Executive Summary

Mississippi River Crossing Feasibility and Location Study

Prepared for

Tennessee Department of Transportation TDOT

Prepared by

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

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Executive Summary: Mississippi River Bridge Crossing Feasibility and Location Study

The Tennessee Department of Transportation (TDOT) has contracted with Wilbur Smith Associates (WSA) to conduct this **Mississippi River Crossing Location Study**.

PURPOSE OF THE STUDY

The purposes of this study are to (1) determine the feasibility of providing a new Mississippi River Bridge Crossing in the Memphis metropolitan area and (2) identify and evaluate possible transportation solutions to help TDOT reach a decision on a preferred corridor alternative for proposed improvements for cross-river mobility over the Mississippi River in the vicinity of Memphis.

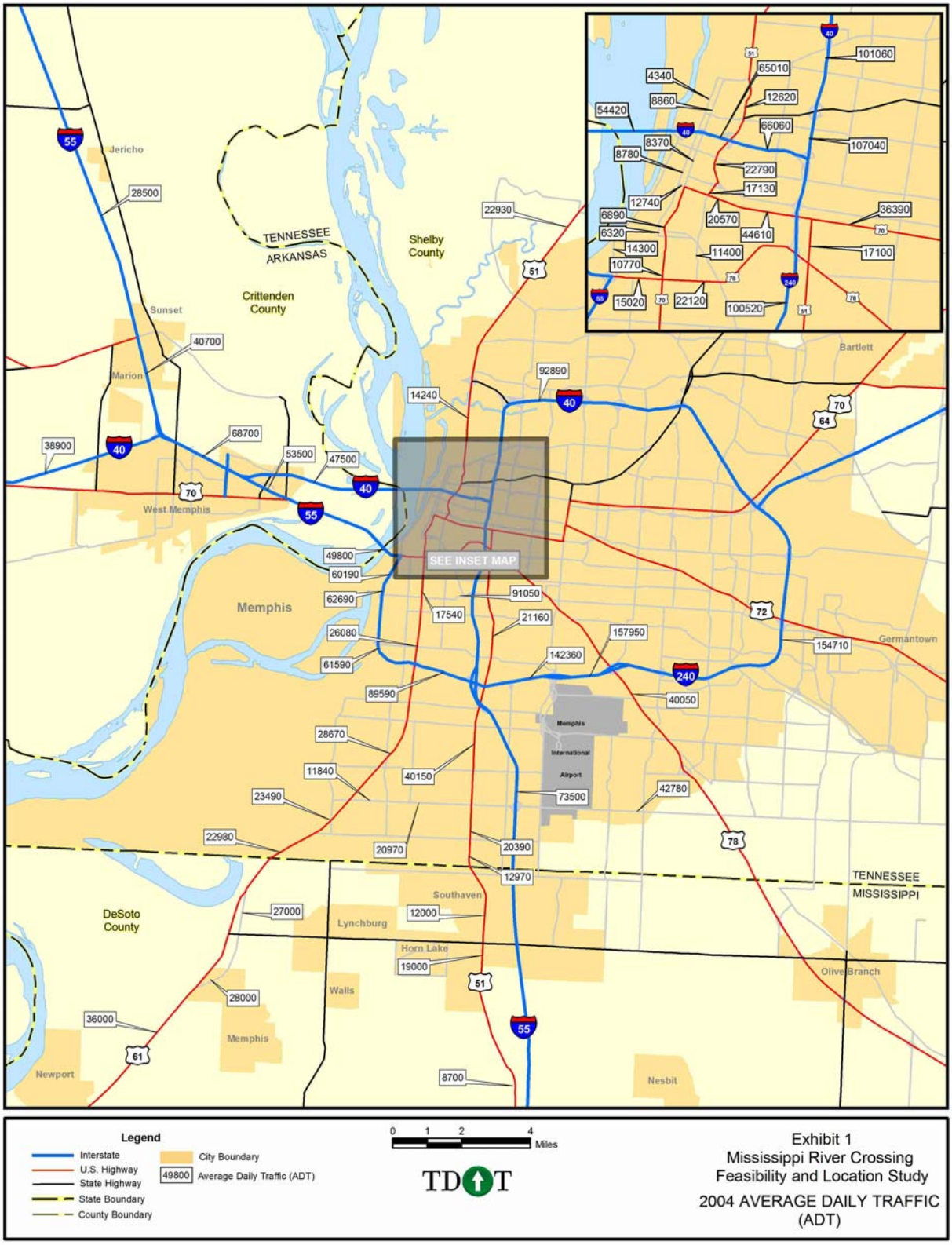
STUDY AREA

The study area encompasses Shelby County, Tennessee; Crittenden County, Arkansas; and DeSoto County, Mississippi. Likely Mississippi River bridge crossing locations generally fall within Shelby County, Tennessee from Tipton County, Tennessee in the north to Mississippi Route 304 in the south. East and west boundaries are based on where connectivity is important to establish logical termini. **Exhibit 1** shows the study area and traffic volumes on major highways.

PROJECT PURPOSE AND NEED

The primary purpose of the proposed Mississippi River Crossing project is to improve cross-river mobility for people and freight in and around the Memphis, Tennessee area. Addressing the need for improved cross-river mobility can help to address additional issues, including the following:

- Provide adequate cross-river system linkage and rerouting opportunities for the Memphis and the tri-state area (Tennessee, Arkansas, and Mississippi);
- Provide efficient mobility for existing and planned growth and employment, including protecting the economic vitality of Memphis and the tri-state area;
- Provide capacity relief for existing crossings (I-40 and I-55);
- Enhance local and regional freight movement, including traffic generated by the airport, rail yards, and riverports;
- Meet current and future transportation demand; and
- Provide a more efficient and effective transportation system for Memphis and the tri-state region.


Legend
Interstate
U.S. Highway
State Highway
State Boundary
County Boundary
City Boundary
49800 Average Daily Traffic (ADT)
0 1 2 4 Miles
TDOT
Exhibit 1
Mississippi River Crossing
Feasibility and Location Study
2004 AVERAGE DAILY TRAFFIC
(ADT)
TENNESSEE
ARKANSAS
Shelby County
Crittenden County
DeSoto County
Memphis
West Memphis
Jericho
Sunset
Marion
Bartlett
Germantown
Southaven
Lynchburg
Horn Lake
Walls
Olive Branch
Nesbit
Newport
Memphis International Airport
SEE INSET MAP
TENNESSEE
MISSISSIPPI
28500
40700
38900
68700
53500
47500
22930
92890
14240
49800
60190
62690
91050
17540
21160
26080
61590
157950
142360
154710
89590
40050
28670
11840
40150
73500
42780
23490
22980
20970
20390
12970
27000
12000
19000
28000
36000
8700
101060
65010
4340
12620
8860
54420
66060
107040
8370
8780
22790
17130
12740
36390
6890
20570
44610
6320
14300
11400
17100
10770
15020
22120
100520

STUDY PROCESS

The study involved the following steps:

- Data collection and analysis of existing conditions for:
  - Transportation facilities and system;
  - Socioeconomic characteristics; and
  - Environmental and community resources.
- Public involvement, including:
  - Project team meetings;
  - Project advisory committee meetings;
  - Public meetings; and
  - News stories in local print and electronic media.
- Development of highway and rail corridor alternatives, using a GIS-based Corridor Analysis Tool (CAT) that selected optimum routes with the least impact on environmental and community resources.
- Application of travel demand model to produce 2030 traffic forecasts for existing and proposed alternatives.
- Analysis of travel efficiency and economic impacts;
- Overview of potential environmental and community impacts;
- Evaluation of corridor alternatives, using a 3-step process:
  - Level 1 Screening, using preliminary data and subjective review;
  - Level 2 Screening, based on
    - Purpose and need (measured by traffic feasibility, travel efficiency feasibility, and economic feasibility);
    - Environmental feasibility; and
    - Cost and engineering feasibility.
  - Final Screening using Level 2 results and input from the Project Advisory Committee and public meetings held in February 2006.

SIGNIFICANT FINDINGS

Some key findings from the analysis of existing conditions are as follows:

- Existing bridges may be susceptible to earthquake damage. While the I-40 bridge has been seismically retrofitted, it appears that the I-55, Frisco Railroad Bridge, and Harahan Railroad Bridge were not adequately designed for earthquake resistance.
- Average daily traffic in 2004 was 54,420 vehicles per day on the I-40 Bridge and 49,800 on the I-55 Bridge, an almost 50% increase in the last ten years, or an annual 4% growth rate.
- Portions of I-40, I-55, and US 61 near the bridges were identified as part of the MPO's 2004 "Existing Congested Network," and all sections had at least one year with crash rates greater than the statewide average crash rate for Interstates.

- There is major freight activity in the study area, including many intermodal and freight facilities, such as the Port of Memphis, FedEx headquarters, five Class I railroads, and other air, port, rail, and truck systems and facilities.
- Major planned highway projects or improvements include I-69, I-269, I-55, and I-22, as well as improved access to riverport facilities along the Jack Carley Causeway and Riverport Road.
- The 2000 Census population for each of the three counties and for the study area was as follows:
    - Shelby County, Tennessee 897,472
    - Crittenden County, Arkansas: 50,866
    - DeSoto County, Mississippi: 107,199
    - Population Total for Study Area: 1,055,537
- Population growth rates from 1990 to 2000 for the three counties were 8.6% for Shelby, 57.8% for DeSoto, and 3.1% for Crittenden.
- Estimated 2004 populations were 908,175 for Shelby County (83%), 130,587 in DeSoto (12%), and 51,488 in Crittenden (5%).
- Environmental Justice communities are likely to exist in the study area, with a higher probability in Shelby County and Crittenden County.
- The study area has numerous industrial parks and sites, and Memphis is also a major tourist destination.
- Potential Section 4(f) resources that have been identified include:
    - Four historical sites, including the I-55 bridge itself;
    - Eight public parks or areas; and
    - One wildlife refuge area.

INITIAL CORRIDOR ALTERNATIVES

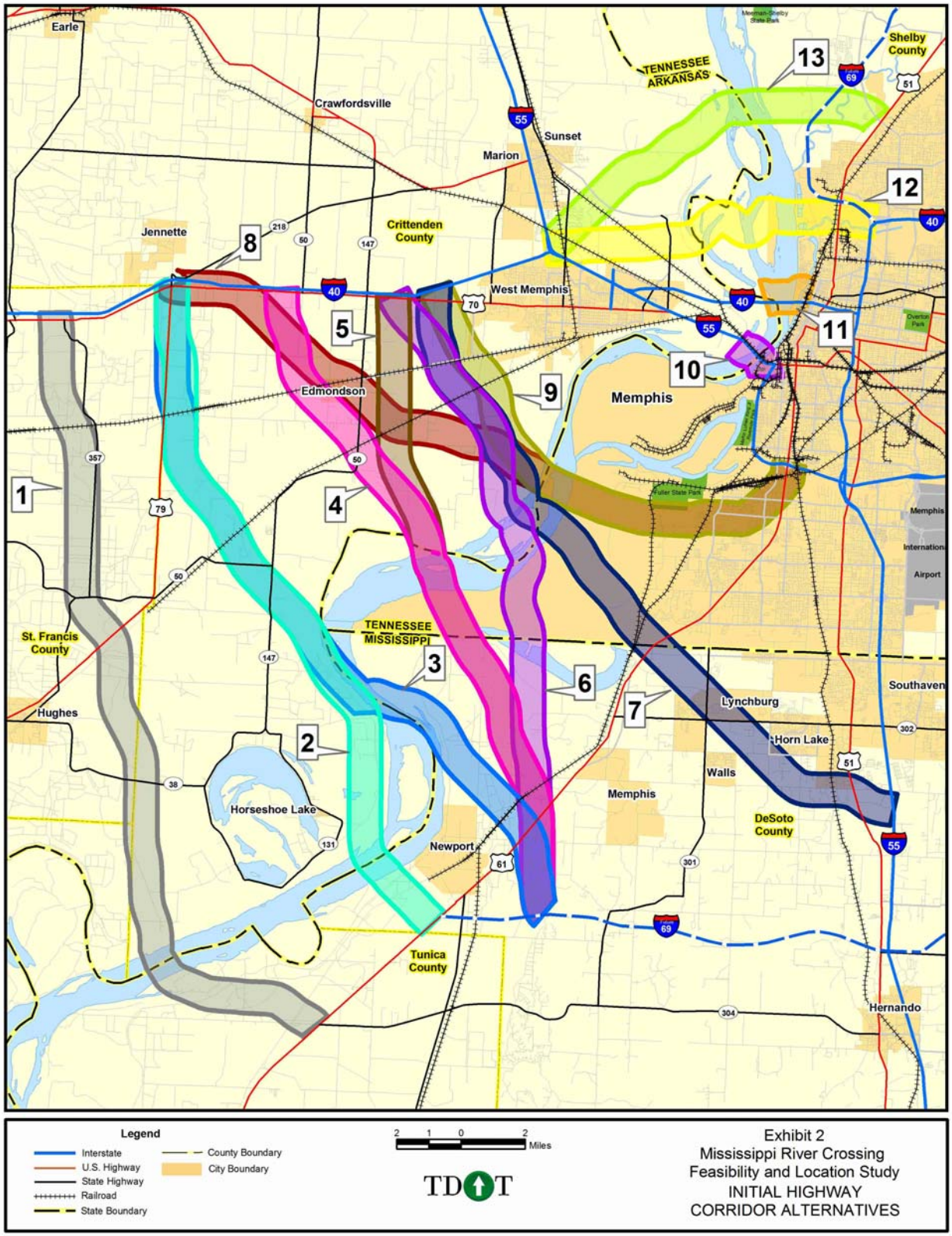
As presented in **Exhibit 2**, a GIS-based Corridor Analysis Tool was used to define thirteen (13) initial highway corridor alternatives for the proposed Mississippi River Bridge Crossing in the Memphis study area.

In addition to a new highway bridge crossing, this study was also intended to evaluate a new railroad bridge crossing. For purposes of the study, it was assumed that each of the highway corridor alternatives should also be considered as rail corridor alternatives at the outset.

LEVEL 1 SCREENING PROCESS

Highway Corridors

A tiered evaluation process was undertaken to determine if any of the corridor alternatives might be eliminated at an early stage. In the first step, the 13 initial corridor alternatives were evaluated as part of a Level 1 Screening process that considered the following factors:


Earle
Crawfordsville
Sunset
Marion
Jennette
Crittenden County
West Memphis
Edmondson
Memphis
TENNESSEE
ARKANSAS
Shelby County
TENNESSEE
MISSISSIPPI
St. Francis County
Hughes
Horseshoe Lake
Newport
Tunica County
Lynchburg
Horn Lake
Walls
Memphis
DeSoto County
Southaven
Hernando
1
2
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9
10
11
12
13
Legend
Interstate
U.S. Highway
State Highway
Railroad
State Boundary
County Boundary
City Boundary
2 1 0 2
Miles
TDOT
Exhibit 2
Mississippi River Crossing
Feasibility and Location Study
INITIAL HIGHWAY
CORRIDOR ALTERNATIVES

- Purpose and need of the project;
- Qualitative assessments of potential environmental and community impacts; and
- Input from the Project Advisory Committee.

Findings were presented to the project team, who decided that:

- Corridor Alternative 1 would be eliminated because it was too far away from the center of the study area and, therefore, could not adequately meet the purpose and need of the project;
- Corridor Alternatives 2 and 3 would be combined, tying directly into I-69 (MS 302 extension), and re-designated as Bridge A;
- Corridor Alternatives 4, 5, 6, 7, and 8 were basically in the same corridor, so they should be combined into Bridge B, with alternative routes on either end;
- Corridor Alternatives 10 and 11 were eliminated because they could potentially cause major disruption in the downtown Memphis area and, therefore, cause major negative impacts on businesses, neighborhoods, and historic areas; and
- Corridor Alternatives 12 and 13 would go forward for further evaluation, but separated into three corridors at Bridges C, D, and E.

During the Level 1 Screening process, subsequent discussions ensued among the project team members. The first decision concerned the location of the bridge crossing, as follows:

- Bridge A would remain at the previously established location.
- Bridge B would be re-located to avoid Edmonston and the wetlands in the area.
- Bridges C, D, and E would be revised to provide the missing link to I-40, as follows:
    - Bridge C would be an extension of SR 300;
    - Bridge D would be a direct extension of I-40; and
    - Bridge E would be located to (1) provide an alternative just north of the Memphis urbanized area, interchanging directly with US 51/SR 3 (future I-69) several miles south of Millington, and (2) avoid the bluffs along the Mississippi River.

The revised corridor alternatives chosen for further study are shown in **Exhibit 3**.

Rail Corridors

Based on the highway corridor alternatives selected after the Level 1 Screening process, a special review was undertaken to determine their suitability for a proposed new rail facility. From this review, it was decided that Bridge A is not a feasible location for a rail crossing, leaving four rail corridor alternatives. The rail corridor alternatives are shown in **Exhibit 4**.

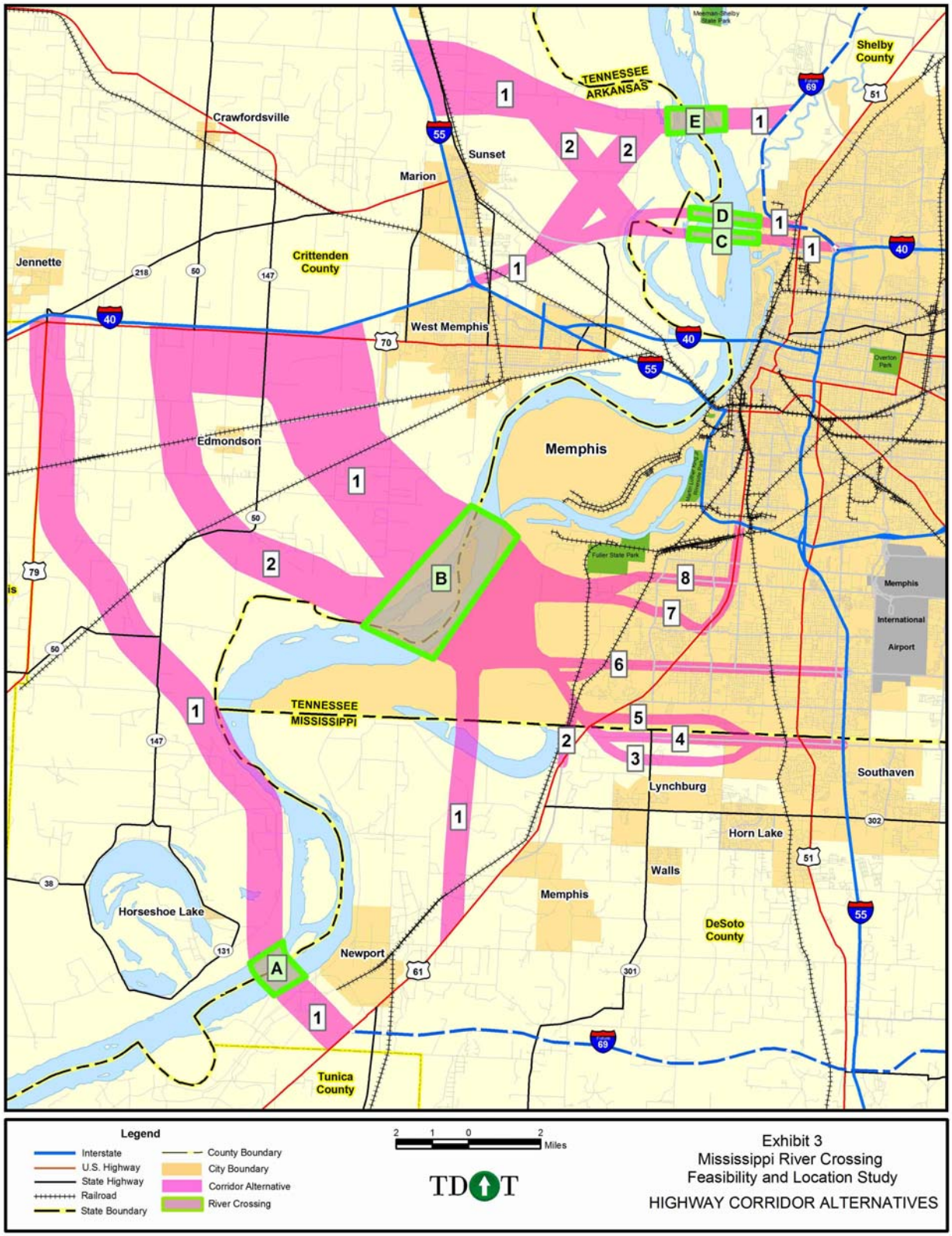


Exhibit 3
Mississippi River Crossing
Feasibility and Location Study
HIGHWAY CORRIDOR ALTERNATIVES

Other Transportation Modes

The scope of this study is centered on highway and rail transportation and does not fully address other transportation modes, such as bicycle, pedestrian, and public transit, including light rail. While no extensive analysis was made regarding the inclusion of all modes on a single structure, accommodation of other modes is considered feasible at present. Therefore, consideration should be given to incorporating or accommodating other modes as part of the proposed project during future phases of project development.

LEVEL 2 SCREENING PROCESS

The next step in the evaluation process was a Level 2 Screening process based on additional information gained during the study. As part of the Level 2 Screening process, each of the highway corridor alternatives was evaluated on:

- How well the corridor alternative meets the defined purpose and need of the project;
- Potential impacts of each corridor alternative on environmental and other community concerns, both positive and negative; and
- Cost estimates and engineering issues associated with the corridor alternative.

RESULTS OF ALTERNATIVES EVALUATION

The Level 2 Screening results were presented to the Project Advisory Team for the Mississippi River Crossing Location Study and at public meetings held in February. The results of the Alternatives Analysis and the public input are as follows:

- The corridor alternatives at Bridge A do not adequately meet the purpose and need for the project and is estimated to have one of the highest costs.
- All corridor alternatives east of the Mississippi River at Bridge B have the potential for major environmental impacts, and the Bridge B corridor alternatives are estimated to have some of the highest costs. However, many of the corridor alternatives were effective in meeting some of the purpose and need statements for the project.
- In comparison to corridor alternatives at the other bridge crossing locations, the corridor alternatives at Bridges C and D better meet the purpose and need for the project, have relatively fewer potential environmental impacts, and have among the lowest cost estimates.
- Corridor alternatives at Bridge E do not meet the primary purpose of the project as adequately as the corridor alternatives at Bridges C and D; otherwise, the corridor alternatives at Bridge E have approximately the same assessment as those at Bridges C and D, and are therefore somewhat redundant to the Bridges C and D corridor alternatives.

Jericho
Shelby County
TENNESSEE
ARKANSAS
Crawfordsville
Sunset
Marion
Crittenden County
West Memphis
Edmondson
Memphis
TENNESSEE
MISSISSIPPI
PROPOSED RAIL BYPASS
Southaven
Lynchburg
Horn Lake
Walls
Memphis
DeSoto County
Horseshoe Lake
Newport
Memphis International Airport
Legend
Interstate
U.S. Highway
State Highway
Railroad
State Boundary
County Boundary
City Boundary
Corridor Alternative
River Crossing
Miles
TDOT
Exhibit 4
Mississippi River Crossing
Feasibility and Location Study
RAIL CORRIDOR ALTERNATIVES

- The No Build Alternative would generate no traffic improvements or travel efficiency benefits and, therefore, would not incur positive economic impacts. The No Build Alternative would not involve new construction; therefore, no construction cost would be incurred and the alternative would not impact known environmental features; however, increased congestion, safety problems, reduced air quality, and other potentially negative community impacts could occur.

RECOMMENDATIONS

Following are some key factors that influenced the recommendations for the proposed project:

- The greatest traffic diversion and highest traffic volume (55,278 vpd) for any of the alternatives are produced at Bridges C and D; the lowest traffic volumes, VMT savings, and VHT savings would be at Bridge A.
- If the existing bridges were lost due to an earthquake or other catastrophic event, the overall economic impacts to the region could be in the range of $4.176 billion to $4.316 billion.
- Assuming that the construction of the new bridge will take five years, the median value of the total economic impacts (in the present value or in sum for employment) among the six new bridge alternatives over 20 years after the new bridge is built will be:
    - $2.2 billion increase in Gross Regional Product;
    - $1.5 billion increase in personal income; and
    - Increase of 32,500 job-years.
- Due to dramatic growth in freight movements, increased economic development in the Memphis area may occur by improving access to the areas associated with freight transportation along the Mississippi River.
- Potential areas for future economic development may be opened up if a new "West Connector" bridge crossing were located in proximity to the proposed I-69 route south of Memphis, i.e., in the vicinity of Bridge A.
- The corridor alternatives that best meet the purpose and need for the project are at Bridges C, D, and E; the corridor alternative at Bridge A is the least effective; and the Bridge B corridor alternatives meet a key purpose:, i.e., access to freight facilities.
- Environmental impacts for the corridor alternatives were lowest at Bridge A; highest at Bridge B; and relatively low at Bridges C, D, and E.
- Highway engineering, right of way, and construction cost estimates were developed for the corridor alternatives at the five crossing locations. It is assumed that engineering and construction of the corridors will begin in 2010. Therefore, all cost estimates are inflated by 3 percent per year up until 2010. Following are the approximate cost estimates:

    - Bridge A - $642 million
    - Bridge B - $607 million to $709 million
    - Bridge C - $512 million to $530 million
    - Bridge D - $501 million to $518 million

    - Bridge E - $449 million to $451 million
- Rail costs were developed at four locations. Bridge A is not considered a feasible location for a rail crossing. Following are approximate rail cost estimates:
    - Bridge B - $435 million to $443 million
    - Bridge C - $344 million
    - Bridge D - $344 million
    - Bridge E - $332 million

Based on the analysis of the corridor alternatives, Project Advisory Committee input, public input, and guidance from the Tennessee DOT, the study has found that providing a new Mississippi River Bridge Crossing is feasible.

Alternatives to be eliminated or carried into the next phase of project development are discussed in the following section:

Corridor Alternatives Eliminated

The previously developed corridor alternatives at Bridges A, B, and E should not be carried forward to the next phase. However, a revised corridor alternative for Bridge B should be considered, as discussed later in this Executive Summary.

Corridor Alternative for Future Development

Although Bridge A did not meet the draft purpose and need for this proposed project, a new river crossing at this location may help stimulate economic development at some future time. Therefore, a new "economic development" project in the Bridge A corridor should be defined and considered in future updates to the Memphis and West Memphis MPOs' long-range transportation plans, as well as TDOT's Statewide Transportation Plan.

Corridor Alternatives for the Next Phase

The following corridor alternatives are recommended to be carried into the next phase:

- The No Build alternative is a viable alternative and should be evaluated in more detail during the next phase of project development.
- Highway corridor alternatives for Bridges C and D should be combined and carried forward as a single corridor, with the multiple alternatives considered as alternative alignments in that corridor.
- Bridge B corridor alternatives were dismissed, primarily due to potential environmental impacts. However, some Bridge B alternatives were effective in meeting project purpose and need. Therefore, two revised Bridge B corridor alternatives are recommended for the next phase:
    - First, a revised version of Corridor Alternative 8 east of the river, designated as Corridor Alternative 8A, would tie more directly into I-55 to the north and, thus, avoid connections to surface streets to better avoid sensitive resources and provide better connectivity to the major highway network.

    - Second, a revised version of Corridor Alternative 3 east of the river (Corridor Alternative 3A) would extend south and east to improve access to I-55 near Hernando and Nesbitt, Mississippi.
- Rail corridor alternatives appear feasible within or in close proximity to all selected highway corridor alternatives and should be considered in more detail in the next phase of project development.

The corridor alternatives recommended for further project development or study are shown in **Exhibit 5**.

DESIGN CONSIDERATIONS

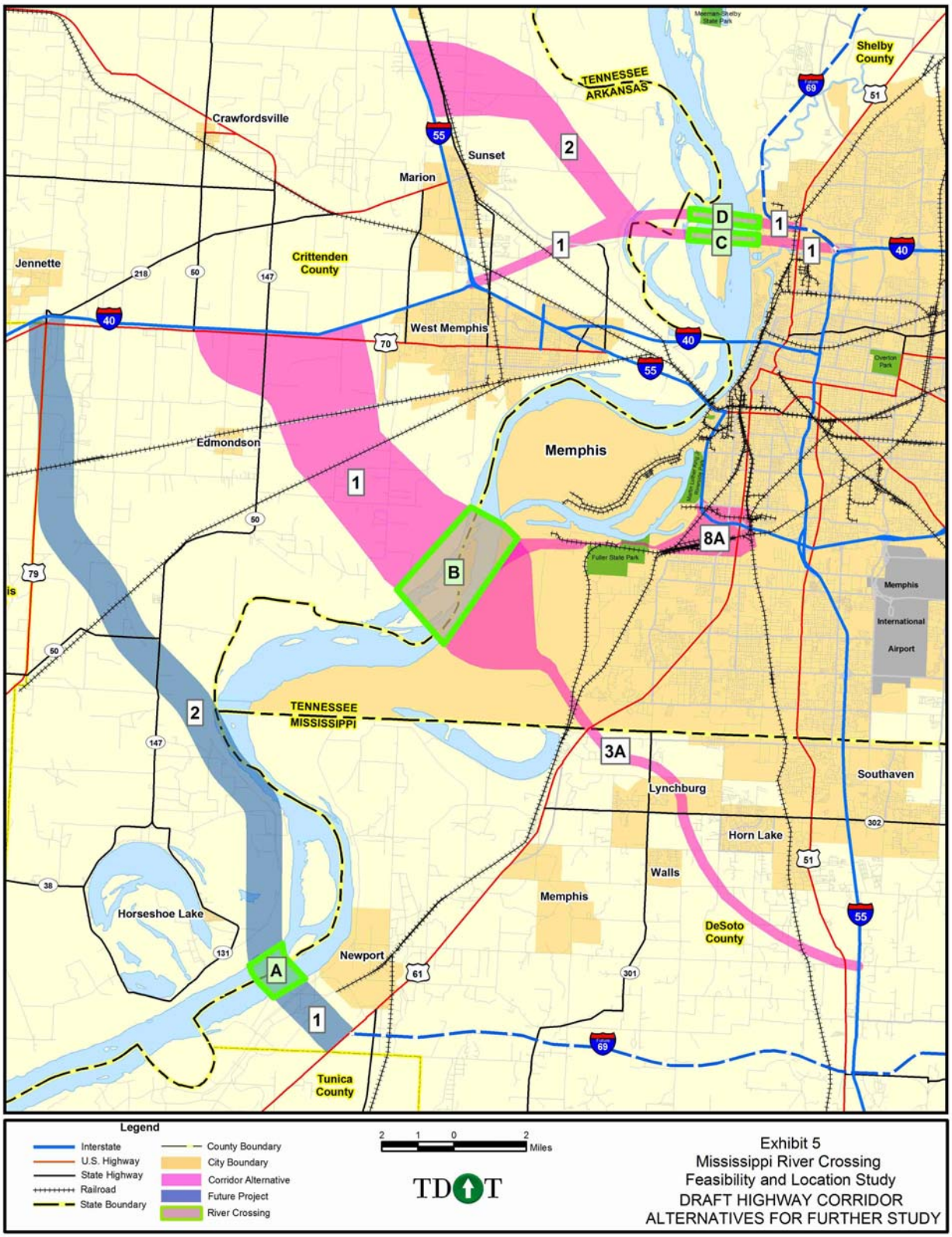
Design considerations for the recommended build alternatives are as follows, with adjustments based on the professional judgment of the design engineer(s):

- Expressway with full access control;
- Design speed of 70 mph for rural freeways and/or 55 mph for urban freeways, in accordance with AASHTO guidelines;
- Four 12-foot lanes with 12-foot merge-diverge lanes, as needed;
- 10-foot usable shoulders, if possible, plus clear zone, with adjustments to allow for special conditions;
- Divided median, with median width consistent with connecting roadways and in accordance with AASHTO guidelines;

OTHER KEY ISSUES

Some additional issues to be addressed in the Environmental phase of include:

- Location of rail bridge crossing;
- Analysis of related traffic operations efforts;
- Pedestrian and bicycle transportation accommodations, particularly in re-routing the Mississippi River Trail, currently routed over the I-55 bridge;
- Consideration of pubic transit, including light rail;
- Environmental Justice, particularly in Shelby and Crittenden Counties;
- Prime farmland in the study area;
- Lakes, creeks, and streams;
- The Mississippi River floodplain;
- Permits, especially 401 and 404 permits;
- Potential UST/HAZMAT sites in the study area;
- Historic or archaeological sites not yet identified;
- Project funding and project financing options (e.g., tolling);
- Suitability for achieving desirable seismic design;
- Mississippi River channel navigatability; and
- Proximity of air traffic to the bridge.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Corridor Alternative
Future Project
River Crossing
2 1 0 2 Miles
TDOT
Exhibit 5
Mississippi River Crossing
Feasibility and Location Study
DRAFT HIGHWAY CORRIDOR
ALTERNATIVES FOR FURTHER STUDY