

PAYING THE PRICE FOR INADEQUATE ROADS IN NORTH CAROLINA

THE COST TO MOTORISTS IN REDUCED SAFETY,
LOST TIME AND INCREASED VEHICLE WEAR

APRIL 2004

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Founded in 1971, The Road Information Program (TRIP)® of Washington, DC is a nonprofit organization that researches, evaluates and distributes economic and technical data on highway transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway engineering, construction and finance; labor unions; and organizations concerned with an efficient and safe highway transportation network.

Executive Summary

North Carolina's extensive network of roads and bridges allows the state's 8.3 million residents to safely and freely travel while enabling businesses to efficiently serve their customers. The tremendous growth in North Carolina's population and travel, however, is straining the capacity of the state's transportation system.

As a result of increased use, North Carolina's system of roads and bridges are in inadequate condition and urban congestion is worsening. Deteriorated roads and bridges, a lack of desirable roadway safety features and increasing traffic congestion are costing motorists in the form of additional safety costs, travel delays and vehicle operating costs.

In addition, as North Carolina's manufacturing, industrial and retail businesses become less dependent upon stockpiled inventories and more dependent on "just-in-time" delivery of goods and services, the state must develop a less congested, integrated transportation infrastructure in order to be competitive in both the North American and global marketplace and to attract job-producing industry to the state.

Making needed improvements to North Carolina's roads and bridges is key to providing a safer, smoother, more efficient transportation system that will save motorists money and time, while improving the economic livelihood of the entire state.

This report looks at road and bridge conditions, traffic safety and congestion levels in North Carolina, as well as the cost to motorists who drive on inadequate roads.

The current federal surface transportation legislation expires on April 30, 2004. With a significant increase in federal funding, North Carolina would be able to move forward on several highway projects designed to relieve traffic congestion, improve traffic safety and boost economic development. However, North Carolina will require additional state and local funding resources to meet many other unmet highway needs. The North Carolina Department of Transportation has identified a \$28 billion shortfall in highway and bridge funding over the next 25 years.

Sources of information for this study include the U.S. Department of Transportation (DOT), Federal Highway Administration (FHWA), the U.S. Census Bureau, the National Highway Traffic Safety Administration (NHTSA), the Texas Transportation Institute (TTI), and the North Carolina Department of Transportation (NCDOT)

Key findings of the report include:

TRIP estimates that North Carolina's roadways that lack desirable safety features, have inadequate capacity to meet travel demands, or have poor pavement conditions cost the state's drivers \$5.3 billion annually in the form of traffic accidents, additional vehicle operating costs and congestion-related delays. TRIP estimates that the average annual cost of inadequate roadways is \$1,270 annually per driver in the Charlotte area, \$1,080 annually per driver in the Raleigh-Durham area, \$971 annually per driver in the Greensboro/Winston-Salem area, \$978 in the Fayetteville area and \$820 per driver living elsewhere in the state.

- Traffic accidents and fatalities in which roadway design was an important factor cost North Carolina motorists approximately \$2.8 billion annually, including medical costs, lost economic and household productivity, property damage and travel delays. Roadway design-related safety costs are estimated at \$464 annually per North Carolina driver.
- Traffic congestion in North Carolina costs licensed drivers \$775 million annually in delays and wasted fuel. Annual traffic congestion costs per driver are \$588 in the Charlotte area, \$385 in the Raleigh-Durham area, \$210 in the Greensboro/Winston-Salem area and \$294 in the Fayetteville area. The annual congestion cost for urban North Carolina drivers not residing in the four major urban areas is \$60.
- Driving on roads in need of repair costs North Carolina's motorists \$1.7 billion – \$296 per driver – annually in extra vehicle operating costs, including accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear. Additional annual vehicle operating costs are estimated to be \$218 per driver in the Charlotte area, \$231 per driver in the Raleigh-Durham area, \$297 per driver in the Greensboro/Winston-Salem area, \$220 per driver in the Fayetteville area.

North Carolina is the third-fastest growing state in the United States, east of the Mississippi River. This rapid population growth has resulted in increased vehicle travel on the state's transportation system, resulting in growing urban traffic congestion levels and longer commute times.

- North Carolina's population increased by 26 percent from 1990 to 2002, from 6.6 million residents to 8.3 million residents. In the eastern United States, only Georgia and Florida experienced faster population growth over that time period.
- Vehicle travel in North Carolina increased by 48 percent between 1990 and 2002, from 63 billion vehicle miles of travel (VMT) to 93 billion VMT. Vehicle travel in North Carolina is projected to increase by another 50 percent by 2020, to 140 billion vehicle miles of travel.
- Nearly half – 45 percent – of North Carolina's urban highways were congested in 2002, the latest year for which data is available, carrying traffic volumes that resulted in significant rush hour delays. Urban traffic congestion in North Carolina has increased

significantly since 1995, when 28 percent of the state's urban highways were considered congested.

- Commute times in North Carolina have increased over the past decade, primarily as a result of increased traffic congestion. The average daily one-way commute increased from 19.8 minutes in 1990 to 24 minutes in 2000. As a result, the typical commuter in North Carolina now spends on average an additional 35 hours a year in traffic – the equivalent of four and a half working days – than 10 years ago.

Traffic fatalities in North Carolina are occurring at a rate higher than the national average. Improving safety features on North Carolina's roads and highways would result in a decrease in fatal traffic accidents.

- More than 1,500 people (an average of 1,523 people) were killed each year in motor vehicle accidents in North Carolina from 1995 through 2002.
- North Carolina's traffic fatality rate per 100 million vehicle miles of travel is 1.7, 13 percent higher than the national average of 1.5.
- There are three key factors associated with fatal vehicle accidents: driver behavior, vehicle design and roadway design. It is estimated that roadway design is a significant factor in one-third of traffic fatalities.
- Highway improvements such as adding lanes, removing obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection design, and better road markings and traffic signals can reduce traffic fatalities and vehicle accidents.
- The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

Pavement conditions on one-third of North Carolina's major roads are inadequate. In addition, one-third of the state's bridges are in need of repair or improvement.

- Approximately 12 percent of North Carolina's major roads were rated in poor condition in 2002, the latest year for which data is available, and are in need of resurfacing or reconstruction. An additional 24 percent of the state's major roads were rated in mediocre condition in 2002.
- Roads rated poor are badly cracked or broken. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed.
- Approximately 12 percent of North Carolina's bridges – 20 feet or longer – were structurally deficient in 2003, the latest year for which data is available.

- A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient are sometimes posted for lower weight or are closed if they are found to be unsafe.
- Approximately 16 percent of North Carolina’s bridges – 20 feet or longer – were functionally obsolete in 2003, the latest year for which data is available.
- Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate underclearances or poor alignment.

The quality of a region’s transportation system is an important factor in where many businesses and industries decide to locate, expand or downsize. A modern transportation system is of critical importance if the state is to capitalize on economic development opportunities.

- Businesses have responded to improved communications and greater competition by moving from a push-style distribution system, which relies on low-cost movement of bulk commodities and large-scale warehousing, to a pull-style distribution system, which relies on smaller, more strategic and time-sensitive movement of goods.
- Ninety-four percent of the \$267 billion worth of commodities delivered annually to and from sites in North Carolina are transported on the state’s highways.
- Commercial trucking is projected to increase by 57 percent in North Carolina by 2020.

The current federal surface transportation legislation, the Transportation Equity Act for the 21st Century (TEA-21) expires on April 30. It is a key source of funding for road and bridge improvement and public transportation in North Carolina.

- A significant increase in federal transportation funding would allow North Carolina to accelerate key transportation projects and improve conditions and service statewide. If federal funding remains at current levels, however, many critical highway and public transit improvements will be delayed and traffic congestion will get worse, hampering North Carolina’s economic development.

The following are examples of the highway projects that could be accelerated with a significant increase in federal funding. The full list can be found in the report:

Type of Project	Closest City	Facility	Project Description	Reason for Work
Interstate Widening	Concord	I-85	Finish eight-laning interstate from Greensboro to Charlotte	Safety and Capacity
Urban Bypass	Goldsboro	US 70	New Freeway Bypass	Safety and Capacity
Widen 2 Lane Highway	Louisburg	US 401	Widen existing roadway to four lanes	Safety and Capacity
Widen Urban Street	Fayetteville	SR 1592	Widen existing roadway to multi-lanes	Safety and Capacity
Interstate Widening	Raleigh	I-440	Widen existing Interstate Route	Safety and Capacity

The following are examples of the bus transit projects that could be accelerated with a significant increase in federal funding. The full list can be found in the report:

Type of Project	Closest City	Project Description	Reason for Work
Intermodal Transportation Center	Raleigh	Design and construct an intermodal transportation center	Need to tie intercity rail and bus, regional rail and city services together in one facility.
Transfer Facility	Fayetteville	Design and construct a passenger transfer facility	New facility is needed next to the existing intercity rail station.
Transit Centers	Charlotte	Design and construct transit hub facilities	Hubs allow for greater efficiency of bus services.

- A significant increase in federal funding would allow North Carolina to reduce the number of road miles in need of reconstruction and resurfacing to 9,000 by 2009, down from 11,206 miles currently.
- A significant increase in federal funding would allow North Carolina to reduce the total number of structurally deficient state-maintained bridges to 800 by 2009, down from 2,363 currently.
- A significant increase in federal funding would allow North Carolina to reduce the total number of functionally obsolete state-maintained bridges to 3,400 by 2009, down from 4,304 currently.

North Carolina will also require additional state and local funding to meet many unmet highway needs. The state has a \$28 billion shortfall over the next 25 years in needed highway and bridge funding to improve the condition of the system, expand key routes to relieve traffic congestion, improve roadway safety and improve key links to support economic development.

- The North Carolina Department of Transportation (NCDOT) has identified \$66.6 billion (2001 dollars) in needed highway and bridge projects between 2003 and 2028, of which over 40 percent represents backlog, or system deficiencies that currently exist. But highway and bridge revenue for that period is projected to be only \$38.6 billion (2001 dollars).
- North Carolina needs to spend an additional \$1.2 billion annually to meet all highway and bridge needs statewide over the next 25 years.

Introduction

North Carolina's extensive network of roads and bridges allows the state's 8.3 million residents to safely and freely travel, while enabling businesses to efficiently serve their customers. However, North Carolina's roads and bridges are significantly deteriorated, do not include all desirable safety features, and are becoming increasingly congested.

Making needed improvements to North Carolina's roads and bridges is key to providing a safer, more efficient transportation system that will save motorists money and time, while improving the economic livelihood of the entire state. Significant road and bridge improvements throughout the state may serve to enhance economic development, ease congestion and foster a better quality of life for North Carolina's residents and visitors.

An increase in federal funding, under pending federal transportation legislation, would help North Carolina undertake many critical road, bridge and public transportation projects. In addition, an increase in state and local transportation funding is required to address many unmet needs as North Carolina faces a substantial shortfall in needed road and bridge funding.

This report looks at road and bridge conditions, traffic safety and congestion levels in North Carolina, as well as the cost to motorists who drive on inadequate roads.

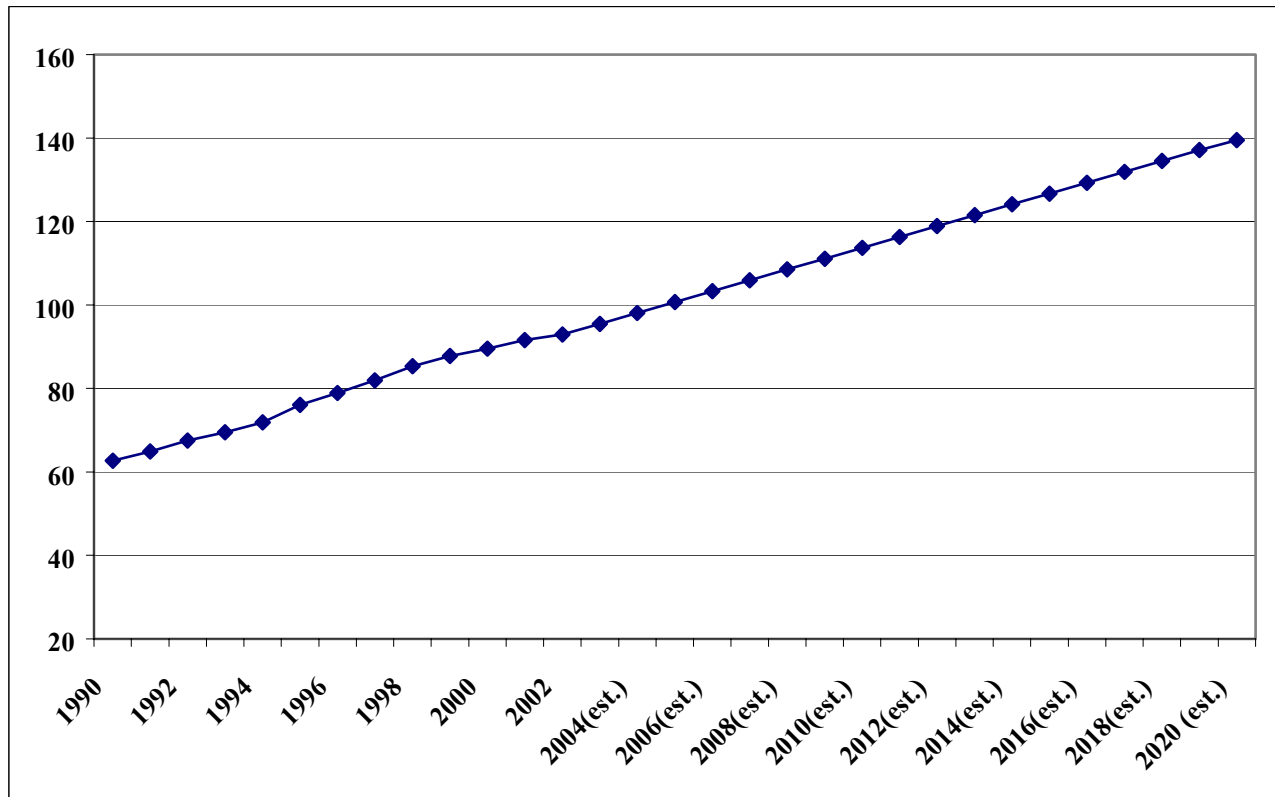
Sources of data for this study include the Federal Highway Administration (FHWA), the Texas Transportation Institute (TTI), the U.S. Census Bureau, the National Highway Traffic Safety Administration (NHTSA), the National Bridge Inventory (NBI) and the North Carolina Department of Transportation (NCDOT).

Population Growth, Travel Trends and Traffic Congestion in North Carolina

North Carolina residents enjoy modern lifestyles that rely on a high level of personal and commercial mobility. North Carolina is the third-fastest growing state in the United States, east of the Mississippi River. This rapid population growth has resulted in increased traffic on the state's roads and bridges. North Carolina's population reached 8.3 million in 2002, up from 6.6 million in 1990 – an increase of approximately 26 percent. Among the states east of the Mississippi River, only Georgia and Florida experienced faster population growth than North Carolina between 1990 and 2002.¹

In addition to population growth, vehicle travel in North Carolina increased by 48 percent from 1990 to 2002, from 63 billion vehicle miles of travel (VMT) to 93 billion vehicle miles of travel.² Based on population and other lifestyle trends, TRIP estimates that travel on North Carolina's roads and highways will increase by another 50 percent by 2020, to 140 billion vehicle miles of travel.

Chart 1. Vehicle Miles of Travel in North Carolina, 1990 to 2020 (in billions)

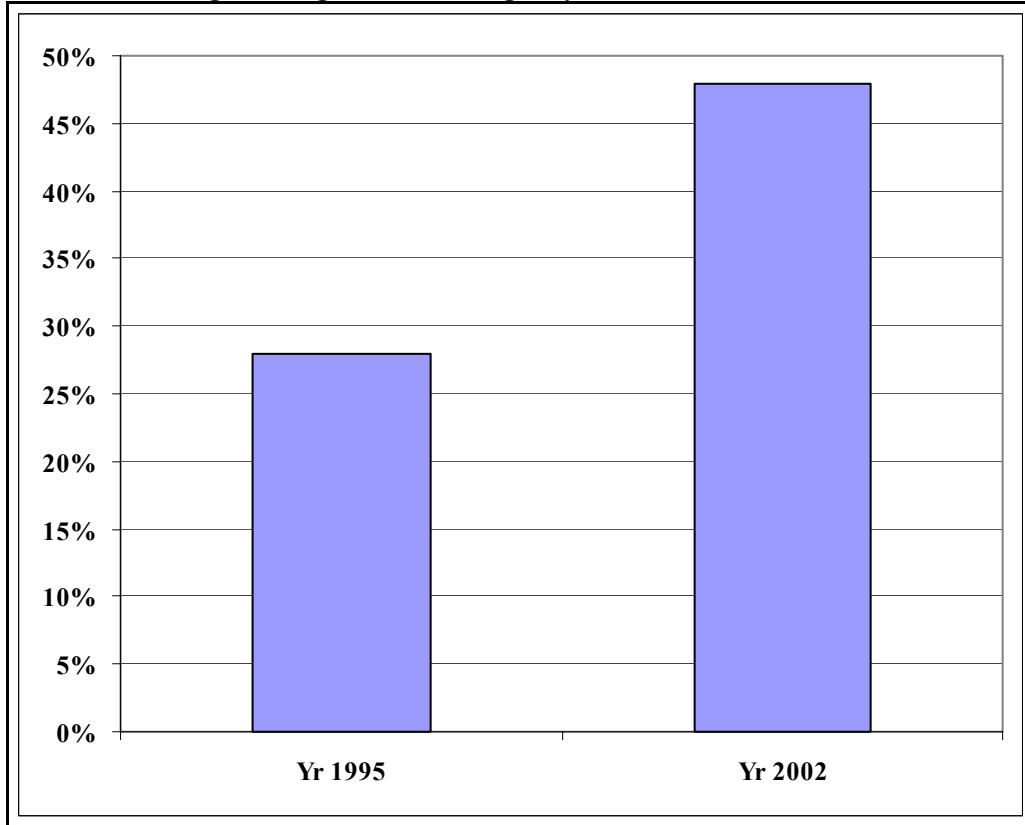


Source: TRIP analysis of Federal Highway Administration data

Traffic congestion is a growing burden in North Carolina’s key urban areas and threatens to impede the state’s economic development. Congestion on North Carolina’s urban highways is increasing as a result of steady increases in vehicle travel. In 2002, the latest year for which data is available, 45 percent of North Carolina’s urban highways (Interstates and other freeways) were congested, carrying traffic volumes that result in significant rush hour delays.³ These routes are considered congested because the levels of traffic they carry are likely to cause delays during peak travel hours, as a result of traffic levels being in excess of what the highway can carry without experiencing delays. Highways that carry high levels of traffic are also more vulnerable to experiencing significant traffic delays as a result of traffic accidents or other incidents. Urban

traffic congestion has increased over the past several years. In 1995, 28 percent of North Carolina's urban highways were considered congested.⁴

Chart 2. Percentage of Congested Urban Highways in North Carolina, 1995 and 2002



Source: TRIP analysis of Federal Highway Administration data

Growing urban traffic congestion is also contributing to longer commute times in North Carolina. Over the past decade, commute times in the state have increased, according to the U.S. Census Bureau. The average daily one-way commute increased from 19.8 minutes in 1990 to 24 minutes in 2000. As a result, the typical commuter in North Carolina now spends on average an additional 35 hours a year in traffic – the equivalent of four and a half working days – than 10 years ago.⁵

Economic Impact of North Carolina's Transportation System

The efficiency of North Carolina's transportation system, particularly its highways, is critical to the health of the state's economy.

The advent of modern national and global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, and consequently, the quality of a region's transportation system has become a key component in a business' ability to compete locally, nationally and internationally. The tremendous increase in freight delivery is being fueled by improved communications and the need for greater competitiveness. Improved communications provided by the Internet are integrating producers, wholesalers, retailers and consumers. Businesses have responded to improved communications and the greater necessity to cut costs with a variety of innovations including just-in-time delivery, an increased demand for small package delivery, demand-side inventory management and by accepting customer orders through the Internet.

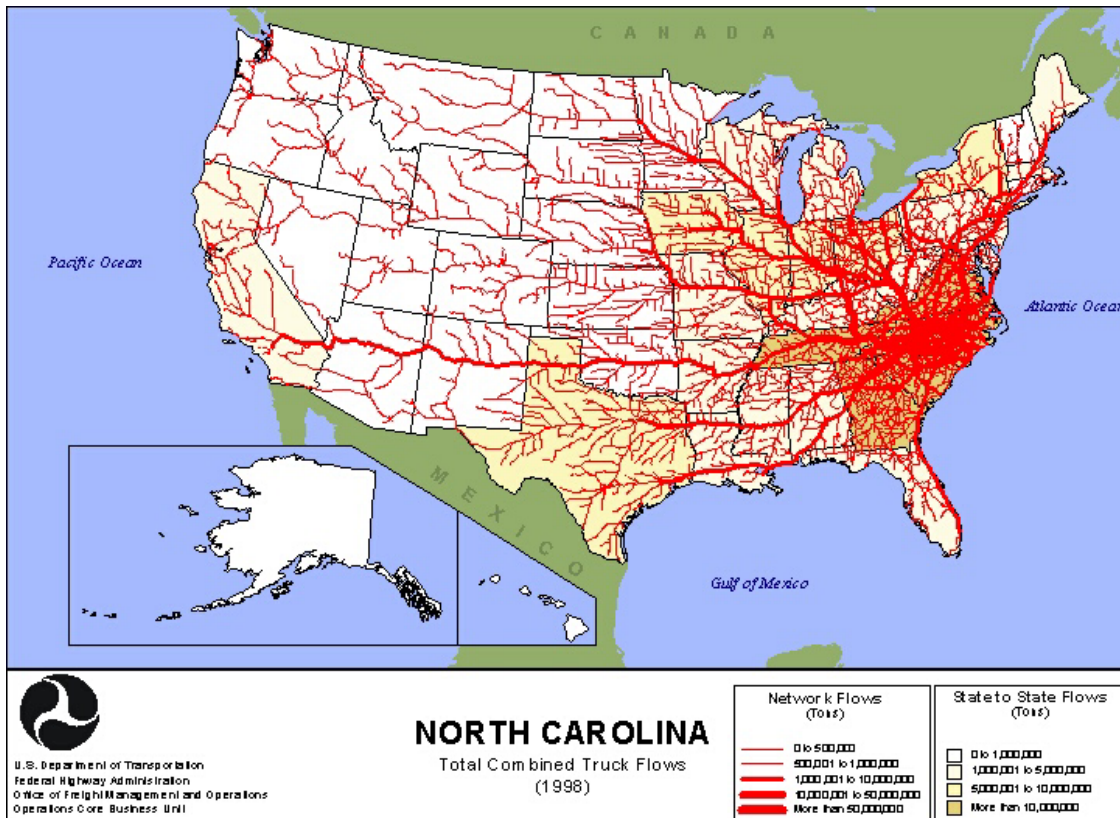
The result of these changes has been a significant improvement in logistics efficiency as firms move away from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. While the nation's economy had depended on low-cost movement of bulk commodities, it increasingly requires the movement of high cost goods with a high level of reliability, and fast movement of smaller, more specialized goods.⁶ The recent improvements in the nation's logistics system have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Trucking is a crucial part of North Carolina's economy, as commercial trucks move goods from sites across the state to markets inside and outside the state. Because of this, commercial truck travel in North Carolina will continue to increase. In fact, the Federal Highway Administration estimates that commercial trucking will increase by 57 percent in North Carolina by the year 2020.⁷

An analysis of commodity transport by the U.S. Bureau of Transportation Statistics (BTS) underscored the economic importance of North Carolina's road system. The BTS report found that in North Carolina, 94 percent of the \$267 billion in products shipped annually to and from sites in the state is transported on highways.⁸

The following map illustrates the truck freight traffic flows for products traveling to and from sites in North Carolina, showing the volume levels along specific highways (indicated by the width of the route). The chart includes truck freight traffic flows for international and domestic freight movement, both imports and exports.

Chart 3. Truck freight flow to and from North Carolina.



Source: Office of Freight Management and Operations, Federal Highway Administration

Because of the importance of transportation to the efficiency and success of many businesses, the level of access and the quality of a region’s transportation system is critical to where businesses choose to locate and expand. Numerous firms cite reliable access to the Interstate highway system and other major routes as a major criterion in deciding where to locate and expand their operations.

A comprehensive 2002 Transportation Research Board report on the adequacy of U.S. freight movement capabilities found that a region's ability or failure to provide a transportation system that minimizes traffic congestion and provides reliable freight movement has a significant impact on whether jobs are created locally or are shifted elsewhere. The report found that "workplaces and residences will move away from congestion within metropolitan areas and from more congested to less congested regions within the United States. Some production will move from the United States to other countries if congestion costs cause the United States to lose comparative advantage in some industries."⁹

Expanding the current transportation system and improving roads and bridges also impacts the state's economy by providing jobs and helping to stimulate the local economy. The Federal Highway Administration estimates that every \$100 million spent on highway construction creates approximately 4,200 jobs. In North Carolina, the state highway program generates approximately 34,000 jobs. This includes both construction jobs and jobs in the related engineering, design, heavy equipment and mining fields as well as general jobs in the local economy as a result of the spending generated by the increase in local wages.¹⁰ In addition, the Federal Highway Administration has found that every dollar spent on street and highway improvements results in \$5.40 in benefits in the form of reduced vehicle operating costs, reduced delays as a result of congestion and improved traffic safety.¹¹

Condition of North Carolina's Roads

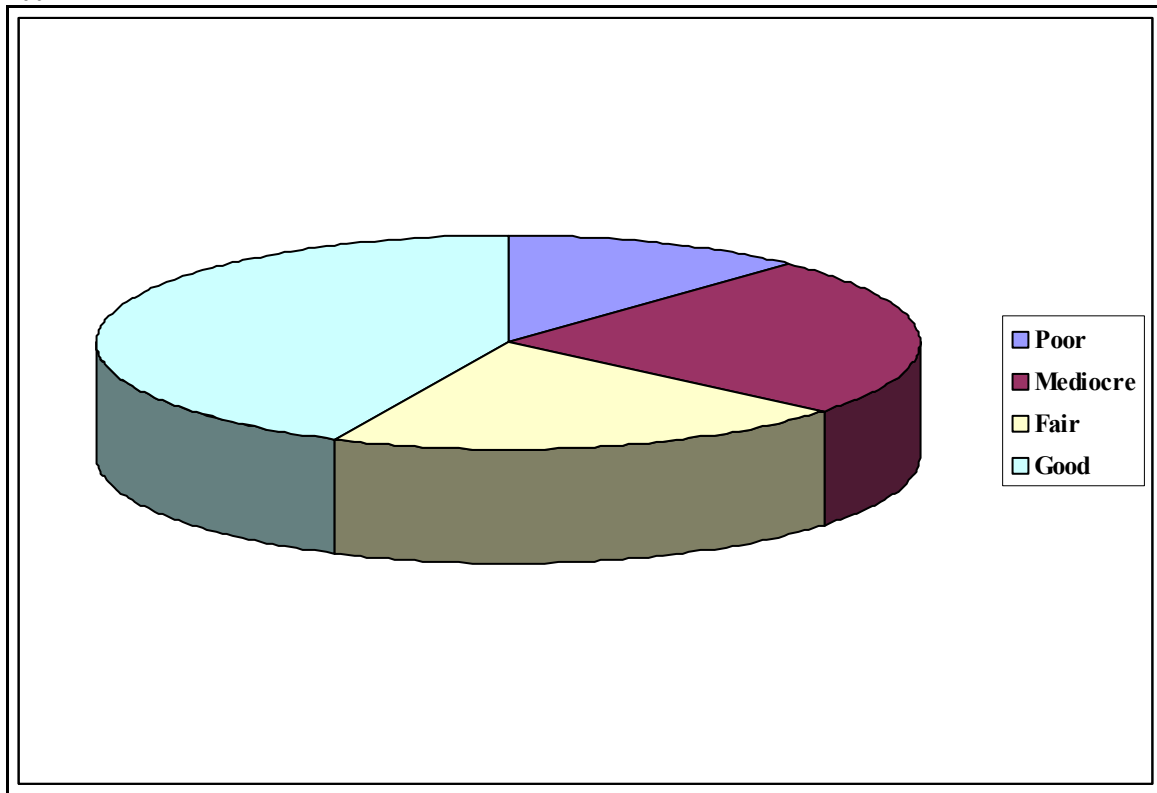
The lifecycle of North Carolina's roads is greatly affected by the state's ability to perform timely maintenance to ensure that structures last as long as possible. The pavement condition of

the state's major roads are evaluated and classified as being in poor, mediocre, fair or good condition. Major roads include all arterial roads, which are Interstate highways, freeways, and major routes connecting urban areas and major routes within cities. In 2002, the latest year for which data is available, 12 percent of North Carolina's major roads were rated in poor condition, while 24 percent of the state's major roads were rated in mediocre condition.¹² Roads rated poor are badly cracked or broken. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed.

Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.¹³

A desirable goal for state and local organizations that are responsible for road maintenance is to keep 75 percent of major roads in good condition.¹⁴ In North Carolina, 43 percent of the state's major roads and highways are in good condition.¹⁵

Chart 4. Percentage of Miles of Major Roads in North Carolina in Poor, Mediocre, Fair and Good Condition, 2002



Source: TRIP analysis of Federal Highway Administration data

Bridge Conditions in North Carolina

North Carolina's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, as well as facilitating commerce and access for emergency vehicles. In 2003, the latest year for which data is available, 12 percent of North Carolina's bridges – 20 feet or longer – were rated structurally deficient. In addition, 16 percent of the state's bridges – 20 feet or longer – were rated functionally obsolete in 2003.¹⁶

A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient are sometimes posted

for lower weight or are closed if they are found to be unsafe. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid these posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate underclearances or poor alignment.

Traffic Safety in North Carolina

There are three key factors associated with fatal vehicle accidents: driver behavior, vehicle design and roadway design. It is estimated that roadway design is an important factor in approximately one-third of traffic fatalities. In North Carolina, an average of 1,523 people were killed annually in motor vehicle accidents from 1995 through 2002, according to the National Highway Transportation Safety Administration.¹⁷

Traffic fatalities are also occurring at a faster rate in North Carolina than the national average. North Carolina's traffic fatality rate per 100 million vehicle miles of travel (VMT) is 1.7, 13 percent higher than the national average of 1.5.¹⁸

Improving safety on North Carolina's roads and highway system can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and, a variety of improvements in roadway safety features. Roadway improvements

such as adding lanes, removing obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection design, and upgrading road markings and traffic signals can reduce traffic fatalities and vehicle accidents. The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.¹⁹

Roads that lack sufficient lanes, have sharp curves, or have inadequately designed intersections or interchanges pose greater risks to motorists, pedestrians and bicyclists. Nationwide, 76 percent of all fatal crashes occur on two-lane roads while only 14 percent of fatal crashes occur on roads with four or more lanes. In North Carolina, 41 percent of major roads, excluding the Interstate, have two lanes.²⁰

The following chart shows the correlation between specific road improvements and the reduction of fatal accident rates nationally:

Chart 5. Reduction in fatal accident rates after needed roadway improvements²¹

Type of Improvement	Reduction in Fatal Accident Rates after Improvements
New Traffic Signals	53%
Turning Lanes and Traffic Signalization	47%
Widen or Modify Bridge	49%
Construct Median for Traffic Separation	73%
Realign Roadway	66%
Remove Roadside Obstacles	66%
Widen or Improve Shoulder	22%

Source: TRIP analysis of U.S. Department of Transportation data

The traffic fatality rate per 100 million vehicle miles of travel on North Carolina’s interstate system is 0.63. The fatality rate per 100 million vehicle miles of travel for non-interstate travel is 1.92.²² Thus, travel on North Carolina’s interstates is three times safer than travel on other routes in the state.

The development and maintenance of North Carolina’s interstate system is a key component in improving traffic safety and reducing fatalities throughout the state. Many of the safety features that are included on most interstates include access limited to interchanges, the separation of traffic from oncoming vehicles, gentler curves, paved shoulders and rumble strips.

By applying some of the safety features of Interstate roads to non-interstate roads, when practical, North Carolina could see a reduction in the number of its accidents and fatalities.

While it is not appropriate to build most routes to interstate standards, traffic safety in North Carolina could be improved by providing many of the safety features found on interstates to many of the state's non-interstate roads.

Highway Funding in North Carolina

Highways, roads and bridges in North Carolina are built and maintained largely by state and local governments, with the state responsible for the most important roadways in the state, including the Interstate system. State revenues for highways derive mostly from user fees on motorists, including the 24.2-cents-per gallon state motor fuel tax. Federal funding for highways in North Carolina are generated through the federal 18.4 cents per gallon motor fuel tax.

Federal dollars primarily fund construction projects on major routes in North Carolina, while the state is responsible for maintenance of major routes and maintenance and construction on the secondary road system. North Carolina's extensive secondary road system comprises 83 percent of all road miles in the state, and it receives no federal funding.²³

State Transportation Funding Needs in North Carolina

North Carolina has a \$28 billion shortfall over the next 25 years in needed highway and bridge funding to improve the condition of the state's highway system, expand key routes to relieve traffic congestion, improve roadway safety and improve key links to support economic development. The North Carolina Department of Transportation (NCDOT) has identified \$66.6 billion (2001 dollars) in needed highway and bridge projects between 2003 and 2028, of which over 40 percent represents backlog, or system deficiencies that currently exist. However, highway and bridge revenue for that period is projected to be only \$38.6 billion (2001 dollars). As a result, North Carolina needs to spend an additional \$1.2 billion annually to meet all highway and bridge needs statewide over the next 25 years.²⁴

NCDOT has focused on preserving the state's highway and bridge infrastructure through two programs--Senate Bill 1005 and N.C. Moving Ahead!. These two programs combined have brought in more than \$1 billion in additional maintenance dollars. Through S.B. 1005, NCDOT was able to tap into its cash balances in the Highway Trust Fund to rehabilitate and resurface more than 1,500 miles of primary highway across the state over a three-year period. In addition, through the N.C. Moving Ahead! program, NCDOT is investing \$700 million in highway maintenance and modernization and public transportation over two years. This program includes projects to resurface more than 2,200 miles of highway, make hundreds of safety improvements along secondary roads such as widening narrow pavement, straightening curves, improving sight distances, drainage improvements and building turn lanes. Forty-nine signal improvements such as new closed loop systems are planned. Additionally, there are 157 bridge replacements across the state.²⁵

Impact of 1998 Federal Transportation Program in North Carolina

In 1998, Congress approved the Transportation Equity Act for the 21st Century (TEA-21), the federal surface transportation legislation that provided federal funding for North Carolina's transportation program over the six-year life of the bill.

North Carolina used the federal funding under TEA-21 to help fund numerous highway projects that have been completed or are scheduled to be completed by 2004, including the following:²⁶

Chart 6. Road Projects, 1998-2004, funded in part by TEA-21

Route Name	Closest City	From	To	Year Completed	Reason for Work
US 23	Madison	NE of US 19	SR 1318	2001	Interstate Construction
I-85	Gaston	East of US 29-74	West of SR 1135	2001	Congestion Relief, Pavement Rehabilitation
I-85	Durham	Orange Co. Line	East of SR 1401	1999	Congestion Relief, Pavement Rehabilitation
I-95	Halifax-Northampton	South of US 158	South of NC 46	2000	Pavement Rehabilitation

US 13	Pitt	NC 903	Bethel Bypass at NC 30	2000	Congestion Relief, Safety Improvements
US 311	Guilford	NC 68	East of US 29A-70A	2003	Congestion Relief, Safety Improvements
US 15-501	Chatham	SR 1599	North of SR 1700	2004	Congestion Relief, Safety Improvements
US 264	Wilson	Existing US 264	East of SR 1136	1999	Congestion Relief

Source: North Carolina Department of Transportation data

North Carolina also used federal funding under TEA-21 to help fund numerous bridge projects that have either been completed or are scheduled to be completed by 2004, including the following:²⁷

Chart 7. Bridge Projects in North Carolina, 1998-2004, funded, in part, through TEA-21

Bridge Name	County	Route Carried	Year Completed	Reason for Work
Bridge 76	Buncombe	US 25	2001	Bridge Replacement
Bridge 37	Richmond	NC 73	1998	Bridge Replacement
Bridge 62	Brunswick	NC 211	2004	Bridge Replacement
Bridge 56	Davidson	NC 150	2000	Bridge Replacement
Bridge 66	Lenoir	US 70	2002	Bridge Replacement
Bridge 39	Avery	US 19E	2001	Bridge Replacement
Bridge 51	Chatham/Lee	US 421	2000	Bridge Replacement
Bridge 152	Nash/Halifax	NC 43	2000	Bridge Replacement
Bridge 63	Beaufort	US 264	2001	Bridge Replacement

Source: North Carolina Department of Transportation data

Federal funding under TEA-21 also helped North Carolina transit agencies and local agencies fund numerous public transportation projects that have either been completed or are scheduled to be completed by 2004, including:²⁸

Chart 8. Public Transportation Projects in North Carolina, 1998-2004, funded, in part, through TEA-21

Type of Project	Closest City	When completed	Reason for Work
Intermodal Transportation Center	Greensboro	2003	New Facility
Bus Replacement	Raleigh	2003	Replacements for portion of fleet
Bus Replacement/Expansion	Wilmington	2003	Replacement of entire fleet and addition of new buses to maintain system reliability and expand services
Durham Bus Replacement	Durham	2003	Replacement of entire fleet of aging and unreliable buses

Source: North Carolina Department of Transportation data

Importance of Future Federal Funding to North Carolina

TEA-21 expires on April 30, 2004. The Senate has approved a six-year, \$318 billion reauthorization of the federal surface transportation program, and the House of Representatives has approved a \$275 billion reauthorization over the same period. The Bush Administration has proposed spending \$256 billion over six years.

A significant increase in federal highway funding under TEA-21 reauthorization would help the North Carolina Department of Transportation undertake numerous significant highway and public transportation projects throughout the state that are needed to improve mobility and traffic safety, reduce traffic congestion and boost economic development.

A significant increase in federal funding over the next six years would result in improvements to the state's road and bridge conditions. Currently, there are 11,206 miles of state-maintained road miles in need of reconstruction and resurfacing. A significant increase in federal funding would allow North Carolina to reduce the number of state-maintained road miles in need of reconstruction and resurfacing to 9,000 by 2009.²⁹

There are currently 2,363 state-maintained structurally deficient bridges in North Carolina. A significant increase in federal funding would allow the state to reduce that total to 800 bridges by 2009.³⁰ There are currently 4,304 state-maintained functionally obsolete bridges in North Carolina. A significant increase in federal funding would allow the state to reduce that total to 3,400 bridges by 2009.³¹

With a significant increase in federal funding, North Carolina would be able to move forward on several highway projects designed to relieve traffic congestion, improve traffic safety and boost economic development. The projects are crucial to the state's ability to provide more efficient traffic flow for motorists and commercial truckers, helping to improve traffic safety and economic productivity, and boost economic growth. These highway projects include:

Chart 9. Proposed Road and Highway Projects (2004-2009), depending on level of federal funding

Type of Project	Closest City	Facility	Project Description	Reason for Work
Interstate Widening and Relocation	Ashville	I-26	Widen I-240 to accommodate I-26 traffic and provide new bridge over the French Broad River	Safety and Capacity
Interstate Widening	Concord	I-85	Finish eight-laning interstate from Greensboro to Charlotte	Safety and Capacity
Interchange Upgrade	Statesville	I-40/I-77	Rebuild interchange	Safety and Capacity
Appalachian Highway	Robinsville	US 74	Roadway Relocation	Safety and Economic Development

development				
Urban Bypass	Goldsboro	US 70	New Freeway Bypass	Safety and Capacity
New Interstate Route	High Point	I-74/US 311	New Interstate Corridor	Safety and Economic Development
Urban Bypass	Shelby	US 74	New Freeway Bypass	Safety and Capacity
Widen 2 Lane Highway	Louisburg	US 401	Widen existing roadway to four lanes	Safety and Capacity
Widen 2 Lane Highway	Jefferson	US 221	Widen existing roadway to four lanes	Safety and Capacity
Relocate US Highway	Monroe	US 74	Roadway Relocation	Safety and Capacity
Urban Bypass	Wilkesboro	US 421	New Urban Bypass	Safety and Capacity
Widen Urban Street	Fayetteville	SR 1592/ Glensford Road	Widen existing roadway to multi-lanes	Safety and Capacity
Interstate Widening	Raleigh	I-440	Widen existing Interstate Route	Safety and Capacity

Source: North Carolina Department of Transportation data

With a significant increase in federal funding, North Carolina could move forward on several public transportation projects designed to relieve congestion and improve access. These transit projects include:

Chart 10. Proposed Transit Projects (2004-2009), depending on level of federal funding

Type of Project	Closest City	Project Description	Reason for Work
Multimodal Transportation Center	Wilmington	Design and construct a new multimodal facility	Existing transfer center is inadequate. New center will also connect city bus to intercity bus and potential intercity rail services.
Transit Maintenance Facility	Rocky Mount	Design and construct a transit maintenance facility	Existing facility is 2 bays in Department of Public Works garage. With a merged city and 2-county fleet, a new maintenance facility is needed.
Intermodal Transportation Center	Raleigh	Design and construct an intermodal transportation center	New regional rail services promoted the need to tie intercity

			rail and bus, regional rail and city services together in one facility.
Transfer Facility	Fayetteville	Design and construct a passenger transfer facility	Existing transfer facility is a temporary structure. A new facility is needed, particularly next to the existing intercity rail station.
Replacement Buses	Winston-Salem	Replace 20 buses	Buses need to be replaced at the end of their useful life cycle to maintain system reliability and to allow for the installation of new technologies allowing for more efficient service and better customer information.
Transit Centers	Charlotte	Design and construct transit hub facilities	New transit centers are needed for a rapidly expanding network of bus services to provide hubs in outlying areas to allow for meeting of crosstown and local routes and to not force all riders to go to the center of the city for all of their trips. Hubs allow for greater efficiency of bus services.

Source: North Carolina Department of Transportation data

THE COST OF NORTH CAROLINA’S INADEQUATE ROADS

Many of North Carolina’s roads lack critical safety features, are in substandard condition and lack adequate capacity to handle travel demand. As motorists drive on substandard roads and highways, they incur increased costs in the form of reduced safety, increased vehicle wear and required vehicle maintenance, as well as wasted time and fuel.

The Cost to Motorists of Roads Lacking Optimum Safety Features

Traffic accidents take a tremendous economic toll on a community, in addition to the suffering and grief that they cause to those injured or killed and their loved ones. A 2002 report by the U.S. Department of Transportation’s National Highway Traffic Safety Administration

(NHTSA) has found that motor vehicle crashes carry a cost to individuals that includes medical costs, lost economic and household productivity, property damage and travel delays.³²

TRIP estimates that roadway design is an important factor in one-third of traffic fatalities, based on an analysis of federal highway safety data. Based on this data, TRIP estimates that the safety cost of roads that lack desirable safety features in North Carolina is approximately \$2.8 billion per year, or \$464 per motorist

The Cost to Motorists of Roads in Inadequate Condition

TRIP has calculated the additional cost of driving on roads in poor or unacceptable condition to motorists. When roads are in poor condition, which may include potholes, rutting or rough surfaces, the cost to operate and maintain a vehicle increases. These additional vehicle operating costs include accelerate vehicle depreciation, increased vehicle repair costs, additional fuel consumption and more rapid tire wear.

TRIP estimates that driving on substandard roads costs the average North Carolina motorist \$296 per year in extra vehicle operating costs. In the Charlotte area, motorists pay an additional \$218 per year in extra vehicle operating costs because of deficient roads. Raleigh-Durham drivers pay an additional \$231 per year, while drivers in the Greensboro/Winston-Salem area pay \$297 per year. In the Fayetteville area, motorists pay \$220 per year in extra vehicle operating costs. The total annual additional vehicle operating costs for all state motorists is \$1.7 billion.

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.³³

The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface. Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

TRIP's additional vehicle operating cost estimate is based on taking the average number of miles driven annually by a region's driver, calculating current vehicle operating costs based on the Automobile Association of America's 2003 vehicle operating costs and then using the HDM model to estimate the additional vehicle operating costs being paid by drivers as a result of substandard roads.³⁴ Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into the TRIP vehicle operating cost methodology.

The Cost to Motorists of Congested Roadways

Congested roadways increase trip length and fuel consumption. Slower traffic, particularly during the morning and evening weekday rush hours, results in workers taking longer to reach work or get home and slows the movement of products and services. Based on travel trends, roadway capacity and population figures, TRIP estimated a per-motorist cost of congestion for the state of North Carolina as well as the three major urban areas based on travel trends, roadway capacity and population figures.

TRIP divided the total regional traffic congestion cost by the number of licensed drivers in each region to determine congestion costs per licensed driver. TRIP estimates that congestion costs each Charlotte motorist an average of \$588 each year, while each driver in Raleigh-Durham pays an additional \$385. In the Greensboro/Winston-Salem area, motorists pay \$210 per year, and in Fayetteville, motorists pay \$294 per year.³⁵ The average cost of traffic congestion in lost time and wasted fuel for urban North Carolina drivers not in the four major urban areas is estimated at \$60 per driver.³⁶ The traffic congestion cost to drivers in other urban areas of the state was determined by comparing urban freeway traffic levels in the state's largest urban areas with urban areas outside these regions. The total urban congestion cost for North Carolina motorists is \$775 million.

North Carolina's urban congestion cost estimates are based on data from the Texas Transportation Institute's 2002 Urban Mobility report, which estimated congestion costs for the nation's largest 75 urban areas. In order to estimate congestion costs, TRIP obtained FHWA

traffic count data per lane mile and estimated traffic congestion based on TTI findings correlating traffic counts per lane mile with congestion costs to motorists.

Total Cost of North Carolina’s Inadequate Roads

Inadequate highways and roads cost North Carolina’s motorists more than \$5.3 billion every year because of additional traffic accidents, lost time and increased wear and tear on their vehicles. The following is a breakdown of the annual total costs associated with driving on a roadway system that lacks optimal safety features and adequate capacity, and is in substandard condition.

Chart 11. Total Annual Costs Due to Driving on North Carolina’s Inadequate Roads

	Total Cost
Safety	\$2.8 billion
Congestion	\$775 million
VOC	\$1.7 billion
Total	\$5.3 billion

Source: TRIP analysis of Federal Highway Administration data, National Highway Traffic Safety Administration data and Texas Transportation Institute data

The following is a breakdown of the annual costs per driver associated with driving on a roadway system that lacks optimal safety features and adequate capacity, and is in substandard condition.

Chart 12. Annual Costs per Driver Due to Driving on North Carolina’s Inadequate Roads

Costs per driver	Charlotte	Raleigh-Durham	Greensboro/Winston-Salem	Fayetteville	North Carolina
Safety	\$464	\$464	\$464	\$464	\$464
Congestion	\$588	\$385	\$210	\$294	\$60

VOC	\$218	\$231	\$297	\$220	\$296
<i>Total</i>	<i>\$1,270</i>	<i>\$1,080</i>	<i>\$971</i>	<i>\$978</i>	<i>\$820</i>

Source: TRIP analysis of Federal Highway Administration data, National Highway Traffic Safety Administration data and Texas Transportation Institute data.

Conclusion

A comprehensive plan for a safer, more efficient transportation system in North Carolina must include projects that will increase safety, relieve congestion and improve road and bridge conditions.

Inadequate roads and bridges cost North Carolina motorists billions of dollars every year in wasted time and fuel, injuries and fatalities caused by traffic accidents, and wear and tear on their vehicles. Making needed improvements to North Carolina’s roads and bridges is key to providing a safer, more efficient transportation system that will save motorists money and time, while improving the economic livelihood of the entire state and its residents.

The continued modernization of North Carolina’s system of roads, bridges and public transportation is crucial to providing a safer, more efficient transportation system, while improving the economic livelihood of the state’s residents. A significant increase in federal funding authorized under new federal surface transportation legislation would help North Carolina undertake numerous critical road, bridge and public transportation projects to relieve traffic congestion and reduce traffic fatalities.

North Carolina will also require additional state and local funding to meet many unmet highway needs. The state has a \$28 billion shortfall over the next 25 years in needed highway and bridge funding to improve the condition of the highway system, expand key routes to relieve traffic congestion, improve roadway safety and improve key links to support economic development. While increased federal funding will certainly facilitate North Carolina's ability to address critical needs, the funding likely to be provided through reauthorization falls well short of what is needed to address current system deficiencies. This does not take into account needs that will develop as the state continues to grow.

These road and bridge projects are designed to improve traffic flow and make driving safer, and help the state accommodate increasing levels of vehicle travel. As travel on North Carolina's surface transportation system becomes more efficient, personal and commercial productivity will increase, boosting economic development statewide.

Endnotes

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²³ North Carolina Department of Transportation: verbal communication.

²⁴ North Carolina Department of Transportation: written communication.

²⁵ Ibid.

²⁶ North Carolina Department of Transportation; results of TRIP survey.

²⁷ Ibid.

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²⁹ North Carolina Department of Transportation; results of TRIP survey.

³⁰ Ibid.

³¹ Ibid.

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³⁵ TRIP estimated based on 2003 Urban Mobility Report by the Texas Transportation Institute. Licensed drivers in each urban area was based on 71 percent of North Carolina residents being a licensed driver (see Highway Statistics 2002, Federal Highway Administration).

³⁶ TRIP estimate made by comparing urban freeway traffic levels in the Charlotte, Raleigh-Durham, Greensboro/Winston-Salem and Fayetteville, and the rest of North Carolina.