

The Interstate Highway System in Tennessee:

Saving Lives, Time and Money

*A report on the condition, impact, use and future needs of
Tennessee's Interstate Highway System*

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Founded in 1971, TRIP of Washington, DC is a nonprofit organization that researches, evaluates and distributes economic and technical data on highway transportation issues. TRIP is supported 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

Fifty years ago the nation embarked on its greatest public works project, the construction of the Interstate Highway System. President Dwight D. Eisenhower provided strong support for the building of an Interstate Highway System that would improve traffic safety, reduce travel times and improve the nation's economic productivity.

Serving as the most critical transportation link in the state's economy, Tennessee's Interstate highways have significantly improved the lives of its residents and visitors. In Tennessee, and throughout the nation, the Interstate system allows for high levels of mobility by greatly reducing travel times and providing a significantly higher level of traffic safety than other routes.

But 50 years after President Eisenhower articulated a vision for the nation's 20th century transportation system, Tennessee and the nation again face a challenge in modernizing the system of aging, increasingly congested Interstate highways. If Tennessee residents are to continue to enjoy their current level of mobility on Interstate highways and bridges, the state will need to make a commitment to providing the public with a 21st Century highway system.

In this report, TRIP looks at the history and benefits of Tennessee's Interstate Highway System, its current use and condition and finally at the future needs of the state's most critical transportation system. Sources of data for this study include the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the U.S. Census Bureau and the Tennessee Department of Transportation (TDOT). The major findings of the report are:

The Dwight D. Eisenhower National System of Interstate and Defense Highways, which has been called the most ambitious public works project built since the Roman Empire, is the most critical link in the nation's and Tennessee's transportation system.

- Tennessee's Interstate system, which includes 3 percent of all roadway lane miles in the state, carries 28 percent of all vehicle travel in the state.
- Since Interstate construction began in 1956, total vehicle miles of travel in Tennessee have increased by 544 percent. Since that time, the number of vehicles in the state has increased by 345 percent, and the state's population has increased by 71 percent.

The state's Interstate Highway System saves the average Tennessee resident \$2,698 per year in saved lives, saved time, reduced motor fuel consumption and reduced clothing, food, housing and transportation costs. The total statewide savings is approximately \$15.9 billion.

- Improved traffic safety provided by the Interstate system saves the state \$949 million annually and the average state resident \$161 annually in reduced healthcare costs and costs associated with lost productivity.
- By reducing travel times, the Interstate system saves each Tennessee resident 93 hours of travel time annually - 546 million hours statewide.
- The Interstate system saves Tennessee residents \$8.8 billion annually in the value of saved time and fuel - \$1,484 per person (\$1,374 in saved time and \$110 in fuel).
- Tennessee's Interstate system annually reduces statewide motor fuel consumption by 260 million gallons.
- Consumer costs have been significantly lowered by the Interstate Highway System. The cost of transporting goods has been reduced because the time it takes to make trips has been decreased. Increased access between locations has enabled access to cheaper land.
- TRIP estimates that consumer costs in Tennessee for clothing, food, housing and transportation are reduced by \$6.2 billion annually, or \$1,053 per state resident, as a result of the Interstate Highway System.
- TRIP's estimates of reduced consumer costs are based on consumer expenditure estimates by the U.S. Department of Labor and estimates of the Interstate's impact on consumer costs collected in a survey of transportation economist.

Construction of the Interstate system in Tennessee started in 1957 and was completed in 1982, providing the state with portions of six Interstate routes totaling 5,042 lane-miles, connecting the state's largest urban areas and Tennessee to the rest of the nation.

- The Federal-Aid Highway Act of 1956, signed into law by President Dwight Eisenhower on June 29th, 1956, called for the construction of a 41,000 mile system of Interstate highways to be paid for by taxes on motorists, such as the federal motor fuel tax. The federal highway user tax on gasoline was set at three cents-per-gallon and is now 18.4 cents-per-gallon.

- Revenue collected from highway user taxes are the primary sources of funding for the federal Highway Trust Fund, which distributes funds to state and local governments for highway and bridge repairs as well as other surface transportation improvements, including public transit, walking and bicycling facilities.
- The first section of Interstate completed in Tennessee was a portion of Interstate 65 in Giles County. The project was let to contract on March 14, 1957 and completed on January 2, 1959.
- The majority of the state's Interstate system was completed by 1976, when 82 percent of the system had been completed.
- The most recent section of Tennessee's original Interstate system open to traffic was a portion of Interstate 40 in Knoxville, from Rutledge Pike to Asheville Highway, which was opened to traffic on December 31, 1982.

More than half of Tennessee's urban Interstates are congested as a result of continued growth in travel.

- Fifty-three percent of Tennessee's urban Interstates are considered congested because they carry traffic levels that result in significant delays during peak travel hours.
- The average annual amount of travel per Interstate lane-mile in Tennessee increased by 46 percent from 1990 to 2004, from an average of approximately 2.7 million miles traveled annually per Interstate lane-mile to approximately 4 million.
- The following is a list of the ten most congested sections of Interstate in Tennessee. A full list of the most congested sections of Interstate can be found in the body of the report.

Rank	Route	County	From	To	Length	ADT	Lanes
1	I-65/I-24	Davidson	I-65/I-24 split. North Nashville	I-65/I-24	3.0	163,370	6
2	I-65	Davidson	I-40	I-65/I-24	2.5	163,370	6
3	I-24/I-40	Davidson	I-24/I-40 split	I-24/I-40 split, South Nashville	1.9	176,190	8
4	I-24	Davidson	I-24/I-40 split	SR-155 (Briley Pkwy.)	2.3	131,020	6
5	I-24	Davidson	I-24/I-40 split	I-65/I-24 split (Downtown Nashville)	3.1	136,510	6
6	I-65/I-40	Davidson	I-40/I-65 split	I-24/I-40 split, (Downtown Nashville)	3.1	118,880	6
7	I-40	Davidson	I-440	I-65/I-40 split	1.9	86,040	6
8	I-65	Davidson	I-40/I-65 split	I-440	2.8	102,560	6
9	I-24	Hamilton	I-75	SR-29 (U.S.27)	7.2	121,990	6
10	I-440	Davidson	I-65	I-40	3.5	108,090	4

Tennessee’s Interstates provide travelers with a network of highways with a variety of safety designs that greatly reduce the likelihood of serious accidents. Travel on Tennessee’s Interstate highways is more than twice as safe as travel on all other roadways in the state.

- Tennessee’s Interstate highways have saved approximately 7,500 lives in the state since 1956, based on an estimate of the number of traffic deaths that would have occurred if Tennessee did not have Interstate highways.
- The number of lives saved by the Interstate was calculated by estimating the additional fatalities that would have occurred had Interstate traffic been carried by other major roadways in the state, which often have higher traffic fatality rates and may lack the safety features common to Interstate routes.
- Tennessee’s Interstate system has saved an average of 190 lives per year over the last ten years, based on the above criteria.
- The features that make Interstates safer than other roads include: a separation from other roads and rail lines, a minimum of four-lanes, gentler curves and often paved shoulders, median barriers and rumble strips to warn drivers when they are leaving the roadway.

- Travel on Tennessee’s Interstate highways is more than twice as safe as travel on all other roadways. The fatality rate per 100 million vehicle miles of travel on Tennessee’s Interstate system in 2004 was 0.89, while it was 2.18 on non-Interstate routes in Tennessee.
- There were 176 traffic fatalities on Tennessee’s Interstate highways in 2004. Only 14 percent of the 1,288 traffic fatalities that occurred in Tennessee in 2004 were on the Interstate system, even though it carried 28 percent of all travel in the state in 2004.

Overall, current pavement and bridge conditions on most of Tennessee’s Interstate system are acceptable, but some deficiencies exist.

- Ninety-six percent of Tennessee’s Interstate pavements are in good condition. Two percent are in poor or mediocre condition. Another 2% of Interstate pavements are in fair condition.
- Bridges are structurally deficient if they no longer meet their intended design capacity or were, in the past, designed for a capacity less than the state’s current legal loads. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment
- Three percent of the state’s Interstate bridges are rated structurally deficient and 12 percent are rated functionally obsolete.
- The average age of Tennessee’s Interstate bridges is 35 years. Older bridges typically need significant repairs, reconstruction or replacement at approximately 50 years.
- The following is a list of the ten most heavily-traveled structurally deficient bridges in Tennessee. A full list of the most heavily-traveled structurally deficient bridges can be found in the report.

County	Route Carried	Route or feature intersected	Average Daily Traffic	Year Built	Lanes
Davidson	I-24	SR1 (Murfreesboro Rd)	131,020	1960	5
Davidson	I-24	Woodland Street	123,070	1961	8
Davidson	I-40	Mill Creek	120,130	1963	6
Davidson	I-24	Spring Street	115,810	1961	8
Hamilton	I-24	I-24 EB/I-24 EB ramp to I-124 N	115,510	1990	2
Shelby	I-240	I-240 / ravine	100,790	1963	4
Shelby	I-240	I-240 WB /Kerr Ave.	100,790	1961	3
Hamilton	I-75	Big Spring Creek	100,160	1959	4
Knox	I-40	5th Ave & ramps	94,510	1967	2
Knox	I-40	Fourth Ave. (NFA A118)	94,510	1967	2

The Interstate system is the backbone of the Tennessee economy and has played a critical role in improving business productivity in the state.

- Travel by large commercial trucks accounted for 23 percent of all vehicle travel on the state's Interstate system in 2004.
- Every year, \$287 billion in goods are shipped annually from sites in Tennessee and another \$200 billion in goods are shipped annually to sites in Tennessee, mostly by truck.
- Eighty percent of the goods shipped annually from sites in Tennessee are carried by trucks and another nine percent are carried by courier services, which use trucks for part of the deliveries. Similarly, 79 percent of the goods shipped to sites in Tennessee are carried by trucks and another 11 percent are carried by courier services, which use trucks for part of their deliveries.
- The Interstate system has led to significant increases in economic productivity. Improvements in the highway system have allowed businesses to adopt more efficient logistics practices, which reduce costs for producers and consumers.
- The initial construction of much of the Interstate system provided a tremendous boost to business productivity as a result of more efficient goods shipment. Economists have estimated that from the initial phase of Interstate construction in 1956 to 1970, the annual rate of return for every dollar of public investment in highway construction was 54 cents, which meant that investments recovered their costs in two years.
- The completion of the vast majority of the Interstate system by the 1980s and the deregulation of the U.S. trucking industry resulted in a significant improvement in the competitiveness of U.S. business. In fact, the cost of moving freight, as measured by U.S. business logistics costs, dropped from 16 percent of U.S. Gross Domestic Product (GDP) in 1980 to nine percent in 2002.
- Tennessee's Interstate highways have reduced travel times both within the state and to locations outside of Tennessee. The improved mobility provided by the Interstate system has given Tennessee's residents greater choices about where they live, work, shop and spend their leisure time.

Over the next ten years, Tennessee faces a \$1.5 billion shortfall in funds needed to rebuild the state's aging Interstate highways system and provide additional lane capacity to meet growing travel demands. Traffic congestion and pavement conditions are likely to worsen unless the state can fund needed projects.

- According to the Tennessee Department of Transportation, the current anticipated average budget available for all state Interstate construction from 2006 to 2016 (including preservation, maintenance and capacity expansion) is approximately \$1.43 billion.
- However, the state estimates that \$2.97 billion is needed between 2006 and 2016 to allow the state to fund a program that adequately addresses Interstate preservation and capacity needs, creating a backlog of \$1.54 billion in needed Interstate funding.
- According to the Tennessee Department of Transportation, 29 percent of Interstate bridges (404 of 1,404 Interstate bridges) will need significant repairs or reconstruction over the next 10 years.
- According to the Tennessee Department of Transportation, if additional capacity is not added to the state's urban Interstate system, 73 percent of urban Interstates will be congested in 2016. If, by the year 2026, if additional Interstate capacity is not added, 98 percent of urban Interstate lane miles percent will be considered congested.
- Tennessee needs to build additional lanes along 239 miles of the existing 1,105 mile Interstate system by 2016 in order to relieve growing traffic congestion.

Introduction

The Dwight D. Eisenhower National System of Interstate and Defense Highways has been called the most ambitious public works project built since the age of the Roman Empire and is literally the backbone of America's economy.

Initially conceived in 1939, significant construction of the Interstate system did not start until 1956 when Congress approved the financing of today's Interstate system, largely through collection of the federal motor fuel tax and other taxes on highway users.

Tennessee's Interstate Highway System is the most critical element of the state's transportation system. Fifty years after construction of the Interstate Highway System began, this network of highways has become the most important set of corridors linking Tennessee's citizens to people and businesses within the state and throughout the nation.

Today, the Interstate continues to provide Tennessee with economic growth, improved traffic safety and convenient access while playing a vital role in the nation's defense.

In this report, TRIP looks at the history and impact of Tennessee's Interstate Highway System, its current use and condition, the system's benefits and finally at the future needs of the state's most critical transportation system. Just as 50 years ago, when our leaders made critical decisions on the future of the nation's highway system, today's political leaders now face challenge of insuring that the safety and reliability of the Interstate system are maintained by investing adequately in needed repairs and improvements to meet the transportation challenges of the 21st Century.

Development of the U.S. Interstate System

In 1919, Lieutenant Dwight D. Eisenhower participated in the U.S. Army's first transcontinental motor convoy, from Washington, DC to San Francisco. During the 62 days it took to cross the country, the convoy experienced numerous difficulties, including roads that were muddy, narrow or otherwise inadequate and bridges that often could not support the vehicles in the convoy.

A generation later, General Eisenhower saw first hand how an efficient, effective highway transportation system benefited a nation, when he noted that the German Autobahn network, opened in 1935, provided a significant military advantage to Germany.

The United States also began exploring the feasibility of constructing a series of interregional highways in the late 1930s. In 1938 Congress directed the then Bureau of Public Roads (BPR) to prepare a study on the possibility of building a national system of toll highways. The resulting 1939 BPR report concluded that it would be impossible to finance a national system of highways strictly through charging tolls, but did recommend that the U.S. build a system of approximately 26,700 miles of transcontinental highways. The BPR report also called for many of the design elements found on modern Interstate highways, including limited access, which separates highway traffic from other traffic and from trains. The BPR report also suggested that the nation's highways should connect with the center of large cities, should include beltways around large urban areas and should bypass small towns.

Further attempts to develop a national highway system were interrupted by World War II. But as the Allies gained the upper hand in the war, Congress started to turn its attention to post-war challenges, including consideration of a modern highway system to support the nation's growing economy and improve safety and mobility. The Federal-Aid Highway Act of 1944 authorized the BPR to designate a system of approximately 40,000 miles of Interstate highways, which proved very similar to the routes approved ultimately as the national Interstate system. But the 1944 highway bill did not specify any additional funds for construction of the highways, other than the small amount of funds currently made available by the federal government for highway construction.

The 1944 Highway Act had identified the need for a national system of interconnected highways, but had left out a key piece of the puzzle – how to fund a uniformly-designed national highway system, which would have significant differences in construction costs and traffic volume, depending on location. Even without significant federal funding available, cities and states began to move forward on their own, with some additional highway networks being built or planned in current Interstate corridors under various financing mechanisms. These early highway projects included toll highways such as the Pennsylvania Turnpike and the New York Thruway and early urban highways including the Los Angeles Freeway System and the Detroit Expressway System.

But for most motorists and businesses, the inadequate roadway system of the late 1940s and early 1950s contributed to growing human and economic losses, as cars and trucks jostled for position on the nation's inadequate, narrow and winding roads and streets.

In 1954 President Eisenhower appointed a committee to draft a proposal to fund a national system of Interstate Highways. Eisenhower noted that the nation's obsolete highway system penalized Americans through increased traffic deaths, the waste of time caused by traffic delays, the increased cost of freight movement and the inability of the nation's highways to meet the mobility demands that would be caused by a regional catastrophe or national defense emergency.

The initial plan prepared for President Eisenhower called for funding a national Interstate Highway System through bond financing, but Congress dismissed the use of bond revenue as the primary source of Interstate financing. In 1956, Congress overwhelmingly approved the construction of a national Interstate Highway System when the financing was changed to a pay-as-you-go format that would collect a series of user fees -- most notably a 3 cent-per-gallon tax on motor fuel -- into a national Highway Trust Fund.

The Federal-Aid Highway Act of 1956 called for the construction of a 41,000-mile Interstate Highway System, which was to be completed by 1970 at a cost of approximately \$27 billion. The design of the system was very similar to the initial 1944 plan, which called for connecting large urban areas, including routing highways into central cities, largely at the request of mayors and other local politicians who feared that their communities would be left behind without modern highway access. The Interstate system was designated to incorporate approximately 2,000 miles of existing highways, including the Pennsylvania Turnpike and the New York Thruway. The highways were to be built to high design standards that would reduce traffic deaths and increase the amount and speed of traffic that could be carried. These design standards included full access

control to limit entrance and exit to on and off ramps, a minimum of four lanes, medians to separate oncoming lanes and moderate curves.

The Construction of the Interstate System in Tennessee

Following the signing of the Federal-Aid Highway Act of 1956 by President Eisenhower on June 29, 1956, Tennessee moved quickly to orient its highway program toward the enormous task of planning and constructing the state's Interstate system. The first section of Interstate completed in Tennessee was Interstate 65 in Giles County. The project was let to contract on March 14, 1957 and completed on January 2, 1959.¹

The most recent section of Tennessee's Interstate system open to traffic was Interstate 40 in Knoxville, from Rutledge Pike to Asheville Highway, which was opened to traffic on December 31, 1982.²

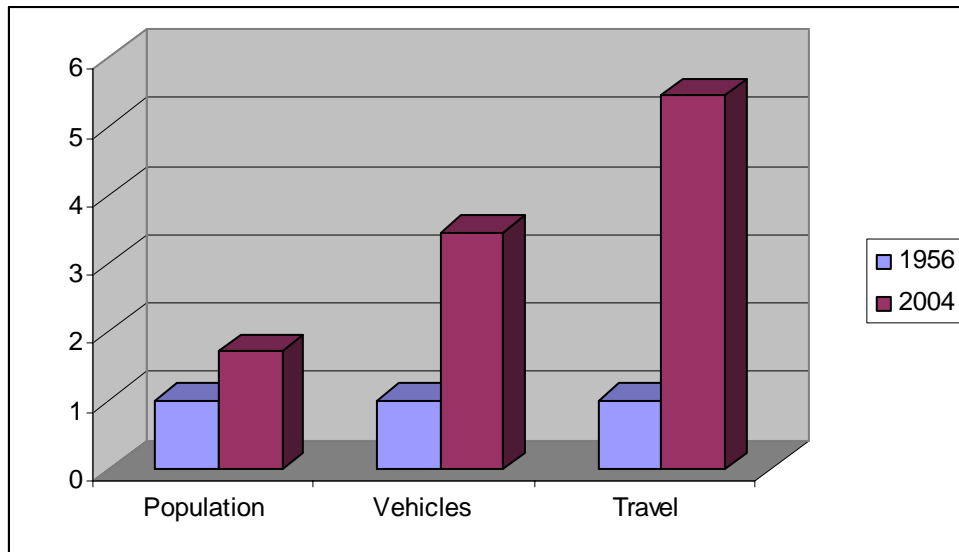
Trends in Interstate Travel and Capacity

Tennessee is served by portions of six Interstate routes, totaling 1,105 center-lane miles. The majority of the state's Interstate system was completed by 1976, when 82 percent of the system had been completed. By 1996, 93 percent of the state's eventual 1,105 Interstate center-lane miles were open to traffic.³

Since the beginning of the Interstate Era 50 years ago, Tennessee has seen enormous increases in population, the number of motor vehicles and the amount of

vehicle travel. From 1956 to 2004 (the latest year for which data is available), the state's population has increased by 71 percent from approximately 3.5 million to 5.9 million, the number of motor vehicles increased by 345 percent from approximately 1.1 million to 5 million and vehicle travel in Tennessee has increased by 544 percent from approximately 11 billion miles driven annually to 71 billion miles.⁴

Chart 1. Increase since 1956 in Population, Vehicles and Travel in Tennessee (1 = 1956 level)



Source: TRIP analysis of U.S. Census and Federal Highway Administration data

Traffic Congestion on Tennessee's Interstates

The Interstate Highway System was initially designed largely to provide transportation between the nation's urban areas and to support national defense. But as Interstate highways were ultimately built around and through many cities, they became the nation's most critical transportation corridors both between and within urban areas.

Today, the Interstate Highway System remains the most critical component of Tennessee's transportation system. While Interstate highways account for only three percent of all lane miles of roads in the state, they carry 28 percent of all travel in the state.⁵

Travel on Tennessee's Interstate highways continues to grow at a significant rate. In fact, the average annual amount of travel per Interstate lane-mile in Tennessee increased by 46 percent from 1990 to 2004, from an average of approximately 2.7 million miles traveled annually per Interstate lane-mile to approximately 4 million miles traveled annually per Interstate lane-mile.⁶

This increase in traffic on Tennessee's Interstate highways has resulted in a significant increase in traffic congestion levels. More than half, 53 percent, of Tennessee's urban Interstates are considered congested because they carry traffic levels that result in significant delays during peak travel hours.⁷ The Federal Highway Administration considers any Interstate highway that carries more than 80 percent of its design capacity to be congested, because at this level of traffic, vehicles experience significant delays in traffic flow. When Interstate traffic reaches 95 percent of the highways' design capacity the route is rated as being severely congested, because vehicles are likely to experience stop and go traffic and any incident can be expected to cause a serious breakdown of traffic flow.

Chart 2: The 30 most congested sections of urban Interstate in Tennessee.

Rank	Route	County	From	To	Length	2004 ADT	Lanes
1	I-65/I-24	Davidson	I-65/I-24 split, North Nashville	I-65/I-24	3.0	163,370	6
2	I-65	Davidson	I-40	I-65/I-24	2.5	163,370	6
3	I-24/I-40	Davidson	I-24/I-40 split	I-24/I-40 split, South Nashville	1.9	176,190	8
4	I-24	Davidson	I-24/I-40 split	SR-155 (Briley Pkwy.)	2.3	131,020	6
5	I-24	Davidson	I-24/I-40 split	I-65/I-24 split (Downtown Nashville)	3.1	136,510	6
6	I-65/I-40	Davidson	I-40/I-65 split	I-24/I-40 split, (Downtown Nashville)	3.1	118,880	6
7	I-40	Davidson	I-440	I-65/I-40 split	1.9	86,040	6
8	I-65	Davidson	I-40/I-65 split	I-440	2.8	102,560	6
9	I-24	Hamilton	I-75	SR-29 (U.S.27)	7.2	121,990	6
10	I-440	Davidson	I-65	I-40	3.5	108,090	4
11	I-65	Davidson	Two Mile Pike	SR-257 (Robertson Co.)	3.5	79,280	4
12	I-440	Davidson	I-65	I-24	2.8	103,360	4
13	I-65	Davidson	I-440	SR-255 (Harding Place)	2.1	128,880	8
14	I-24	Davidson	From Haywood Lane	SR-254 (Hickory Hollow Pkwy.)	3.1	108,960	8
15	I-24	Davidson	U.S. 431	SR-155 (Briley Pkwy.)	8.7	55,210	4
16	I-40	Davidson	SR-155 (Briley Pkwy.)	I-440	1.9	111,160	6
17	I-40	Knox	Northshore	I-75	0.8	154,890	6
18	I-24	Davidson	Briley Parkway (SR-155)	Haywood Lane	3.3	131,570	8
19	I-40	Knox	I-75	I-275	2.5	107,900	6
20	I-75	Knox	I-275/I-640	Callahan Dr	2.8	83,190	6
21	I-240	Shelby	I-55/I-240 split	SR-4 (Lamar Ave.)	4.1	157,950	6
22	I-40	Davidson	SR-255 [Donelson Pk.]	SR-45 [Old Hickory Blvd.]	4.3	102,230	8
23	I-275	Knox	I-40	I-75/I-640	3.0	60,680	4
24	I-24	Davidson	SR-155 [Briley Pkwy.]	I-65	1.6	52,360	4

25	I-40	Knox	Campbell Station Rd.	SR-162 [Pellissippi Pkwy.]	3.2	109,840	6
26	SR-29	Hamilton	I-24	SR-389	1.7	77,610	4
27	I-40	Davidson	SR-24 (Charlotte Pk.)	SR-155 [Briley Pkwy.]	2.9	81,540	6
28	I-65	Williamson	SR-253	SR-259 Davidson Co.)	5.4	101,900	8
29	I-24	Rutherford	SR-266	SR-102	3.6	85,810	8
30	I-24	Hamilton	Browns Ferry Rd.	SR-29/I-24 split	3.3	70,980	4

Source: Tennessee Department of Transportation

Freight Shipment by Large Trucks on Tennessee’s Interstate Highways

Every year, \$287 billion in goods are shipped from sites in Tennessee and another \$200 billion in goods are shipped to sites in Tennessee, mostly by trucks.⁸ In fact, 80 percent of the goods shipped annually from sites in Tennessee are carried by trucks and another nine percent are carried by courier services, which use trucks for part of their deliveries.⁹ Similarly, 79 percent of the goods shipped to sites in Tennessee are carried by trucks and another 11 percent are carried by courier services, which use trucks for part of their deliveries.¹⁰

Tennessee’s Interstate Highway System is the most critical set of highways for goods shipment. In 2004, travel by large commercial trucks accounted for 23 percent of all miles traveled on Tennessee’s Interstate system.¹¹

Traffic Safety on Tennessee’s Interstate Highways

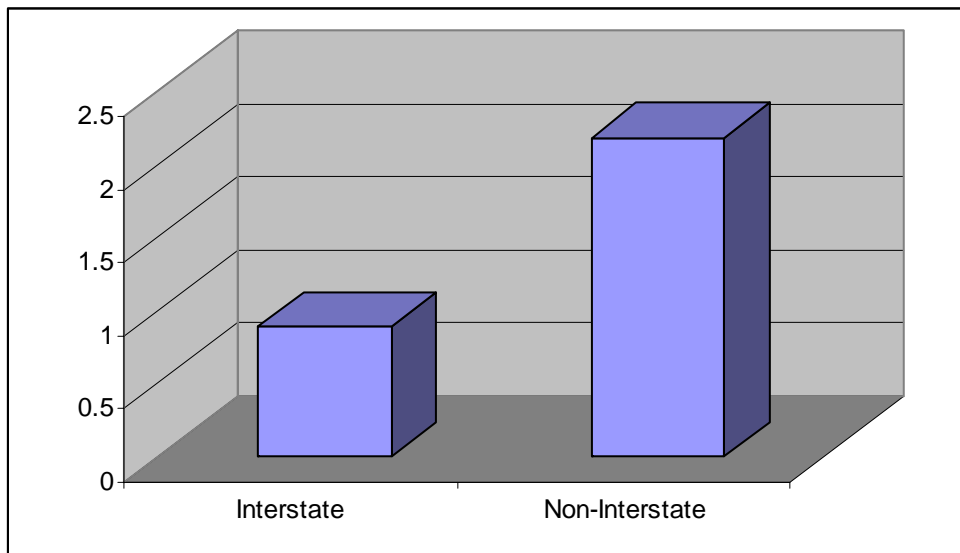
Perhaps the most significant benefit of the Interstate system is that it has greatly improved traffic safety in Tennessee, and throughout the U.S., by providing travelers

with a network of highways with a variety of safety designs that greatly reduce the likelihood of serious accidents.

The safety features that are required on Interstates include a separation from other roads, streets and rail lines, access limited to on and off ramps, a minimum of four-lanes to prevent the need to enter oncoming lanes for passing, and gentler curves. Most Interstate highways also have paved shoulders, and many have median barriers to avoid cross-over accidents and rumble strips to warn drivers if they are leaving the roadway.

The result of the high level of safety design standards on the Interstate is that travel on Tennessee’s Interstate highways is nearly two and a half times safer than travel on all other roads and highways in the state. The traffic fatality rate per 100 million vehicle miles of travel on Tennessee’s Interstate highways was 0.89 in 2004, the latest year for which data is available. The fatality rate per 100 million vehicle miles of travel in 2004 on Tennessee’s non-Interstate routes was 2.18 – 145 percent higher than the rate on the state’s Interstates.

Chart 3. Fatality rate per 100 Million Vehicle Miles of Travel for Tennessee’s Interstate and Non-Interstate roadways, 2004



Source: TRIP analysis of FHWA data

Tennessee's Interstate Highway System, which carried 28 percent of the state's travel in 2004, accounted for only 14 percent of the state's fatalities as a result of its superior traffic safety features. There were 176 traffic fatalities on Tennessee's Interstate highways in 2004 – 14 percent of the 1,288 traffic fatalities, which occurred in Tennessee in 2004.¹²

Pavement Conditions of Tennessee's Interstate System

The lifecycle of highway pavements is greatly affected by a transportation agency's ability to perform timely maintenance and upgrades to ensure that surfaces remain smooth for as long as possible. The pavement condition of a state's major roads are evaluated and classified as being in poor, mediocre, fair or good condition. 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.¹³

In 2004 (the latest year for which data is available), two percent of pavements on Tennessee's Interstate highways were rated in poor or mediocre condition.¹⁴ Roads rated in mediocre condition show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition. In Tennessee, two percent of Interstate pavements are rated in fair condition and the remaining 96 percent of Interstate pavements are rated in good condition.¹⁵

Pavement deterioration 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.¹⁶

Bridge Conditions of Tennessee's Interstate Highways

Of the 1,423 bridges on Tennessee's Interstate highways, three percent are rated as structurally deficient and 12 percent are rated as functionally obsolete.¹⁷ Nationally, five percent of Interstate bridges are structurally deficient and 16 percent are functionally obsolete.

Bridges that are rated structurally deficient show significant signs of deterioration as a result of use and exposure. Bridges are structurally deficient if they no longer meet their intended design capacity or were, in the past, designed for a capacity less than the state's current legal loads. Functionally obsolete bridges no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

While most of the state's Interstate bridges are generally in acceptable condition, a large number of these bridges are reaching an age when they will soon require significant repairs and in some cases replacement. The average lifespan of an older bridge is 50 years.¹⁸ Older bridges often need significant repairs or rehabilitation or may need to be replaced to continue to provide adequate service. The average age of Tennessee's Interstate bridges is 35 years.¹⁹

The following is a list of the most heavily-traveled bridges in Tennessee that are structurally deficient.

Chart 4: Most heavily-traveled Interstate bridges that are structurally deficient.

County	Route Carried	Route or feature intersected	Average Daily Traffic	Year Built	Lanes
Davidson	I-24	SR1 (Murfreesboro Rd)	131,020	1960	5
Davidson	I-24	Woodland Street	123,070	1961	8
Davidson	I-40	Mill Creek	120,130	1963	6
Davidson	I-24	Spring Street	115,810	1961	8
Hamilton	I-24	I-24 EB/I-24 EB ramp to I-124 N	115,510	1990	2
Shelby	I-240	I-240 / ravine	100,790	1963	4
Shelby	I-240	I-240 WB /Kerr Ave.	100,790	1961	3
Hamilton	I-75	Big Spring Creek	100,160	1959	4
Knox	I-40	5th Ave & ramps	94,510	1967	2
Knox	I-40	Fourth Ave. (NFA A118)	94,510	1967	2
Knox	I-40	Gill Ave. (NFAC581)	94,510	1967	3
Knox	I-40	Fourth Ave. (NFA A118)	94,510	1967	3
Knox	I-40	Gill Ave. (NFAC581)	94,510	1967	3
Knox	I-40	SR33, Southern RR, Second Cr.	94,510	1964	4
Davidson	I-40	Westboro Road	81,540	1962	6
Hamilton	I-124	19th St. W. (FAU5395)	77,610	1962	3
Hamilton	I-124	W. Main St. (FAU3553)	77,610	1963	2
Hamilton	I-124	W. 12th St. (FAU3568)	69,580	1963	3
Hamilton	I-124	W. 12th St. (FAU4425)	69,580	1963	4
Madison	I-40	SR-5	68,600	1961	3

Source: Tennessee Department of Transportation

Benefits of Tennessee’s Interstate System

The construction of Tennessee’s Interstate Highway System has had a profound impact on the state’s development, impacting the quality of life of the state’s residents and visitors in numerous ways including improved safety, expanded lifestyle choices, improved business productivity and an enhanced economic standard of living.

By greatly increasing the number of areas that are within a reasonable driving distance, the Interstate system has greatly increased people's access to jobs, housing, recreation, healthcare, shopping and other amenities.

Similarly, the construction of the Interstate system has benefited the nation's economy by reducing the costs of and increasing the speed of goods movement. The ability to cheaply and quickly ship products to or from Tennessee and many U.S. and international sites has provided lower costs and greater selection to consumers and has opened up new markets to Tennessee businesses. The completion of the vast majority of the Interstate system by the 1980s and the deregulation of the U.S. trucking industry resulted in a significant improvement in the competitiveness of U.S. business. In fact, the cost of moving freight, as measured by U.S. business logistics costs, dropped from 16 percent of U.S. Gross Domestic Product (GDP) in 1980 to nine percent in 2002.²⁰

The initial construction of much of the Interstate system provided a tremendous boost to business productivity as a result of more efficient goods shipment. Economists have estimated that through the initial phase of Interstate construction to 1970, the annual rate of return for every dollar of public investment in highway construction was 54 cents, which meant that investments recovered their costs in two years.

The continued tremendous increase in freight deliveries over recent years has been partly fueled by improved communications and the need for greater economic competitiveness. Improved communications provided by the Internet are integrating producers, wholesalers, retailers and consumers. Businesses have responded to improved communications and the necessity to cut costs with a variety of innovations, including

just-in-time delivery, increases in small package delivery, demand-side inventory management and 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.²¹

Interstate Benefits for Individuals in Tennessee

TRIP has calculated the annual financial benefit per person and statewide in Tennessee, based on the value of improved traffic safety, reduced travel time, reduced fuel use and reduced consumer costs.

Safety:

By carrying significant volumes of traffic on roadways with higher safety standards and lower traffic fatality rates, the Interstate saves numerous lives annually. Since 1956, TRIP estimates that Interstate highways have saved approximately 7,500 lives in Tennessee, an average of approximately 190 lives saved per year over the last ten years.²² This estimate is based on a comparison of the annual fatality rate on Tennessee's Interstate highways compared to the fatality rate each year on other major roads in the state. Interstate safety benefits were estimated by calculating the additional fatalities that would have occurred in each year if the travel that occurred on Tennessee's Interstate highways had instead been carried by other major roads in the state, many of

which often lack many of the safety features found on Interstate highways and have a significantly higher traffic fatality rate.

TRIP estimates that the improved highway safety provided by Tennessee's Interstates saves the state \$949 million annually in reduced economic costs as a result of the reduction in fatal or serious traffic accidents, saving \$161 per person annually.²³ TRIP's estimate is based on research by the National Highway Traffic Safety Administration (NHTSA), which annually estimates the economic costs of fatal and serious traffic accidents in the U.S. The NHTSA estimates are strictly of the economic consequences of serious and fatal traffic crashes, such as lost productivity and increased healthcare costs.

Time and motor fuel:

Because it features limited access, no stoplights and often more direct routes between major urban areas, the Interstate system has saved travelers time by reducing travel times and making travel more efficient. By reducing travel times, the Interstate Highway System has saved motorists time and has also increased the choices people have of where to live, work, shop and travel for recreation.

TRIP has estimated the additional time that Tennessee residents would spend traveling if the state did not have its network of Interstate highways. These estimates are based on assuming that if there were no Interstate highways in Tennessee that this traffic would be carried by other major roads in the state, such as other urban freeways and urban and rural arterial roads and highways. Shifting the state's Interstate traffic onto other routes would increase traffic congestion on these other routes and also slow travel

times, by shifting travel from faster-moving Interstate highways onto slower-moving roads and highways. TRIP applied traffic speed calculations developed by the Texas Transportation Institute, which annually estimates traffic congestion levels throughout the U.S., to estimate the traffic speeds that would result on other major roads in the state if they had to carry the traffic in Tennessee currently being carried by the state's Interstate system.

TRIP found that without Interstate highways, Tennessee residents would spend an additional 546 million hours annually traveling in vehicles, or 93 hours per person annually.²⁴ TRIP also found that without Interstate highways, Tennessee motorists would use an additional 260 million gallons of motor fuel annually.²⁵ The total value of the time and motor fuel that is saved annually in Tennessee by the Interstate Highway System is \$1,484 per person (\$1,374 in time and \$110 in fuel).²⁶

Reduced Consumer Costs:

The Interstate system has had a significant impact on consumer costs by reducing the time it takes to complete trips, thereby reducing the cost of transporting goods. It has also reduced costs by increasing access between locations, which has increased access to cheaper land and increased consumer choices for everything from housing and jobs to recreation and shopping.

To calculate the economic impact of the Interstate Highway System on individual consumers in Tennessee, TRIP has gathered data on average consumer expenditures in the state and has estimated the impact of the Interstate Highway System on these costs. Based on data from the U.S. Department of Labor and the Bureau of Economic Analysis, TRIP has calculated the average expenditure per capita in each state on clothing, food,

housing and transportation.²⁷ TRIP then surveyed the nation's leading transportation economists for their estimates of the percentage reduction in consumer expenditures, as a result of the Interstate system, for clothing, food, housing and transportation. TRIP used the average estimated impact in each category to calculate the average amount saved by Tennessee consumers annually in each category.

Clothing and food costs are impacted by reduced logistics costs. Transportation costs, which include the cost of a vehicle, vehicle repairs and maintenance, and the cost of fuel, are similarly impacted by reduced logistics costs. The impact of the Interstate system on housing costs includes its impact on the cost of materials that are used in constructing homes as well as the impact that the Interstate system has had on lowering land prices by increasing consumer access to cheaper land, thus lowering housing costs.

TRIP estimates that the average Tennessee resident saves \$1,053 per year as a result of the Interstate Highway System. The following chart indicates the annual saving per Tennessee resident for clothing, food, housing and transportation costs as a result of the Interstate Highway System. The total annual statewide savings in Tennessee in reduced consumer costs as a result of the Interstate Highway System is estimated to be \$6.2 billion.

Chart 5. Annual, per person savings in Tennessee, as a result of the Interstate Highway System.

	ANNUAL SAVINGS
Clothing	\$41
Food	\$147
Housing	\$571
Transportation	\$294
Total	\$1,053

Source: TRIP

The Interstate Highway System provides tremendous benefits every year to the people of Tennessee. The total annual benefit per person in Tennessee of the Interstate system is \$2,698 as a result of saved lives, time fuel and consumer expenses. The total statewide benefit in Tennessee of the Interstate Highway System is approximately \$15.9 billion. The following chart shows the combined annual benefit of the Interstate system per person and statewide in Tennessee.

Chart 6. Total Annual Interstate Benefit Per Person and statewide in Tennessee

	Per Person	Statewide (millions)
Safety	\$161	\$949
Time and Fuel	\$1,484	\$8,757
Reduced Consumer Costs	\$1,053	\$6,215
Total	\$2,698	\$15,921

Source: TRIP

Meeting Tennessee's Future Interstate Travel Needs

Tennessee faces a significant challenge in maintaining and rebuilding its aging Interstate Highway System and providing additional lane capacity to meet growing travel demand.

According to the Tennessee Department of Transportation, 29 percent of Interstate bridges (404 of 1,404 Interstate bridges) will need significant repairs or reconstruction over the next 10 years.²⁸

Currently, 53 percent of Tennessee's urban Interstate lane miles are considered congested during peak travel hours. According to the Tennessee Department of Transportation, if additional capacity is not added to the state's urban Interstate system, 73 percent of urban Interstates will be congested in 2016. By the year 2026, if additional Interstate capacity is not added, 98 of urban Interstate lane miles percent will be considered congested in 2026.

According to the Tennessee Department of Transportation, there exists a need to add additional lanes along 239 miles of its existing 1,105-mile Interstate system by the year 2016 in order to relieve growing traffic congestion and maintain reliable goods movement.²⁹

According to the Tennessee Department of Transportation, the current anticipated budget available for all state Interstate construction from 2006 to 2016 (including preservation, maintenance and capacity expansion) is approximately \$1.43 billion.

However, the state estimates that \$2.97 billion is needed between 2006 and 2016 to allow the state to fund a program that adequately addresses Interstate preservation and capacity needs, creating a backlog of \$1.54 billion in needed Interstate funding.³⁰

Conclusion

Fifty years after construction of the Interstate Highway System began, Tennessee, and all of the U.S., continues to reap tremendous benefits from the nation's most critical transportation network. Tennessee's Interstate system has saved approximately 7,500 lives since its inception in 1956 and in addition to saving lives, the Interstate continues to save Tennessee residents time, fuel and money by reducing the costs of goods that improve their quality of life, including the cost of clothing, food, housing and transportation. The state's Interstate highways also play a critical role in supporting economic growth and increasing personal access to jobs, recreation, health care and housing, enhancing the lifestyle choices of the state's residents and visitors.

The safe, reliable and timely mobility provided by the state's Interstate highways has also improved the efficiency of Tennessee's businesses and is integral to the functioning of the state's economy.

Prior to the approval of the Interstate system, President Eisenhower noted that inadequate highways resulted in lost time due to traffic delays, reduced economic productivity and reduced traffic safety.

Today, similar challenges are faced in Tennessee, with growing traffic congestion, increasing car and truck travel and aging road surfaces and bridges that will soon need significant repairs and rehabilitation.

As Tennessee's citizens look back on the many benefits that the Interstate Highway System has provided the state, they must also look ahead to meeting the challenge of providing a 21st Century Interstate Highway System that will continue to enhance the quality of life of today's and future residents of Tennessee.

Endnotes

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- ¹ Tennessee Department of Transportation, 2006. Response to TRIP survey.
- ² Ibid.
- ³ Tennessee Department of Transportation, 2006. Response to TRIP survey.
- ⁴ U.S. Census Bureau data, Federal Highway Administration data. See charts MV-1 and VM-2. Additional historical data from Highway Statistics Summary to 1995.
- ⁵ TRIP analysis of Highway Statistics, 2004, Federal Highway Administration. Data is from charts VM-2 and HM-20.
- ⁶ Ibid.
- ⁷ Tennessee Department of Transportation, 2005. Response to TRIP survey.
- ⁸ Bureau of Transportation Statistics, U.S. Department of Transportation. 2002 Commodity Flow Survey, State Summaries. State Table 13.
- ⁹ Ibid.
- ¹⁰ Ibid. State Table 15.
- ¹¹ Tennessee Department of Transportation response to TRIP survey. 2006.
- ¹² Highway Statistics 2004, Federal Highway Administration. Charts FI-10, VM-2.
- ¹³ Ibid.
- ¹⁴ TRIP analysis of 2004 Federal Highway Administration data. See charts HM-63 and HM-64 in Highway Statistics 2004.
- ¹⁵ Ibid.
- ¹⁶ Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.
- ¹⁷ Federal Highway Administration, 2005. National Bridge Inventory data.
- ¹⁸ Commonwealth of Pennsylvania. 2005-06 Governor's Executive Budget.
- ¹⁹ Tennessee Department of Transportation response to TRIP survey, 2006.
- ²⁰ TRIP analysis of Federal Highway Administration data. See 2004 Federal Highway Statistics, charts HM-60 and VM-2.
- ²¹ Ibid. P. 7.
- ²² TRIP calculation is based on TRIP analysis of 1997 to 2004 data. Estimates of lives saved by the Interstate system from 1956 to 1996 are based on analysis by Wendell Cox and Jean Love in the 1996 publication "The Best Investment a Nation Ever Made."
- ²³ TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data.
- ²⁴ TRIP analysis of 2004 Federal Highway data, using speed factors from the 2005 Urban Mobility Report, which is published by the Texas Transportation Institute.
- ²⁵ Ibid.
- ²⁶ The value of time used for these estimates was \$14.85 per hour, based on the value used by the Texas Transportation Institute in their annual report on urban traffic congestion. Fuel cost used was \$2.50 per gallon.
- ²⁷ The U.S. Department of Labor estimates consumer costs per capita for U.S. regions. TRIP then calculated this data for each state by using state income per capita data to estimate cost differences between states.
- ²⁸ Tennessee State Highway and Transportation Department, 2006. Response to TRIP survey.
- ²⁹ Ibid.
- ³⁰ Ibid.