where projects are located.
- The good condition of Tennessee's current highways and bridges allows flexibility in responding to future transportation needs rather than having to allocate large amounts of funds to maintain the existing system.
- The amount of freight moved by truck continues to increase. Higher levels of truck traffic have implications on traffic congestion and on the durability of highways and bridges. Shifting more freight to other travel modes could have a positive impact on traffic congestion and required highway maintenance.

4.2. Intelligent Transportation Systems

ITS uses technology to improve the transportation system efficiency without relying on constructing or widening roadways. ITS lessens the traffic impact of crashes or other incidents that occur on the interstate highway system by linking traffic operations agencies, emergency response agencies, and transit agencies, and by providing real-time travel information to the public so that they have an opportunity to adjust their travel. To explore this alternative to improving transportation in the state, TDOT completed an ITS Plan in 2000. The plan provides a strategy and establishes priorities and projects to be implemented for the deployment of ITS in the state's major metropolitan areas. The plan is summarized below.

4.2.1. Background Information

The current TDOT direction for ITS and IM[20] is established in the *TDOT SmartWay Strategic Plan, Annual Report* (December 2003) and the *Strategic Plan for Highway Incident Management in Tennessee* (August 2003).

Each document recommends strategic priorities for ITS and IM. These priorities were intended to help guide TDOT in continuing the development of both programs and to be responsive to public and private concerns involving ITS and IM. Both plans recommend an annual review and updates of strategic priorities and goals (as summarized in Table 4-4).

Currently, ITS operations in Tennessee focus primarily on travel and traffic management, commercial vehicle operations, information management, and maintenance and construction management. TDOT also provides a supporting role to public transportation and emergency management.

Many of the recommendations of the *TDOT ITS Strategic Plan* and the *Strategic Plan for Highway Incident Management in Tennessee* rely heavily on:

- Continued leadership and direction from legislative, policy, and program steering committees
- Adding new information, criteria, or priorities to existing resources and processes
- Increased awareness of the importance and benefits gained by sharing and adapting existing resources and processes
- Developing appropriate training and education programs
- Initiating a comprehensive set of performance measures related to time and safety, efficiency, cost effectiveness, and economic benefit
- Improving technology.

[20] Incident management is defined by "highway incident" or "...any nonrecurring event or circumstance that disrupts the normal flow of traffic or threatens the safety of motorists, residents, or businesses in the vicinity of the highway."

Table 4-4. Summary of Strategic ITS Priorities and Goals

TDOT ITS Strategic Plan Priorities	Highway Incident Management Plan Goals
1. Support freeway service patrols and incident response initiatives.	1. Reduce the number and severity of highway incidents.
2. Apply ITS technologies at welcome centers and rest areas.	2. Better inform and educate motorists to reduce congestion and improve safety.
3. Target implementation of ITS elements in select locations to support data collection and field test deployment strategies.	3. Expand and enhance resources for systematic management of highway incidents.
4. Develop ITS regional architecture.	4. Expand and enhance training for highway incident responders.
5. Institute training program for ITS stakeholders.	5. Support highway IM teams in metropolitan and urban areas.
6. Establish information system infrastructure to support ITS needs.	6. Sponsor highway IM teams in rural areas.
7. Establish ITS public outreach program.	7. Accelerate deployment of new technologies to improve IM.
8. Integrate TDOT/MPO plans and programs.	8. Reduce traffic congestion caused by highway work zones.
9. Foster ongoing ITS strategic planning initiative.	9. Establish working groups to focus specific issues and recommended actions.
10. Apply ITS applications to other modes of transportation.	10. Promote ongoing interagency planning and coordination.
11. Implements statewide IM.	
12. Provide 511 Traveler Information Service.	
13. Evaluate benefits and costs of ITS and IM projects.	

4.2.2. Future Capital and Operations Needs

The future direction of ITS strategic deployment includes several areas of operational needs that are not yet developed at a statewide level. These include but are not limited to the following:

- Deploy additional incident response equipment statewide and expand response training for TDOT forces in the regions, districts, and counties.
- Enhance IT applications at welcome centers and rest areas.
- Prepare a framework for a statewide ITS communication network.
- Continue to develop a statewide framework for ITS/IM operations and management, as with the SmartWay initiative.
- Extend ITS/IM-related IT applications to other areas within TDOT.
- Consider integrating weather-related data, disaster response and relief, and emergency management systems with Internet, GIS, and statewide traffic and safety information systems.

- Continue to create public ITS/IM awareness through an integrated TDOT public affairs program.
- Identify opportunities for joint TDOT/MPO ventures at modal and intermodal levels.
- Identify and assess statewide urban public transportation ITS strategies.
- Continue development of a statewide rural public transportation strategy.
- Continue to support and provide implementation assistance to the 511 Traveler Information Service.
- Develop ITS/IM specific performance measures for modal and integrated transportation systems.

Both the ITS and IM strategic plans note that the majority of improvements will have moderate to significant capital costs. The ongoing operation and maintenance costs will require increased attention at policy and legislative levels. Given this level of expense, implementing many ITS or IM strategies will likely require new and innovative financial sources.

4.2.3. Intelligent Transportation System/Incident Management Implications

Additional coordination is needed to fully realize the benefits of ITS. Each strategic priority will require different combinations of legislative involvement, partnerships, funding levels, and internal agency staffing.

4.3. Aviation System

Tennessee's commercial service airports play a significant role in the state's economy. All of the commercial service airports have invested in new air cargo handling infrastructure, positioning them for the most rapidly growing segment in aviation – air freight. The Memphis International Airport is the number one air cargo handling facility in the world, primarily a result of being the central hub for Federal Express.

The Memphis International Airport, Chattanooga Metropolitan, McGhee Tyson in Knoxville, Nashville International, McKellar Sipes in Jackson, and the Tri-Cities Regional Airport all support commercial air service to most major cities in the United States. These commercial airports, with other regional and community airports, form an aviation system that serves the state. Tennessee's aviation industry annually generates approximately $3 billion for the state's economy and provides approximately 49,000 jobs.

An Airport System Plan was completed in 2000 (and updated as part of the LRTP) to define a statewide airport system that would provide sufficient statewide coverage. The plan proposed a revised classification system that considers economic factors, aviation trends, and intermodal analysis within the context of Tennessee's unique geographic regions. The airport classification system establishes three classes of airports (commercial, regional, and community service) along with the minimum physical requirements for each class type.

Table 4-5 lists all Tennessee airports and their classifications. It should be noted that the table includes a sub-set listing of the regional candidate airports that were not selected at this time for consideration as regional airport classifications.

Table 4-5. Airports by Classification

Commercial Service			
Tri-Cities Airport	McKellar Sipes Airport		
McGhee Tyson Airport	Memphis International		
Lovell Field	Nashville International		
Regional Service			
Gatlinburg-Pigeon Forge	Outlaw Field-Clarksville	Carroll County	
Greeneville Municipal	Boma Field – Shelbyville	Robert Sibley	
John C. Tune	Upper Cumberland	Moore-Murrell	
Smyrna	Millington Municipal	Campbell County	
Sumner County	Dyersburg Municipal		
Community Service – Business (Regional Candidates)			
Knoxville Downtown	William L. Whitehurst	Ellington	
Rockwood Municipal	Covington Municipal	Portland Municipal	
McMinn County	Crossville Memorial	Fayetteville Municipal	
New Cleveland	Warren Co. Memorial	New Tazewell	
Everett Stewart	Maury County	Beech River	
Community Service			
Hardwick Field	Wolf River	Cornelia Fort	Perry Co.
Monroe County	Arnold Field	Murfreesboro	Lafayette Municipal
Collegedale	Martin Campbell	Lebanon	John A Baker
Marion County	Gibson County	Pickett	Houston Co
Johnson City	Humboldt	Dickson Municipal	Jackson Co.
Elizabethton	Henry County	Livingston Municipal	Jamestown Municipal
Mark Anton	Franklin-Wilkins	Winchester Municipal	Hassell Field
Johnson County	Scott Field	Smithville Municipal	Meadowlake
Scott Municipal	Beech River	Abernathy Field	Hawkins County
Powell	Fayette Co.	Franklin Co.	Tullahoma
Chilhowee	Benton County	Lawrenceburg	Springfield/Robertson Co.
General Dewitt Spain	Savannah-Hardin	Humphreys Co	
Charles W. Baker	Reelfoot Lake	Centerville	

4.3.1. Commercial Service Airports

One transportation challenge is to provide sufficient statewide access to commercial service airports. Six such airports serve the state. Obtaining sufficient service levels and pricing from commercial operators often depends on a number of market-related factors, but is a concern for those served by smaller commercial airports.

4.3.2. Regional Service Airports

Regional service airports provide air facilities for small commercial operators and private planes. The statewide objective is to ensure convenient accessibility to commercial and regional service airports. Convenient access was defined as providing "75 percent of businesses with 10 or more employees within 25 miles or 25 minutes of an airport with an instrument approach."

The 14 regional airports, plus the 15 candidates, represent what would be considered a long-term network of regional airports in the state. Candidate airports are listed in Table 4-5 under Community Service-Business. Two airports (New Tazewell and Beech River) are listed as regional candidates; however, they are proposed as future airports and have not yet been constructed.

4.3.3. Community Service Classifications

With the exception of private airports, all other airports in the state system plan were classified as community service. Privately operated, public use airports will maintain their existing status. Privately operated airports interested in making improvements necessary to meeting the airport classification standards must work with the TDOT Division of Aeronautics.

4.3.4. Aviation System Implications

- TDOT is working to develop a system of airports that is adequate to meet the current and future aviation needs of the state. Challenges include maintaining a safe and reliable airport system, and, when considering system expansion, minimizing environmental impacts and non-compatible land uses to the extent feasible.
- The Airport System Plan provides Tennessee with an effective system of airports. Each airport is now being reviewed to determine future onsite improvements. TDOT is also evaluating improvements to airport access as part of individual site plans.
- Six commercial service airports serve the state. Obtaining sufficient service levels and pricing from commercial operators often depends on a number of market-related factors, but is a concern for those markets served by smaller commercial airports.

4.4. Waterway System

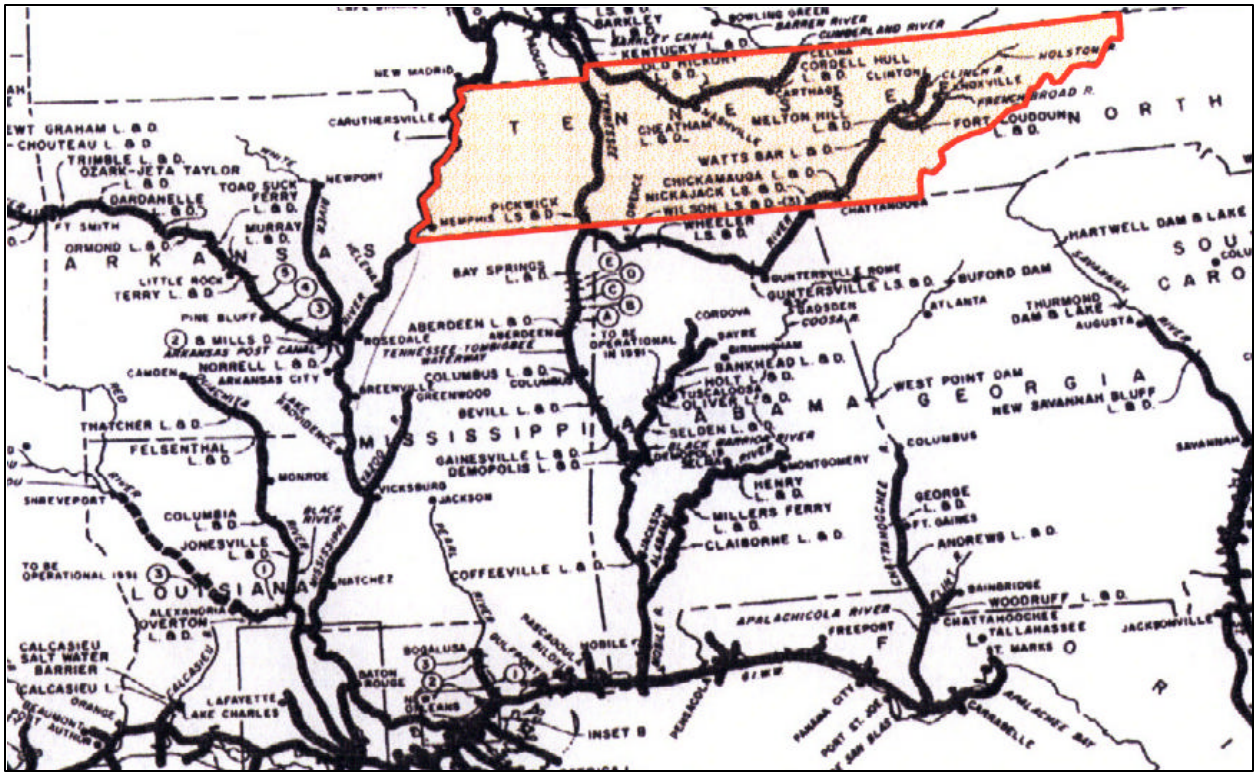
Freight is also transported on Tennessee's waterway system. Tennessee has the fifth largest navigable inland waterway system in the United States. There are 1,062 miles of navigable waterways and 172 ports located along or inside the borders of Tennessee. The number of navigable waterway miles in Tennessee roughly equals the state's number of interstate highway miles. Tennessee also has two direct links to sea ports on the Gulf of Mexico via the Mississippi River and the Tennessee-Tombigbee waterway. These direct links offer significant international opportunities.

While TDOT has an interest in ensuring that the waterway system functions effectively, the Tennessee Valley Authority (TVA) and the USACE have the primary responsibility for capital improvements to and operations of these waterways. As such, they collect data on waterway

infrastructure, demand, and usage, and develop the planning programs and project development work undertaken for waterways. TDOT is exploring ways to support these agencies and private operators to increase the movement of freight via waterway.

The majority of the nation's navigable waterways are in the eastern United States. The Mississippi River basin and its tributaries dominate the landscape of the east and create a region rich in water resources. Tennessee is unique in that it is centrally located in this water-rich region. Due to its location, Tennessee can use its waterways to easily transport commodities north into major metropolitan ports or south to deep water ports. Figure 4-9 shows the navigable waterways in the eastern U.S. and how Tennessee is advantageously located within this region.

Figure 4-9. Navigable Waterways in the Eastern United States



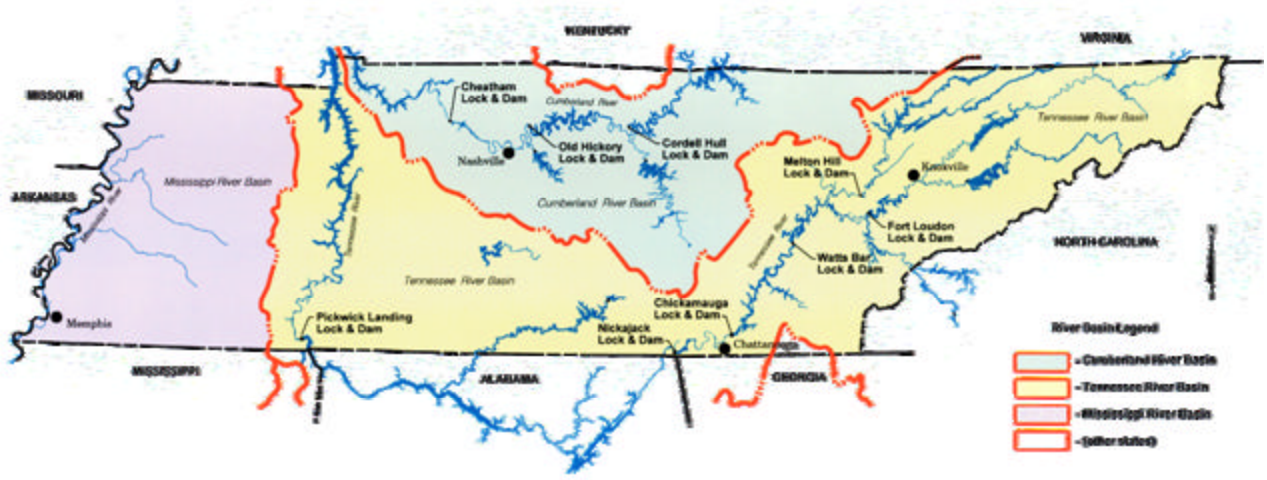
4.4.1. Tennessee's Waterway System

Tennessee's navigable waterway system consists of three major watersheds: the Mississippi River, Tennessee River, and Cumberland River basins. These basins are shown in Figure 4-10.

Mississippi River Basin

The Tennessee portion of the Mississippi River Basin has approximately 176 miles of navigable water. It extends eastwardly over the geologic region known as the Gulf Coastal Plain until it reaches the western perimeter of the Tennessee River watershed.

Figure 4-10. Tennessee's Waterway System



Tennessee River Basin

The Tennessee River Basin flows across areas of four states: Tennessee, Alabama, Mississippi, and Kentucky. The main channel covers 652 miles of navigable water flowing from the junction of the Holston and French Broad rivers near Knoxville to its union with the Ohio River at Paducah, Kentucky. Of the 652 navigable river miles, approximately 401 miles are within Tennessee boundaries. In addition to the main channel of the Tennessee River, approximately 153 miles of additional navigable waters are associated with a number of connecting tributaries.

Cumberland River Basin

The Cumberland River Basin's main channel flows through Tennessee and Kentucky, where it merges with the Ohio River. Of the more than 385 miles of navigable waterways, approximately 310 river miles are in Tennessee. In addition, about 29 miles of navigable waters are in the connecting tributaries.

4.4.2. Freight Movement Using Waterways

The functions of Tennessee's waterway system include the transport of commercial and special freight as well as bulk commodities, recreation usage, and water supply. Special freight is not considered a commodity, but rather equipment that needs the forgiving size of the river to be moved. Power providers may need the river to move large items such as hydro-turbines. It also allows businesses or institutions that must be located near water due to the size of their equipment to build their factories or laboratories inland to more centrally located property.

Movement of freight on the nation's waterways is monitored by the USACE. According to statistical data from 2001, Tennessee's river systems carry a variety of products. On the Tennessee River, coal, petroleum products, chemical products, aggregates, lime and cement, steel products and scrap, and grains are the primary commodities moved. Products moved on the Cumberland River include limestone aggregate, petroleum products, chemicals, steel products and scrap, lime and cement, and grains. Finally, the section of the Mississippi River bordering the western edge of Tennessee is used to transport petroleum products, chemicals, aggregates,

steel products and scrap, lime and cement, and grains. Table 4-6 summarizes the percentages of commodities transported throughout the state.

Table 4-6. Percentage of Commodities Transported on Tennessee's Waterways

Commodity	Percentage of Total Tonnage		
	Cumberland River	Tennessee River	Mississippi River (Memphis)
Coal, Lignite, and Coal Coke	45	40	14
Petroleum Products	4	6	35
Chemicals and Fertilizers	2	7	5
Crude Materials, Inedible Except Fuels	40	33	18
Primary Manufactured Goods	6	5	9
Food and Farm Products	3	9	19
Manufactured Goods	<1	<1	<1
Unknown Classified Products	N/A	N/A	N/A

4.4.3. Locks and Dams

The main stem of the Tennessee River has 9 multipurpose dams and 12 navigation lock chambers including three auxiliary chambers at Wilson, Wheeler, and Guntersville. Five of the main locks are located in Tennessee: Pickwick, Nickajack, Chickamauga, Watts Bar, and Fort Loudoun.

The main stem of the Cumberland River has four multipurpose dams and locks with no auxiliary chambers. Three of these locks and dams are in Tennessee: Cheatham, Old Hickory, and Cordell Hull.

Tennessee is positioned downstream of the last lock (No. 27) on the Mississippi River. Lock 27 is just north of St. Louis, Missouri. The Mississippi River is free of locks and dams from St. Louis to the Gulf of Mexico.

4.4.4. Ports and Terminals

Tennessee has 172 port terminals within its boundaries. Twenty-three terminals are classified as inactive. Of the remaining 149 active terminals, 59 are on the Tennessee River, 29 are on the Cumberland River, and 61 are on the Mississippi River.

Tennessee's largest and most active port is the International Port of Memphis. It is the second largest inland port on the Mississippi River, and the fourth largest inland port in the United States. The Port of Memphis is on the Mississippi River from mile 725 to mile 740. The port includes President's Island, Rivergate Harbor, Wolf River Harbor, and Fullen Dock and Harbor north of downtown.

Three other areas have significant barge traffic: Nashville, Chattanooga, and Knoxville. Within the Ohio River basin, Nashville ranked sixth, Chattanooga eighth, and Knoxville ninth in port size.

4.4.5. Public Agency Involvement

The USACE is the primary agency responsible for operating and maintaining Tennessee's navigable waterways. USACE and the TVA share regulatory authority within the Tennessee River basin. Although the TVA owns and operates the dams on the Tennessee River, the USACE operates and maintains the navigation locks.

Other public agencies involved in Tennessee's waterways are the U.S. Coast Guard and the Tennessee Wildlife Resource Agency. The Coast Guard patrols the river systems for safety of the commercial river traffic, maintains navigation aids, and promotes homeland security. The Wildlife Resource Agency patrols the Tennessee and Cumberland rivers promoting recreational safety, enforcing state laws, and protecting our natural resources and wildlife.

4.4.6. Waterway System Implications

In order for Tennessee's waterways to further contribute to the movement of freight, the waterway system must be upgraded. Upgrades include replacing aging infrastructure at a number of major locks and dredging rivers in key locations to allow use by deeper barges.

4.5. Rail System

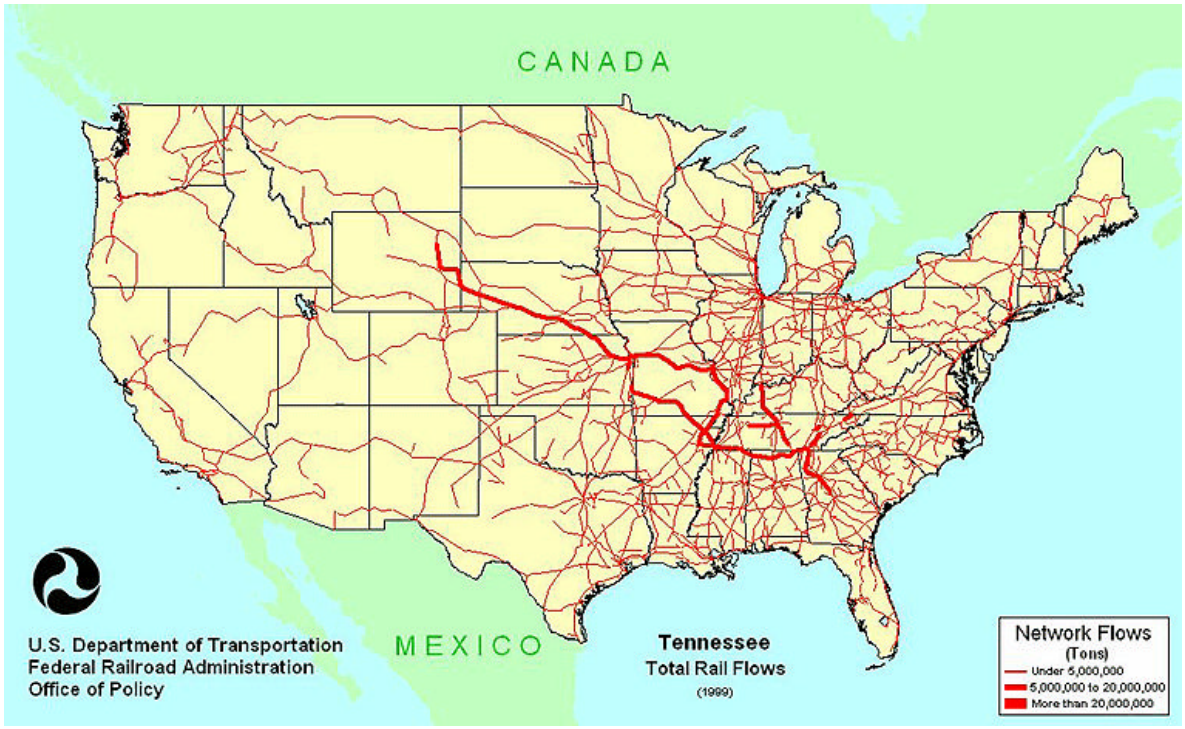
The rail system provides for significant goods movement inbound, outbound, and through Tennessee. Tennessee is served by six Class I major freight railroads and 19 short line railroads, which comprise a network of 3,081 miles of track. In 1998, 80 million tons of freight valued at $33 billion was moved by rail. Freight moved by rail is expected to increase to 137 million tons by 2020.

TDOT prepared the *Tennessee Rail System Plan* in December 2002. This plan includes a feasibility study that explores the potential to establish intercity passenger rail service to all major cities. The purpose of the study was to evaluate the opportunities to develop more direct travel corridors that can compete with interstate highways in terms of speed, time, and convenience.

4.5.1. Existing Rail Network

Tennessee's existing rail network is almost entirely oriented toward moving freight. The six Class I railroads provide mainline service within and through the state. These railroads span 2,335 miles and account for 76 percent of the rail network. The Tennessee rail system is shown on Exhibit 2b. In 1999, these railroads moved 57 million tons of freight (more than 1.9 million carloads). Most of the Class I freight is moved in a north-south direction (see Figure 4-11).

Figure 4-11. Tennessee Rail Freight Flow



The six Class I railroads and associated mileage are:

Burlington Northern & Santa Fe	173 miles
Canadian National/Illinois Central	150 miles
CSX Transportation	1,137 miles
Kansas City Southern Railway	7 miles
Norfolk Southern	850 miles
Union Pacific	18 miles
Total	2,335 miles

A network of 19 short line railroads provides service over branch lines and connects local shippers to main line Class I railroads. In many cases, short line railroads provide service that would be uneconomical for the larger Class I railroads. Short line railroads account for 24 percent of the state's rail network, or 746 miles of track. TDOT provides financial support for short line operators by assisting in various infrastructure renewal projects. Such support translated to short line railroads shipping four million tons of freight in 48,000 carloads in 2001.

4.5.2. Identified Rail System Gap

The *Tennessee Rail System Plan* included a number of recommendations that could lead to additional use of the rail system to move freight. While most of Tennessee's main line rail network can be thought of as "mature," the plan identified a gap between Nashville and Knoxville, over the Cumberland Plateau. At one time, railroad tracks connected these cities, but over time this route was abandoned. To restore east-west service between these two cities would require physically replacing rails between Algood (east of Nashville) and Oliver Springs (west of Knoxville). If rails were restored, it would be once again possible to ship freight directly between Memphis and Nashville to Knoxville (and points north, south, and east) by train. Restoring rail service over the plateau would also allow for passenger rail service to connect these important metropolitan areas.

4.5.3. At-Grade Crossings

As safety and maintenance issues are continually addressed, at-grade crossings are a source of concern for railroad companies and state and local jurisdictions. In Tennessee, the railroads are responsible for roadway and track maintenance at crossings. Potential solutions to reduce vehicle and train conflicts include constructing bridges, closing crossings, and installing gates and warning lights.

An effective safety measure is to reduce the number of at-grade crossings by closing some roads and directing traffic to consolidated crossings. This option can be difficult to implement given the land use patterns that have developed near existing railroads, the need for emergency vehicle access, and traffic circulation needs.

4.5.4. Rail System Implications

- While the shipment of freight over rail is a viable and growing alternative to shipment by truck, the projected growth in rail traffic raises the potential for increased rail/vehicle conflicts, traffic delays, and noise impacts.

- While increased use of freight rail could decrease demands on Tennessee's highways, it could also require increased public investment in rail-related infrastructure to add sufficient capacity. Intermodal connectors or access would also require additional investment.

4.6. Public Transportation System

Twenty-five agencies provide public transportation services to all 95 counties in Tennessee. Public transportation has traditionally been designed to provide mobility to persons without access to a private vehicle. In some cases, however, public transportation can also attract individuals with a private vehicle who use public transportation to save money or who do not want to use their travel time driving. Higher public transportation ridership can contribute to reducing traffic congestion, improving air quality, and saving energy. Total ridership in Tennessee in 2003 was more than 30 million trips. Since 1998, ridership has grown about 2.3 percent. Public transportation carries about 3 percent of the total trips taken in urban areas.

This section summarizes information in the *Twenty-Five Year Transit Plan* completed by TDOT during 2003–2004. Additional information related to public transportations conditions and future options is also in the plan. Key information from the report is summarized below.

Nine of Tennessee's 11 urban areas have public transportation systems. Three specialized trolley bus systems serve the recreational areas of Gatlinburg and Pigeon Forge and the city of Franklin. The city of Oak Ridge also operates a small demand response system.

Rural public transportation is provided in each of the state's 11 HRAs. These social service agencies provide demand response services using 7- to 15-passenger public transportation vans. The service focuses on providing mobility to elderly, disabled, and low-income customers. In 2001, approximately 1.36 million trips were delivered by agencies serving the rural public transportation districts. In addition to 25 public agency providers, 80 private not-for-profit and other public organizations received some level of state or federal assistance to purchase vehicles and provide transportation services to people with mental or physical disabilities.

Public transportation's role is vital in many parts of the state, serving as a lifeline for elderly and disabled persons making trips for medical and social service needs; providing a daily low-cost transportation connection for urban workers; interconnecting workers, shoppers, and diners in major activity centers; or providing convenient mobility for visitors in crowded tourist attractions.

In 2003, Tennessee's urban public transportation systems expended almost $106 million for daily operations from a variety of funding sources. For rural systems, operations costs totaled nearly $21 million. Significant capital costs are required to provide public transportation services including rolling stock, user amenities, maintenance facilities, and, for some new and planned systems, rail guideway construction costs. While the state provides funding to local transit agencies for both ongoing operations and capital projects, no dedicated financial sources at the state level support public transportation. In 2002, TDOT covered 17 percent of statewide public transportation operating costs and 11 percent of capital costs.

4.6.1. Use of Public Transportation

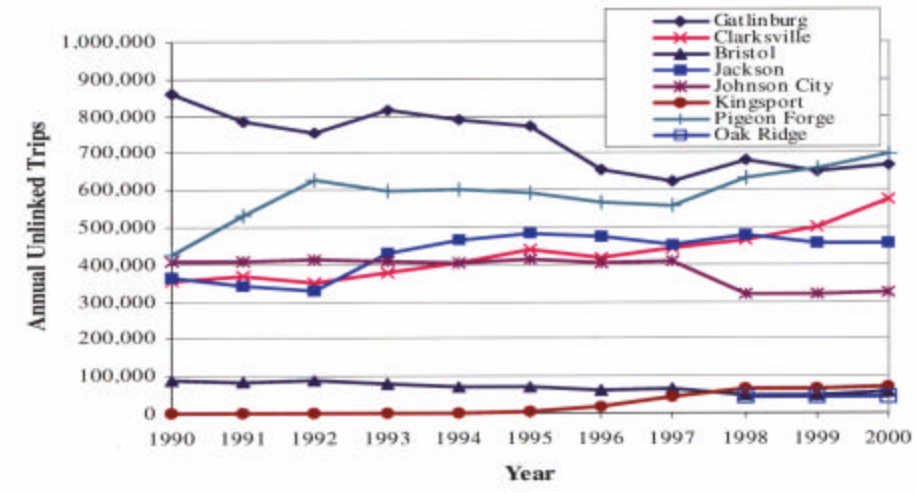
Existing public transportation ridership in Tennessee has surpassed 30 million annual trips. Ridership trends through the 1990s are shown in Figures 4-12, 4-13, and 4-14.

Total public transportation ridership declined over the decade, largely because fixed route bus patronage was down by 15 percent. There was, however, a noticeable flattening and some recovery of ridership in the latter part of the decade, a trend that has persisted, echoing public transportation ridership gains nationally over the past several years. This trend is occurring on both urban fixed route and demand responsive services. Rural trips have remained generally level, reflecting limitations in the amount of service provided.

Between FY 2000 and FY 2003, TDOT funding in support of public transportation increased significantly, growing from $22.3 million to $30.5 million. Federal assistance programs include operating, capital, planning, and technical assistance funds. The State Operating Assistance

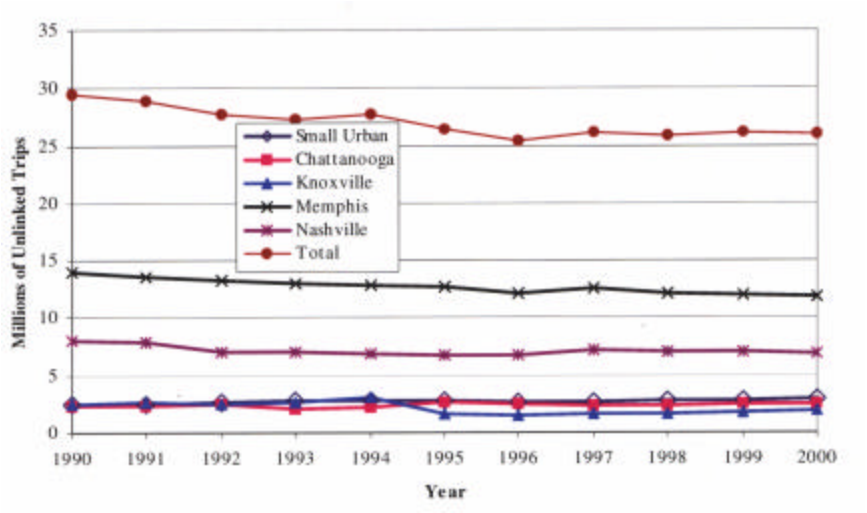
Program assists local transit agencies with the non-federal share of operating and capital costs. In 2002, $14.1 million (82 percent) went to urban operating assistance, and $3.1 million (18 percent) flowed to rural state operating assistance (total of $17.2 million).

Figure 4-12. Public Transportation Ridership in Small Urban Areas in the 1990s



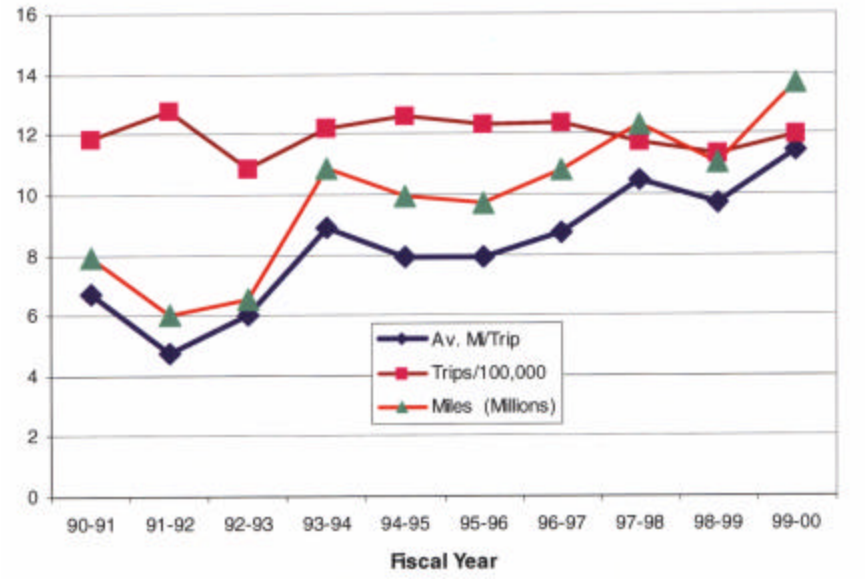
Source: *An Assessment of Future Demands for and Benefits of Public Transit Services in Tennessee,* March 2002, page 4.32. (Oak Ridge National Laboratory)

Figure 4-13. Total Urban Public Transportation Ridership in the 1990s



Source: *An Assessment of Future Demands for and Benefits of Public Transit Services in Tennessee,* March 2002, page 4.32. (Oak Ridge National Laboratory)

Figure 4-14. Rural Public Transportation Ridership in the 1990s



Source: *An Assessment of Future Demands for and Benefits of Public Transit Services in Tennessee,* March 2002, page 5.18. (Oak Ridge National Laboratory)

4.6.2. Projected Operating Costs

To meet differing rates of ridership growth, operating cost forecasts through 2010 were developed for both urban and rural service scenarios. To accommodate a tripling of ridership, total public transportation funding per capita for operations would need to increase by 54 percent over existing levels. This level of increase would require $162 million in operating cost in 2010. Maintaining the existing level of ridership requires $127 million in operating cost (32 percent over 2002). For rural areas, a gain of 20 percent ridership would require a funding increase over 2002 levels, from 17 to 21 percent.

4.6.3. Capital and Operations Needs

Forecasts for capital costs include allowances for proposed rail systems in Memphis and Nashville, bus rapid transit in the Sevierville corridor, new public transportation systems in emerging markets, and general expansion of conventional services in all urban and rural service areas. Highlights of these significant projects include:

- The Memphis Area Transit Authority is reviewing three potential light rail corridors and is currently expanding its downtown trolley system.
- The Regional Transit Authority in Nashville is sponsoring a planned commuter rail service extending eastward from downtown, and, in concert with the Metropolitan Transit Authority and the MPO, is studying four other corridors for potential high-performance public transportation service.

- In the Sevierville-Pigeon Forge-Gatlinburg corridor, the feasibility of Bus Rapid Transit service is being explored.
- By 2025, five urban areas are anticipated to be large enough to warrant new public transportation systems: Murfreesboro, Morristown, Cleveland, Columbia, and Cookeville.
- Continued expansion of existing fixed route urban bus systems is expected in Memphis, Nashville, Knoxville, Chattanooga, Clarksville, Jackson, Johnson City, Oak Ridge, Bristol, Kingsport, Pigeon Forge, and Gatlinburg. Demand responsive services in urban areas as well as rural public transportation services will also increase.

4.6.4. Intercity Passenger Rail

Tennessee's intercity passenger rail network spans 132 miles and serves two stations (Memphis and Newbern-Dyersburg) with one round trip per day. This service is part of the much longer Chicago to New Orleans route, provided by Amtrak's City of New Orleans service.

TDOT recently participated in a state planning effort for a high-speed train corridor between Nashville, Chattanooga, and Atlanta. This corridor could employ either steel-wheeled train technology or maglev technology. Maglev technology replaces steel wheels with a small cushion of air created by using the repelling forces of magnets to levitate and propel the trains at speeds of up to 300 mph.

To provide multimodal integration, train stations serving the airports in Nashville, Chattanooga, and Atlanta were proposed. These stations would enable trains to serve as another transportation "spoke" in the airline's hub system, so that customers could take a high-speed train to the airport, and then on the same ticket set, transfer to a longer-haul flight for destinations nationally or internationally. To serve smaller towns, train stations would be located in Murfreesboro and Manchester, Tennessee, and in Dalton, Cartersville, and Marietta, Georgia.

A second, smaller rail project called the Music City Star will be Tennessee's first commuter rail line (32 miles long); the project is scheduled to link Nashville with Lebanon in 2005. This easterly route from Nashville is the first of five proposed potential commuter rail lines radiating from Nashville.

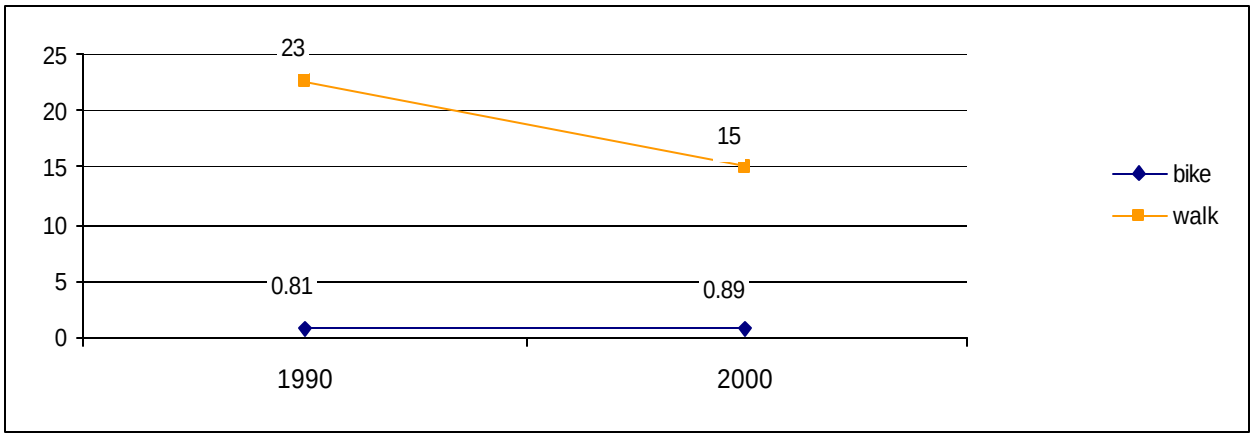
4.6.5. Public Transportation Implications

For many persons, the role of public transportation as a part of the overall transportation system may not be large. It is anticipated, however, that over the next 10 to 20 years, increased fixed route services and newer premium public transportation services could provide cost-effective mobility as our system capacity needs become more challenging to implement. However, for public transportation use to increase, it must be more competitive with other modes of transportation. Service must be more frequent and more comfortable, provide convenient access to destinations, and offer competitive total travel times. In addition, demographic forecasts project growth in rural and elderly populations. This will create a growing need for public transportation services in rural areas.

4.7. Bicycle and Pedestrian System

Many Tennessee residents are interested in walking and bicycling for both transportation and recreation. Walking and bicycling make up about 1.6 percent of work-related trips (Figure 4-15) in Tennessee in 2000[21], making them the second most popular forms of travel after driving. As modes of travel, walking and bicycling are healthy, efficient, low cost, and available to nearly everyone. However, the percentage of walk-to-work trips in Tennessee is approximately half of the national average.

Figure 4-15. Bicycle and Pedestrian Commutes to Work (Per Thousand Workers)



These modes provide an opportunity for communities to achieve the larger goals of developing and maintaining livable communities; making neighborhoods safer and friendlier; and reducing transportation-related environmental impacts, mobile emissions, and noise. There is also growing interest in encouraging walking and bicycling as a way to improve public health. Increasingly, public health organizations are looking to metropolitan and state transportation planners to create more walkable and bikeable communities that encourage healthier lifestyles.

As part of this LRTP, TDOT is developing a bicycle and pedestrian plan. TDOT adopted the TEA-21 provisions for bicycle and pedestrian facilities and planning in January 2003. Policy guidelines to implement these provisions are being developed, and TDOT has provided the MPOs with the opportunity to provide input.

An important challenge is to determine ways to increase the percentage of Tennesseans who walk and bicycle. In Tennessee, bicycle use increased between 1990 and 2000 from 1,818 bike commuters in 1990, or 0.08 percent of commuters, to 2,330 bike commuters in 2000, or 0.09 percent of all commuters.

One major constraint on pedestrian and bicycle travel is a lack of appropriate facilities. Currently, 8,500 miles of Tennessee roadway have 4-foot-wide shoulders that could potentially accommodate bicycle travel. The state also has 150 miles of greenways and trails. These facilities, while important, provide only a limited number of bicycle or pedestrian connections between destinations. Gains in pedestrian and bicycle travel will likely require an integrated and

[21] Travel to Work Characteristics for the United States. Census 2000.

consistent network of pedestrian and bicycle facilities, especially within cities and towns. Busy roadways with no shoulders, bike lanes, or sidewalks, facilities in poor condition, barriers to the disabled community, and other deficiencies constrain growth in walking and bicycling.

Providing for pedestrian and bicyclist safety is a major challenge. Over the past 5 years, bicyclists' injury and fatality rates have decreased, as shown in Figure 4-16. The statistics appear positive; however, the rate could indicate that fewer people are bicycling. While bicycle commute trends have improved slightly in the last decade, there is evidence that the rate of all bicycle trips has been dropping as fewer children ride to school, traffic volumes increase, and roads become less inviting to bicyclists.

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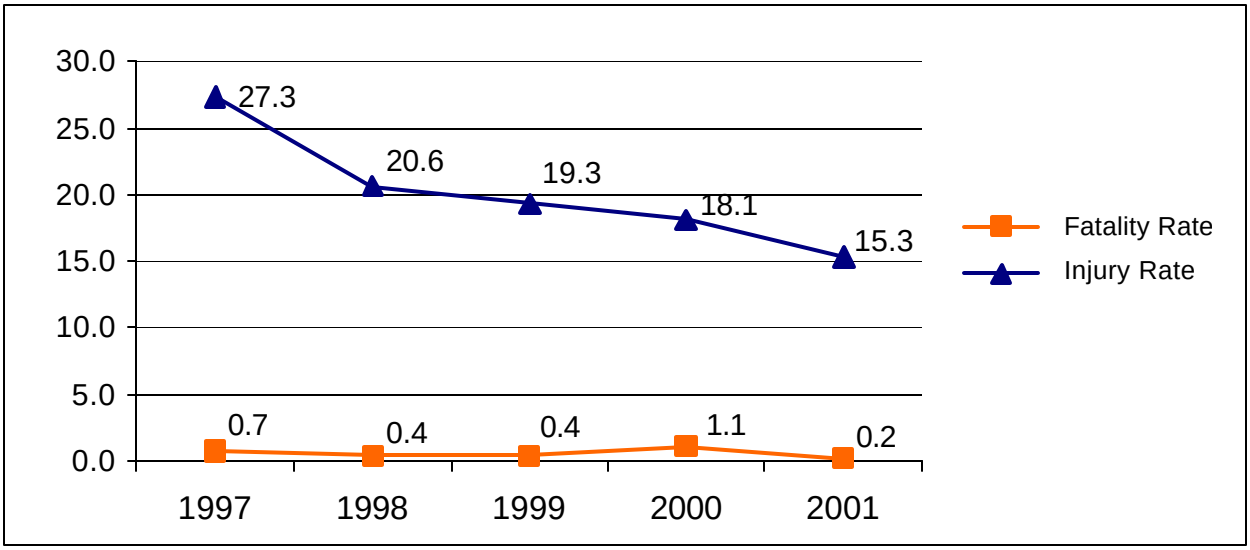


Contrary to popular belief, most bicycle crashes do not involve crashes with motor vehicles. They usually involve falls or crashes with stationary objects, other cyclists, and pedestrians. Also, most crashes are due to bicyclists or motorists disobeying the rules of the road. In a review of bicycle-motorist crash causes, the fault lies equally between motorists and bicyclists. Most crashes occur where two roadways or a roadway and a driveway intersect, and one user fails to yield the right-of-way to the other.

4.7.1. Bicycle and Pedestrian System Implications

- Improving bicycle and pedestrian facilities will require identifying fundable and feasible, bicycle or pedestrian projects that connect destinations. In addition, if bicycle or pedestrian use is to increase, new highway and development projects must consider how safe bicycle or pedestrian movement can be accommodated.

- Coordination with local and regional jurisdictions and private developers is particularly important if bicycle and pedestrian conditions are to improve.

4.8. Summary of Transportation System Trends

The current composition and future trends for Tennessee's transportation system are some of the most significant considerations in estimating the future demand on the transportation system. The sections above describe baseline conditions, trends, and issues for the various modes that comprise the transportation system and how they influence Tennessee's current and future transportation system. Table 4-7 summarizes the major trends and implications identified for each mode and lists the challenges and opportunities Tennessee will face for each implication.

Table 4-7. Summary of Transportation System Challenges and Opportunities

Implications	Challenges	Opportunities
Highway and Bridge System Trends		
Both nationally and within Tennessee, the average annual number of VMT continues to grow. People drive longer distances and make more trips. Suburb-to-suburb and other long-distance commuting have worsened peak-hour congestion.	Slowing VMT rate of growth. Improving quality of life for users of the transportation network and those affected by its use. Reduce reliance on single-occupant vehicles. Improve transportation system safety.	Construct new roadways that meet higher design standards. Meet or exceed environmental standards. Provide additional transportation choices.
Higher speed limits and the need to improve travel safety have led FHWA to require more stringent design standards.	Constructing new highways to new standards may increase project cost and result in more environmental impacts.	Improve transportation system safety. Improve the traffic operating efficiency of the transportation system.
The good condition of the state's highways and bridges.	Maintaining the highways and bridges to retain the current good condition.	The current level of spending for maintenance can be maintained. New additional funds can address other transportation needs.

Table 4-7. Summary of Transportation System Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Highway and Bridge System Trends (Continued)		
The amount of goods moved by truck continues to increase.	More truck traffic leads to more congestion and adds wear to highways and bridges.	Improve or encourage transport of goods via other travel modes. Design roadways to accommodate more trucks and/or develop a designated freight network, a set of routes specifically designed to accommodate high amounts of truck travel. Develop an automated truck safety and weight inspection program. Establish partnerships among all levels of government and the private sector to provide transportation improvements. Provide a stable, dedicated, and adequate source of funds to meet the critical needs of the transportation system.
The state's freight system is becoming increasingly intermodal, increasing the need for efficient connections between various freight movement modes (e.g., truck, rail, water, and air).	Providing adequate vessel berths, cranes, and cargo storage space (open and closed) as well as safe and efficient channels, roadways, and rail networks to enable future increases in freight movement.	Ensure transportation and land use plans and policies for infrastructures are adequate to supply newly located freight distribution centers. Modernize existing facilities through necessary improvements to continue to attract and maintain business. Develop a policy promoting a multimodal approach toward future transportation supply and demand management.

Table 4-7. Summary of Transportation System Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Intelligent Transportation Systems Trends		
Further implement ITS/IM strategies as recommended in the TDOT Smartway Strategic Plan.	Managing congestion on the state's busiest highways through traffic monitoring, IM, traveler information, traffic management, and system integration and communication. Improving integration of transportation system operations management with emergency management operations and law enforcement agencies. Facilitating more efficient operations of major transportation investments. Reducing crashes and reducing emergency response times.	Investigate pay-as-you-go strategies on highways (tolls, high-occupancy/toll lanes, etc.) Provide users of the transportation system more information on real-time traffic conditions, weather-related data, and emergency management using intelligent transportation systems. Improve information to users of public transportation customer service and system management. Implement ITS and traffic IM infrastructure. Develop a statewide framework for ITS/IM operations, communications and management.
Aviation System Trends		
The growth in air freight service as the use of "just in time" inventory practices will increase.	Developing and maintaining a safe and reliable airport system.	Expand airports and improve facilities. Minimize environmental impacts and incompatible land uses of expansion. Develop air freight capabilities and the associated economic development adjacent to airports.
Given the changing travel markets, prices and flight availability can vary.	Ensuring that Tennessee residents and visitors have access to a reliable and competitive air service.	Reap economic benefits associated with good air service. Obtain sufficient service levels and economic pricing from major commercial operators. Develop a system of airports that meets the current and future aviation needs of the state.

Table 4-7. Summary of Transportation System Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Waterway System Trends		
The condition of the waterway system is deteriorating. To move more freight, it is necessary to modernize a number of components of the waterway system.	Increase the organizational effort at the state level dedicated to the states waterway needs. Expand the amount of freight moved on the waterways to reduce freight on highways.	Manage and promote Tennessee's water resources. Replacing the aging infrastructure, provide adequate security, compete for federal funds for waterway projects, and promote a waterway to business and industry. Use the efficiency of barges rather than other forms of transportation. Identify commodities that currently are shipped by truck or rail, but are suitable for barge transport.
Rail System Trends		
The growth in rail freight traffic and faster and longer trains will raise concerns about grade crossings, traffic delays, and safety concerns	Determining the role rail freight should play in Tennessee's transportation and economic future.	Improve intermodal safety where modes intersect, such as at highway railroad crossings. Develop rail corridor access and safety policies and enforce them in partnership with the railroads. Examine the potential to divert future freight flows from the highways to rail to alleviate traffic congestion. Provide a state-private partnership that leads to a more efficient rail network, ultimately leading to more goods shipped by rail.
While increased use of freight rail could decrease demands on Tennessee highways, it could also require increased public investment in rail-related infrastructure to add sufficient capacity.	Longer and more frequent trains could lead to more rail delay. More vehicle delay could occur as switching operations become more difficult. Rail freight movement may become constrained, resulting in inefficiencies leading to shifts to other modes.	Develop a statewide transportation access management system plan that includes freight movement. Provide a state-private partnership that leads to a more efficient rail network, ultimately leading to more goods shipped by rail.

Table 4-7. Summary of Transportation System Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Public Transportation System Trends		
An increasing number of elderly and special needs persons need transportation services	Providing and funding sufficient levels of transportation to enable these population groups to access the transportation system. Serving these population groups that may have specific requirements such as demand-response public transportation.	Provide access to the transportation system to those without access to an automobile. Provide access to medical and shopping opportunities to persons without access to an automobile.
For public transportation use to increase, it must be more competitive with other modes of transportation. Service must be more frequent, more comfortable, provide convenient access to destinations, and be competitive in terms of total travel time.	Increasing public transportation ridership to 90 million trips by 2025. Providing mobility and accessibility with transportation choice. Programming necessary capital funds over the next 25 years to expand the public transportation service market. Identifying funding sources to expand public transportation services.	Develop premium public transportation in strategic corridors where travel demand is high and destinations are clustered. Promote integrated public transportation as an alternative to driving. Develop programs that encourage employees to use public transportation to get to/from work. Provide an enhanced public transportation infrastructure and amenities that encourage public transportation usage. Enhance the quality of public transportation service (speed, frequency, coverage, and flexibility) to promote greater mode share. Expand services in suburbs, small cities, and in rural areas. More aggressively promote Transportation Demand Management strategies (carpools, vanpools, park-and-ride lots, flextime, and telecommuting) to shift time and mode of travel.
A growing need for public transportation services exists in rural areas.	Serve these population groups that may require specific services such as demand-response public transportation. Service costs can be high per rider in low-density rural areas.	Provide access to the transportation system to those without access to an automobile who live in rural areas. Improve quality of life for persons living in rural areas. Provide access to medical and shopping to persons without access to an automobile.

Table 4-7. Summary of Transportation System Challenges and Opportunities (Continued)

Implications	Challenges	Opportunities
Public Transportation System Trends (Continued)		
Low-density land use development trends are not supportive of public transportation service.	The development community has not yet fully responded to development practices that are public transportation supportive.	Provide incentives for land use development policies that result in more efficient public transportation service. Promote public transportation-oriented development practices to increase the land use mix and density.
Bicycle and Pedestrian System Trends		
Improving bicycle and pedestrian facilities will require identifying fundable, feasible, bicycle or pedestrian projects that connect destinations. In addition, if bicycle or pedestrian use is to increase, new highway and development projects must consider how safe bicycle or pedestrian movement can be accommodated.	Identifying fundable, feasible bicycle or pedestrian projects. Increasing the percentage of Tennesseans who walk and bicycle to work, as well as other destinations such as school, shopping, and to visit friends. Providing suitable and safe facilities for bicycling and walking along state roadways. Nearly half of all the shoulders in Tennessee are comprised of dirt or gravel, requiring the bicyclist (and pedestrian in many cases) to ride and walk in the roadway. Developing an integrated and consistent network of pedestrian and bicycle facilities, especially within cities and towns. Removing barriers and gaps to safe movement of bicycles and pedestrians.	Include provisions for safe bicycle or pedestrian movement as part of new projects. Integrate federal laws and policies related to bicycle and pedestrian use into TDOT policies. Develop comprehensive user maps and coordinated signage systems. Make public transportation facilities more accessible by adding bicycle racks to buses, providing secure bicycle parking at public transportation centers and major bus/train stops, and providing adequate bicycle and pedestrian facilities that connect to public transportation stops and centers. Develop a model program for bicycling and walking commute programs within TDOT. Coordinate with local and regional jurisdictions to improve bicycle and walking facilities in metropolitan areas and improve connections to existing and planned local facilities.

Chapter 5
Financial Trends

This chapter describes TDOT's major sources and uses of revenue, surplus/deficit, and potential future revenue sources. It also describes how the major revenue sources are collected and distributed, and their relative share in TDOT's overall budget for FY 2004-05. Major revenue uses are also described in terms of TDOT's budget, including details on the relative burden of federal, state, and local support.

A preliminary list of potential future revenue sources is also presented. It should be noted that this initial list is based on an early review of TDOT's program and will likely be refined as the planning and review process moves forward and as successor legislation to TEA-21 is passed.

5.1. Overview

The first and most desirable choice is pay-as-you-go financing, whereby available revenue sources fund the construction and implementation of capital projects. The second option is to finance the project by issuing long-term debt. Debt financing provides the ability to advance project implementation by borrowing against projected future revenue.

TDOT's program is currently run on a pay-as-you-go basis. Strictly speaking, there is not a surplus or deficit, such as in other programs. The majority of the program is funded through highway user taxes and from federal funds. A portion of TDOT's budget is funded through bond authorizations in lieu of selling bonds. This program is described below.

TDOT's FY 2004-05 budget is just over $1.6 billion. Highway user fees and federal funds account for more than 88 percent of TDOT's revenues. These revenues are distributed across programs as follows. Mass transit receives $56 million through TDOT and a combination of federal, state, and local funds. The combined budget for aviation, rail, and waterway modes is nearly $45 million when federal, state, and local sources are totaled. The remainder of the budget supports system maintenance, equipment, physical plant, administrative functions, and highways and bridges.

5.2. Major Sources of Revenue

Each major revenue source is described in Table 5-1 and discussed in the following sections.

Table 5-1. Total TDOT Budget for FY 2004-05 by Major Source of Revenue

Source	Amount ($M)	Share of Total (%)
Highway User Fees and Taxes	650,400	40.2
Miscellaneous Department Revenues	28,600	1.8
Fund Balance and Reserves	12,000	0.7
Bond Authorization	159,000	9.8
Transportation Equity Fund	21,600	1.3
Federal	777,173	48.0
Local	36,872	2.3
Transfer to General Fund	-65,800	-4.1
Total	1,619,845	100.0

Source: TDOT budget documents

5.2.1. Highway User Fees and Taxes

User fees are comprised of the state's gasoline and motor fuel taxes, special petroleum taxes, vehicle registration fees, and beer and bottle fees. Collections from these sources total more than $1.1 billion in FY 2004-05 and are split among the Highway Fund, the Sinking Fund, the General Fund, and Tennessee's cities and counties. About 66 percent (Highway Fund plus Sinking Fund) of all user fee revenues are distributed to TDOT.

Fuel-related revenues (gasoline, motor fuel, and special petroleum taxes) represent 69 percent of the revenues supporting the Highway Fund. The breakdown of components is shown in Table 5-2.

Table 5-2. Estimated Distribution of Highway User Taxes, FY 2004-05 (In Millions)

	Gasoline 20¢				Motor Fuel 17¢			Special Petroleum Tax	Motor Vehicle Registrations	Beer/ Bottle Tax	Total
	3¢	6¢	11¢	Total	5¢	12¢	Total				
General Fund	$ 0.9	$ 5.8	$ 3.6	$ 10.3	$ 1.0	$ 2.2	$ 3.2	$18.7	$ 53.8		$86.0
Highway Fund		105.5	192.4	297.9	48.2	72.1	120.3	33.0	193.9	$5.3	650.4
Sinking Fund		74.0		74.0							74.0
Cities	30.6		48	78.6		14.6	14.6	7.4			100.6
Counties	61.1		95.7	156.8		29.3	29.3	4.6			190.7
Total	$92.6	$185.3	$339.7	$617.6	$49.2	$118.2	$167.4	$63.7	$247.7	$5.3	$1,101.7

Source: TDOT Finance Division

Table 5-3 shows the composition of user fees supporting the Highway Fund; each fee is described in more detail following the table.

Table 5-3. Composition of User Fees Supporting the Highway Fund

Source	Amount ($M)	Share of Total (%)
Gasoline Tax (20 ¢)	297,900	45.8
Motor Fuel Tax (17 ¢)	120,300	18.5
Special Petroleum Tax	33,000	5.1
Motor Vehicle Registration Fee	193,900	29.8
Beer and Bottle Tax	5,300	0.8
Total	650,400	100.0

Source: TDOT Finance Division

Gasoline Tax

The gasoline tax in Tennessee is 20 cents per gallon (cpg), excluding federal taxes. The state levies an additional 1.4 cpg in taxes. Thus, the aggregate 21.4 cpg of tax collected is composed of three separate taxes: a 20 cpg tax on gasoline, a 1 cpg special petroleum tax, and a 0.4 cpg environmental assurance fee used for underground storage tanks. In aggregate, in FY 2004-05, each penny is worth $30.88 million per year.

However, TDOT does not receive the full amount collected from the taxes placed on gasoline purchases. For example, the 0.4 cpg environmental fee is distributed to the General Fund for non-transportation-related uses. The gasoline tax and special petroleum tax receipts are distributed among the General Fund, cities, and counties, as well as the Highway Fund and Sinking Fund.

The gasoline tax was last raised in 1989, increasing the base rate from 16 cpg to the current 20 cpg.

Motor Fuel Tax

The motor fuel tax in Tennessee is 17 cpg, excluding federal taxes. (The rate for special fuels is lower; for liquefied gas it is 14 cpg, and for compressed natural gas it is 13 cpg.) The state levies an additional 1.4 cpg tax on motor fuels. Thus, the rate is composed of three parts: the base rate of 17 cpg for diesel, a 1 cpg special petroleum tax, and a 0.4 environmental fee. In aggregate, in FY 2004-05, each penny is worth $9.8 million per year.

TDOT does not receive the full amount collected from the motor fuel tax. The 0.4 cpg environmental fee is distributed to the General Fund and does not support TDOT's program in any way. The 17 cpg motor fuel tax and 1 cpg special petroleum tax are split among the General Fund, cities, and counties, as well as the Highway Fund and Sinking Fund.

The motor fuel tax was last raised in 1990, increasing the base rate from 16 cpg to the current 17 cpg.

Special Petroleum Tax

As noted in the discussion of the fuel taxes, both gasoline and motor fuels are subject to a 1.4 cpg special petroleum tax (1 cpg plus 0.4 cpg environmental assurance fee). Of the $63.7 million in revenues raised by this tax (which is levied on all petroleum products) the

Highway Fund is projected to receive $33.0 million in FY 2004-05. The 0.4 cpg tax is distributed to the General Fund and is used in regulating underground storage tanks.

Vehicle Registration Fees

Registration fees range from $23 to $50 by vehicle, but vary by class and county of registration. Vehicle registration fees across all classes of vehicles and types of plates are expected to generate $247.7 million in revenues for the state, of which the Highway Fund will receive $193.9 million, or 78.3 percent.

Beer and Bottle Taxes

Tennessee imposes a 1.9 percent gross receipts tax on soft drink bottlers. Of these revenues, 21 percent goes to the Highway Fund earmarked for litter control. The state also imposes a $4.29/31 gallons (barrel) privilege tax on beer manufactured or sold in the state. Of these revenues, 12.8 percent goes to the Highway Fund for litter control.

In total, dedicated beer and bottle taxes generate $5.6 million for litter control.

5.2.2. Miscellaneous Department Revenues

Miscellaneous TDOT revenues are a diverse grouping of sources comprising railroad inspection fees (dedicated to the TDOT Rail Inspection Program), outdoor advertising fees, permit and logo fees, rents, sales from maps and property, and toll service charges, among other miscellaneous revenues. In total, these sources combine to yield $28.6 million in the FY 2004-05 budget.

5.2.3. Transportation Equity Fund

Established in 1987, the Transportation Equity Fund (TEF) generates revenues for projects in Tennessee's aviation, rail, and waterway transportation modes. TEF revenues are derived from a sales tax on petroleum products used in these modes. Distributors file a report with the state's Department of Revenue describing how many gallons of fuel they sold and at what price. The Department of Revenue then calculates the amount of sales tax on that level of sales and transfers that amount of revenue to the TEF.

Aviation and jet fuel is taxed at a rate of 4.5 percent. Fuel sold for locomotives or for use on barges is taxed at a rate of 5.5 percent. In FY 2004-05, $21.6 million is anticipated in sales tax revenues for the TEF.

The budget for aviation, rail, and waterway programs is based on the actual annual individual collection percentage for each mode. This collection percentage is applied to the total estimated budget for the TEF to determine an amount available for projects in each of the three programs. Aviation accounts for the largest share, followed by rail and waterways.

The TDOT Aeronautics Division receives just over 75 percent of the TEF disbursements. These funds are also used to support the state's six commercial service airports and 69 general aviation airports.

All rail funds were spent on the state's 19 short line railroads. These rail lines serve 33 counties and account for 746 miles of track. In addition to funds received from the TEF, the TDOT Rail Program receives a $3.5 million annual transfer from user fees collected in the state. These funds are also used primarily to support the state's short line railroads.

Waterway funds are used to pay Tennessee's dues to the Tennessee-Tombigbee Waterway Development Authority.

5.2.4. Unissued Bond Authorizations

TDOT's use of unissued bond authorizations is a cash flow management tool developed by the state to accelerate projects in anticipation of expected revenues over a project's horizon. The benefit of this financing method is that it permits projects to begin earlier than if they were held until sufficient funds had accrued to cover the cost. The authorization allows TDOT to obligate projects and start them. Project costs are then paid during the year using current TDOT cash flow. Thus, Tennessee residents have a better transportation system sooner than they would otherwise, and at lower cost. The use of authorized and unissued bonds does not generate revenue itself; it is a cash management tool.

This financing method was first used in 1986 when the Tennessee State Legislature passed a $3.3 billion road program to construct 288 projects across the state. Additional projects have been added to the program, and the estimated total cost of the program is now $6.6 billion. Using TDOT's cash balance (in excess of $300 million in 1987) and this cash flow financing technique, TDOT has been able to finance the program without selling bonds.

Because project obligations are based on bond authority, TDOT is required to pay debt service to the state as if the bonds had been sold. At the end of each year, the state cancels a portion of the bond authority, in effect retiring that authorization, and issues a new bond authorization.

Thus, the bond authority is a sliding window of bond obligations of varying vintages. In sum, these obligations total about $641 million, which is approximately what TDOT can cover on a pay-as-you go basis with the current tax base without actually having to sell the bonds. If TDOT were to cease operations, it could cover all expenses with its cash balance, except the $641 million rolling window of obligated expenses. Table 5-4 shows the TDOT bond authorization history from FY 1987 to present.

Table 5-4. TDOT Bond Authorization History FY 1987 to Present

Fiscal Year	Amount Authorized ($M)	Amount Cancelled ($M)	Cumulative Authorization Outstanding ($M)
1987	190.0	-	190.0
1988	52.0	-	242.0
1989	31.8	-	273.8
1990	87.7	-	361.5
1991		-	361.5
1992	225.0	75.0	511.5
1993	115.0	115.0	511.5
1994	233.8	83.8	661.5
1995	87.7	87.7	661.5
1996	77.0	87.0	651.5
1997	148.0	158.0	641.5
1998	75.0	75.0	641.5
1999	90.0	90.0	641.5
2000	83.8	83.8	641.5
2001	87.7	87.7	641.5
2002	80.0	80.0	641.5
2003	77.0	77.0	641.5
2004	74.0	74.0	641.5
2005	159.0	159.0	641.5
Total	1,974.5	1,333.0	641.5

Source: TDOT Finance Division

5.2.5. Local Revenues

Local revenues reflect the local match required of cities and counties in order to qualify for federal funds. Some state programs also require local matching funds. For example, state aid requires a 75/25 match; bridge grants require an 80/20 match. The interstate connector requires a 50/50 state local match.

Local funds account for about 2 percent of the TDOT budget; however, this share can vary over time with the mix of federal programs (and thus match requirements). In FY 2004-05, local funds are expected to exceed $36 million.

5.2.6. Federal Funds

Federal funds account for $777 million of TDOT's budget spread across several modes. Public transportation funding accounts for 2.3 percent of the federal contribution, and federal support for aviation, rail, and waterways accounts for 1.9 percent of federal monies invested in the state's transportation system. The remainder is divided across highway, road, and bridge programs, with the bulk supporting state highway investments.

5.2.7. Transfers to General Fund

The $65.8 million transfer of TDOT revenues to the state's general fund reflects the state's continued fiscal distress. Although not regular budget items, four such transfers have occurred in recent years as the state worked to balance the budget: $30 million in FY 2001-02; $30 million in FY 2002-03; $65.8 million in FY 2003-04; and this fiscal year's transfer of $65.8 million.

5.3. Major Expenditures

Table 5-5 lists the major categories of expenditures of revenues by revenue source.

Table 5-5. Summary of TDOT Expenses by Federal, State, and Local Source, FY 2004-05

Description	Federal ($M)	State ($M)	Local ($M)	Total ($M)
TDOT Headquarters	0	14,271	0	14,271
Bureau of Administration	0	32,840	0	32,840
Bureau of Engineering	0	25,900	0	25,900
Bureau of Environment and Planning	0	7,174	0	7,174
Field Engineering	0	26,630	0	26,630
Insurance Premiums	0	10,282	0	10,282
Total Administration	0	117,097	0	117,097
Equipment Purchases and Operations	0	21,431	0	21,431
Highway Maintenance	0	253,428	1,100	254,528
Highway Betterments	0	5,700	100	5,800
State Aid	0	28,922	8,759	37,681
State Industrial Access	0	10,815	200	11,015
Local Interstate Connectors	0	1,475	1,475	2,950
Capital Improvements	0	10,055	0	10,055
Total 100% State Construction	0	56,967	10,534	67,501
Mass Transit	17,573	38,546	238	56,357
Highway Planning and Research	12,100	5,100	0	17,200
Interstate	133,700	14,825	1,500	150,025
Forest	700	200	0	900
State Highway Construction	511,700	267,821	14,200	793,721
Bridge	87,000	4,100	5,000	96,100
Aviation, Rail, and Waterway	14,400	25,385	5,200	44,985
Total Federal Construction	777,173	356,877	25,238	1,159,288
Total TDOT	777,173	805,800	36,872	1,619,845

Source: TDOT budget documents

5.4. Potential Future Revenue Opportunities

TDOT can employ number of strategies to increase the available revenues for its program of services or the flexibility with which revenues may be used. The sections below show a preliminary list of possible revenue sources or methods. Each possibility will be evaluated in subsequent work and reassessed once the provisions of new federal legislation are known.

Strategy 1: Alternative Methods of Collecting Revenues

By adopting more efficient methods of collections, some states have been able to increase transportation revenue without increasing taxes or fees.

Strategy 2: Value Pricing–High-Occupancy Toll Lanes

High-occupancy toll lanes are constructed adjacent to free roads and involve selling excess capacity that exists in a high-occupancy vehicle lane. Optional fees are paid by drivers of single-occupant vehicles to gain access to alternative road facilities, thus providing a superior LOS and offering time savings as compared to free facilities.

Strategy 3: Value Pricing–Express Lanes

Express lanes are constructed adjacent to free roads and involve selling capacity created by adding a tolled facility. Fees are paid by drivers to gain access to alternative road facilities providing a superior LOS and offering time savings as compared to free facilities. No provision exists to mix high-occupancy vehicle and single-occupancy vehicle traffic. Toll schedules are developed based on vehicle size and classification and may involve variable tolling.

Strategy 4: Shadow Tolls

The concept of shadow tolls is linked to the private implementation of highway facilities, whereby the shadow tolls represent revenues paid by a third party (usually a governmental entity) to an operator of a facility based on traffic volume. The shadow tolls attempt to replicate explicit toll charges based on traffic counts along a specific facility. Shadow tolls are usually implemented in conjunction with a public/private venture (that is, a design-build-operate-maintain contract).

Strategy 5: Naming Rights

A naming rights strategy involves selling the rights to name a public facility (for example, a toll road). Naming rights have migrated from sports stadiums and arenas to performing arts centers. A recent application is a shopping mall, which has been named by a credit card company.

Strategy 6: Joint Development–Resource Leveraging

This strategy is the cost sharing or leasing of public assets with private entities for contractual payments, shared revenues, or in-kind payments.

Strategy 7: Asset Management–Infrastructure Preservation

A broad definition of asset management involves life-cycle costing leading to asset preservation to eliminate more expensive replacement costs.

Strategy 8: Cash Management

Cash management is not a specific revenue enhancement strategy; however, efficient cash management has permitted TDOT to expedite projects. Cash management is important because, while TDOT begins projects based on bond authorization, there is the risk that actual expenditures may occur in different months and even different years than planned. Cash balances are therefore essential for TDOT to meet its contractual obligations.

Strategy 9: Weight-Distance Tax

The funding strategies available to TDOT, other than the major expansion of tolled facilities or the dedication of a sales tax or other new source, do not generate sufficient revenue to counter the downside risk in future fuel/tax revenues due to greater vehicle fuel efficiency. An alternative future source of funding is likely to be a weight-distance tax based on vehicle size, mileage traveled, or peak/off-peak facility use. This type of tax can be implemented when ITS is in place from both the perspective of the highway infrastructure and vehicle interface technology.

Strategy 10: Index Fuel Fees to Inflation

Tennessee's fuel tax is fixed at a cents-per-gallon rate. The gasoline tax was last increased in 1989, indicating that inflation has eroded the purchasing power of this revenue source. Moreover, growth occurs only if consumption increases. While the number of drivers continues to increase, the fuel efficiency of their vehicles is also increasing, canceling some of this gain.

Strategy 11: Extension of the State Sales Tax to Motor Fuels

Taxed at a cents-per-gallon rate, gasoline and diesel used for road travel are exempted from Tennessee's sales tax. Removing this exemption would increase fuel-related taxes.

Strategy 12: Value-Based Annual Motor Vehicle Registration Fee

This strategy would tax the vehicle value, rather than its size or type.

Strategy 13: Rental Car Surcharges

This strategy would impose a dedicated tax on rental cars.

Strategy 14: Tire Tax

This strategy would impose a modest tax (typically $1 to $2) per tire.

Strategy 15: Toll Road/Bridge

This strategy would introduce toll facilities and periodic toll rate increases to compensate for inflation.

5.5. Financial Implications

- Continued diversion of transportation revenue to support the state's general fund obligations will exacerbate the challenge of meeting transportation needs.
- Increasing demand for transportation services and for transportation system operation and maintenance will require more flexibility in using available funding and accessing new sources of capital funding.

- Changes in technology and the energy supply will likely impact Tennessee's transportation revenues, as gasoline consumption per unit of transportation begins to drop. This will create the need to investigate new sources of transportation revenue.
- By using unissued bond authorizations, TDOT is limited in its ability to expand the program. The requirement for debt service payments constrains TDOT's cash flow. Because TDOT is managing as much bond authorization as it is, expanding the program requires identifying a new revenue source. Without a new revenue source, TDOT would have to reduce the current highway program to permanently cancel the rolling window of bond authorization.

5.6. Summary of Financial Trends

The funding available for current and future transportation system improvements is a key consideration in estimating the future challenges and opportunities of the transportation system. Table 5-6 summarizes the major trends and implications identified for the financial components of Tennessee's transportation system; the table also lists the challenges and opportunities Tennessee will face for each implication.

Table 5-6. Summary of Financial Challenges and Opportunities

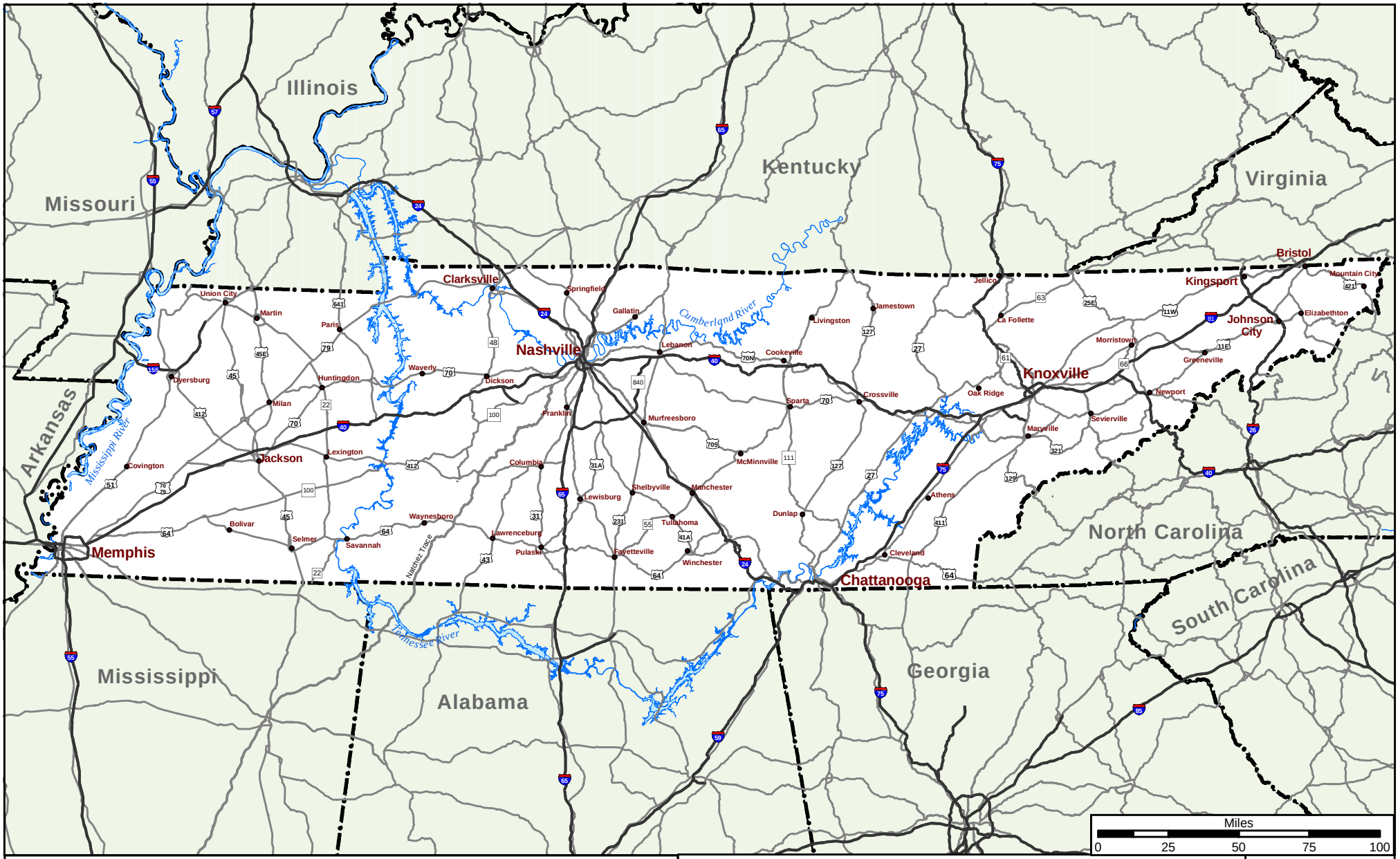
Implications	Challenges	Opportunities
Financial Analysis Trends		
Continued diversion of transportation revenue to support the state's general fund obligations will exacerbate the challenge of meeting transportation needs.	Funding many of the current transportation programs. Funding new transportation programs.	Retain collected funds and use to support many of the transportation strategies identified in this report. Seek new funding mechanisms.
Increasing demand for transportation services and for transportation system operation and maintenance will require more flexibility in using available funding, and access to new sources of capital funding.	Funding expansion of existing transportation programs to meet increased demands from growth. Providing funding for new transportation programs.	Provide multimodal transportation services to a growing population.
Changes in technology and energy supply are likely to have a significant impact on Tennessee's transportation revenues, as gasoline consumption per unit of transportation begins to drop. This will create the need to investigate new sources of transportation revenue.	Maintaining services from motor fuel taxes.	Examine new funding sources to supplement current motor fuel-based funding sources.
By using unissued bond authorizations TDOT is constrained in its ability to expand the program. Because the Department is managing as much bond authorization as it is, expanding the program requires the identification of a new revenue source.	Identifying new revenue sources to expand the current program.	Seek new funding mechanisms.

Chapter 6

Conclusion

This *Challenges and Opportunities* report represents a first step in the long-range planning process. The report provides a foundation for decisions that must be made on how resources could be applied over the next 25 years to best achieve and develop an integrated transportation system that serves all of Tennessee's residents and visitors. The information in this report will be used to identify long-range goals, objectives, and performance measures. These three elements will then serve as the foundation for further analysis of transportation needs and ultimately the establishment of transportation priorities.

Exhibits



Tennessee Long-Range Transportation Plan

Major Highway System

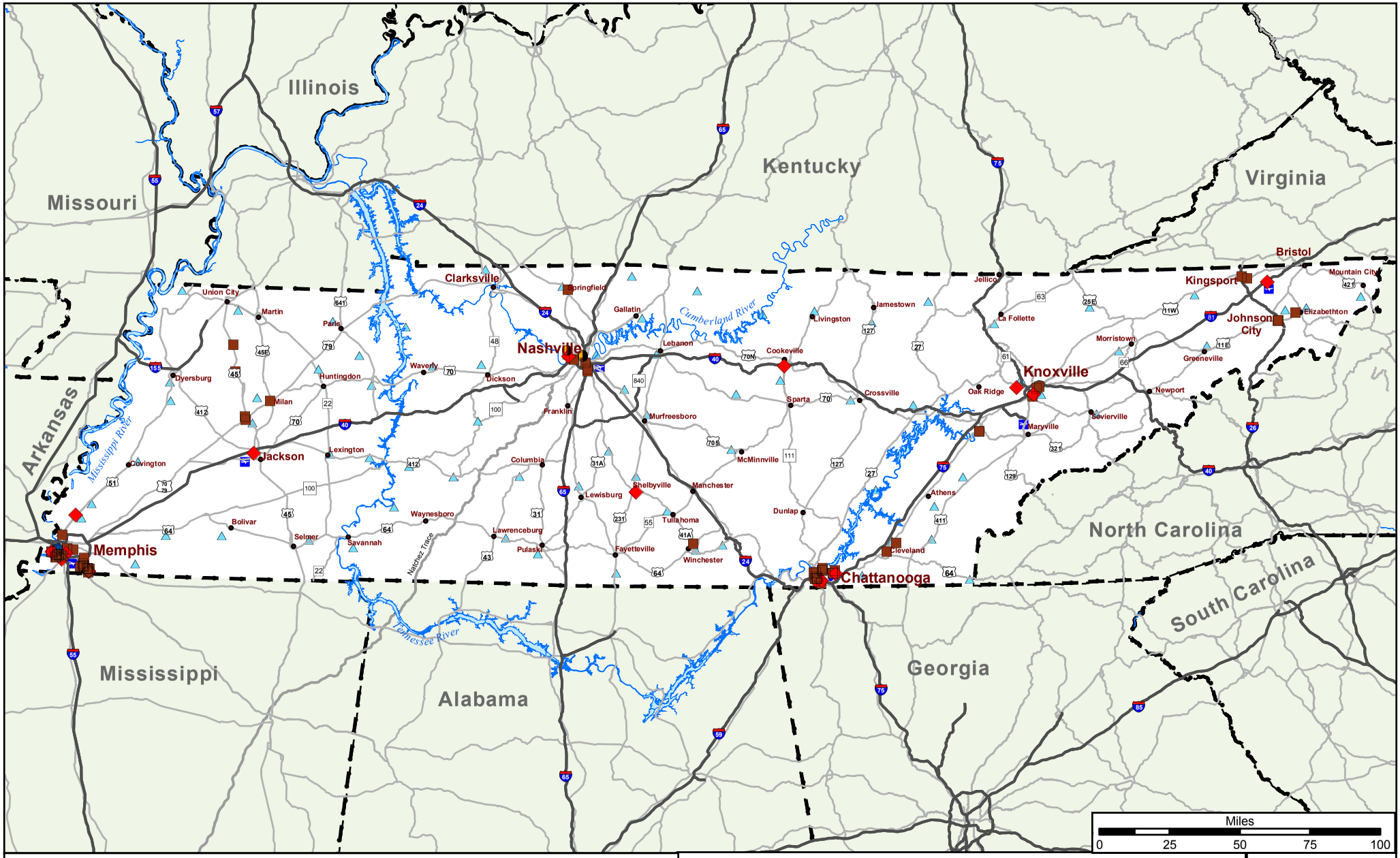
Exhibit 1

TDOT Go.

Major Routes

Interstates/Freeways

Other Major Highways



Tennessee Long-Range Transportation Plan

Multimodal Facilities

Exhibit 2

Source: US Bureau of Transportation Statistics

Facility Type

- Independent Port
- Port
- Rail Terminal
- Truck Terminal
- Commercial Aviation
- General Aviation

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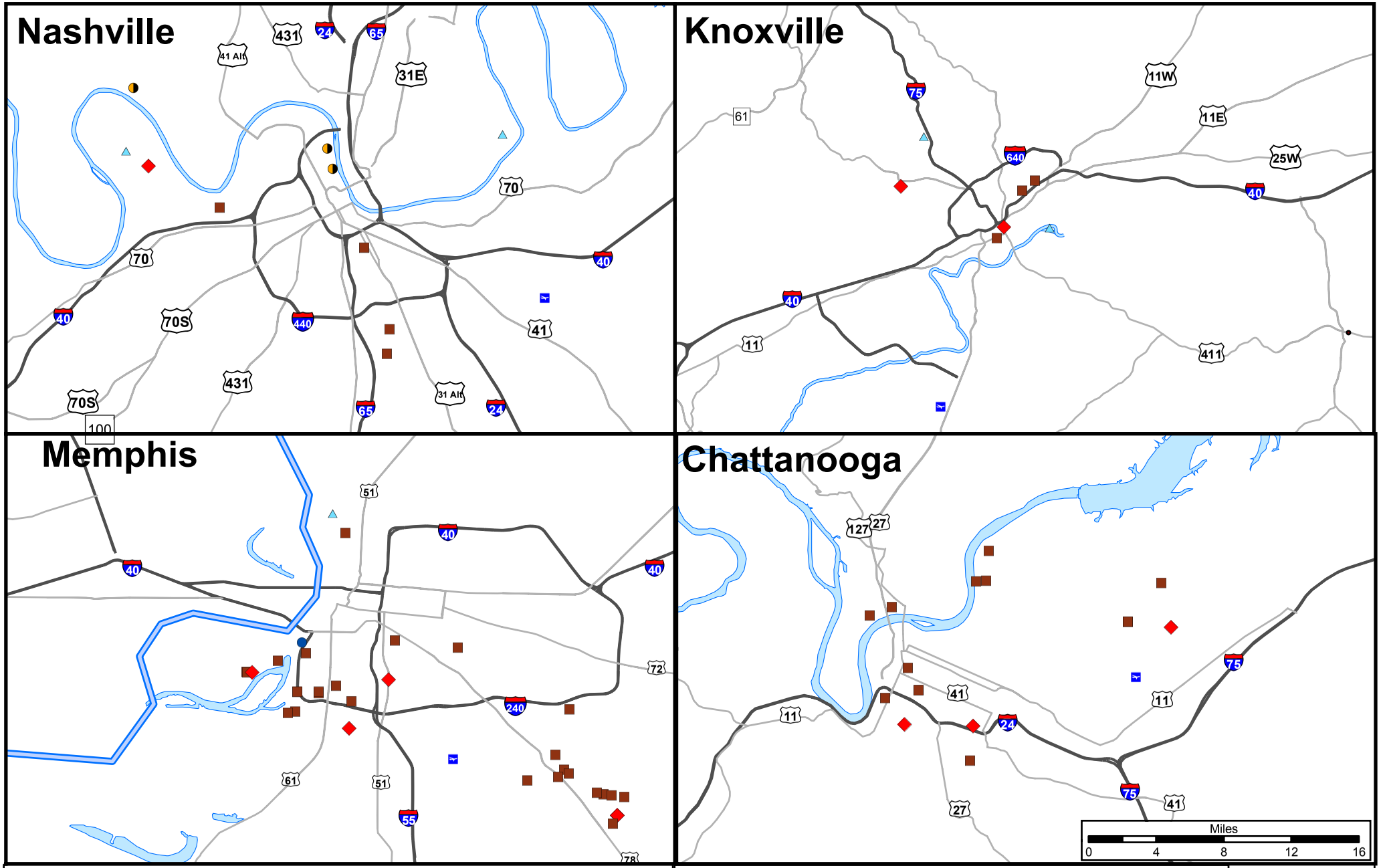


Tennessee Long-Range Transportation Plan

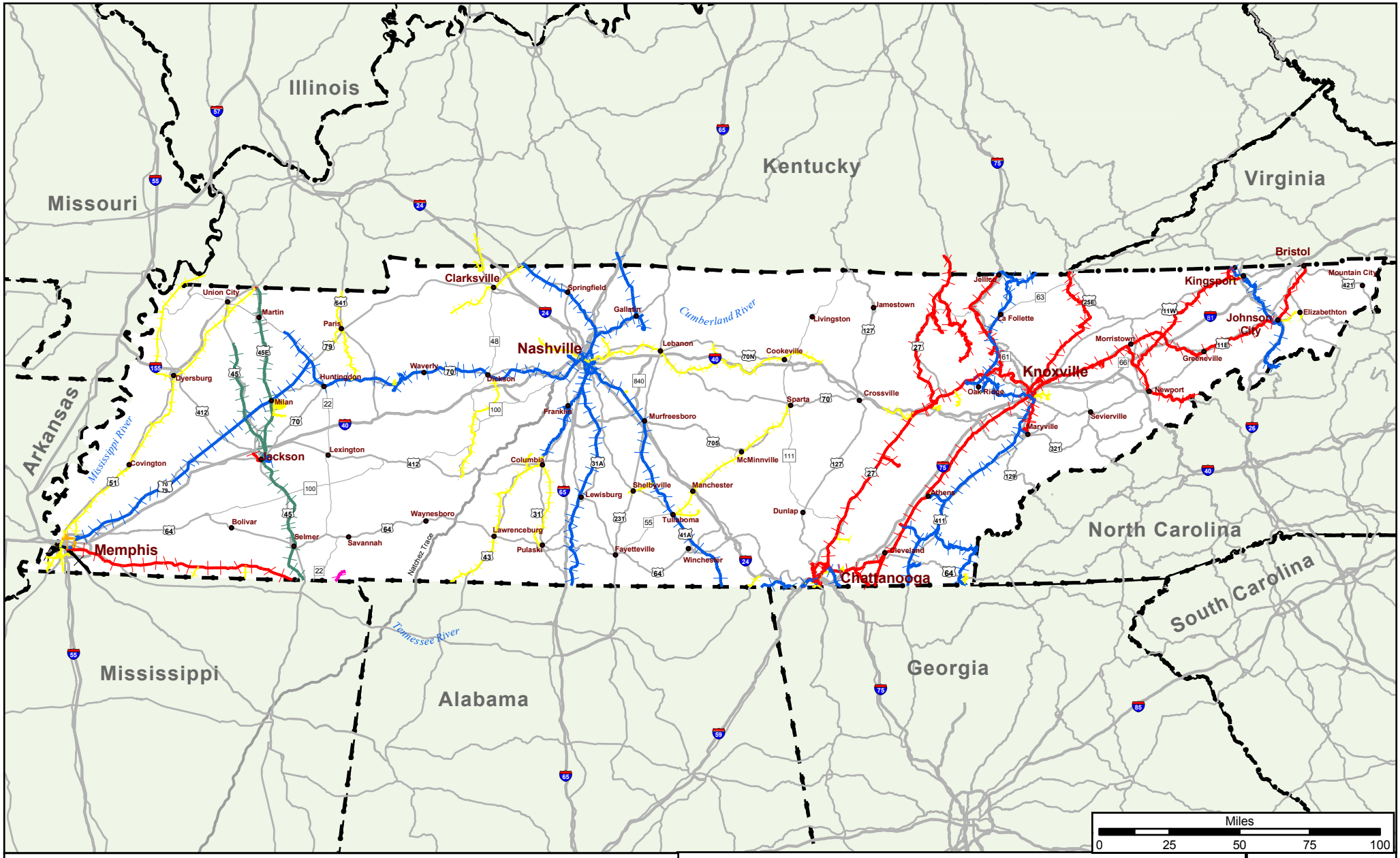
Multimodal Facilities Inset Maps

Exhibit 2a

Source: US Bureau of Transportation Statistics

Facility Type

- Independent Port
- Port
- Rail Terminal
- Truck Terminal
- Commercial Aviation
- General Aviation



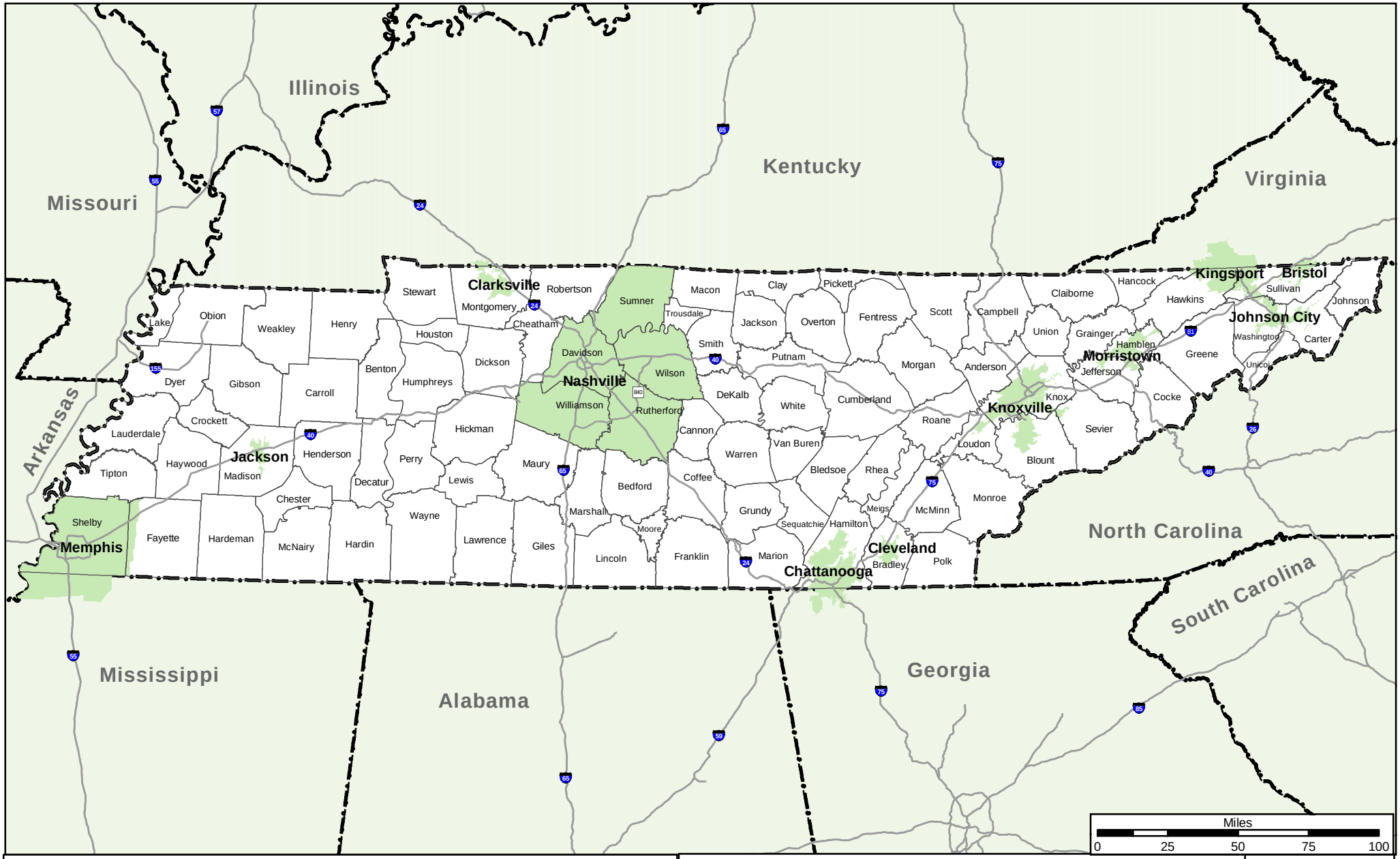
Tennessee Long-Range Transportation Plan

Rail Lines

Exhibit 2B

Source: US Bureau of Transportation Statistics

- Burlington Northern
- CSX
- Illinois Central Railroad
- Kansas City Southern
- Norfolk Southern
- Union Pacific
- Short Line



Tennessee Long-Range Transportation Plan

Metropolitan Planning Organization Areas

TDOT Go.

Exhibit 3

Source: From individual MPOs when electronically available, U.S. Census

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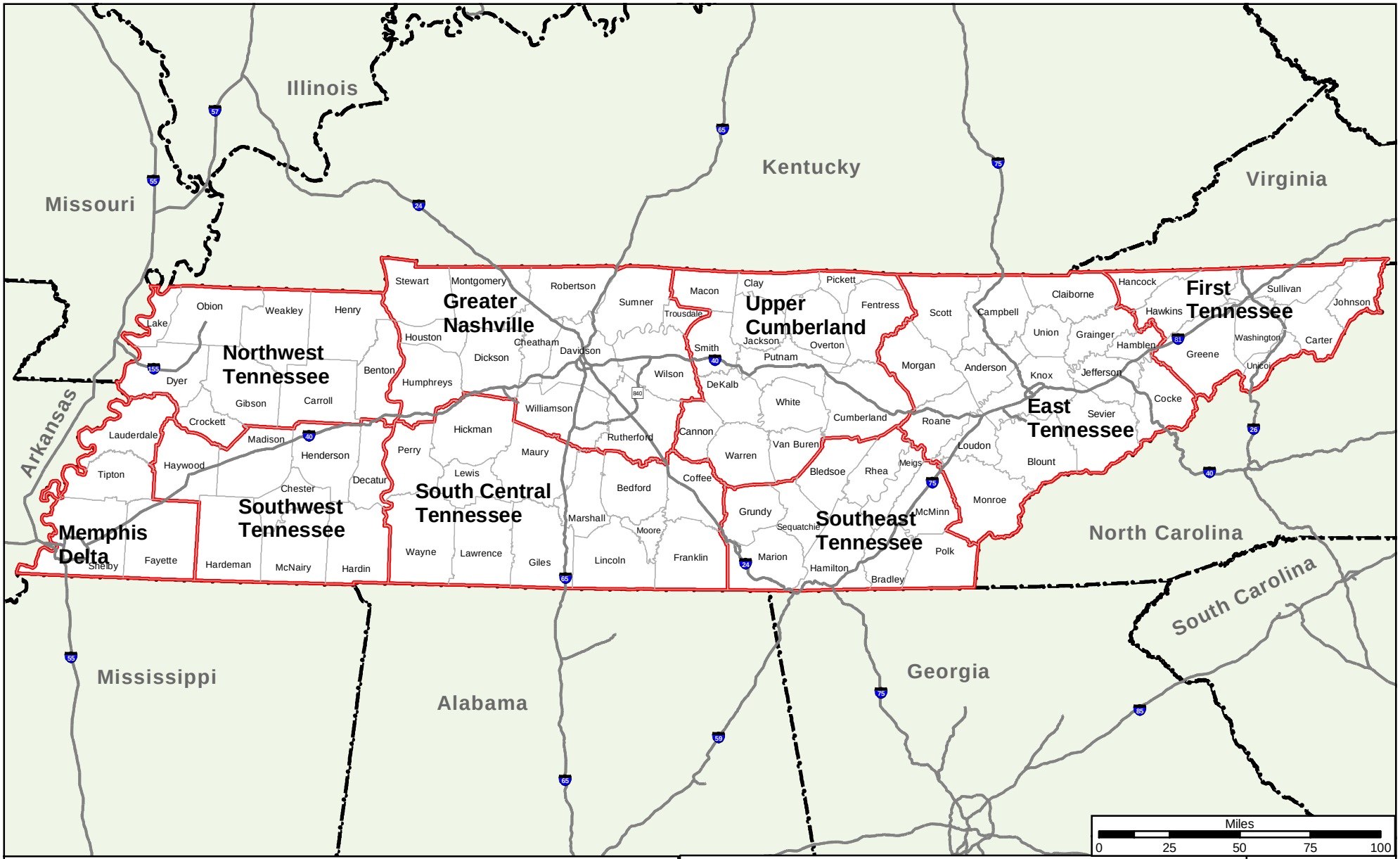
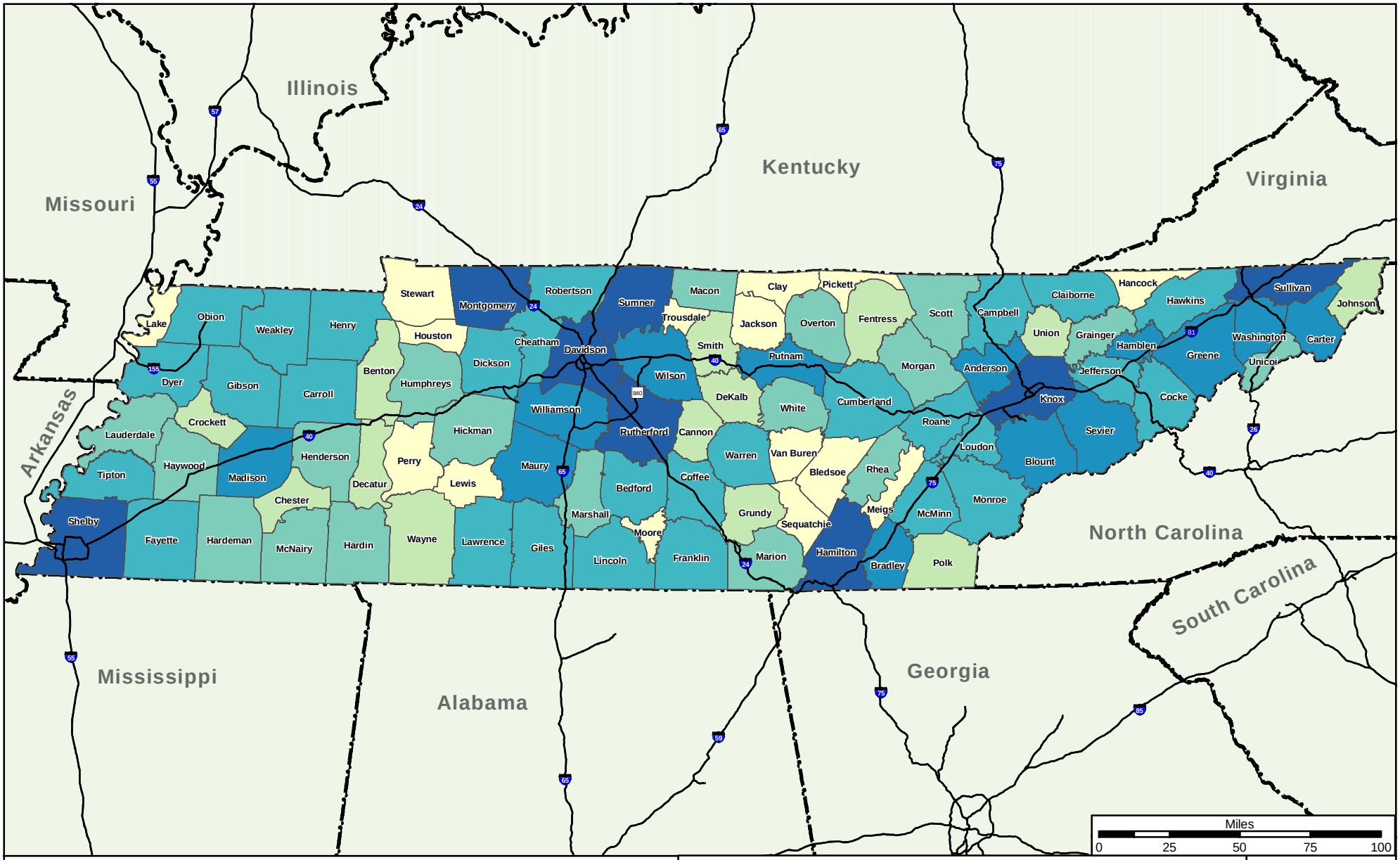


Tennessee Long-Range Transportation Plan

Economic Development Districts

TDOT Go.

Exhibit 4



Tennessee Long-Range Transportation Plan

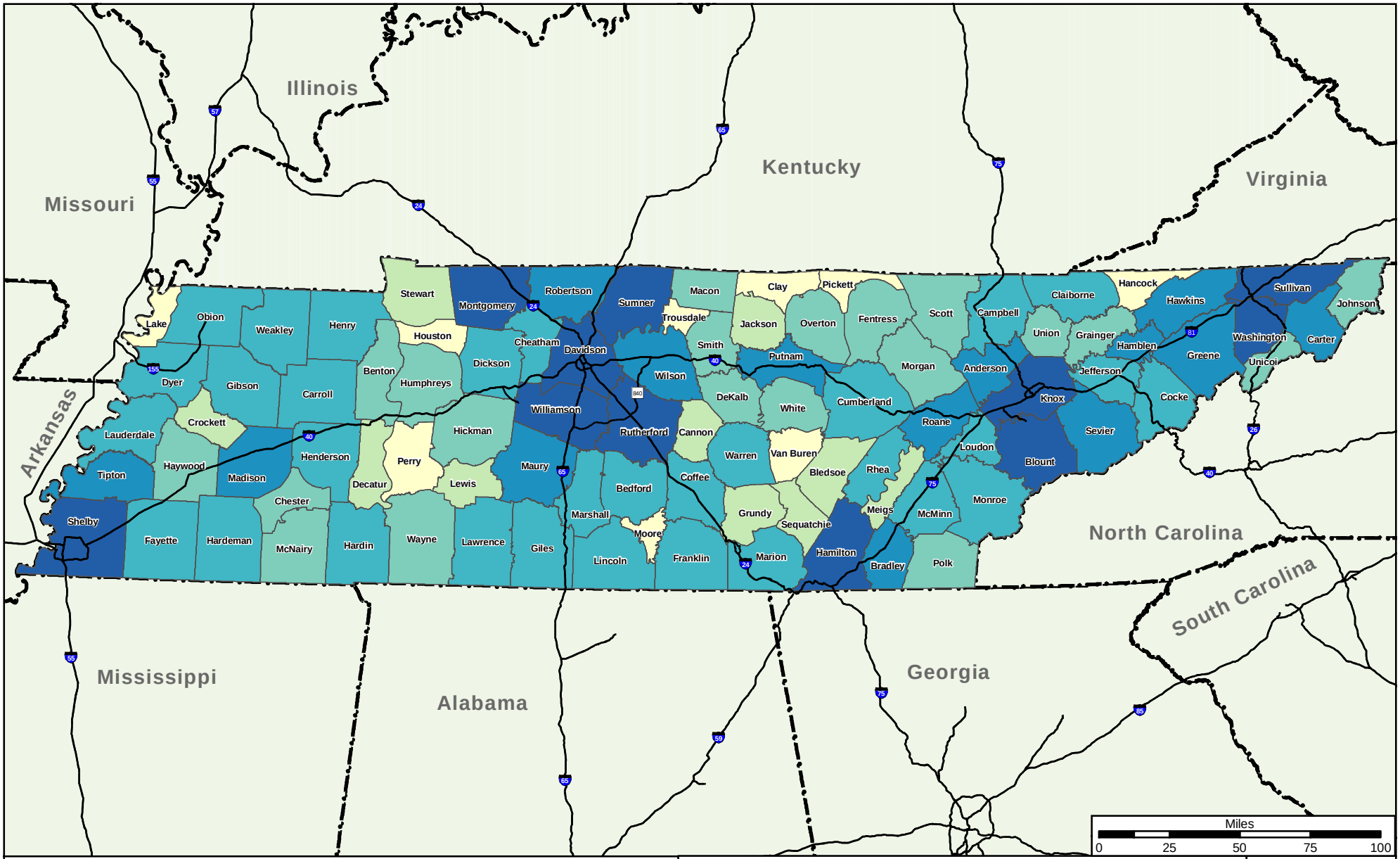
1990 County Population

Exhibit 5

1990 County Population

- 0 - 10,000
- 10,001 - 15,000
- 15,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- Over 100,000

N
W
E
S



Tennessee Long-Range Transportation Plan

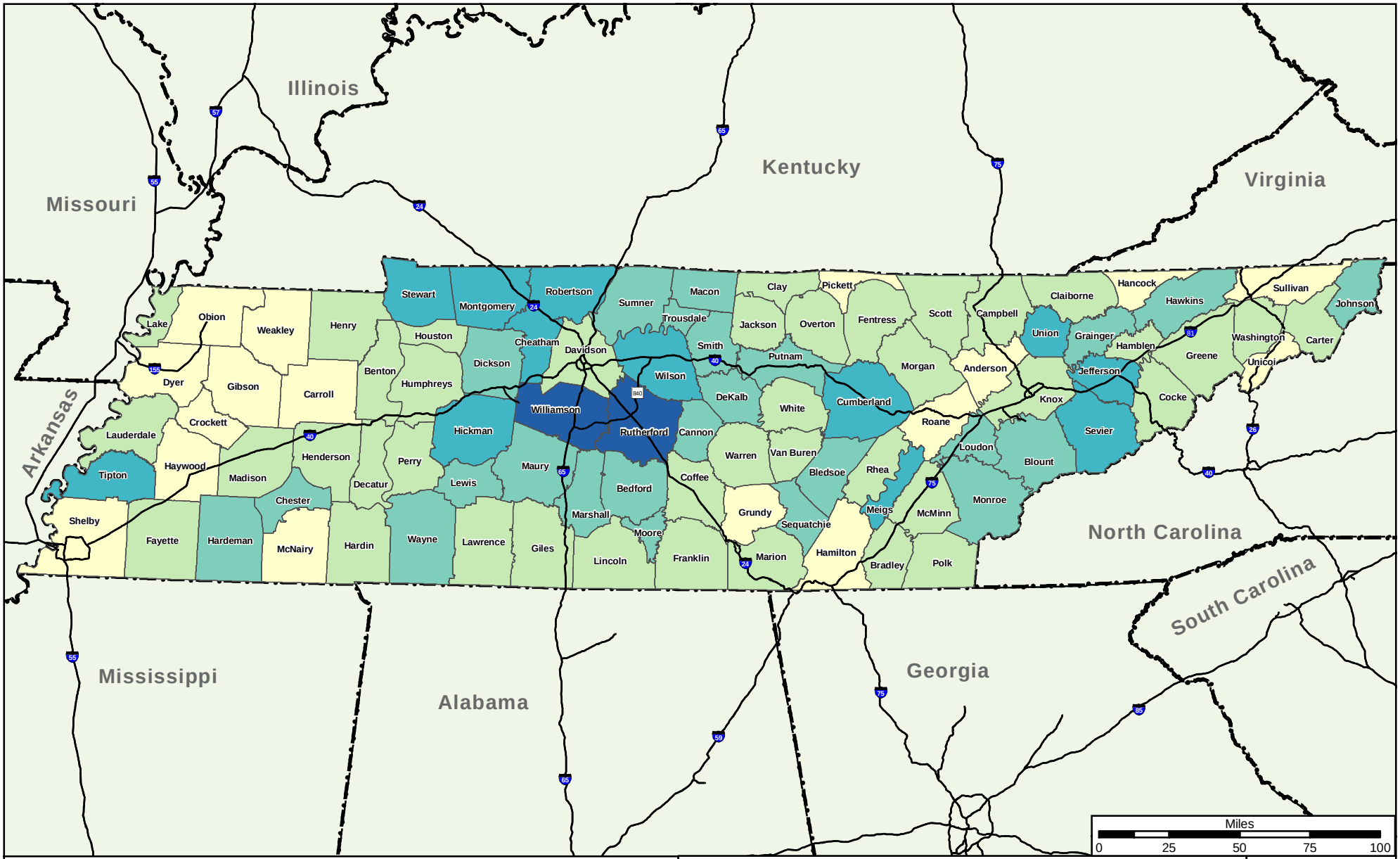
2000 County Population

Exhibit 6

2000 County Population

- 0 - 10,000
- 10,001 - 15,000
- 15,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- Over 100,000

N
W
E
S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Blount
Tipton
Madison
Decatur
Lewis
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Bledsoe
Rhea
Monroe
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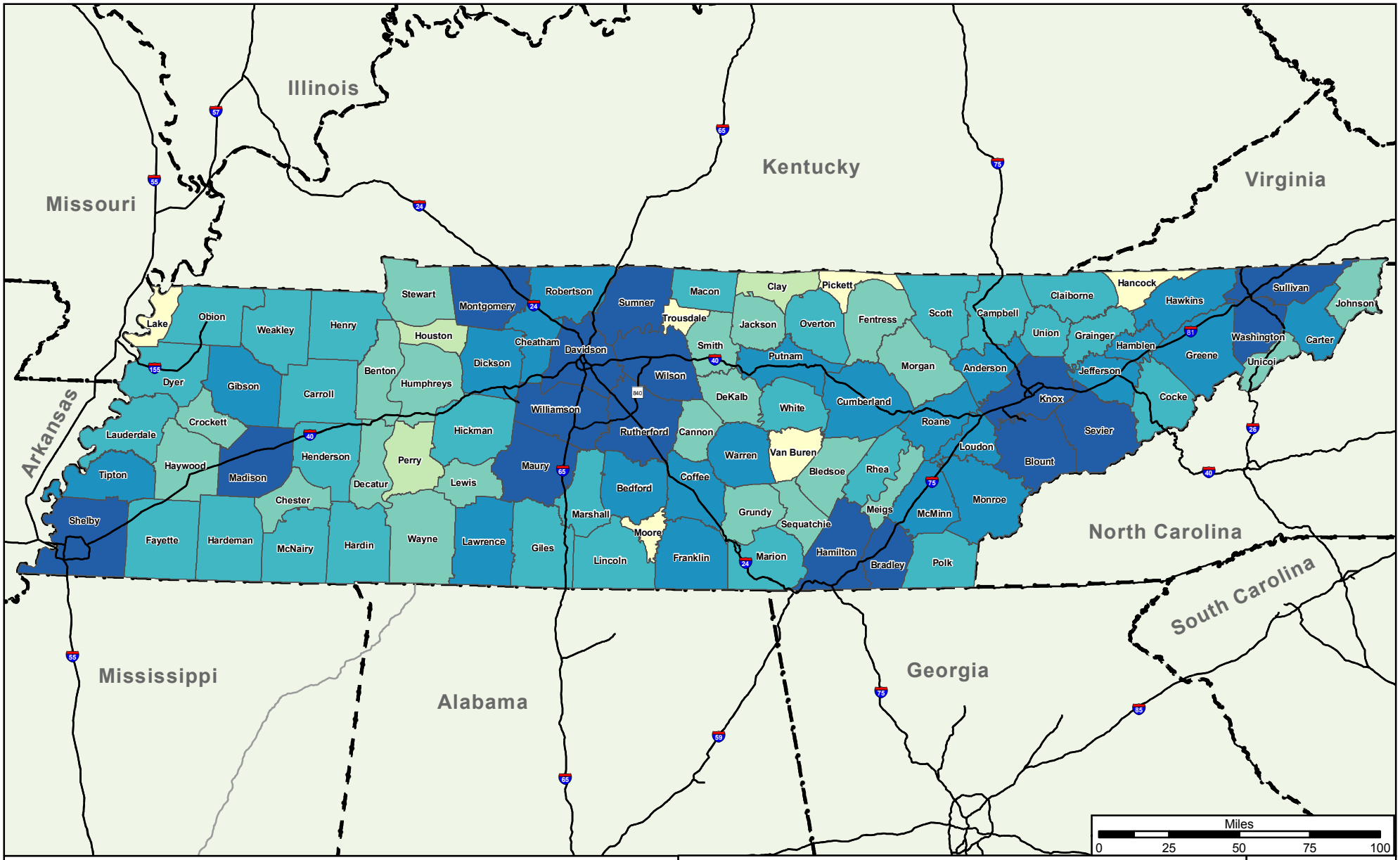
Bedford
Grundy
Meigs
McMinn
Shelby
Fayette
Hardeman
McNairy
Hardin
Wayne
Lawrence
Giles
Marshall
Moore
Sequatchie
Hamilton
Bradley
Polk
Lincoln
Franklin
Marion
Miles
0
25
50
75
100
Tennessee Long-Range Transportation Plan
1990-2000 County Population Change
Exhibit 7
1990 - 2000 Population Change
0 - 10%
11% - 20%
21% - 30%
31% - 40%
41% - 50%
Over 50%
N
W
E
S



Tennessee Long-Range Transportation Plan

Projected 2030 County Population

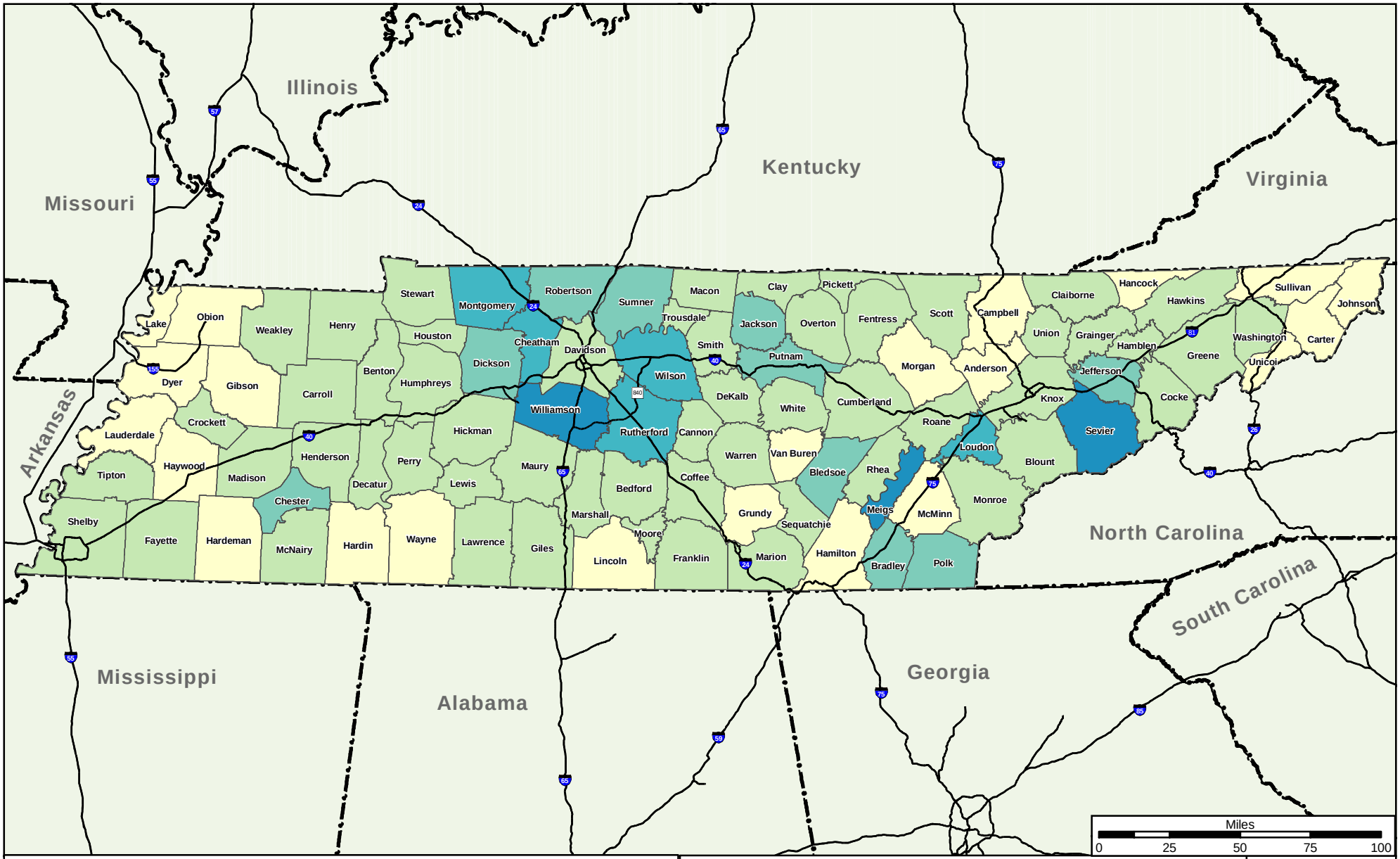
TDOT Go.

Exhibit 8

Projected 2030 County Population

- 0 - 10,000
- 10,001 - 15,000
- 15,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- Over 100,000

N
W
E
S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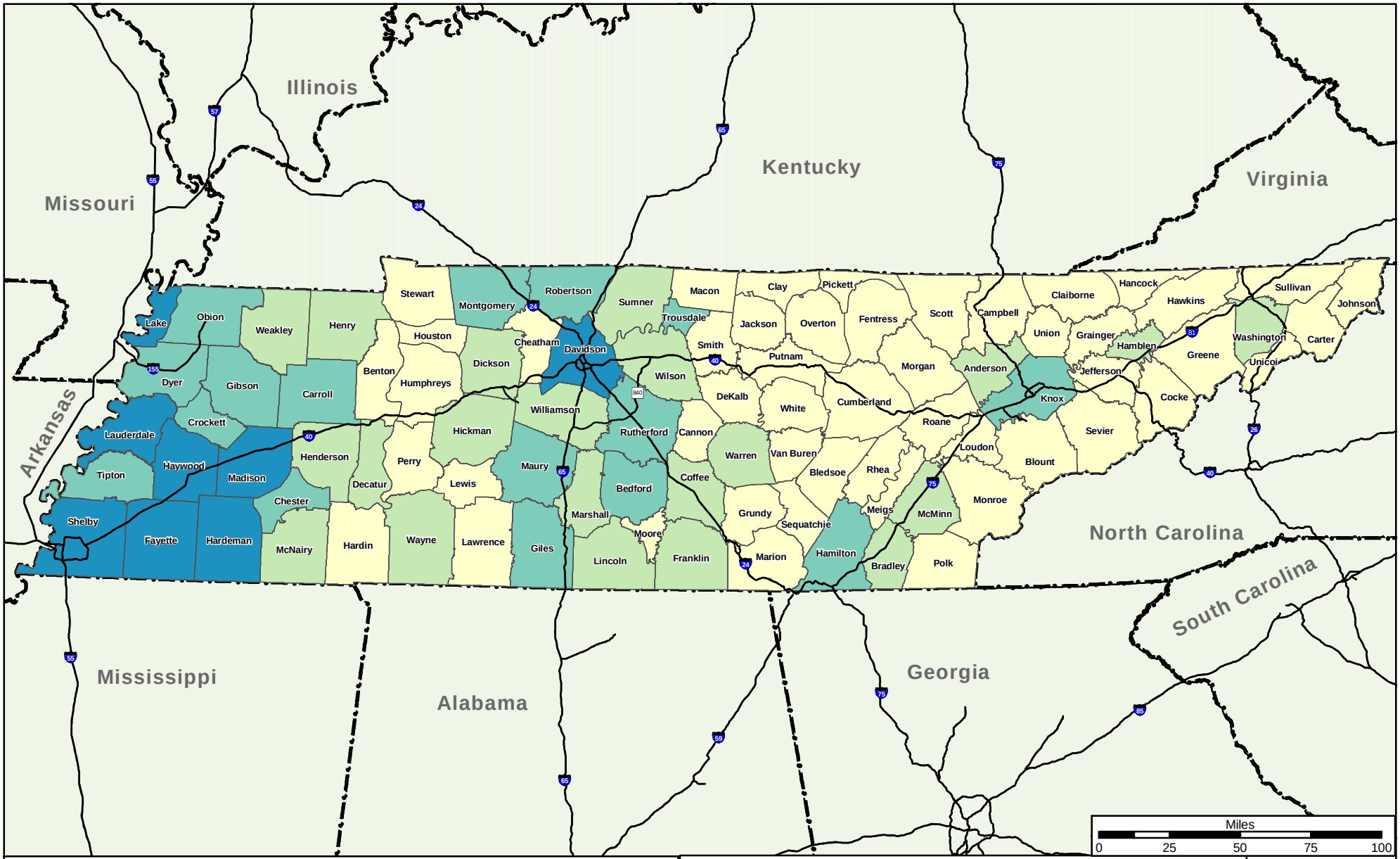
Madison
Decatur
Lewis
Bledsoe
Rhea
Coffee
Bedford
Monroe
Chester
Shelby
Fayette
Hardeman
McNairy
Hardin
Wayne
Lawrence
Giles
Marshall
Grundy
Sequatchie
Meigs
McMinn
Moore
Lincoln
Franklin
Marion
Hamilton
Bradley
Polk
Miles
0
25
50
75
100
Tennessee Long-Range Transportation Plan
2000-2030 Projected County Population Change
Exhibit 9
2000-2030 Population Change
0% - 25%
26% - 50%
51% - 75%
76% - 100%
101% - 118%
N
W
E
S



Tennessee Long-Range Transportation Plan

2000 Minority Population

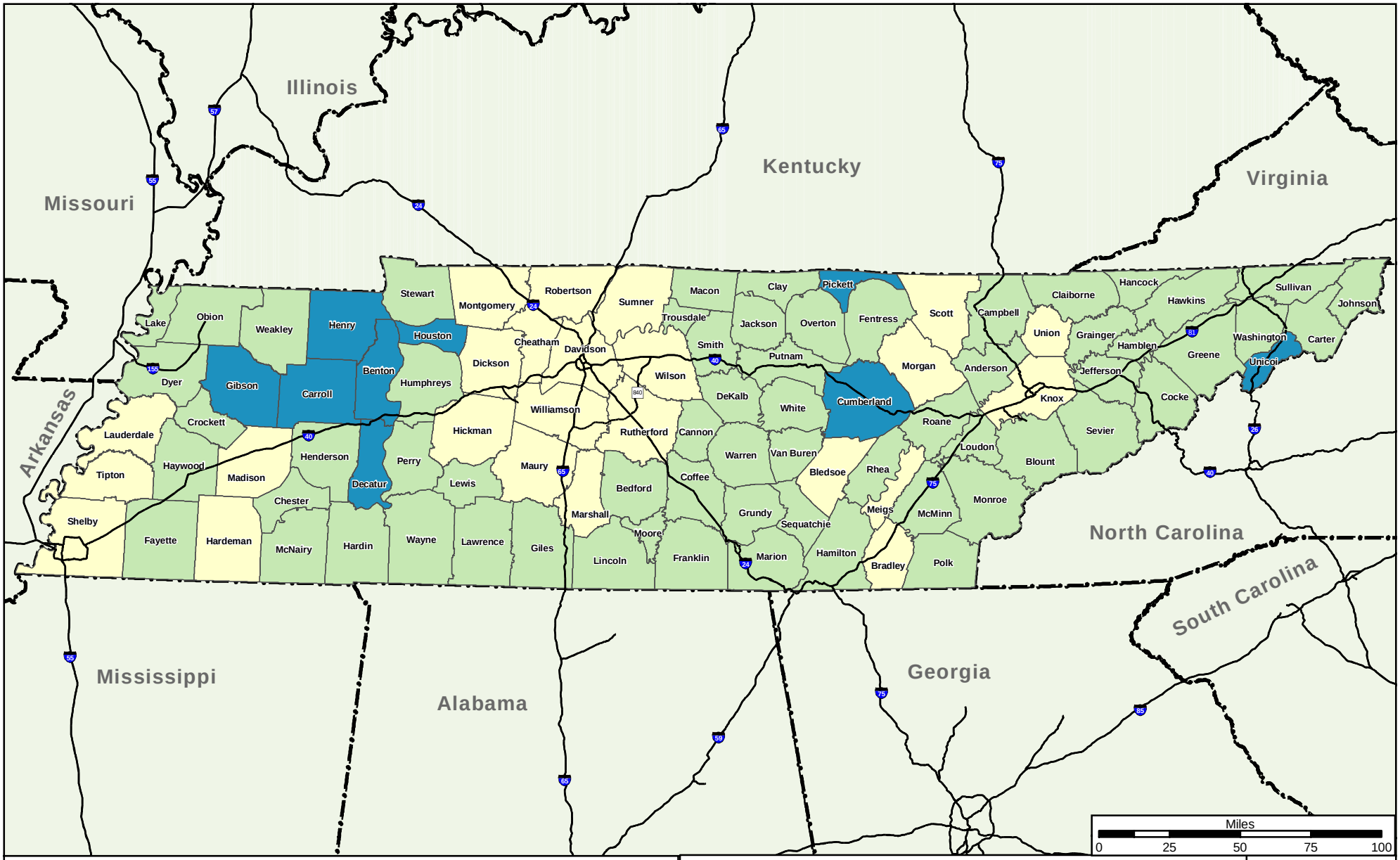
TDOT Go.

Exhibit 10

Minority Population

- 0% - 5%
- 6% - 10%
- 11% - 25%
- Over 25%

N
W
E
S



Tennessee Long-Range Transportation Plan

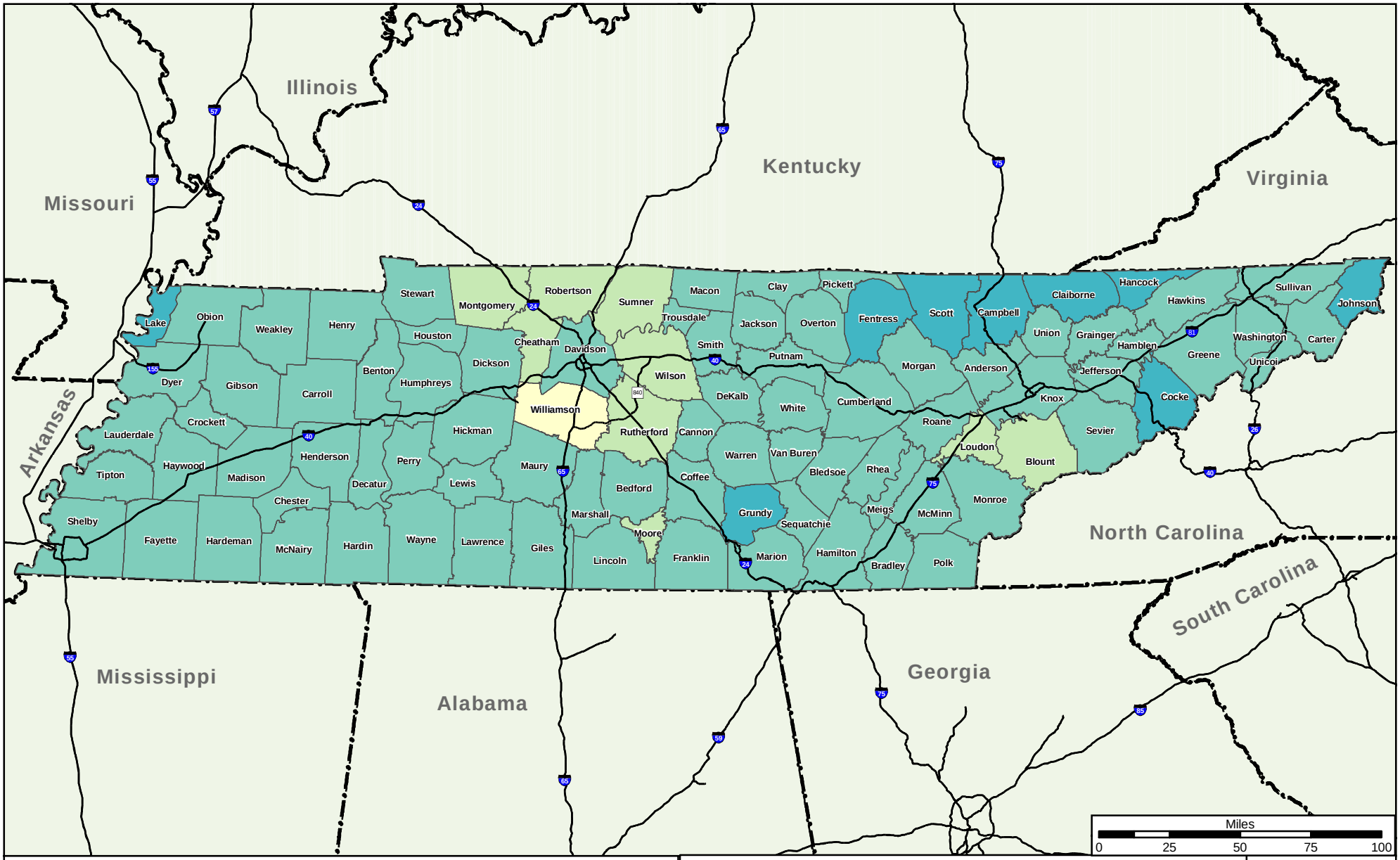
2000 Population 62 Years and Older

TDOT Go.

Exhibit 11

Population 62 Years +

- 9% - 15%
- 16% - 20%
- 21% - 25%



Tennessee Long-Range Transportation Plan

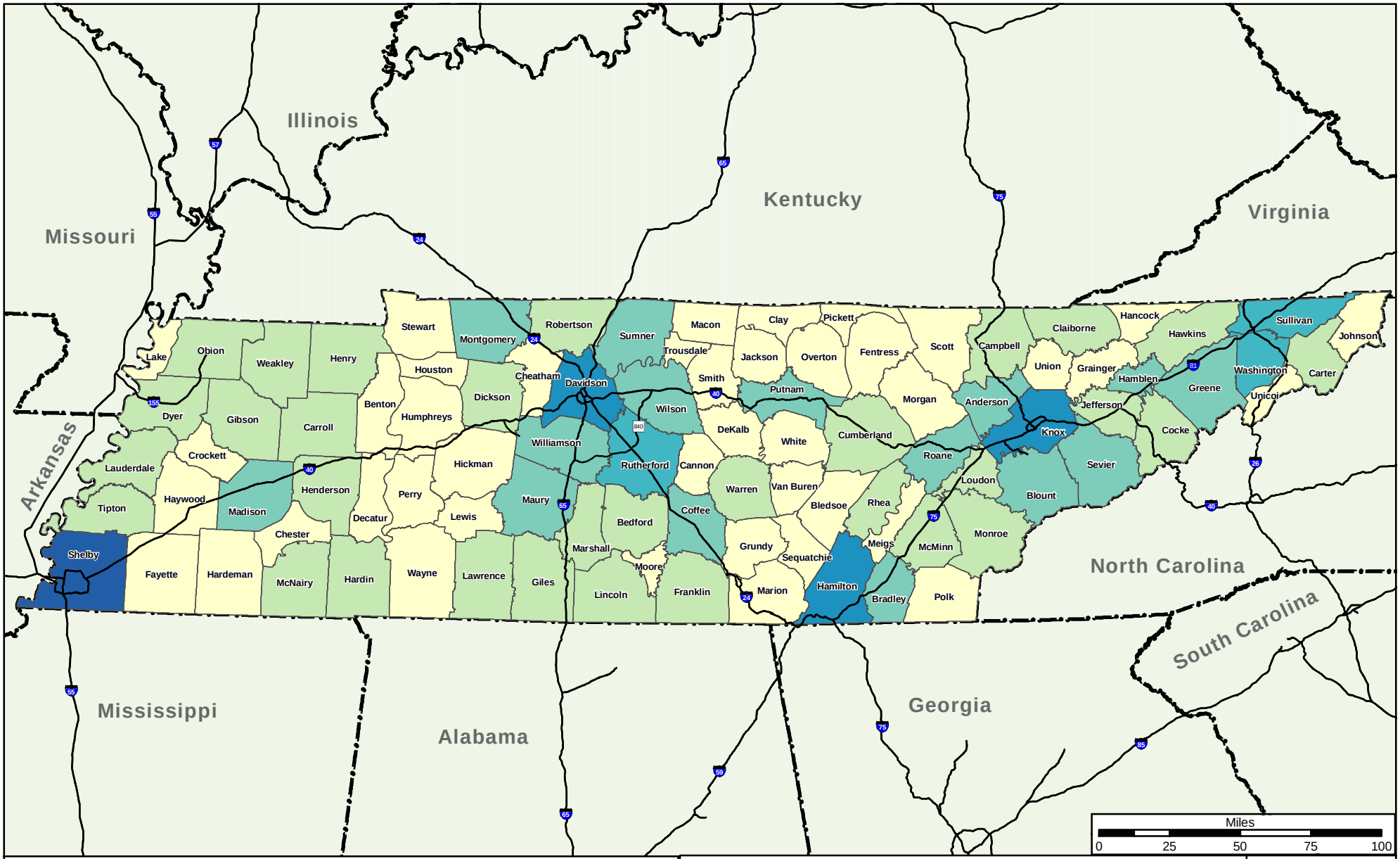
2000 Population Below Poverty Level

TDOT Go.

Exhibit 12

2000 Population Below Poverty Level

- 0% - 5%
- 6% - 10%
- 11% - 20%
- Over 20%



Tennessee Long-Range Transportation Plan

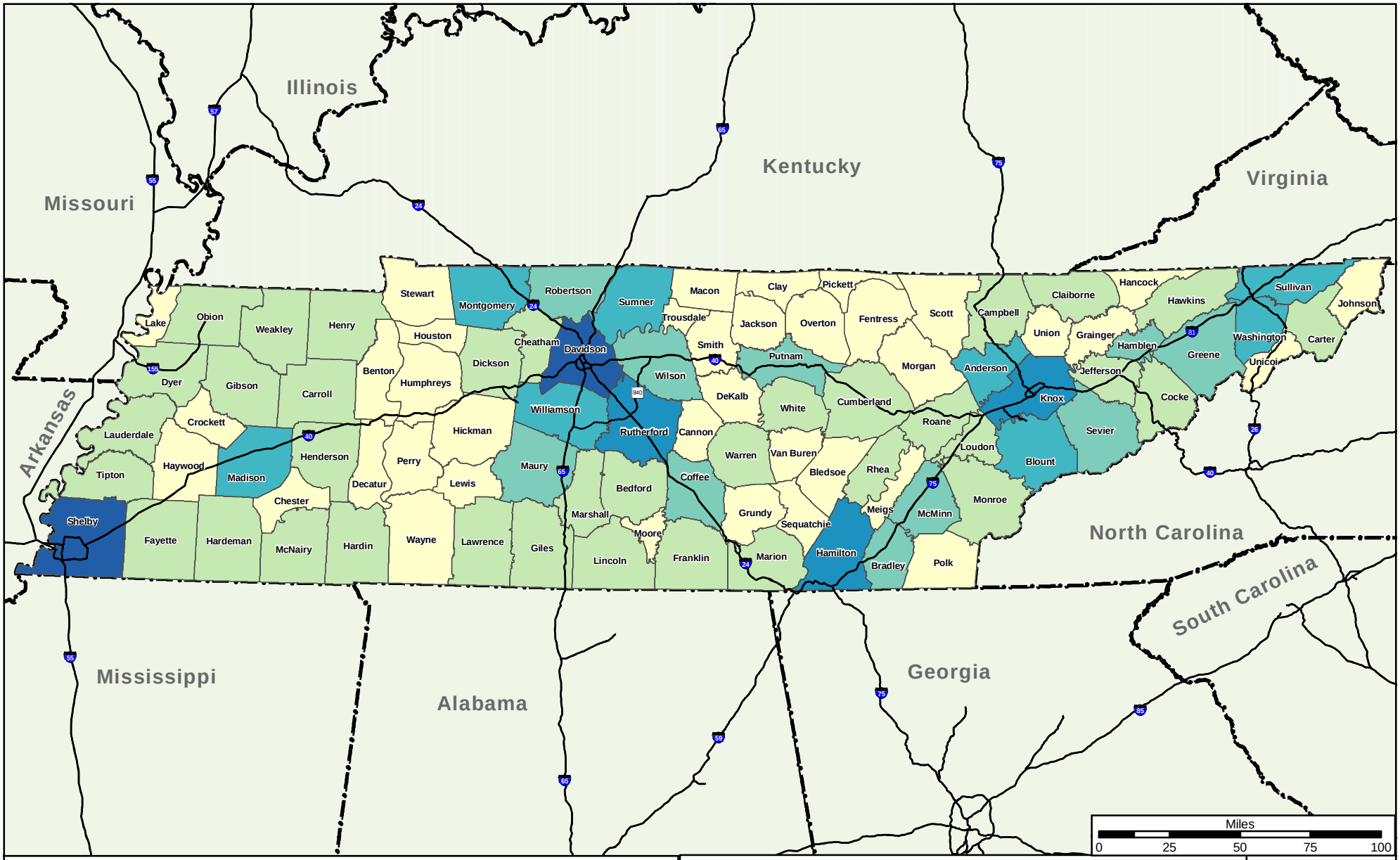
1990 County Employment

TDOT Go.

Exhibit 13

1990 Employment

- 0 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 500,000
- Greater than 500,000



Tennessee Long-Range Transportation Plan

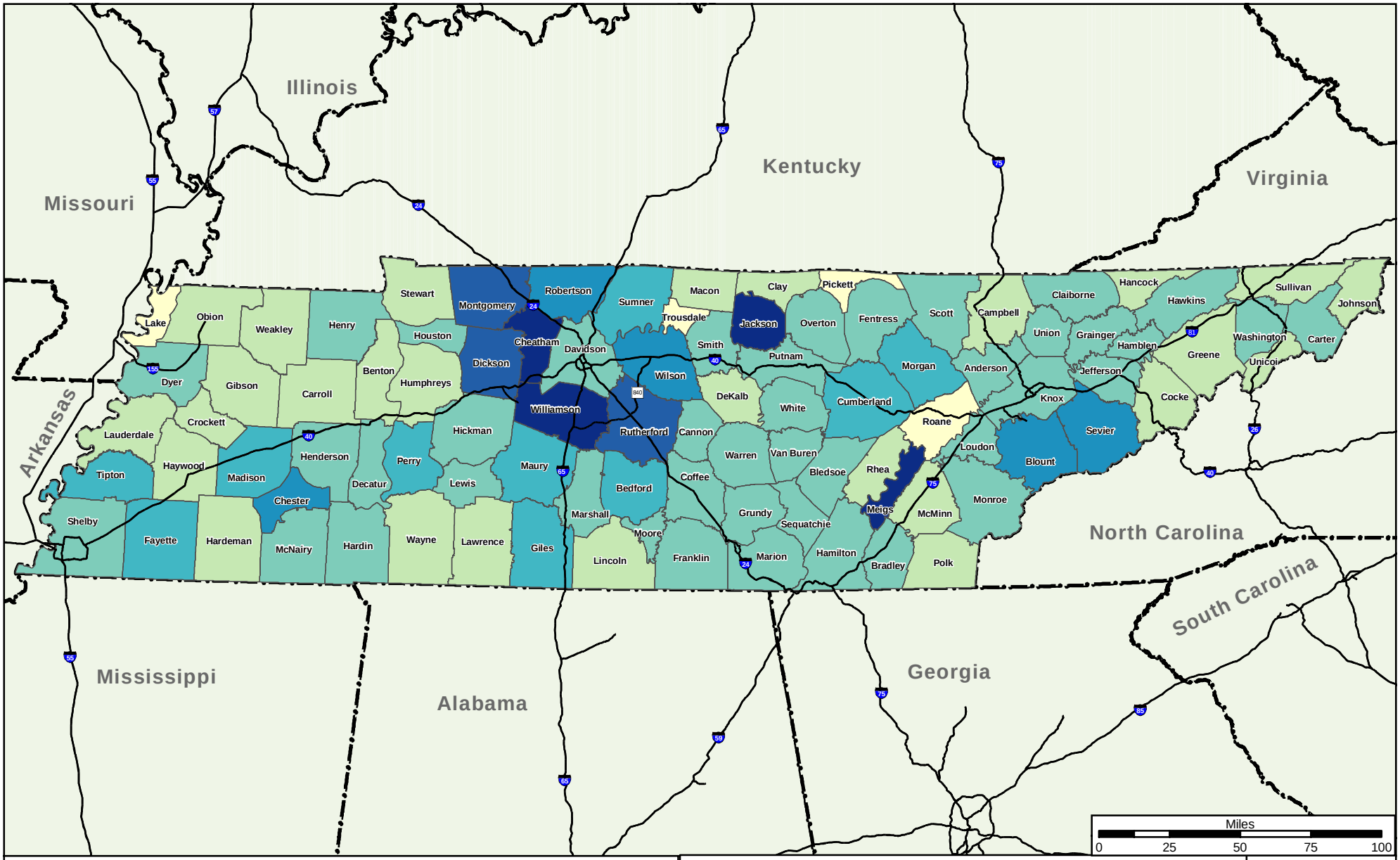
2000 County Employment

TDOT Go.

Exhibit 14

2000 Employment

- 0 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 500,000
- Greater than 500,000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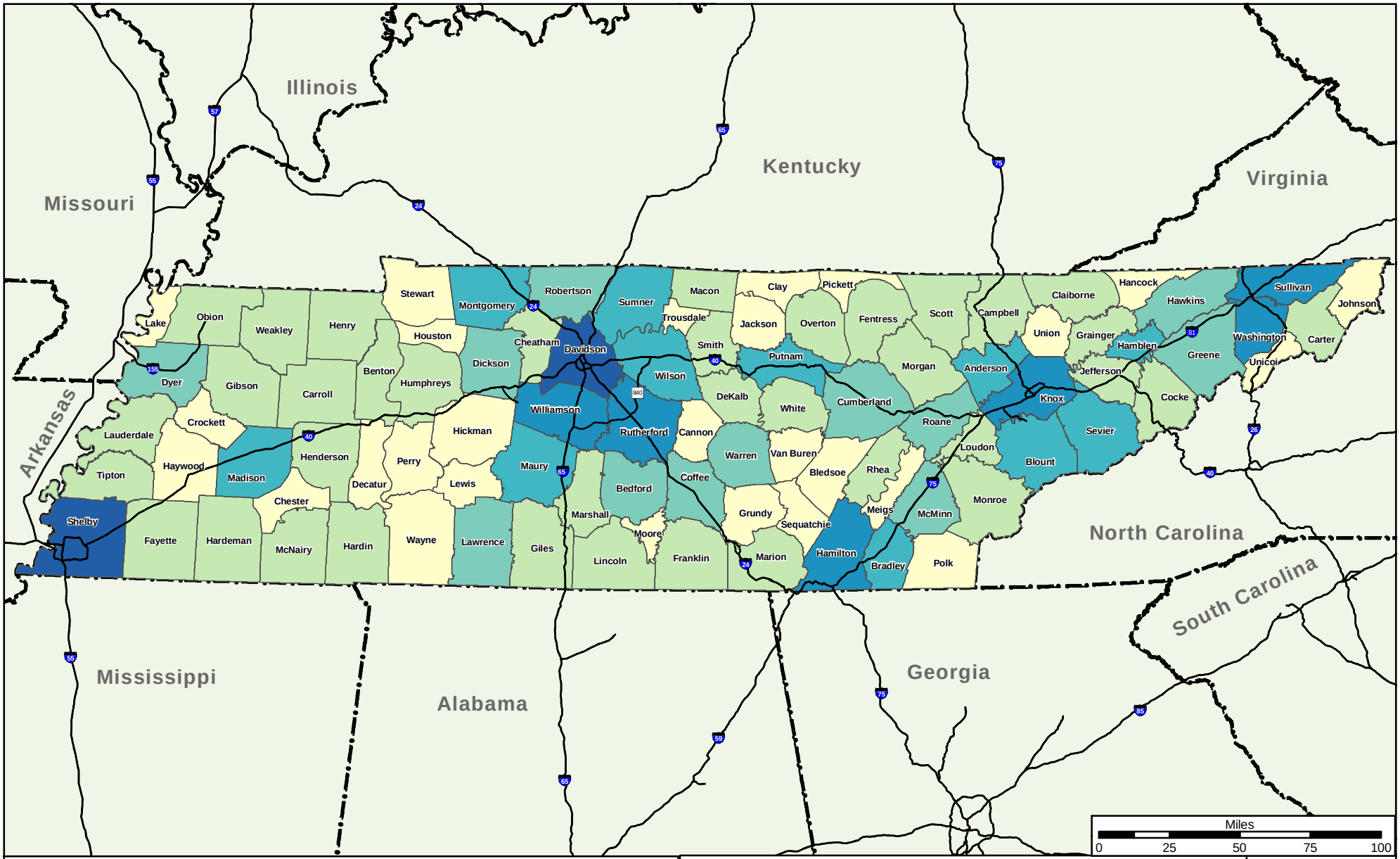
Lincoln
Franklin
Marion
Hamilton
Bradley
Polk
Miles
0
25
50
75
100
Tennessee Long-Range Transportation Plan
1990-2000 Percent Employment Change
Exhibit 15
1990-2000 Percent Employment Change
-14% - 0%
1% - 15%
16% - 30%
31% - 45%
46% - 60%
61% - 75%
Greater than 75%
N
W
E
S



Tennessee Long-Range Transportation Plan

2030 Projected County Employment

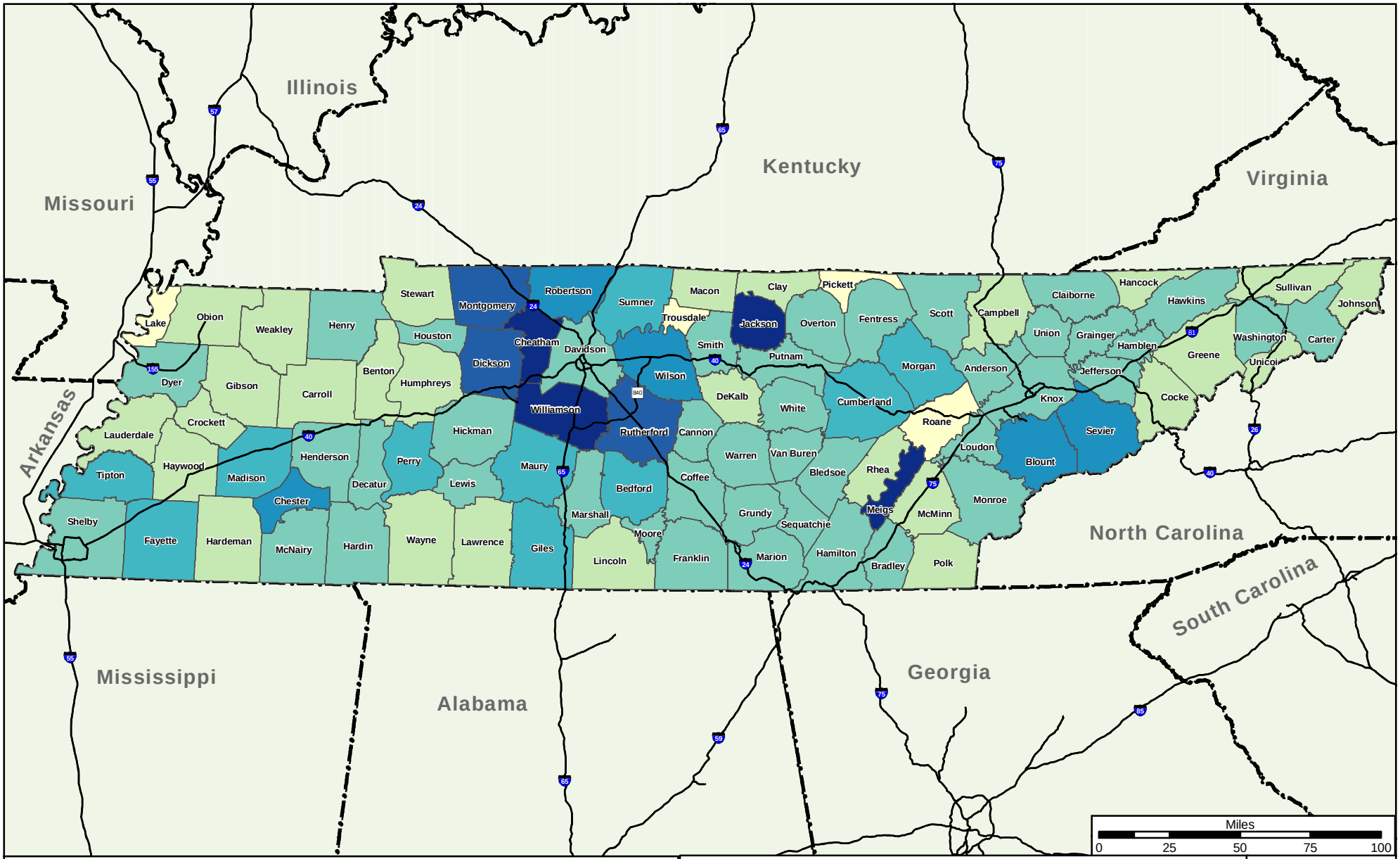
TDOT Go.

Exhibit 16

2030 Projected County Employment

- 0 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 500,000
- Greater than 500,000

N
W
E
S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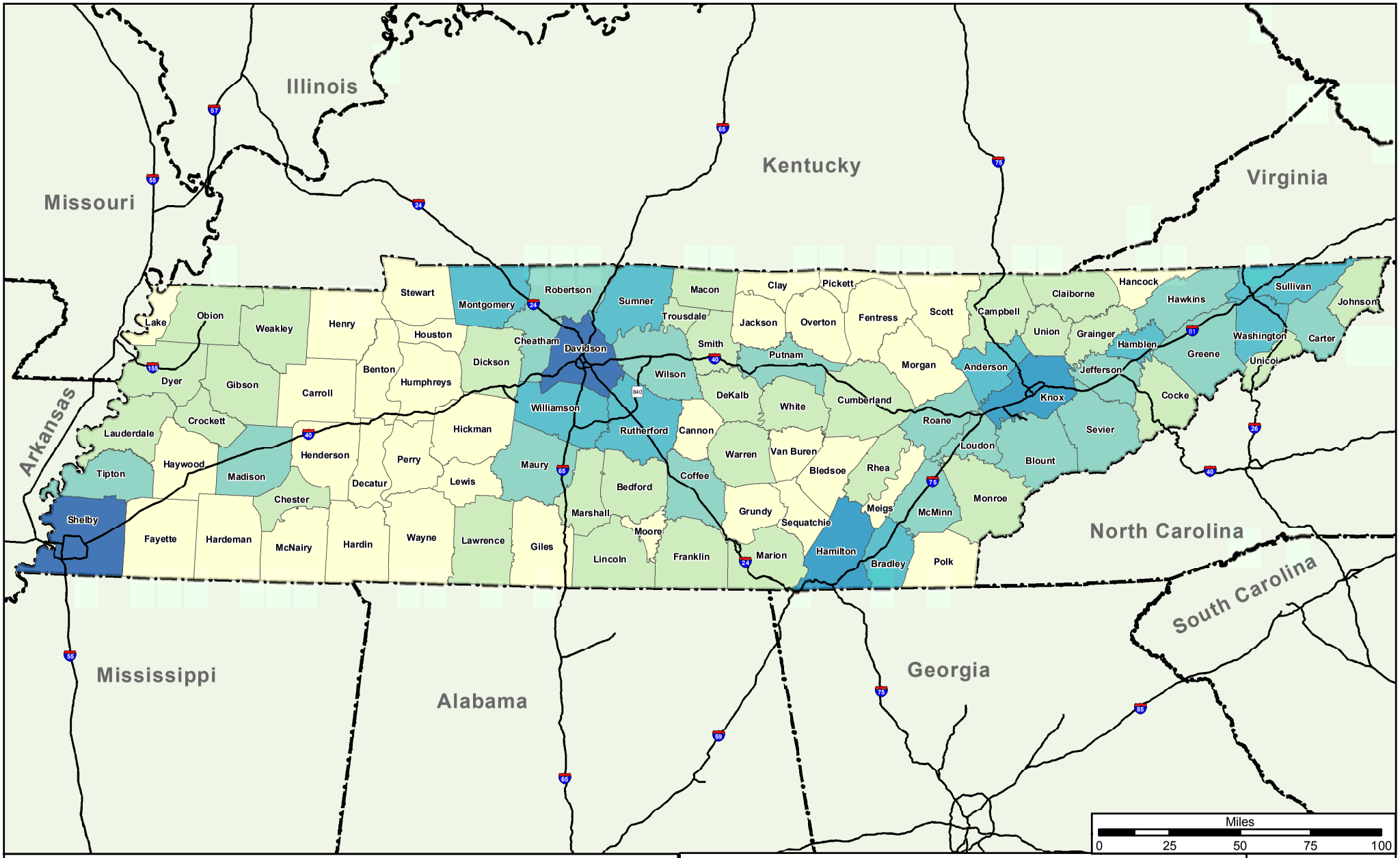
Lawrence
Giles
Marshall
Moore
Lincoln
Franklin
Grundy
Sequatchie
Marion
Hamilton
Bradley
Polk
Miles
0
25
50
75
100
Tennessee Long-Range Transportation Plan
2000-2030 Percent Employment Change
TDOT Go.
Exhibit 17
2000-2030 Percent Employment Change
-14% - 0%
1% - 15%
16% - 30%
31% - 45%
46% - 60%
61% - 75%
Greater than 75%
N
W
E
S



Tennessee Long-Range Transportation Plan

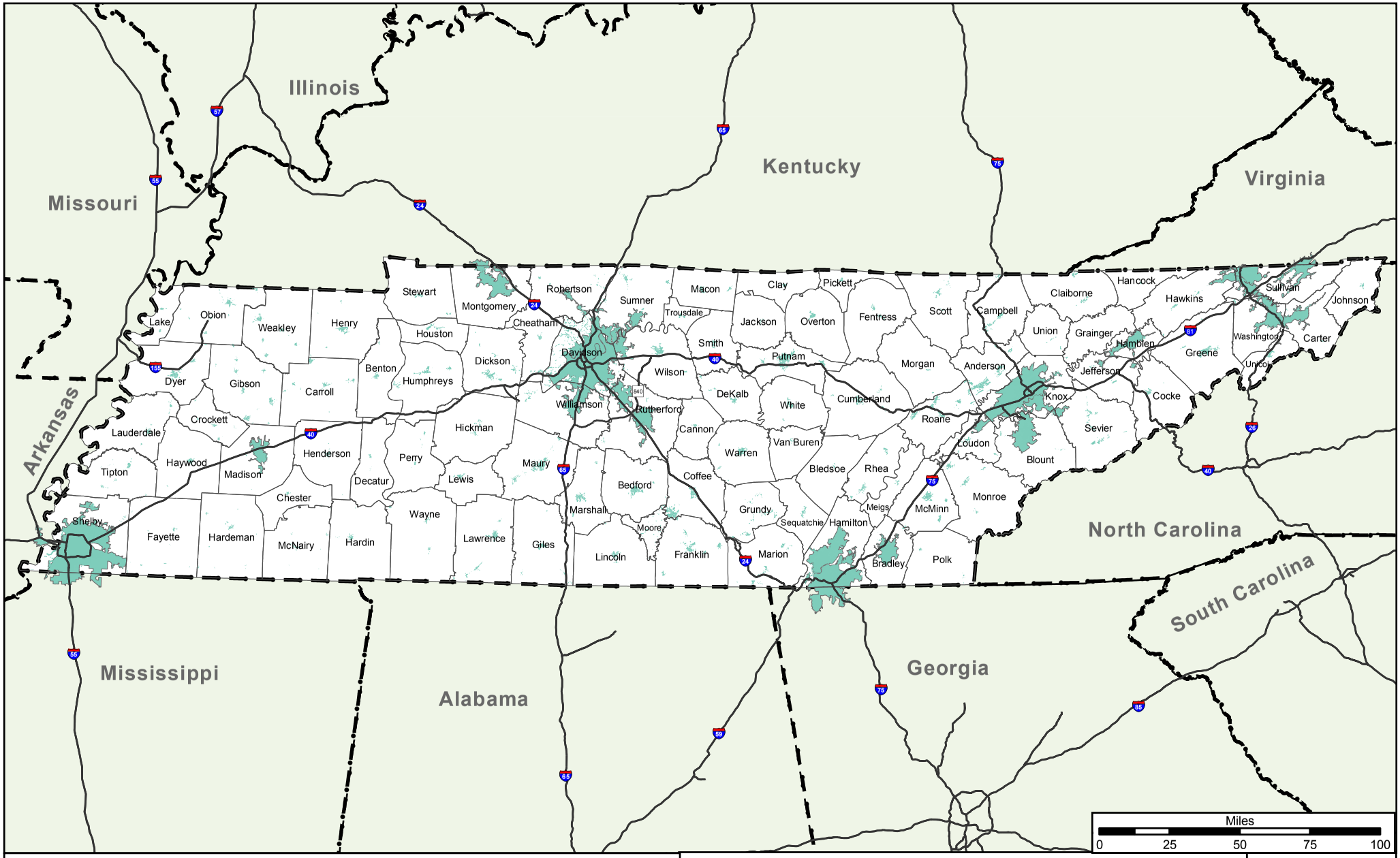
2000 County Population Density

Exhibit 18

2000 County Population Density
People Per Square Mile

18 - 52	188 - 356
53 - 95	357 - 727
96 - 187	728 - 1,145

N
W E
S

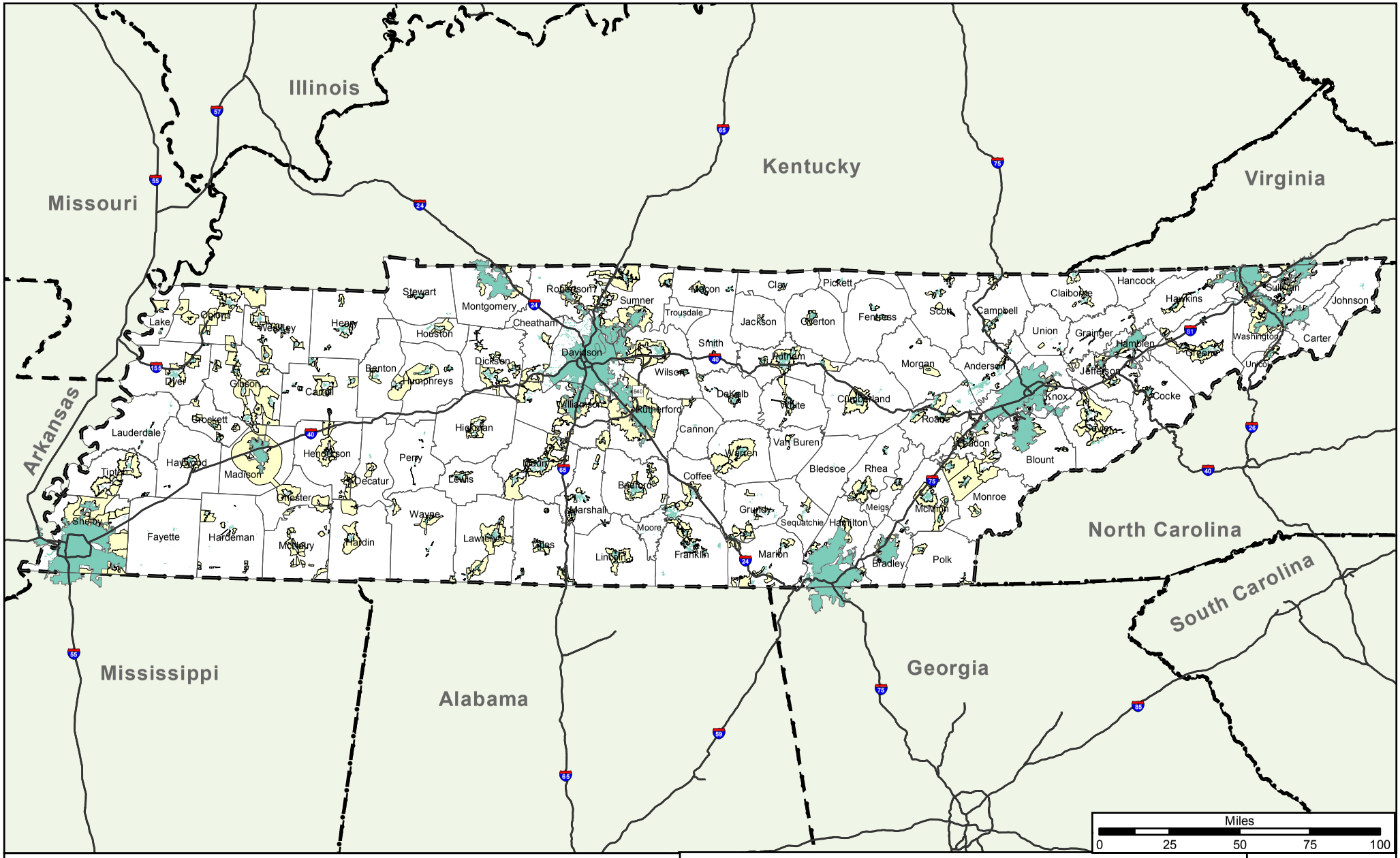


Tennessee Long-Range Transportation Plan

Urbanized Areas

Exhibit 19

Source: U.S. Census, TRIMS



Tennessee Long-Range Transportation Plan

20-Year Future Growth Boundaries

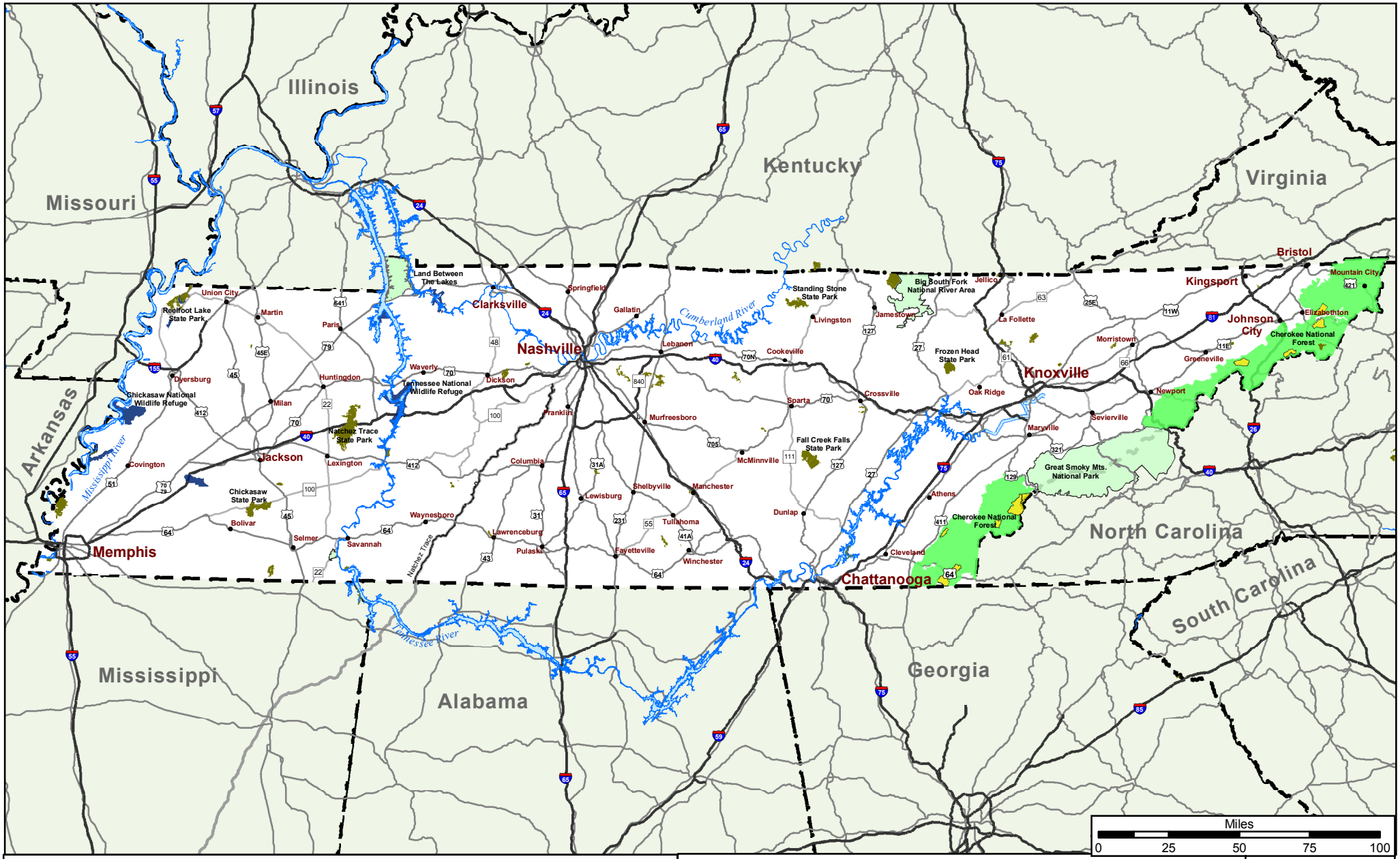
Exhibit 20

Source: TDOT

Urban Areas

- Future Growth Boundaries
- Existing Urban Boundaries

N
W
E
S

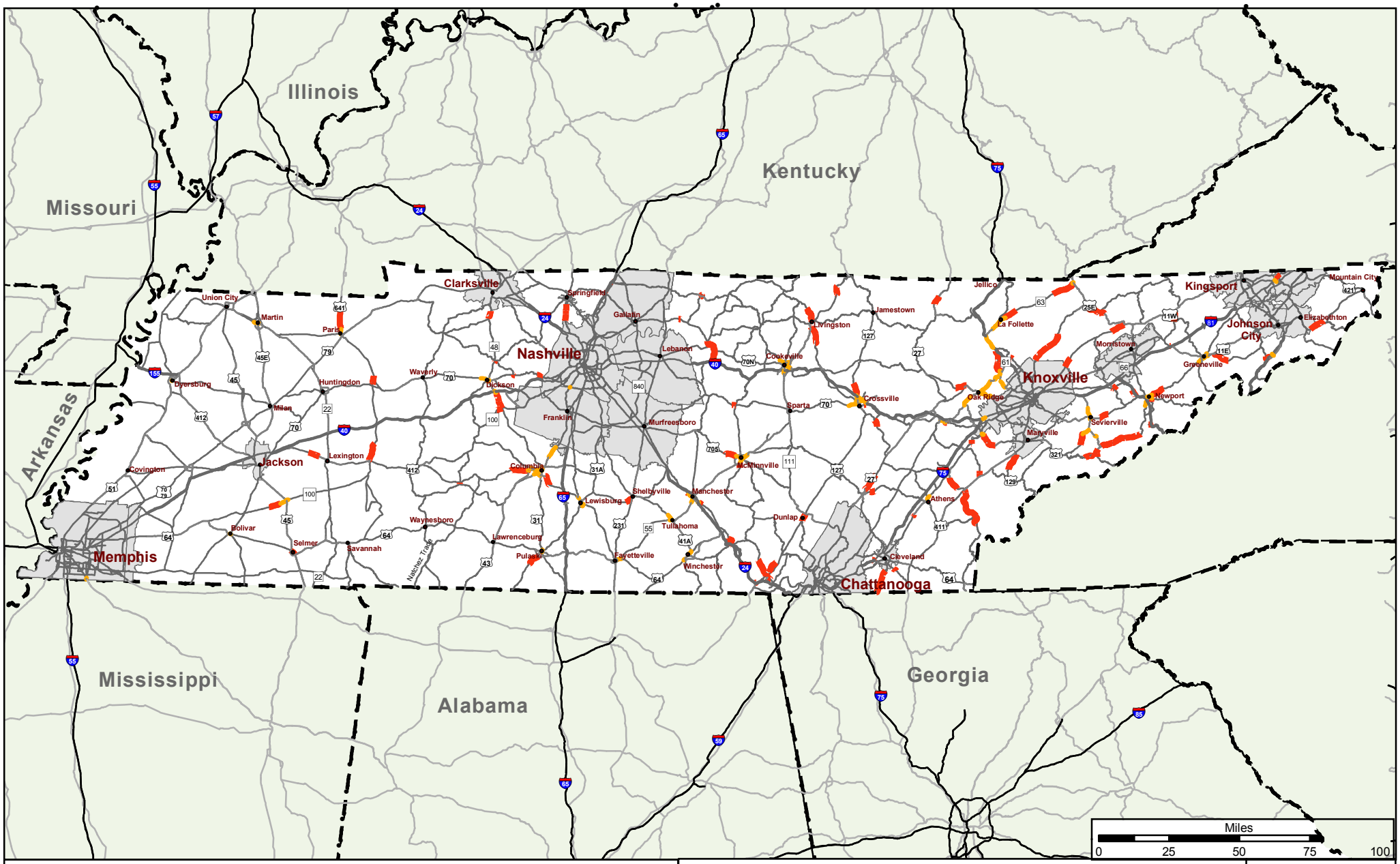


Tennessee Long-Range Transportation Plan

Major Parks and Natural Areas

Exhibit 21

- National Park
- US Forest Service, National Forest
- Fish and Wildlife Service National Wildlife Refuge
- US Forest Service Wilderness Area
- State Parks



Tennessee Long-Range Transportation Plan

2003 Level of Service

Exhibit 22

Source: Tennesse Statewide Transportation Model

Interstate Not Congested

Highway Not Congested

Congested

Terrain Impacted Congestion

MPO Boundaries *

* Capacity information within the MPO Boundaries is not shown.

N

W

E

S