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1. Introduction

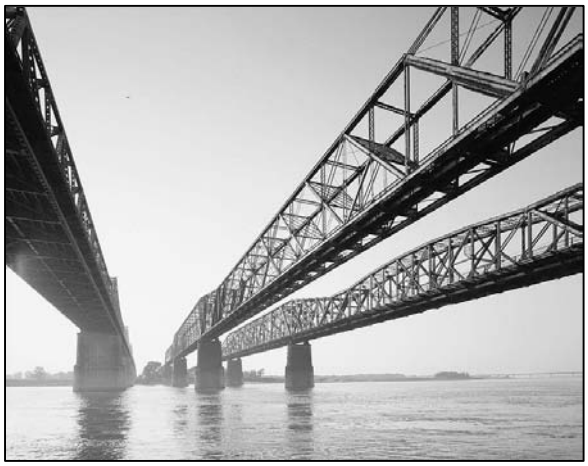
This report describes the purpose of and need for the proposed Tennessee Department of Transportation (TDOT) project to provide a new crossing of the Mississippi River in the vicinity of Memphis, Tennessee, known as the Southern Gateway project (see **Figure 1**, Vicinity Map). As a federally-funded project, this document is prepared in accordance with the National Environmental Policy Act (NEPA) of 1969. NEPA policy requires agencies using federal funding, such as the Federal Highway Administration (FHWA) and their representative state departments of transportation, to consider the environmental effects of proposed projects. An Environmental Impact Statement (EIS) will be prepared for the Southern Gateway project.

The Council on Environmental Quality (CEQ) regulations 40 CFR 1500-1508 require that the EIS address a "no-action" (also called a "no build" alternative) and "rigorously explore and objectively evaluate all reasonable alternatives." This Purpose and Need Statement is the beginning of the environmental documentation process and will be used as the first chapter of the EIS. The reason for writing a Purpose and Need Statement is to establish reasons a project is worthwhile and necessary. It forms the basis of the project's alternative selection process, analysis, and eventual selection of the recommended alternative.

Description of Existing Bridges in the Project Area

There are currently four bridges across the Mississippi River in Memphis:

- The Frisco Bridge (owned by Burlington Northern Santa Fe (BNSF) Railway and opened in 1892),
- The Harahan Bridge (owned by Union Pacific Railroad (UP) and opened in 1916),
- The Memphis/Arkansas Bridge carrying I-55 (opened in 1949), and
- The Hernando DeSoto Bridge carrying I-40 (opened in 1973).



Above Left: I-55 Bridge;
Middle: Frisco Bridge; Right: Harahan Bridge
Source: Library of Congress

Hernando DeSoto Bridge
Source: City of Memphis website

The Frisco and Harahan Bridges provide railroad crossings, and the Memphis/Arkansas and Hernando DeSoto Bridges carry vehicular and truck traffic. The age and design characteristics of each bridge (described in detail in the *Existing Bridges Deficiency Analysis* and summarized in Section 2, *Need #1*) amplify the severe risks for sustaining transportation and commerce on a local, regional, and national level. Three of the four bridges are not designed to withstand a major earthquake, which poses a threat to disrupt the Memphis region's role as a transcontinental distribution hub. It is estimated that the economic losses due to the failure of these existing bridges would exceed the cost of building three new bridges. In the early 1990's TDOT partnered with Arkansas to begin the seismic retrofit of the Hernando DeSoto Bridge. The first project began in 2000, and several phases have been completed. The seismic retrofit is designed to protect this bridge and its approaches in the case of an earthquake of up to magnitude 7.7 on the Richter Scale. TDOT's project website[1] notes, "The loss of this structure during an earthquake would have a huge impact on America's economy." The retrofit of the Hernando DeSoto Bridge will alleviate some concern about the seismic risk for this structure, but it does not eliminate the need for the Southern Gateway project. On a local level, the existing bridge infrastructure deficiencies (i.e. capacity, geometry, etc. described below) frequently cause delays in rail, vehicular, and truck movement resulting in increased noise and air pollution, safety problems, security risks, and emergency response hindrances in the region.

Description of the Proposed Project

The Southern Gateway project will study the possibility of a new roadway and railroad crossing of the Mississippi River in the Memphis area to address the seismic design needs noted above and connect important transportation facilities. The new crossing would serve passenger vehicles, trucks, and rail. The Tennessee Department of Transportation (TDOT), Arkansas Highway and Transportation Department (AHTD) and Mississippi Transportation Department (MDOT) have agreed to prepare an Environmental Impact Statement for the proposed Southern Gateway project.

Project Setting

The study area for the Southern Gateway project includes portions of Shelby County, Tennessee; Crittenden County, Arkansas; and DeSoto County in Mississippi (**Figure 1**, Vicinity Map). The greater Memphis area is an important location for several major transportation systems with national and international importance, including interstate highways, railroad intermodal terminals, Memphis International Airport, and the International Port of Memphis. See **Figure 2** for the locations of these transportation facilities. Interstate Highway 40 (I-40) which connects California to North Carolina intersects I-55 in Memphis, which connects Louisiana and Illinois. I-69 will connect Canada and Mexico with a direct route through Memphis and connections with I-40 and I-55. Portions of I-69 are complete within the study area. I-240 connects these major highways on an approximate 20-mile loop in Memphis.

Memphis International Airport serves as a Delta Air Lines hub and is home to the FedEx Express Super Hub. According to the airport's website, more than ten million passengers travel through the airport each year, and it is the busiest cargo airport (by volume) in the world. The Tennessee Air National Guard is headquartered at Memphis International Airport[2].

[1] TDOT: www.tdot.state.tn.us

[2] Memphis International Airport: www.mscaa.com

The International Port of Memphis is located along the Mississippi River between Tennessee and Arkansas and is the fourth largest inland port in the United States. The port is approximately 15 minutes away from the Memphis International Airport and has access to I-40 and I-55.

Five Class I freight railroad carriers serve the Memphis region: BNSF Railway, Union Pacific Railroad (UP), Canadian National Railway (CN), CSX Transportation, and Norfolk Southern. Three rail intermodal terminals are located in the Memphis area: BNSF on US Highway 78, UP in Marion, Arkansas, and CSX / CN at the Memphis Gateway Terminal at Pidgeon Industrial Park.. In addition, a rail terminal for Norfolk Southern in southwest Fayette County, Tennessee (approximately 30 miles from the Mississippi River and downtown Memphis) is scheduled for completion in 2012.

Project History

The Southern Gateway project originates from several previous studies and investigations related to improving the regional transportation system. Early studies such as the *Memphis to Pine Bluff Freeway Study* conducted in the early 1990s and more recent studies such as the *Mississippi River Crossing Feasibility and Location Study* completed in June 2006, and the *Mississippi River Bridge Toll Feasibility Study* completed in early 2009, all have a common theme: eventually another highway bridge across the Mississippi River will be needed in the Memphis area. Recently, the Greater Memphis Chamber's *Memphis Regional Freight Infrastructure Plan* (March 2010) identified the substantial volume of rail and highway freight transport across the river and the impact that the loss of any of the current bridges across the river would have on the regional and national freight movements. This study further highlighted the need for a new bridge capable of accommodating multiple types or modes of transportation (i.e. highway, freight rail, etc.). Residents and citizens identified a new multi-modal bridge as one of the highest transportation needs of the region and included the project in the *Memphis Urban Area 2030 Long Range Transportation Plan* (*Memphis LRTP*), adopted by the Memphis Urban Area Metropolitan Planning Organization (Memphis MPO) on March 12, 2008.

Over the past several years, TDOT has conducted broad studies to determine if a new Mississippi River bridge would be feasible in the metropolitan Memphis area. The *Mississippi River Crossing Feasibility and Location Study* (June 2006) collected preliminary data on the existing highway transportation system, natural environment, and socio-economic characteristics of the Memphis area. Highway corridors and several possible bridge locations were screened based on their potential environmental and community impacts, engineering issues, and estimated costs. The *Mississippi River Bridge Toll Feasibility Study* (2009) determined that a new bridge is feasible and recommended moving forward with an EIS for this project.

The Memphis MPO is a bi-state MPO that includes portions of Tennessee and Mississippi. Because of the dependent relationship between Memphis and West Memphis, Arkansas, there are cooperative agreements in place between the Memphis MPO and the West Memphis MPO. TDOT, MDOT, and AHTD all have input in determining the transportation needs of the region and have agreed that this project is one of the greatest needs of the region, as reflected in the *Memphis LRTP*. All three states have agreed to contribute to the funding of the Southern Gateway project, making it a multi-state, multi-jurisdictional project.

Problem Statement

The Southern Gateway will address the following transportation needs in the greater Memphis area:

1. Three of the existing highway and railroad bridges crossing the Mississippi River in the Memphis area were not designed to withstand the effects of a major earthquake event. The Memphis area is located in the New Madrid Seismic Zone, and therefore the existing bridges are at risk for damage or collapse depending on the potential earthquake magnitude.

2. The level of existing and projected freight movement in the Memphis area requires a consistent number of roadway lanes/rail lines crossing the Mississippi River in order to maintain existing and future transportation of goods throughout the United States.

3. The level of existing and projected passenger vehicular traffic in the Memphis area requires bridge capacity across the Mississippi River that is adequate to maintain an acceptable level of traffic service. The existing bridges would not provide adequate capacity for projected traffic volumes.

2. Purpose of and Need for the Project

Definition of the project purpose and need

The purpose of this project is to improve cross-river mobility for people and freight in and around the Memphis, Tennessee area.

The need for a new connection across the Mississippi River is derived from the following summary of existing and future conditions:

- Need #1 – The need to improve infrastructure to withstand a major earthquake.
- Need #2 – The need to improve the movement of freight on roadways and railroads.
- Need #3 – The need to increase capacity and improve operations for vehicular traffic.

Need #1: Improve Infrastructure to Withstand a Major Earthquake

Current Seismic Conditions

The Memphis area is located in the New Madrid Seismic Zone (NMSZ) and approximately 120 miles south of the small community of New Madrid, Missouri, the site of one of the most violent series of earthquakes in recorded history. During the winter of 1811-1812, residents of New Madrid experienced more than 200 moderate to large earthquakes, the effects of which were felt as far away as Washington, D.C. The NMSZ is the most seismically active region in central and eastern North America. The continued ability of the Frisco, Harahan, I-55, and I-40 bridges to carry railroad freight, truck freight, and passenger vehicles without disruptions is vital to Memphis and adjacent communities, the tri-state region, and the entire nation.

The risk of individual bridge failure due to an earthquake is related to three primary factors:

- The underlying geology and soils;

- The probability of a seismic event of sufficient magnitude and frequency to inflict major structural damage requiring repair; and

- The ability of the bridge to withstand movements and forces generated by a design seismic event at a specific location. (See *Need #1* for an explanation of a design seismic event.)

Geology and Soils

The topography of the project area consists of gently rolling hills and the relatively flat alluvial plains of the Mississippi River. Nonconnah Creek, Wolf River, and the Loosahatchie River flow into the Mississippi River and have relatively broad alluvial plains at those intersections. The potential for liquefaction is greatest within these alluvial plains, and the existing bridges are located in the alluvial plains of the Mississippi River basin. Liquefaction is a condition in which loose granular soils take on the characteristics of a liquid, resulting from an increase in pore pressure and a reduction in stress under significant seismic loading. Quicksand is an example of liquefaction. Lateral spreading is a condition in which this soil tends to flow downhill because of a lack of shear strength in the liquefied layer. Liquefaction and lateral spreading would be anticipated during a major earthquake and could cause strong horizontal forces on bridge foundations.

Above: Road damaged by lateral spreading near Pajaro River, 1989 Loma Prieta earthquake.

Left: Tilted home in the Mission District of San Francisco showing liquefaction-related damage from the 1906 earthquake. Source: USGS

Probability of Seismic Events

Seismologists believe this series of earthquakes in 1811-1812 in the NMSZ measured approximately 8.5 on the Richter Scale. Memphis is located in the NMSZ near the zone's southern boundary. The NMSZ is still one of the most seismically active regions in the United States with hundreds of small events

occurring annually. Magnitude 4 and greater events recorded in the NMSZ (roughly bounded by the area from 34°N 86°W to 41°N 93°W) between the years 1812 and 2008 are shown on the chart below. (The size of the point indicates the relative size of the earthquake.) **Figure 3** also shows the locations of major events in the NMSZ. Table 1 shows the estimated recurrence intervals, annual occurrence probabilities, and relative degree of impact for various earthquake magnitudes in the NMSZ. A recurrence interval is an estimate of the interval of time between events like an earthquake or flood of a certain intensity or size. The annual occurrence probability is a measure of the likelihood of an event occurring each year.

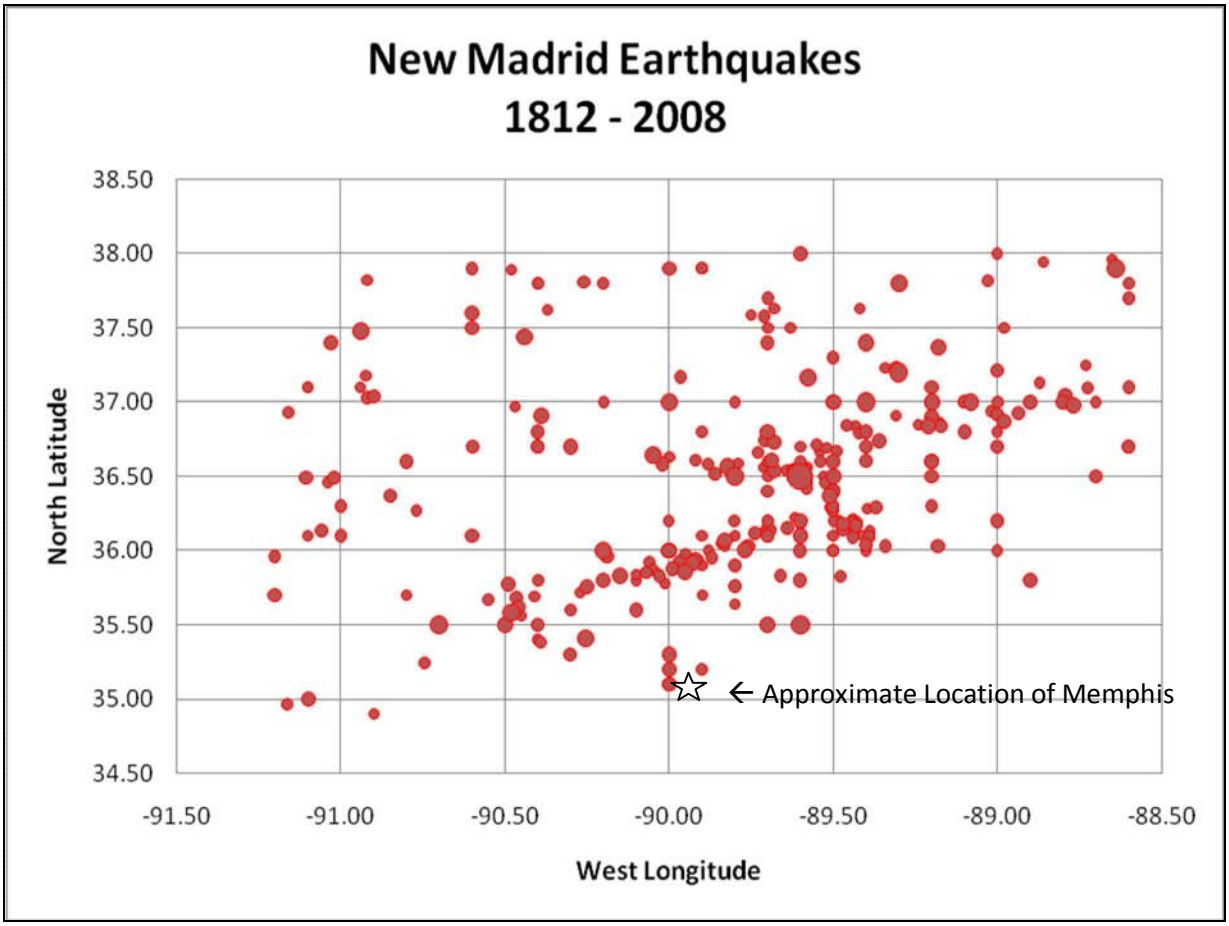


Table 1: Recurrence Interval and Probabilities for NMSZ Earthquakes

Magnitude	Recurrence Interval	Annual Probability of Occurrence	Degree of Impact
1.0 – 1.9	2 Days	-	Not Felt
2.0 – 2.9	2 Weeks	-	Some are Felt
3.0 – 3.9	4 Months	-	Almost Always Felt
4.0 – 4.9	4 Years	25%	Minor Damage
5.0 – 5.9	40 Years	2.5%	Damaging
6.0 – 6.9	80 Years	1.25%	Destructive
7.0 – 7.9	200 Years	0.50%	Devastating
8.0 – 8.9	500 Years	0.20%	Disastrous

"Design" Earthquake and Analysis of Existing Structures

Bridge owners/designers in the New Madrid Seismic Zone currently design for seismic events having a 90 percent probability of not being exceeded in 250 years. The existing bridges were not designed to this standard. A general assessment has been made of the four existing bridges for known effects of the magnitude 8 events (as were experienced in New Madrid in 1811-1812) in order to qualitatively determine their potential vulnerability to a similar earthquake. This assessment was made based on experience and knowledge of the effects of earthquakes on similar bridges, an examination of bridge plans made available by the bridge owners, and conversations with those owners with respect to their bridges.

BNSF's Frisco Bridge – The Frisco Bridge, currently owned by the BNSF Railroad, is the oldest bridge over the Mississippi River in the Memphis area. Constructed in 1892, this bridge was designed at a time when little consideration was given to the lateral effect of seismic forces on bridge structures. With no real mechanism to hold the masonry substructure together under the expected lateral loads, the Frisco Bridge has little chance of surviving an earthquake similar to the 1811-1812 events in the NMSZ.

Union Pacific's Harahan Bridge – The Harahan Bridge (shown in the diagram below) is the newer of the two rail bridges in the Memphis area, opened in 1916. The advances in engineering between the time of the design and construction of the Frisco Bridge and the Harahan Bridge were not substantial enough to provide details which would significantly improve the seismic performance of this bridge over the other. The bridge superstructure is expected to perform well during an earthquake, but the connections between the support towers and the superstructure are likely insufficient to provide support to the superstructure during an earthquake of this magnitude. The bridge would be at risk of collapse if an earthquake similar to the 1811-1812 events occurred in the NMSZ.

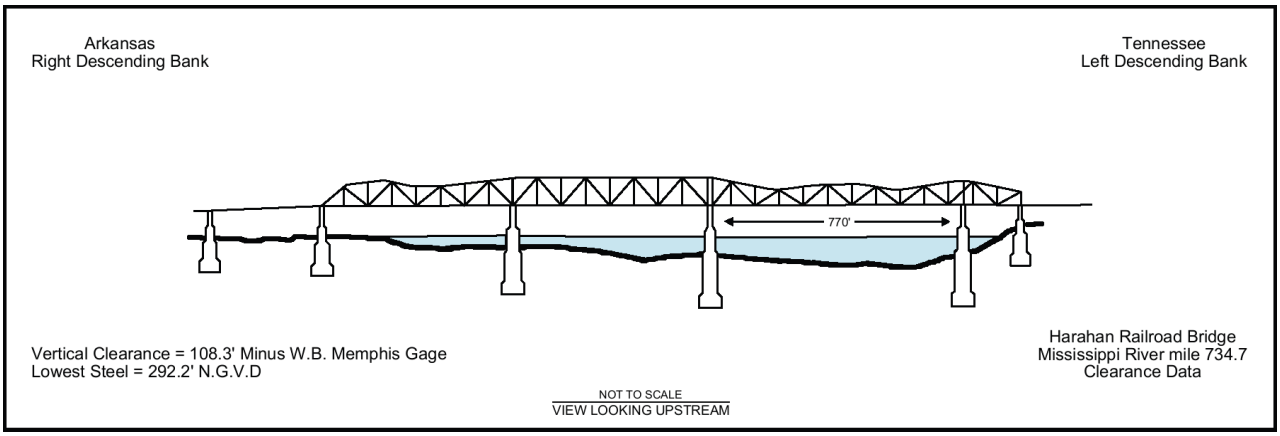


Diagram of the Harahan Bridge

TDOT's I-55 Bridge – Built in 1949, the I-55 Bridge is the older of the two highway bridges (I-55 and I-40) in the Memphis area. A diagram of the I-55 Bridge is shown on the next page. The concrete bridge piers would not be able to resist large lateral loads induced by an event similar to the 1811-1812 events, and it is doubtful that any retrofit is possible to provide a reasonable assurance of survivability. In their seismic evaluation of the two bridges in the Memphis area, TDOT determined to invest in the seismic retrofit of the I-40 Bridge (as discussed in the *Description of the Project* section).

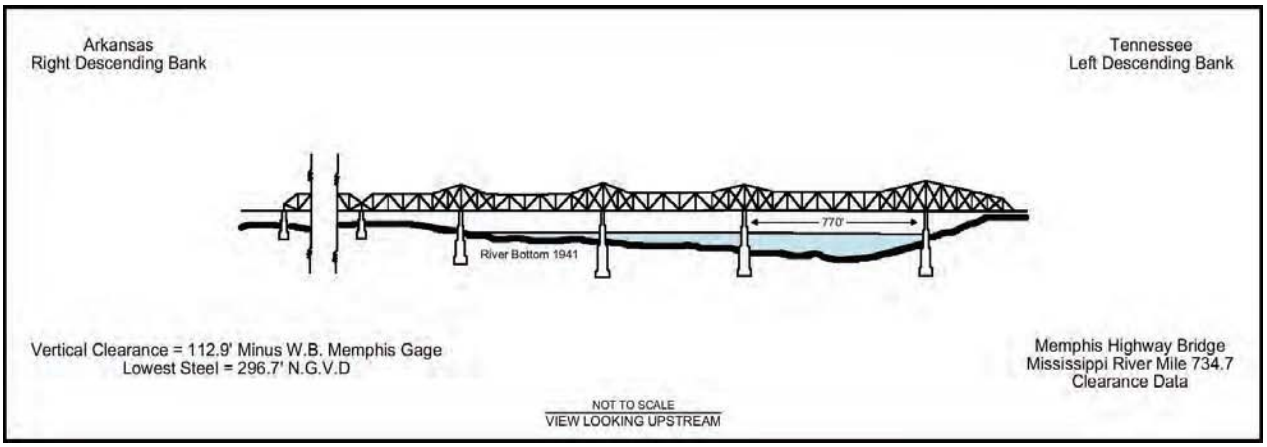


Diagram of the I-55 Bridge

TDOT's I-40 Bridge – The newest and most robust of the Memphis bridges, the 1973 Hernando DeSoto Bridge, is currently in the final stages of a seismic retrofit project designed to withstand an earthquake up to magnitude 7.7. It is expected that the bridge could be available for emergency responders and other aid workers immediately following a severe earthquake in the NMSZ. Of the four Memphis area bridges, the I-40 Bridge has the greatest chance of surviving an earthquake of the same magnitude of the 1811-1812 events.

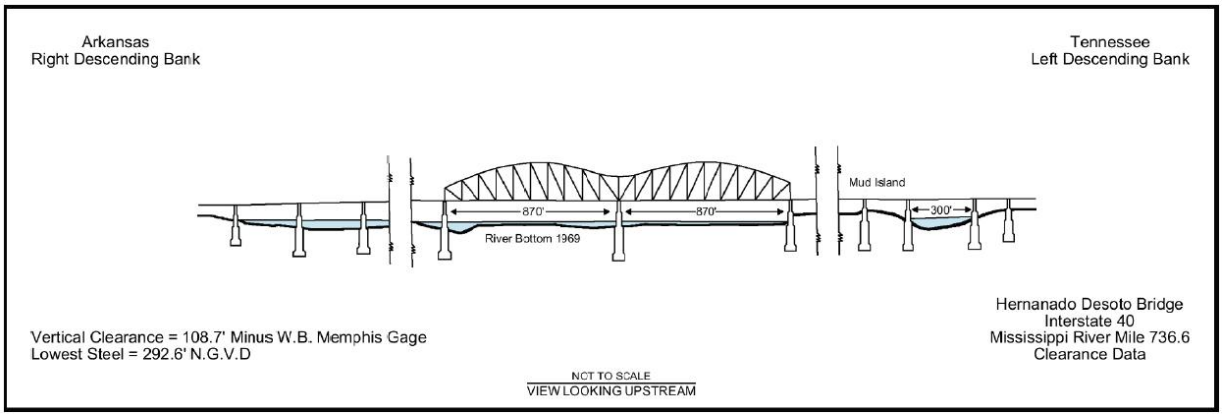


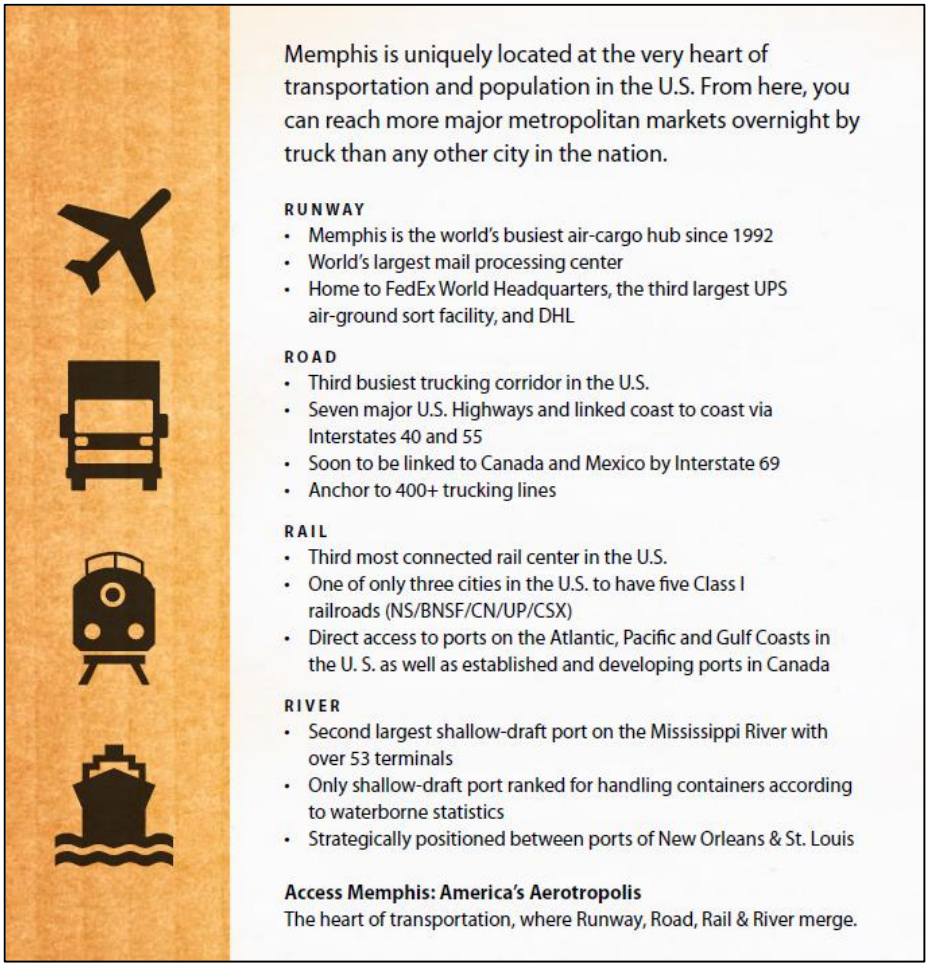
Diagram of the I-40 Bridge

Need #2: Improve Freight Movement on Roadways and Railroads

Freight moves in and through the Memphis area via roadways, railroads, air, and Mississippi River shipping. Transportation facilities are shown in **Figure 2**. Two interstate highways currently serve the area (I-40 and I-55), and one additional facility is planned (I-69). The area is served by five Class I railroads and four rail intermodal terminals: BNSF (Lamar Avenue), UP (Marion, Arkansas), proposed Norfolk Southern (southwest Fayette County, Tennessee), and the Memphis Gateway Terminal (CSX and CN) at Pidgeon Industrial Park. The Memphis International Airport and the International Port of Memphis also serve as major freight facilities.

Freight connectivity in the project study area is supported primarily by the Memphis region's highway network. Roadways are a critical element linking major freight nodes with warehouses, shippers, receivers, and logistics firms. An analysis by the University of Memphis Center for Intermodal Freight Studies identified the highway segments that are used most frequently for transport between major freight facilities in the Memphis area. Seven connecting roadways (I-55, I-240, Winchester Road, Riverside Boulevard, US 78 (Lamar Avenue), Shelby Drive, and State Route 385 (Nonconnah Parkway)) have volume to capacity ratios (v/c) greater than 0.9 and are considered deficient in supporting growing traffic volumes and freight connectivity. Volume to capacity ratios and Level of Service are explained in more detail in the next section. To the extent that the Southern Gateway project could alleviate congestion on any of the above highway links, it would contribute to improving the overall connectivity in the region.

Besides connectivity between major freight nodes, each freight mode network (roadway, rail, air, and water) must also have enough capacity to support current and expected future freight volumes in the project study area. In the *Memphis Regional Freight Infrastructure Plan* (March 2010), system deficiencies by mode were identified in relation to their ability to carry future domestic and international freight volumes. These system deficiencies are summarized below.



Advertisement for Memphis: America's Aerotropolis.

Source: The Greater Memphis Chamber

Roadway System Deficiencies

Memphis is a critical link for freight movement on interstates. Of the 1,000 miles of interstates carrying the highest volumes of long-haul truck freight, Arkansas (I-40) has 23% and Tennessee 8%. It is estimated that over 205,000 intermodal (freight transferred from rail to truck) shipments crossed the Mississippi River in Memphis in 2010, almost 60% traveling from Arkansas to Tennessee or Mississippi (primarily intermodal traffic from the UP terminal in Marion). More than 150,000,000 tons of freight crossed the Mississippi River in Memphis in 2008, mostly Asian-produced goods imported into the US in California and destined for the east coast, as shown in the graphic below. Total intermodal shipments crossing the Mississippi River are expected to increase over 75% in the next 15 years to over 365,000 trucks in 2025.

Source: 2008 IHS Global Insight TRANSEARCH Data

In addition to the roadways listed above, highway deficiencies and/or required highway improvements identified in the *Freight Infrastructure Plan* also include:

- *I-55 and Crump Boulevard Interchange* – Reconstruction is currently in the design phase. The purpose of the proposed project is to resolve safety and capacity issues at this interchange.

- *I-40 and I-240 East Interchange* – Improvement to this interchange is a priority by the Memphis Metropolitan Planning Organization and programmed in the Transportation Improvement Program (TIP) for 2011 with dedicated Federal Interstate Maintenance and state funds. The I-40 / I-240 interchange on the east side of Memphis is considered to be a chokepoint where growth has caused congestion to increase rapidly in recent years. When the interchange was originally designed and built in 1964, I-40 was to go through Memphis, while I-240 was to serve as a loop around the city. Since litigation stopped I-40 west of the interchange and it was never finished through Memphis, the interchange became overburdened with westbound I-40 traffic using I-240.

- *Construction of I-69 / I-269* - I-69 is planned to be a north-south interstate route that will provide a continuous controlled access highway link between Mexico and Canada. I-269 is part of the larger I-69 system. The new four-lane interstate would begin near the interchange of Interstate 55 and State Route 304 in Hernando, MS and extend north to the intersection of US-51 and State Route 385 in Millington, Tennessee, connecting to I-69 north of Memphis. It is intended to divert through traffic around the city and reduce congestion.

- *I-240 and Airways Boulevard Interchange* - The I-240 and Airways Boulevard intersection is a major freight link in the Memphis region and a key ingress and egress point to the Memphis International Airport.

- *I-40 and I-55 Interchange* – Segments on both I-40 and I-55 exceed a congestion ratio of 0.9. Complex weaving patterns and the convergence of four major roadways in this area lead to congestion and accidents.

Rail System Deficiencies

More than 50,000,000 tons of freight crossed the Mississippi River in Memphis by rail in 2008, mostly due to coal shipments from Wyoming. Three of the five major railroad lines serving Memphis are projected to be near or over capacity by 2035. Of the two freight railroads crossing the Mississippi River, UP uses the two-track Harahan Bridge and has no significant capacity issues. BNSF uses the single-track Frisco Bridge and experiences congestion on this bridge at various times during the day. BNSF has asked UP for permission to operate on the Harahan Bridge to alleviate this congestion.

Source: 2008 Surface Transportation Board 1% Rail Waybill Data/IHS Global Insight

Because segments of the rail network in the Memphis area are owned by multiple rail carriers, coordination to operate over one another's tracks contributes to delays. One problem is the beltline segment used by the CN and operated by CSX. CN operates multiple trains over this CSX line, many of which are delayed due to poor operational coordination between the two railroads.

Local rail service by CN to President's Island and the Port of Memphis is another rail system deficiency. Rail trackage between the CN's rail yard and the Island is circuitous with limited track capacity to switch and store railcars, often resulting in delayed delivery to rail customers.

Air System Deficiencies

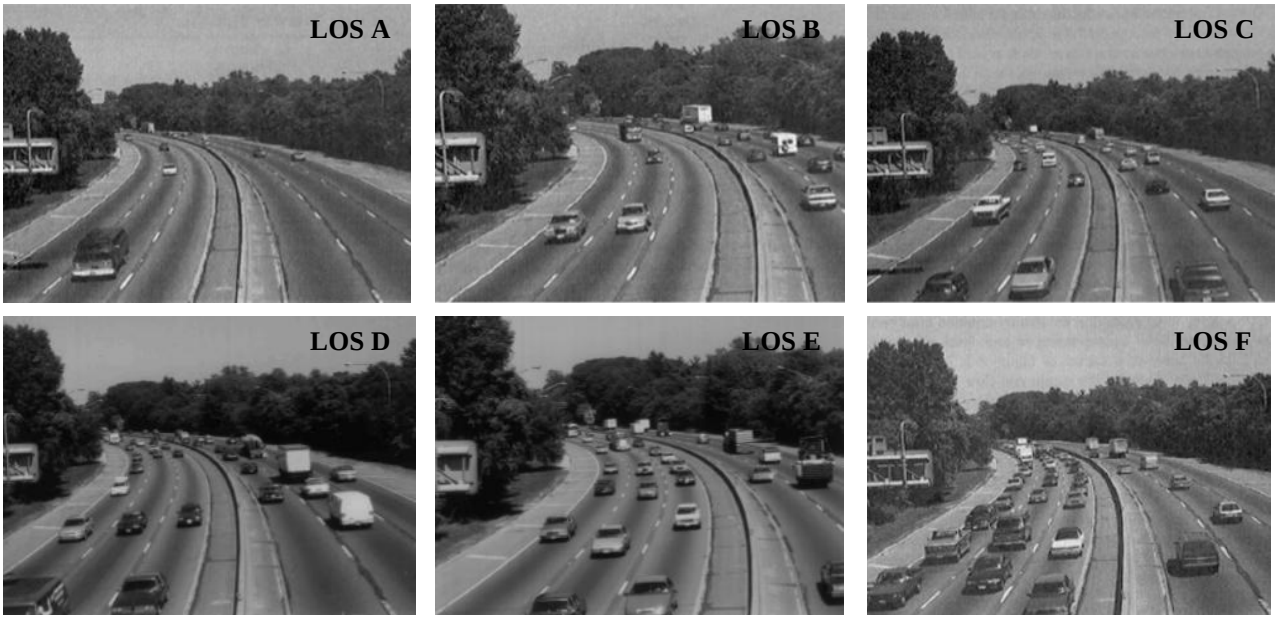
The air freight infrastructure capacity analysis conducted in the Infrastructure Plan found no serious deficiencies in the region's air freight system. The major deficiency with the air network system is improved ground airport-area cargo access, including better access to nearby warehouses and distribution centers.

Water System Deficiencies

While increases in water terminal capacity is not necessary, the *Plan* found that road and rail access to certain river terminals, particularly Frank C. Pidgeon Industrial Park, need improving.

Need #3: Increase Capacity and Improve Operations for Vehicular Traffic

The Level of Service (LOS) is defined in the *Highway Capacity Manual* as "a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience." Level of service is defined in terms of the relationship between the capacity of the roadway and the volume of traffic, or the volume to capacity ration (v/c ratio). There are six categories of LOS that range from A to F:



Source: Highway Capacity Manual, 2000

The *Memphis LRTP* defines recurring congestion as those roadway segments operating with LOS E or F. Consistent with the *Memphis LRTP*, this definition of congestion is used for this study. The capacity of the existing roadways over the Mississippi River is inadequate to carry future traffic volumes. Interstate 55 is projected to operate with a LOS F, and I-40 will operate with a LOS E in the year 2030 if no capacity improvements are made. The increase in traffic volumes on existing facilities with no corresponding increase in capacity will result in congestion, a reduction in travel speed, an increase in delay, and a decrease of air quality.

The Memphis Travel Demand Model was used to estimate base and future year traffic volumes, as well as roadway link capacities in the study area. Historic traffic count data for the existing Mississippi River crossings on I-55 and I-40 was obtained from the Tennessee Advance Traffic Data Analysis and Management (ADAM) database. The Average Annual Daily Traffic (AADT) volumes for I-55 and I-40 over the Mississippi River from 1985 through 2009 are shown in Table 2.

Table 2: Average Annual Daily Traffic (AADT)

Average Annual Daily Traffic					
Year	**I-55**	**I-40**	**Year**	**I-55**	**I-40**
1985	23,061	28,288	1998	43,626	44,602
1986	25,000	30,000	1999	48,260	46,693
1987	27,904	31,966	2000	44,712	49,883
1988	29,832	32,383	2001	47,082	51,529
1989	30,188	32,740	2002	43,550	44,428
1990	31,340	33,200	2003	47,291	50,608
1991	32,424	36,375	2004	49,797	54,420
1992	34,747	38,136	2005	50,839	54,047
1993	36,245	36,789	2006	50,488	50,759
1994	34,228	37,184	2007	45,422	50,734
1995	42,432	37,477	2008	47,538	43,952
1996	38,414	40,000	2009	48,032	45,991
1997	32,191	51,591	-	-	-

Source: Tennessee Advance Traffic Data Analysis and Management Database

Trendline analysis of the historic data shows a 4.2% average linear growth rate on I-55 and a 3.2% average linear growth rate on I-40. Based on the Travel Demand Model, the horizon year 2030 AADT on I-55 and I-40 is approximately 78,500 and 95,800 vehicles per day, respectively.

Due to the operating characteristics of heavy vehicles, the percentage of these vehicle types in the traffic stream impacts the level of service. The existing truck percentage on I-55 is 37% , and 27% on I-40. Daily traffic volumes in the Memphis area are expected to increase by the year 2030, including truck traffic. Although the percentage of truck traffic is projected to decrease, truck volumes are still projected to increase. The projected horizon year (2030) truck percentage on I-55 is 32% and 24% on I-40.

The Memphis Travel Demand Model, with refinements to include Crittenden County, was used to estimate future traffic volumes. The base and future year Annual Average Daily Traffic (AADT) volumes for roadways in and adjacent to the study area are shown on **Figure 4**. Using these volumes and the existing and planned roadway characteristics, the level of service along the study corridor for the base and horizon analysis years was estimated. The existing 2010 level of service for roadways in the study area is shown in **Figure 5**. The horizon year 2030 level of service for existing and planned roadways in the study area is shown in **Figure 6**. Year 2010 and 2030 capacity-deficient segments on the Memphis-area interstate system in the project study area are shown in Table 3.

Table 3: Deficient Segments of the Interstate System

Route	Location	Level of Service	
		Year 2010	Year 2030
I-40	West of SR 118 (Airport Road)	C	F
	SR 118 (Airport Road) to I-55/I-40 Interchange West	C	F
	I-55/I-40 Interchange West to I-55/I-40 Interchange East	C	F
	I-55/I-40 Interchange East to Riverside Drive	C	E
	SR 14 (Jackson Avenue) to Highway 300	F	E
	Highway 300 to North Hollywood	D	E
I-55	South of I-69/I-269	C	F
	I-69/I-269 to Church Road	D	F
	Church Road to SR 302 (Goodman Road)	C	E
	SR 302 (Goodman Road) to Stateline Road	B	F
	Stateline Road to Shelby Drive	C	E
	Shelby Drive to Brooks Road	C	F
	I-240 to US 61 (SR 14/South Third Street)	E	E
	Crump Boulevard/Riverside Drive to I-55/I-40 Interchange East	D	F
	I-55/I-40 Interchange West to US 64 (Old Military Road)	B	E
	North of US 64 (Old Military Road)	B	E
I-240	US 78 (Lamar Avenue) to South Parkway	F	E
	South Parkway to I-55/I-240	F	E
	I-55/I-240 to Airways Boulevard	F	E

As shown in Table 3 and in **Figures 3 and 4**, much of the existing and future interstate system is not adequate to carry traffic in and through the study area with an acceptable level of service. Traffic volumes exceeding the capacity of the roadway system increase travel time and delay across the I-40 and I-55 bridges and throughout the region. These delays negatively impact local commuter traffic, interstate truck freight traffic, and motorists traveling through the region.

Goals and Objectives

The establishment of project goals and objectives articulates the desired benefits of the proposed project. Project goals and objectives also drive the definition of evaluating criteria to be used in comparing the performance of the alternatives with respect to defined measures/criteria.

In addition to the project goals outlined above through the definition of the project need, the Southern Gateway project is further supported by the following goals and objectives:

Providing Improved Bicycle, Pedestrian, and Multimodal Connections

Bicycle and pedestrian facilities in the Memphis region are deficient based on the results of the Memphis MPO plan entitled *Final Report: Memphis MPO Regional Bicycle and Pedestrian Plan* (January 2005),

although community support for such facilities continues to increase. In the MPO report, 83% of survey respondents rated the bicycle facilities in the region as "poor," and 38% rated the sidewalk system as "poor." The *Statewide Long-Range Transportation Plan* (December 2005) developed by TDOT also identified several gaps in the Memphis region's bicycle and pedestrian network, including a Mississippi River crossing. The state plan assumed that a new river crossing would include bicycle and pedestrian facilities to address that system gap.

A bicycle crossing in the Memphis area is also needed as part of the Mississippi River Trail (MRT). The MRT is a bicycle route that travels from the headwaters of the Mississippi River at Lake Itasca, Minnesota to the Delta of the Gulf of Mexico in Louisiana. It is a 3,000-mile system of bicycle-friendly roads and multi-use pathways. The MRT will connect ten states, the cities of Minneapolis, St. Louis, Memphis, and New Orleans and hundreds of smaller cities and towns along the way. The MRT plans show a Mississippi River crossing in the Memphis area.

The Memphis Area Transit Authority (MATA) serves four cities in Shelby County and West Memphis, Arkansas. The *Memphis LRTP* estimates that MATA transports 40,000 riders throughout the Memphis region each weekday using buses, paratransit (on-demand) vans, and vintage rail trolleys. Bus service to West Memphis uses the I-55 Bridge. MATA planning for a regional light rail (passenger) transit system began in the early 1990's, and light rail is considered a part of the long-term transportation strategy for the area. A goal of the Southern Gateway project is to provide efficient and operationally effective transit connections.

Supporting Economic Development

Average annual growth rates in population from 2011-2020 for Shelby County (TN) and DeSoto County are expected to increase between 0-0.5% and 0.5-1.0%, respectively. Average annual growth rates in housing units from 2011-2020 for Crittenden County (AR) and DeSoto County are expected to increase between 0.8-3.0% and 3.0% and above, respectively. All three counties are expected to see an average annual employment growth rate over 0.4% for the year 2020. Population, housing units, and employment opportunities are growing in the Memphis region and are expected to continue increasing over the next ten years.

The existing bridges are a critical link in the region's economic fabric. The Senior Vice President for Community Development with the Greater Memphis Chamber recently stated (March 2010) that a loss of the bridges crossing the Mississippi would have a large national impact, "between $11 billion and $15 billion a year" (Eyewitness News.com). Recent business developments and discussions with the Greater Memphis Chamber show strong economic development potential in parts of south Memphis, West Memphis, and northwest Mississippi. The Southern Gateway project will likely stimulate future growth and associated development by improving or providing new transportation access in the region.

Providing Reliable Infrastructure in Case of a National Security Event

The importance of the existing bridges to the region's economy and operations makes security planning an important consideration. The existing bridges are possible security targets because of their accessibility and potential impact on human lives and economic activity. The proposed Southern Gateway would provide an additional route for vehicles and freight in the event of a threat to national

security. The Homeland Security Presidential Directive 7 (HSPD-7, available online) established a national policy to identify and prioritize critical infrastructure and protect this infrastructure from terrorist attacks. As part of this effort, federal agencies have provided research and recommendations on bridge security that will be incorporated into the design considerations of the Southern Gateway project.

Providing Reliable Infrastructure for Emergency Responders

Mississippi River crossings are very limited in the Memphis region. The nearest highway crossings are located near Helena, Arkansas (approximately 70 miles south of Memphis) and Dyersburg, Tennessee (approximately 75 miles north of Memphis). The nearest freight rail crossings are near Vicksburg, Mississippi (approximately 220 miles south of Memphis) and Cairo, Illinois (approximately 165 miles north of Memphis). Due to limited east-west access across the river in the region, river crossing in the Memphis area are critical links for emergency response and the movement of equipment and/or personnel to address local, regional, or national issues that may occur. These factors increase the importance of safety, operation and maintenance of the existing bridge facilities.

Interviews were conducted with Memphis-area agencies with interests in safety, operations, and maintenance. Stakeholders who identified issues along the existing main routes in the study area included TDOT headquarters and Region 4 office, MDOT, AHTD, West Memphis MPO, the DeSoto County Sherriff's office, and the DeSoto County Planning Commission. First responders to the scene of an incident are often hindered by the inadequate shoulders on the existing bridges. A new crossing of the Mississippi River would provide an alternate route and modern geometry (most likely including paved shoulders) to alleviate some of these operations and safety concerns.

3. Planned and Programmed Improvements

Consistency With Local, Regional, and State Plans

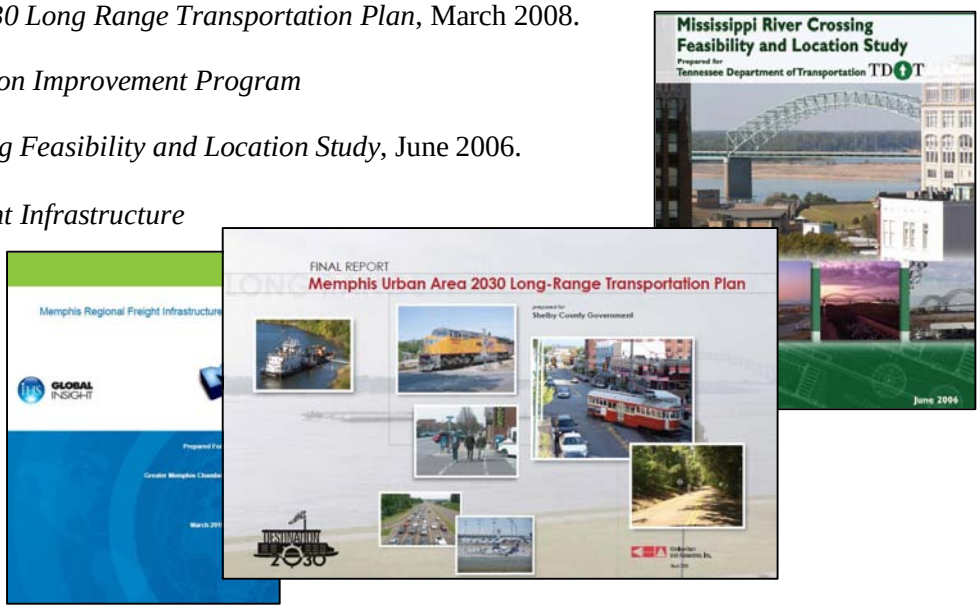
The Southern Gateway project has been recognized by current and past City and State leaders and is included in currently approved transportation plans:

Memphis Urban Area 2030 Long Range Transportation Plan, March 2008.

TDOT *State Transportation Improvement Program*

Mississippi River Crossing Feasibility and Location Study, June 2006.

Memphis Regional Freight Infrastructure Plan, March 2010.



Other Planned Projects in the Area

Projects are either planned or are currently underway in the Memphis area are noted in Table 4 and shown in **Figure 7**.

Table 4: Active Projects Along Major Facilities in the Study Area

No.	Route	Project Location/Limits	Improvement	Year
1	I-55	I-55 at Crump Boulevard and Riverside Drive	Reconstruct Interchange	2020
2	I-69	From south of SR 385 to the Tipton/Shelby County Line	Construct 4.8 miles of new freeway	2020
3	I-240	I-55/I-240 Interchange to I-40/I-240 Interchange	Widen interstate from 6 to 8 lanes	2020
4	I-269	Mississippi/Tennessee State Line to SR 385	Construct 2.3 miles of new freeway	2020
5	I-269	SR 57 to Raleigh Lagrange Road	Construct 3.3 miles of new freeway	2015
6	I-55	SR 304 to Church Road	Widen interstate from 4 to 6 lanes	2020
7	I-55	Church Road to Goodman Road	Widen interstate from 4 to 6 lanes	2020
8	I-269	I-55 to SR 305	Construct 10.0 miles of new freeway	2015
9	I-269	SR 305 to Desoto/Marshall County Line	Construct 7.0 miles of new freeway	2015
10	I-40	Kuhn Road, West Memphis, AR	Construct new interchange	2033
11	I-40/I-55	I-40/I-55 East Interchange, West Memphis	Reconstruct Interchange	2011
12	I-40/I-69	Jackson Avenue (SR 14) to Chelsea Avenue	Widen interstate from 6 to 8 lanes	2020
13	I-240	Millbranch Road to Airways Blvd.	Widen interstate from 6 to 8 lanes	2020
14	I-240	I-55 to Millbranch Road	Widen interstate from 6 to 8 lanes	2020
15	I-240	I-55 Interchange	Widen exit ramp to I-55 from 2 to 3 lanes	2020
16	I-69	Highway 300 to the Shelby/Tipton County Line	Construct new freeway	2020
17	I-40/I-69	Chelsea Avenue to Highway 300	Widen interstate from 6 to 8 lanes	2030
18	I-269	I-69 to US 51	Construct new freeway	2030
19	I-55	Holmes Road	Construct new interchange	2025
20	I-55	Commerce Street to I-69/I-269	Widen interstate from 4 to 8 lanes	2030
21	I-55	Mallory	Reconstruct Interchange	2011
22	I-269	US 78 to SR 302	Construct 7.95 miles of new freeway	2015
23	I-269	SR 302 to the Mississippi/ Tennessee State Line	Construct 2.26 miles of new freeway	2015
24	I-40	Hernando DeSoto Bridge	Seismic Retrofit	2011

4. Additional Benefits of the Project

Beyond the Goals and Objectives outlined in Section 2, additional benefits of the proposed project may be realized later in the planning stages. The Southern Gateway project presents additional possible opportunities for the Memphis area, such as streetscaping, public art, or shared common areas to be developed near the project.

5. Evaluation Criteria and Decision-Making Factors

The TDOT *Tennessee Long-Range Transportation Plan; Project Evaluation System Final Report* (December 2005) describes the state's method for evaluating transportation projects. This methodology will be used to evaluate various project alternative corridors for the Southern Gateway.

The Project Evaluation System (PES) Report is an analytical methodology to aid programming efforts and prioritize multimodal investments. The methodology consists of both quantitative and qualitative evaluation criteria built upon the Guiding Principles, goals, objectives, and policies established in Tennessee's Long-Range Transportation Plan (LRTP). The PES serves as both a prioritization tool and a system of accountability designed to maximize public investment in transportation system improvement projects.

The LRTP includes Guiding Principles that serve as a thread through the planning and program delivery process. The PES consists of evaluation criteria developed for all transportation modes based on the Guiding Principles to aid in the programming of projects.

The seven Guiding Principles of the Tennessee LRTP are:

- Preserve and Manage the Existing Transportation System
- Move a Growing, Diverse, and Active Population
- Support the State's Economy
- Maximize Safety and Security
- Build Partnerships for Livable Communities
- Promote Stewardship of the Environment
- Emphasize Financial Responsibility

The project development process begins with preliminary needs analyses determined through system planning, goals and objectives, and the desired performance of the transportation system. A preliminary project scoping process begins to study deficiencies and develop project data for possible solutions. The multimodal project development phase involves regional and local input and a proactive public involvement process. The public input and project data are used to determine desirable and appropriate candidate projects to solve system deficiencies and modal needs. The PES serves as an analytical methodology to aid programming efforts and prioritize multimodal investments.

Candidate projects are prioritized according to the PES criteria established for each mode. Engineering and transportation planning judgment are imperative for the consideration and inclusion of multimodal projects, transportation demand management strategies, and intelligent transportation systems technology in solving transportation needs along strategic corridors. While candidate projects are evaluated individually, selected projects must fit together in a holistic and practical multimodal framework to create a seamless, efficient overall transportation system.

The PES is comprised of modal criteria to prioritize highway, transit, airport, rail, waterway, and bicycle and pedestrian projects. These criteria are developed for each mode in accordance with the Guiding Principles, performance measures, goals and objectives, and policies established in the LRTP.

Beyond evaluation criteria such as estimated cost and natural and human (community) environmental impacts, build alternatives of the Southern Gateway project that meet the Purpose and Need will be judged against a set of evaluation criteria. Specifically, alternatives will be analyzed by how well each meets the following criteria:

Table 5: Evaluation Criteria

Project Goals	Specific Evaluation Measures	Overall Evaluation Measures
Need #1: Improve infrastructure to withstand a major earthquake	***Highway and Rail***: ability to withstand certain seismic event	***Environmental Impacts:*** • Impacts to neighborhoods, communities, and other public sites • Reduction or mitigation of impacts to wetlands, water resources, ecosystem, and air quality ***Public / Community Support:*** • Adherence to approved plans • Continuity with Memphis-area goals and initiatives • Local official and overall community support ***Funding Availability***
Need #2: Improve the movement of freight on roadways and railroads	***Highway and Rail***: levels of current and future congestion and delay; connectivity to intermodal freight centers and infrastructure	
Need #3: Increase capacity and improve operations for vehicular traffic	***Highway*:** levels of current and future traffic congestion and delay	
Goal: Improved bicycle, pedestrian, and multimodal connections	***Multimodal connections***: connectivity and access to existing pedestrian / bicycle / transit facilities	
Goal: Supporting economic development	***Highway and Rail***: connectivity and access to major employment and population centers	
Goal: Providing reliable infrastructure in case of a national security event	***Highway and Rail***: connectivity to major transportation corridors	
Goal: Providing reliable infrastructure for emergency responders	***Highway***: geometric improvements (i.e. narrow lanes and shoulders)	

Table modified from TDOT LRTP: http://www.tdot.state.tn.us/plango/pdfs/plan/ProjEvalSys.pdf

6. Identification of Requested Federal Actions

The application for and acquisition of permits would occur prior to initiation of construction. These permits could include:

- US Army Corps of Engineers – **Clean Water Act, Section 404 Permit** – required for construction that involves placement of dredge and fill material in Waters of the US and/or impacts to Waters of the US.
- US Coast Guard – **Section 9 of the US Rivers and Harbors Act** – requires federal approvals for new bridge construction over navigable waters. Navigational lights and other such required components will approved by the USCG prior to construction.
- Tennessee Department of Environment and Conservation – **Section 401 Water Quality Certification** – ensures that activities requiring a Federal permit of license will not cause pollution in violation of State water quality standards.
- Tennessee Department of Environment and Conservation, Division of Water Pollution Control Issues – **Aquatic Resource Alteration Permit** (ARAP) – required for any alterations of State waters, including wetlands that do not require a Federal (Section 404) permit. The ARAP permits are required for construction at locations where the proposed project involves placement of fill in the following: a pond that is spring-fed or impacts springs; reservoirs; wetlands; streams; intermittent streams; and any stream that supports any form of aquatic life; or is in the vicinity of a State-listed endangered species.
- Tennessee Department of Environment and Conservation, Division of Water Pollution Control – National Pollutant Discharge Elimination System (NPDES) **Stormwater Construction Permit** – required for grubbing, clearing, grading, or excavation of one or more acres of land.

Based on conversations between TDOT and the Tennessee Valley Authority (TVA), it is not anticipated that a TVA permit would be required for the Southern Gateway project.

7. Summary

The purpose of this project is to improve cross-river mobility for people and freight in and around the Memphis, Tennessee area. The need for a new connection across the Mississippi River is derived from the following summary of existing and estimated future conditions:

- Need #1 – The need to improve infrastructure to withstand a major earthquake.
- Need #2 – The need to improve the movement of freight on roadways and railroads.
- Need #3 – The need to increase capacity and improve operations for vehicular traffic.

Goals and Objectives of the project are:

- Providing bicycle, pedestrian, and multimodal connections,

- Supporting economic development,
- Providing reliable infrastructure in case of a national security event, and
- Providing reliable infrastructure for emergency responders.

8. References

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CEQ 40 CFR 1500-1508: http://ceq.hss.doe.gov/nepa/regs/ceq/toc_ceq.htm

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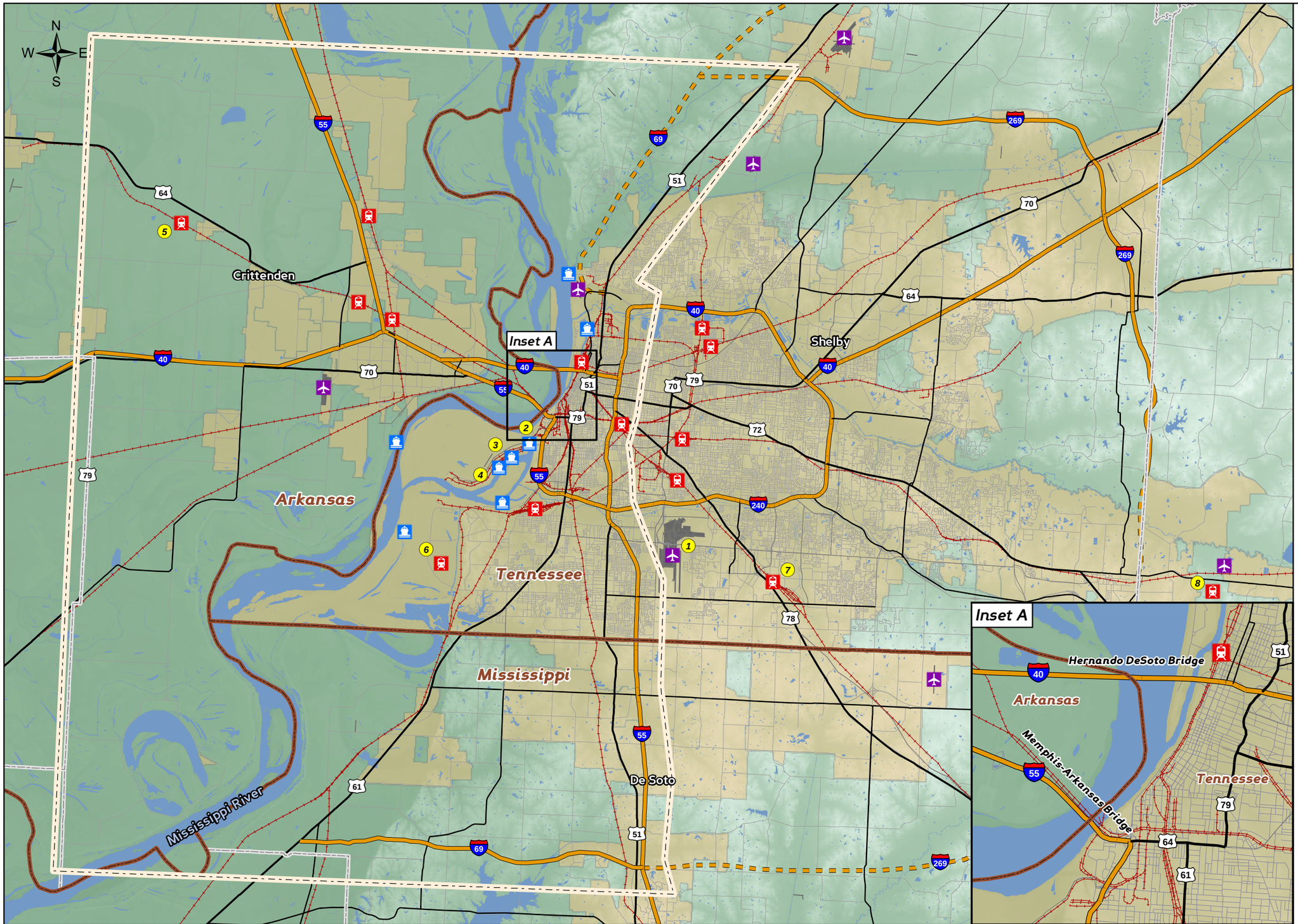
the SOUTHERN gateway
Crossing the River Connecting America

Vicinity Map

Figure 1



the SOUTHERN Gateway
Crossing the River Connecting America

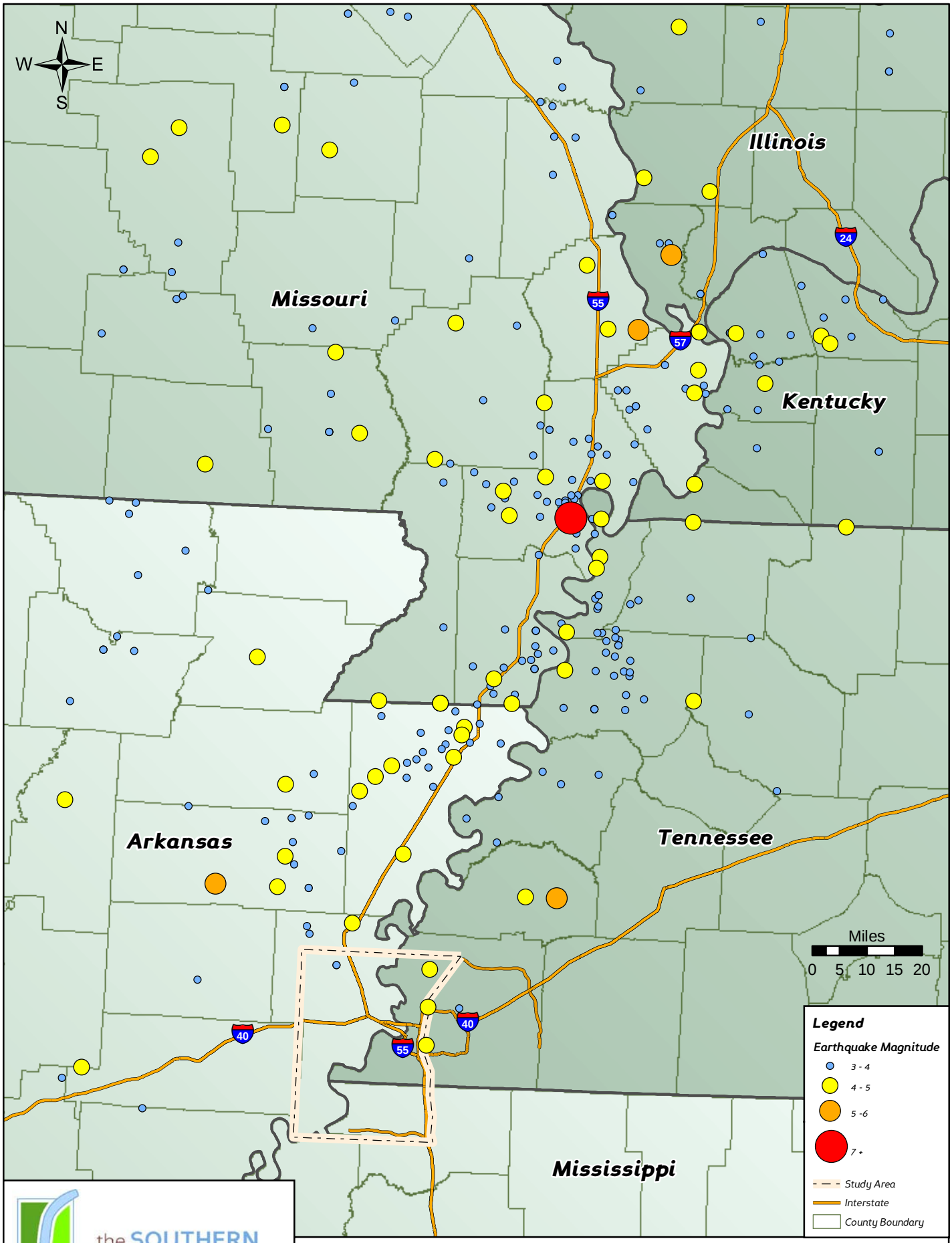
Legend

- Study Area
- State Boundary
- County Boundary
- Interstate
- US Route
- State Route
- Local
- Proposed Interstate
- Railroad
- Municipalities
- Railroad Yards
- Ports
- Public Airports

ID	Facility
1	Memphis International Airport
2	Port of Memphis
3	Pidgeon Industrial Park
4	Presidents Island
5	UP Intermodal Terminal
6	Memphis Gateway Terminal
7	BNSF Intermodal Rail Terminal
8	Norfolk Southern Intermodal Rail Terminal (Proposed)

Figure 2

Transportation Facilities



the SOUTHERN Gateway
Crossing the River Connecting America

New Madrid Fault Earthquakes (1812-2008)

Figure 3

the SOUTHERN Gateway
Crossing the River Connecting America

Legend

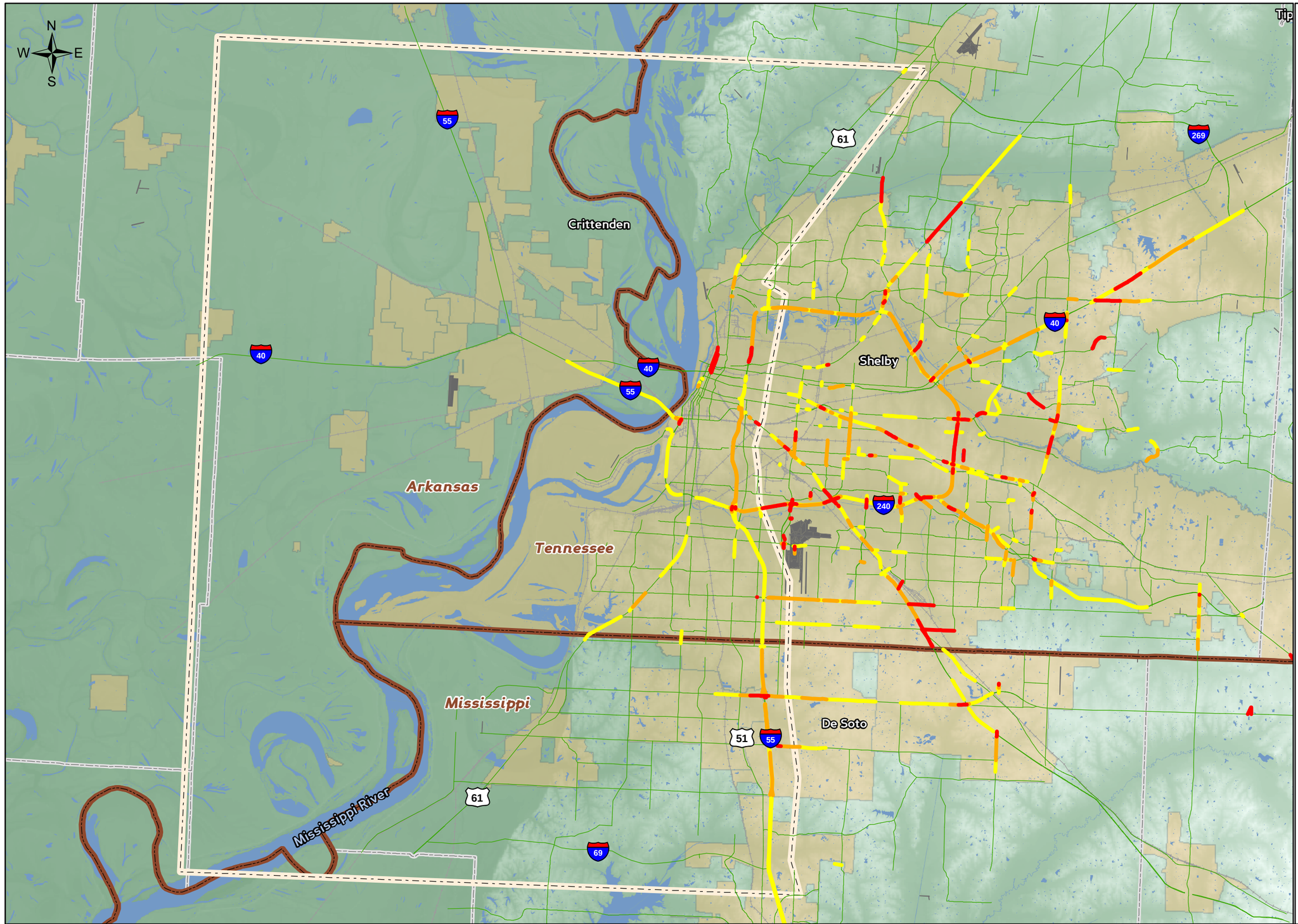
- Study Area
- State boundary
- County boundary
- Municipalities
- Interstate
- US Route
- State Route
- Railroad
- AADT
- Existing AADT XXX
- Projected (2030) AADT (XXX)

Miles
0 0.9 1.8 2.7 3.6

Figure 4

Existing and 2030 Projected Traffic Volumes (AADT)

Notes: Volumes from most recent sources available



the SOUTHERN Gateway
Crossing the River Connecting America

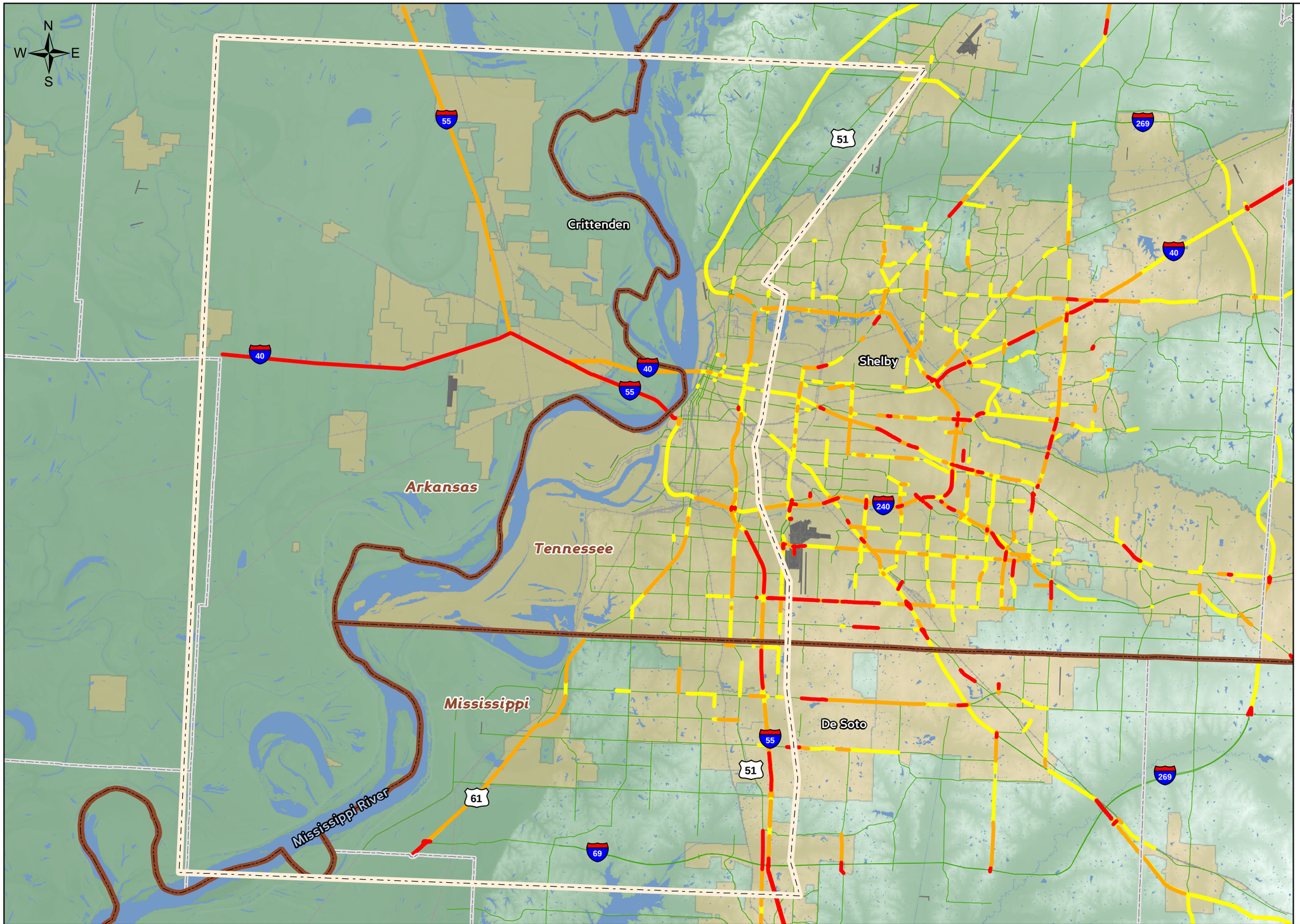
Legend

- Study Area
- State Boundary
- County boundary
- Municipalities
- LOS F
- LOS E
- LOS D
- LOS C
- LOS B
- LOS A
- Railroad

Miles
0 2 4 6 8

Figure 5

Existing 2010 Roadway Level of Service



the SOUTHERN Gateway
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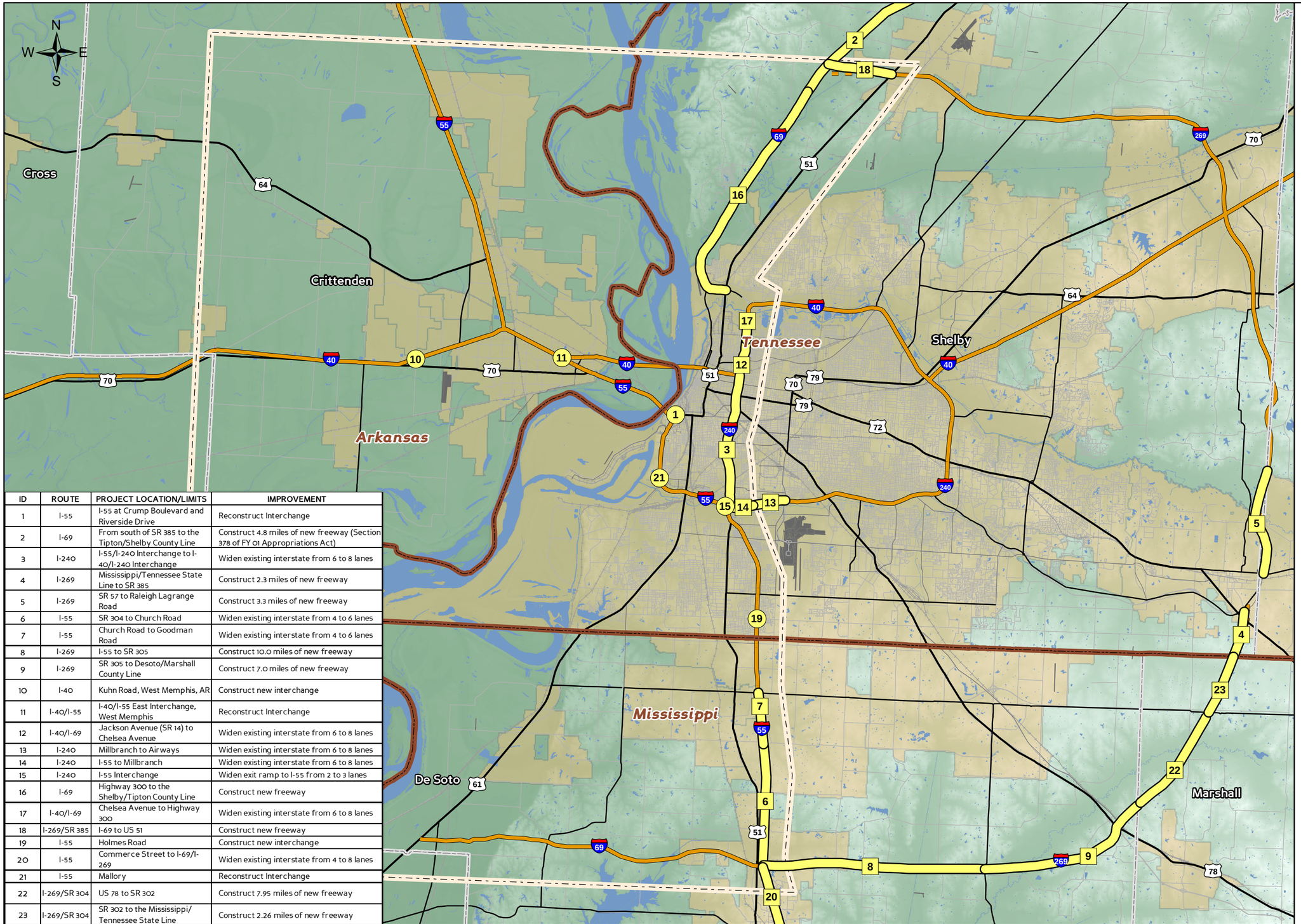
Legend

- Study Area
- State Boundary
- County boundary
- Municipalities
- LOS F
- LOS E
- LOS D
- LOS C
- LOS B
- LOS A
- Railroad

Miles
0 2 4 6 8

Figure 6

Future 2030 Roadway Level of Service



ID	ROUTE	PROJECT LOCATION/LIMITS	IMPROVEMENT
1	I-55	I-55 at Crump Boulevard and Riverside Drive	Reconstruct Interchange
2	I-69	From south of SR 385 to the Tipton/Shelby County Line	Construct 4.8 miles of new freeway (Section 378 of FY 01 Appropriations Act)
3	I-240	I-55/I-240 Interchange to I-40/I-240 Interchange	Widen existing interstate from 6 to 8 lanes
4	I-269	Mississippi/Tennessee State Line to SR 385	Construct 2.3 miles of new freeway
5	I-269	SR 57 to Raleigh Lagrange Road	Construct 3.3 miles of new freeway
6	I-55	SR 304 to Church Road	Widen existing interstate from 4 to 6 lanes
7	I-55	Church Road to Goodman Road	Widen existing interstate from 4 to 6 lanes
8	I-269	I-55 to SR 305	Construct 10.0 miles of new freeway
9	I-269	SR 305 to Desoto/Marshall County Line	Construct 7.0 miles of new freeway
10	I-40	Kuhn Road, West Memphis, AR	Construct new interchange
11	I-40/I-55	I-40/I-55 East Interchange, West Memphis	Reconstruct Interchange
12	I-40/I-69	Jackson Avenue (SR 14) to Chelsea Avenue	Widen existing interstate from 6 to 8 lanes
13	I-240	Millbranch to Airways	Widen existing interstate from 6 to 8 lanes
14	I-240	I-55 to Millbranch	Widen existing interstate from 6 to 8 lanes
15	I-240	I-55 Interchange	Widen exit ramp to I-55 from 2 to 3 lanes
16	I-69	Highway 300 to the Shelby/Tipton County Line	Construct new freeway
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18	I-269/SR 385	I-69 to US 51	Construct new freeway
19	I-55	Holmes Road	Construct new interchange
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21	I-55	Mallory	Reconstruct Interchange
22	I-269/SR 304	US 78 to SR 302	Construct 7.95 miles of new freeway
23	I-269/SR 304	SR 302 to the Mississippi/ Tennessee State Line	Construct 2.26 miles of new freeway

Miles
0 2 4 6 8

the SOUTHERN Gateway
Crossing the River Connecting America

Legend

- Study Area
- State Boundary
- County boundary
- Municipalities
- Interstate
- US Route
- State Route
- Local
- Proposed Interstate
- Railroad
- Interstate Capacity Projects
- Interchange Capacity Projects

Figure 7

Planned and Programmed Freeway Capacity Projects