CORRIDOR 18 FEASIBILITY STUDY

FINAL REPORT

Submitted by:
Wilbur Smith Associates
HNTB Corporation

November 1995

WILBUR
SMITH
ASSOCIATES
ENGINEERS • ECONOMISTS • PLANNERS

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November 15, 1995

Mr. Dan Flowers, Director
Arkansas State Highway &
Transportation Department
P.O. Box 2261
10324 Interstate 30
Little Rock AR 72203

RE: Corridor 18 Feasibility Study - 292570
Final Report

Dear Mr. Flowers:

We are pleased to submit the Final Report of the Corridor 18 Feasibility Study. The report describes the study analyses, findings and conclusions regarding a variety of topics which relate to the feasibility of Corridor 18. These include the cost, economic efficiency, economic development, financial viability and other features of this large-scale highway project.

As noted herein, the study's analyses indicate that the project is feasible and that, on balance, the Nation and the corridor would be better off with it. The financial analyses show that financing the project will be a major challenge.

We sincerely appreciate the opportunity to work with and for the Steering Committee.

Respectfully submitted,

WILBUR SMITH ASSOCIATES

James L. Covil, P.E.
Senior Vice President
Transportation Policy & Planning

JLC/rhd

TABLE OF CONTENTS

TITLE **PAGE**

TITLE **PAGE**

TITLE **PAGE**

TITLE PAGE

TITLE **PAGE**

LIST OF EXHIBITS

EXHIBIT NUMBER & TITLE PAGE

EXHIBIT NUMBER & TITLE **PAGE**

EXHIBIT NUMBER & TITLE **PAGE**

EXECUTIVE SUMMARY

The Corridor 18 Feasibility Study produced information regarding the cost, economic efficiency, impacts on economic development, financial viability and other relevant features of this large-scale highway project. This information will assist the eight participating states in making decisions regarding development of the project.

CORRIDOR 18 DESIGNATION

In the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Congress designated certain highway corridors of national significance to be included in the National Highway System. In this legislation, Corridor 18 was defined as extending from Indianapolis, Indiana to Memphis, Tennessee, via Evansville, Indiana. Subsequent legislation in 1993 amended this definition to extend the corridor from Memphis, Tennessee to Houston, Texas, via Shreveport-Bossier City, Louisiana. This feasibility study specifically addressed the Indianapolis/ Evansville/Memphis/Shreveport-Bossier City/Houston definition of Corridor 18.

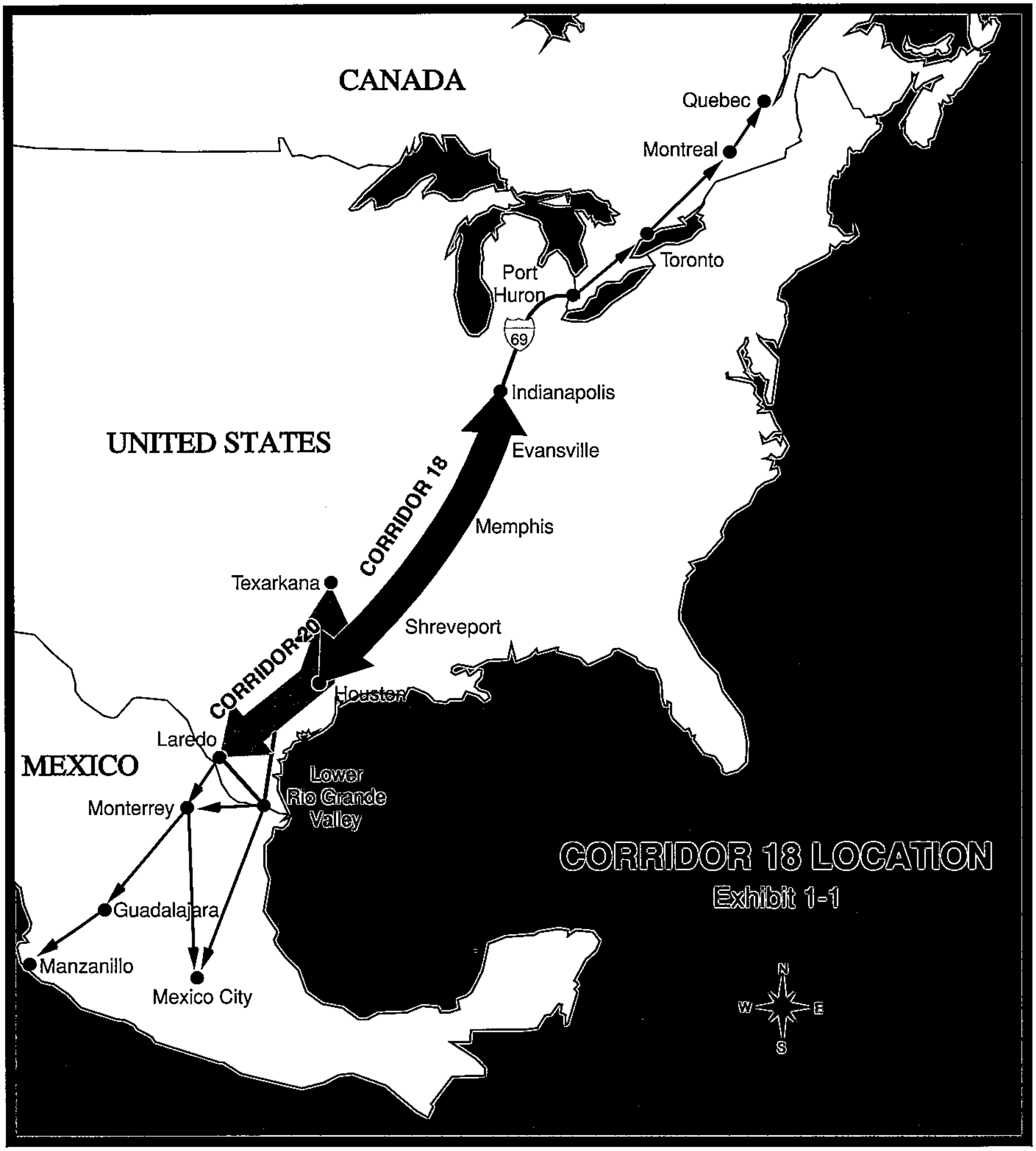
Additional legislation, proposed in June 1995 and currently pending in Congress, would extend Corridor 18 even further, from Houston to the Lower Rio Grande Valley at the Mexican border. While this extension has not yet been officially approved, the study took a very broad view and did consider the Houston/Mexican border portion in all relevant aspects of its analyses.

Corridor 20

A separate on-going study is being conducted for ISTEA Corridor 20 (U.S. 59) which includes a connection between Houston and Mexico at Laredo, Texas. Key members of the Corridor 18 Study Team also are participating in the Corridor 20 Study, thereby enabling considerable coordination between them.

I-69 Connection

As considered in this study, Corridor 18 would connect to I-69 in Indianapolis. As depicted in Exhibit 1, I-69 currently exists north of Indianapolis through Michigan to Port Huron, Michigan/Sarnia, Ontario, Canada. At this point, I-69 joins an Interstate-quality road that connects to Toronto, Montreal and Quebec.



CORRIDOR 18 LOCATION
Exhibit 1-1

Because of its connection to I-69, Corridor 18 sometimes has been referred to as the I-69 Corridor, although this is not technically correct.

A connection to I-69 is vital if Corridor 18 is to achieve its maximum potential. With it, Corridor 18 would provide a continuous facility from Canada to Mexico and would be an important land route serving trade between member countries in the world's largest trading block. Enactment of the North American Free Trade Agreement (NAFTA) in 1992 has given even more urgency to the development of routes like Corridor 18.

To achieve the maximum benefits from development of Corridor 18, some upgrading of I-69 likely will be required. For instance, the Truckway and High Speed Interstate-type Highway Concepts discussed subsequently in this Executive Summary and the main report would benefit from I-69 upgradings. The same is true for the connection from Houston to the Mexican border. The scope of work for this Feasibility Study did not address these upgradings.

PUBLIC PARTICIPATION

On November 7, 1994, a meeting was held in Memphis, Tennessee to permit those individuals and organizations interested in the outcome of this feasibility study to present their ideas to the Study Team. Although not a formal public hearing, this was an important opportunity for all interested parties to be heard regarding Corridor 18.

During this important meeting, the Steering Committee received information from 33 presenters from various areas of the corridor. Additionally, considerable presentation materials were received from the participants. These materials provided useful background information for the Study Team.

On September 25, 1995, a second public meeting was held in Memphis, Tennessee. At this meeting, results of the study were presented and questions were addressed concerning the study process, the results it yielded, and expectations for follow-up activities. The information in this Newsletter presents a summary of the materials presented at the second public meeting.

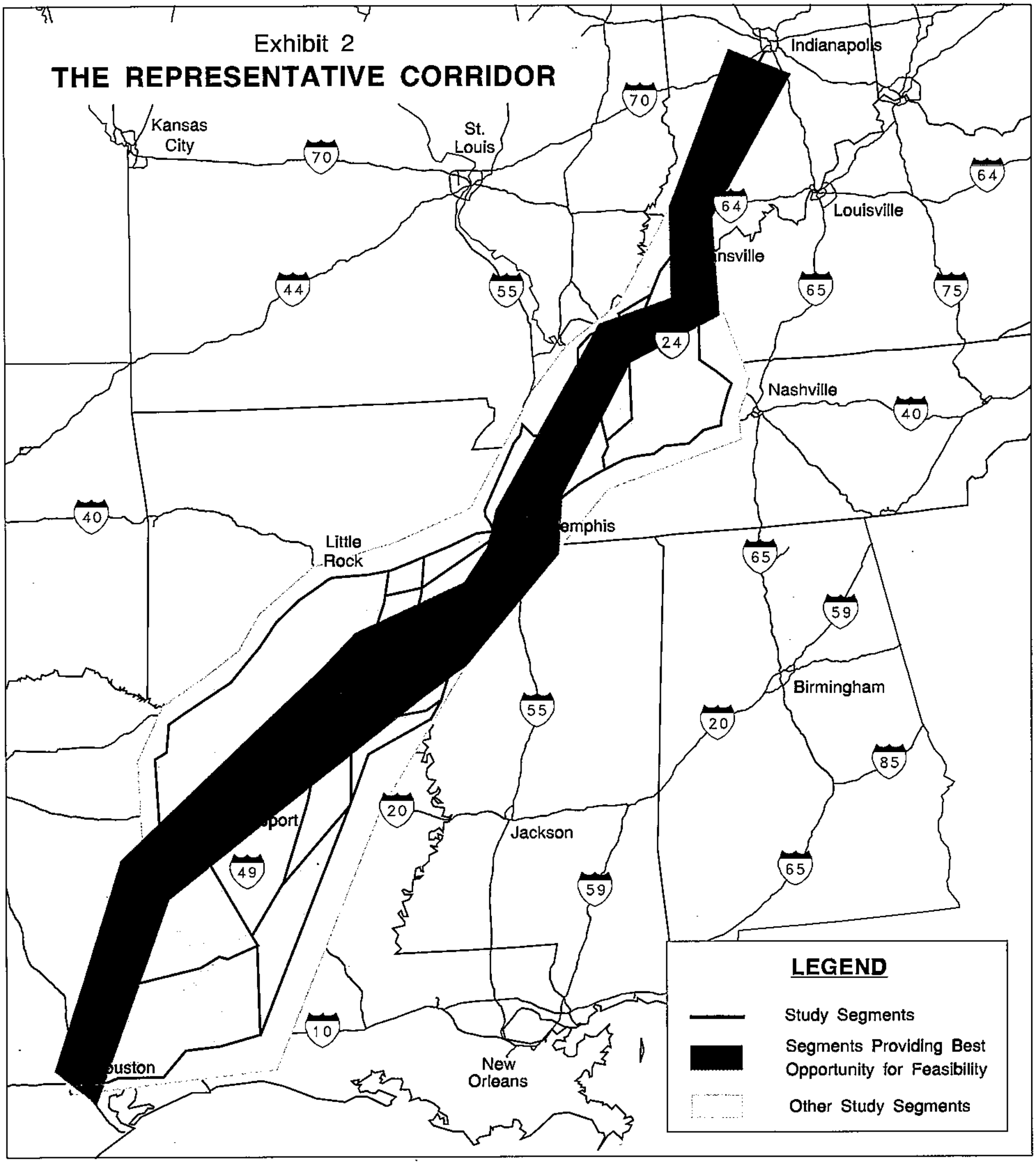


Exhibit 2
THE REPRESENTATIVE CORRIDOR
Kansas City
St. Louis
Indianapolis
Louisville
nsville
Nashville
emphis
Little Rock
Birmingham
Jackson
New Orleans
uston
port
70
70
64
64
44
55
65
75
24
40
40
65
59
55
20
20
85
49
59
65
10
LEGEND
Study Segments
Segments Providing Best Opportunity for Feasibility
Other Study Segments

REPRESENTATIVE CORRIDORS

An initial undertaking in the feasibility study was to compile suggestions from interested parties regarding suggested routes and portions of routes. Following reviews of all of these suggestions, the States participating in the study recommended 93 route segments for evaluation. Traffic, environmental and cost data were compiled for each of the 93 segments as an initial step in the Study's progressive screening process. This screening process involved reviews of segments to determine those which had the greatest potential for providing a feasible, continuous route from Indianapolis to Houston. These reviews became progressively more detailed until 12 Candidate Representative Corridors were identified. These 12 alternatives were deemed to be representative of the range of opportunities and constraints existing within the defined corridor.

Data regarding population served, traffic volumes, user time savings, project costs, environmental impacts, service to intermodal and military installations, and traffic relief to existing facilities were compiled for each of the 12 Candidate Representative Corridors. A scoring system was applied to facilitate identification of those alternatives with the most favorable attributes. Rankings were then established for each attribute. This was followed by a series of analyses in which different weights were assigned to the several attributes and comparative rankings were developed in a structured, systematic process.

Review of the various comparative rankings for the 12 alternatives revealed the Representative Corridor that had the most favorable overall ranking. While the Representative Corridor was not superior in every respect, overall it was found to have positive attributes which, on balance, identified it as the candidate that had the greatest opportunity for project feasibility. The Representative Corridor selected as the basis for the Study's detailed feasibility assessments is depicted in Exhibit 2.

As noted, the area encompassed by the Representative Corridor is sufficiently wide to provide flexibility in subsequent route location studies which would define more precisely the location of a Corridor 18 facility.

REPRESENTATIVE PROJECT COSTS

Construction cost estimates were developed upon the basis of generalized conditions within the Representative Corridor. While these estimates would vary somewhat based on specific features of the final alignment selected for a Corridor 18 facility, they provide a reasonable and realistic approximation for the Representative Corridor.

The construction cost estimate includes the mainline facility, bridges, right-of-way, environmental mitigation, and other elements. The cost of the 1,642 km (1,020 mile) facility was estimated to be about $5.5 billion in current day dollars. Annual maintenance and operations costs were estimated to average about $34 million for the full facility.

TRAVEL DEMANDS

Comprehensive reviews were made of both personal and freight travel by all transportation modes in the Corridor 18 region. Additionally, considerable analyses were made of international trade patterns and the anticipated impacts of the North American Free Trade Agreement (NAFTA).

These analyses show that a Corridor 18 facility would carry significant travel volumes on many segments in the year 2015. The higher volume segments are forecast to have daily traffic volumes in the range of 37,000 total vehicles.

By the year 2015, daily travel demand on Corridor 18 is estimated at 38 million vehicle-km (23 million vehicle-miles). A significant amount of this total traffic is forecast to be commercial vehicles. Trucks are projected to account for 26 percent of travel on the facility.

ECONOMIC EFFICIENCY

A public investment in Corridor 18 is "economically feasible" if the Nation's economy is better off with it than without it. For purposes of determining whether Corridor 18 is feasible from an economic efficiency perspective, transportation cost savings are viewed as benefits. That is, when the benefits to travelers and freight from time savings, greater safety and/or reduced vehicle operating costs, exceed the cost of providing a Corridor 18 facility, it is deemed to be economically feasible.

Economic Efficiency
Conventional Interstate-type Highway

- 1.39 Benefit/Cost Ratio
- $2.2 billion Net Present Value
- 9.9 percent Internal Rate of Return

Study analyses indicate that the ratio of benefits to cost for the entire Corridor is 1.39.

That is, for every dollar spent on it, Corridor 18 will produce $1.39 in user benefits.

These analyses show that the National economy will be better off by $2.207 billion if a Corridor 18 facility is built.

The project has an Internal Rate of Return of 9.9 percent, well in excess of the constant dollar discount rate of 7.0 percent recommended by the U.S. Office of Management and Budget (OMB) as a minimum value.

ECONOMIC DEVELOPMENT IMPACTS

Currently, much of the study area encompassed by Corridor 18 has below average per capita incomes. Indeed, certain areas rank as some of the most economically-depressed areas in the entire country.

A Corridor 18 facility would have significant positive effects on the economy of the study area. In aggregate, it is estimated that provision of such a facility would have the following results:

Economic Development Impacts
Conventional Interstate-type Highway

- Create 27,000 jobs (in 2025)
- Result in $11 billion in additional wages (1995-2025)
- Produce $19 billion in value added (1995-2025)

The Lower Mississippi Delta Development Commission studied and made recommendations regarding the economic needs, problems and opportunities of the Lower Mississippi Delta region. Currently, the transportation component of the Delta Initiatives Report is being updated. It is clear that a Corridor 18 facility would support the development initiatives that were promoted by this Commission.

The U.S. Department of Agriculture has underway a program which *"... confers upon rural distressed American communities the opportunity to take effective action to create jobs and opportunities."* One of the three designated Empowerment Zones is located in the study area of Corridor 18.

Additionally, six of the Enterprise Communities designated to participate in this program are within the study area. Provision of a Corridor 18 facility should be a benefit to the achievement of the purposes of this program.

FINANCIAL VIABILITY

Financing a project with a capital cost of $5.5 billion constitutes a major challenge.

An important potential source of revenue for such purposes could be the application of tolls along the facility. Subject to more detailed analyses, tolls could produce sufficient revenues to cover about one-third of the project costs. Although tolls could be the largest source of project-generated revenues, additional potential sources include joint use of right-of-way (e.g., fiber optic lines), telephone commissions (from telephone coinboxes) and advertising. There also are the possibilities of reducing the public share of project costs through right-of-way donations.

Study analyses suggest that the public funding requirement for Corridor 18 will be substantial. If these requirements are to be met by existing revenue sources, then Corridor 18 will have to compete with other funding needs of the corridor states, including preservation of existing infrastructure and other committed capital projects.

Special funding for Corridor 18 could be most instrumental in the implementation of the project. This could include both state and National initiatives.

ENVIRONMENTAL IMPACTS

The Corridor 18 study area includes some of the most extensive river systems and wetlands in the country. In addition, there are some threatened and endangered species within the corridor which potentially could be affected if a new facility is provided. Decisions regarding the final location of the facility must take these matters into consideration as well as the presence of National and state parks, forests and other wildlife and recreational areas and preserves. Also, there are some air quality non-attainment areas within the corridor which require special consideration.

Study analyses suggest that the 93 study segments provide ample opportunities to minimize the adverse impacts a Corridor 18 facility would entail. Indeed, within these segments, there is significant flexibility regarding final location that the vast majority of small environmentally sensitive areas can be avoided. Where this is not possible, there are opportunities for mitigation, the costs for which are included in the project costs reported herein.

SAFETY IMPACTS

A Corridor 18 facility will result in slightly more vehicle travel, thereby resulting in greater exposure to accidents. However, this additional travel, plus substantial volumes of traffic diverted from other facilities, will occur on an Interstate-type highway. Such highways have much better safety records than do facilities which do not have the special safety features of Interstate-type facilities. As a consequence, a Corridor 18 facility will result in a reduction in the number of accidents, injuries and fatalities that otherwise would occur.

INTERMODAL FACILITIES

Passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) has given increased emphasis to development of an efficient, seamless transportation system that utilizes the several transportation modes to do the things which they do best. One of the most important elements in creating a seamless transportation system is the provision of good access to major intermodal facilities.

Both large and small intermodal facilities are found throughout Corridor 18. Depending upon the location eventually selected for a Corridor 18 highway, many of these intermodal facilities will most likely enjoy a very significant improvement in their access to the regional, national and international transportation system. For instance, there are a number of railroad freight intermodal facilities which could benefit from a Corridor 18 facility, including those in Indianapolis, Evansville, Memphis and Houston. A Corridor 18 facility also could provide improved access to Amtrak's City of New Orleans passenger services. Certain waterports also could be served by a Corridor 18 highway, the largest of which are at Memphis and Houston (and other Texas ports served by Corridor 20 or other connecting facilities). Within Corridor 18 there are 11 airports with at least 50,000 annual passenger enplanements which could have improved intermodal connections if this facility is built. Improved highway access to the Memphis airport (and its Federal Express hub) also could have significant beneficial impacts upon air freight.

MILITARY INSTALLATIONS

The mobility of the armed services is critical to the Nation's defense. For example, a major emphasis of the Interstate Highway System was the value it had to the movement of defense personnel, equipment and supplies, as evidenced by its official designation as the Dwight D. Eisenhower System of Interstate and Defense Highways.

A Corridor 18 facility has the potential of serving a number of military locations, depending on the route location ultimately selected. This potential could include Crane Naval Surface Warfare Center in Indiana, Fort Campbell in Kentucky, Milan Arsenal and Memphis Defense Depot in Tennessee, and Fort Polk and Barksdale Air Force Base in Louisiana.

TRUCKWAY CONCEPT

The basic analyses undertaken in this feasibility study address the Interstate-type highway concept.

Because of the high potential of Corridor 18 being a major NAFTA route, analyses also were conducted to determine the effects if a truckway concept was implemented. While the concept is primarily aimed at facilitating long-distance freight movements, it also would serve shorter trips of a regional or local nature.

Economic Efficiency - Truckway Concept

- 1.64 to 2.42 Benefit/Cost Ratio
- $4.0 to $9.0 billion Net Present Value
- 11.6 to 16.5 percent Internal Rate of Return

Longer combination vehicle (LCVs) are viewed by freight carriers to be important enhancements to their productivity and efficiency. Although LCV operating costs are about 15 percent higher than conventional semi-trailer trucks, the ton-km cost savings can range from 20 to 50 percent.

The benefits to truck operators comes at the expense of higher capital and maintenance costs for highway infrastructure. Initial construction costs for a truckway concept in Corridor 18 are estimated to be:

- $6.2 billion
- Compared to $5.5 billion for a conventional Interstate-type highway, an increase of 12 percent.

Analysis of the relationship between benefits and costs reveal that, compared to the conventional Interstate-type highway, the benefits would exceed the additional costs required to accommodate the LCVs.

HIGH SPEED INTERSTATE-TYPE HIGHWAY CONCEPT

Major advances are being made regarding Intelligent Transportation Systems (ITS). Many of these are focused upon improved highway safety. It is quite likely that the resulting safety improvements could be so significant that an increase in vehicle speed limits is justified.

Economic Efficiency - High Speed Interstate-type Highway Concept

- 1.02 Benefit/Cost Ratio
- $145 million Net Present Value
- 7.1 percent Internal Rate of Return

Currently, research regarding the Automated Highway System (AHS) is not sufficiently advanced to permit full determination of all aspects of the system. With regard to these feasibility analyses, one of the most important unreconciled issues is the number of lanes required for different levels of system automation. Therefore, the study has had to make certain assumptions which subsequently may prove to be in need of modification. For study purposes, it was assumed that to achieve a system which permits speed limits of 130 km/h (80 mph), a minimum of three lanes in each direction would be required.

Based upon this assumption, initial construction costs for a high speed Interstate-type highway concept in Corridor 18 are estimated to be:

- $8.74 billion.
- Compared to $5.5 billion for a conventional Interstate-type highway, an increase of 59 percent.

CONCLUSIONS

Much of this study has focused upon the development of information to guide decision makers regarding the feasibility of a highway facility extending between Indianapolis/ Evansville / Memphis / Shreveport-Bossier City/ Houston. That is, the study has addressed the question: ***Does the project make sense and should it be built?***

The analyses indicate that the project is feasible and that, on balance, the Nation and the corridor would be better off with it. This conclusion is based upon the summary information presented in Exhibit 3.

Exhibit 3
OVERALL FEASIBILITY ASSESSMENT
Conventional Interstate-type Highway

CRITERIA	FINDINGS
Engineering Feasibility	■ No insurmountable obstacles are foreseen. ■ Capital Cost = $5.5 billion
Need	■ Would serve significant traffic volumes on most segments. ■ Would enhance freight transportation, including international, national and regional trade.
Economic Efficiency	■ Would provide $1.39 cents in travel benefits for every $1.00 in cost. ■ National productivity would be increased by the project's $2.2 billion Net Present Value.
Economic Development Impacts	■ Would help development in economically-depressed areas. ■ Would have positive benefits for the Corridor in terms of job creation, wages and value added. ■ Would support the Initiatives of the Lower Mississippi Delta Development Commission. ■ Would have a positive effect on the Rural Empowerment Zones and Enterprise Communities located in the area.
Financial Viability	■ All states in the Corridor have constrained budgets. ■ Special funding arrangements most likely will be required.
Environmental Impacts	■ Significant environmental challenges, especially wetlands. ■ Dependent upon final location decisions, no insurmountable obstacles are foreseen.
Safety Impacts	■ Safety will be enhanced by an upgraded highway facility. ■ Over 30 years, safety benefits would be: ➤ 1,300 lives saved ➤ 57,000 injuries avoided ➤ 80,000 property damage only accidents avoided
Intermodal Facilities and Military Installations	■ Improved access could be provided to several important intermodal facilities and military installations.

Chapter 1
INTRODUCTION

This document records the analyses, findings and conclusions produced by a 15-month feasibility study of a potential new continuous highway in Corridor 18 (as defined below). The study produced information regarding the cost, economic efficiency, impacts on economic development, financial viability and other relevant features of this macro-scale highway project. This information will assist the eight participating states in making decisions regarding development of the project.

CORRIDOR 18 DESIGNATION

In the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Congress designated certain highway corridors of national significance to be included in the National Highway System. Twenty-one of these "high priority corridors" were designated. They are mainly in regions that are not well served by the existing Interstate Highway System.

In this legislation, Corridor 18 was defined as extending from Indianapolis, Indiana to Memphis, Tennessee, via Evansville, Indiana. Subsequent legislation in 1993 amended this definition to extend the corridor from Memphis, Tennessee to Houston, Texas, via Shreveport-Bossier City, Louisiana. This feasibility study specifically addressed the Indianapolis/ Evansville/Memphis/Shreveport-Bossier City/Houston definition of Corridor 18.

Additional legislation, proposed in June 1995 and currently pending in Congress, would extend the corridor even further, from Houston to the Lower Rio Grande Valley at the Mexican border. While this extension has not yet been officially approved, the study took a very broad view and did consider the Houston/Mexican border portion in all relevant aspects of its analyses.

Corridor 20

A separate on-going study is being conducted on ISTEA Corridor 20 (U.S. 59) which includes a connection between Houston and Mexico at Laredo, Texas. Key members of the Corridor 18 Study Team also are participating in the Corridor 20 study, thereby enabling considerable coordination between them.

I-69 Connection

As considered in this study, Corridor 18 would connect to I-69 in Indianapolis. As depicted in Exhibit 1-1, I-69 currently exists north of Indianapolis through Michigan to Port Huron, Michigan/Sarnia, Ontario, Canada. At this point, I-69 joins an Interstate-quality road that connects to Toronto, Montreal and Quebec.

Because of its connection to I-69, Corridor 18 sometimes has been referred to as the I-69 Corridor, although this is not technically correct.

A connection to I-69 is vital if Corridor 18 is to achieve its maximum potential. With it, Corridor 18 would provide a continuous facility from Canada to Mexico and would be an important land route serving trade between member countries in the world's largest trading block. Enactment of the North American Free Trade Agreement (NAFTA) in 1992 has given even more urgency to the development of routes like Corridor 18.

To achieve the maximum benefits from development of Corridor 18, some upgrading of I-69 likely will be required. For instance, the truckway and High Speed Interstate-type Highway Concepts discussed subsequently in this report would benefit form I-69 upgradings. The same is true for the connection from Houston to the Mexican border. The scope of work for this Feasibility Study did not address these matters.

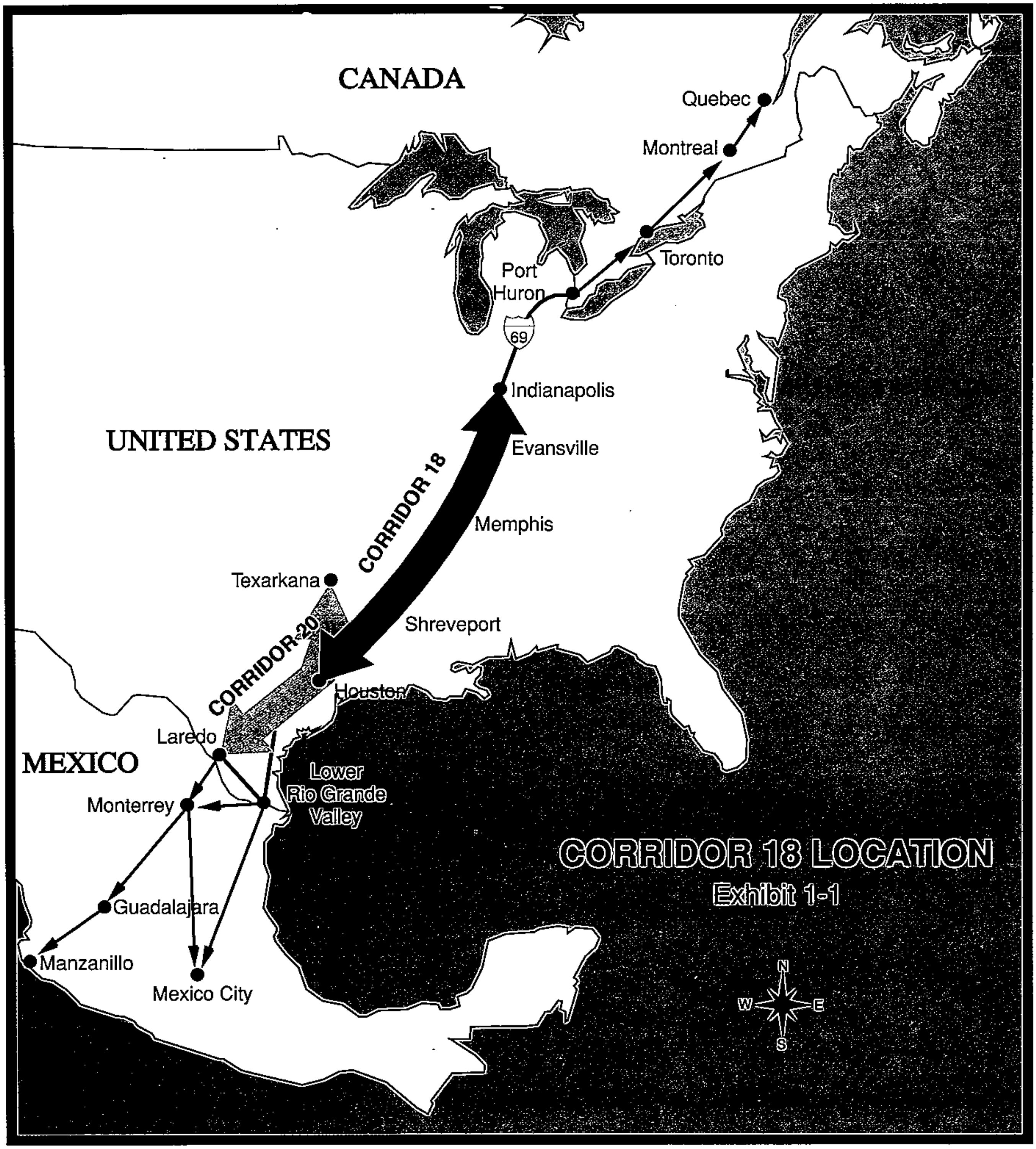
STUDY AREA

The general study area includes portions of Michigan, Indiana, Kentucky, Tennessee, Mississippi, Arkansas, Louisiana and Texas. The study area is sufficiently wide to permit identification of all reasonable alternatives for a continuous highway facility for this eight-state region.

STUDY PURPOSE

The focus of this Corridor 18 Feasibility Study was to determine the feasibility of developing a highway facility within the general location defined by the ISTEA legislation, as amended in 1993. Feasibility was determined by examining a number of important features associated with a large-scale facility of this type. These are:

- Engineering feasibility (constructability and cost)
- Need (people and freight utilization)
- Economic efficiency (user cost savings)


CANADA
Quebec
Montreal
Toronto
Port Huron
69
Indianapolis
UNITED STATES
Evansville
CORRIDOR 18
Memphis
Texarkana
Shreveport
CORRIDOR 20
Houston
Laredo
MEXICO
Monterrey
Lower Rio Grande Valley
Guadalajara
Manzanillo
Mexico City
CORRIDOR 18 LOCATION
Exhibit 1-1
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W
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S

- Economic development impacts (jobs, wages, value added)
- Financial viability (costs, revenues, funding)
- Other implications (environmental, energy, safety, military installations)

While the study examined various potential locations for a Corridor 18 facility, this was done as an analytical step in the process of determining the Corridor's feasibility. These examinations of potential locations were at a macro-scale and were not in sufficient detail to determine a preferred location. Subsequent studies would help select a specific location for the facility.

STUDY ALTERNATIVES

In addressing the feasibility of a new continuous highway facility within the Corridor 18 region, a broad vision of opportunities and constraints was maintained. This approach is particularly appropriate given the ongoing emphasis upon the development and implementation of Intelligent Transportation Systems (ITS). ITS is not a distant vision. Deployment, field operational tests and basic research are already underway regarding a wide range of potential technologies which will improve the safety and efficiency of the Nation's transportation systems. Development of a new, major highway such as Corridor 18 affords the opportunity to incorporate ITS into its basic design.

CORRIDOR 18
ALTERNATIVE TRANSPORTATION CONCEPTS

Principal Alternative
— Conventional Interstate-type Highway

Other Alternatives
— Truckway Concept
— High Speed Interstate-type Highway

Another important element in the study's broad vision is the potential for Corridor 18 to be a major facilitator for trade with Canada and Mexico. Data show that Texas is a major trading partner with Canada and Michigan is a major trading partner with Mexico. The NAFTA agreement holds the promise of increasing trade through the Corridor 18 region with these two neighbors. The connections to I-69 on the north and Corridor 20 on the south would make this a major route serving these major trading partners.

The basic analysis conducted in this feasibility study addressed a conventional Interstate-type highway. Two alternative transportation concepts also were investigated. One alternative was a truckway which would permit the operation of longer combination vehicles (LCVs). This alternative was addressed because of the potential beneficial effects of increased trucking efficiencies upon international, National, regional and local trade. Another concept examined in the study involved the deployment of significant ITS technologies. With the attendant improvements in safety, it was anticipated that increases in speed limits up to 130 km/h (80 mph) would be justified. The feasibility of these two alternatives are discussed subsequently in this report.

STUDY PROCESS

A comprehensive approach was taken to evaluate whether a highway facility within Corridor 18 is feasible. The study process involved a number of tasks and activities which were designed to progress logically from a very broad consideration of a variety of options to an assessment of those alternatives which seem to make the most sense. The process is depicted as follows:

Task A: Study Concepts and Procedures Task B: Existing Conditions	**BACKGROUND** ↓
Task C: Future Opportunities Task D: Concepts Evaluation Task E: Corridor Applications Task F: Feasibility Assessments	**ANALYSES** ↓
Task G: Study Conclusions	**RESULTS**

PUBLIC PARTICIPATION

On November 7, 1994, a meeting was held in Memphis, Tennessee to permit those individuals and organizations interested in the outcome of this feasibility study to present their ideas to the Study Team. Although not a formal public hearing, this was an important opportunity for all interested parties to be heard regarding Corridor 18.

During this important meeting, the Steering Committee received information from 33 presenters from various areas of the corridor. Additionally, considerable presentation materials were received from the participants. These materials provided useful background information for the Study Team.

On September 25, 1995, a second public meeting was held in Memphis, Tennessee. At this meeting, results of the study were presented and questions were addressed concerning the study process, the results it yielded, and expectations for follow-up activities.

During the course of the study, newsletters were distributed at important stages to keep all interested parties informed regarding the study's status and findings. Each newsletter identified contacts on the Steering Committee and the Consultant Team who were available to receive comments and information. Many parties took advantage of this opportunity. Each submission was duly recorded and information thus received was reviewed and kept on file throughout the study.

STUDY TEAM

The Corridor 18 Study Team was composed of representatives of each of the eight participating states, the Federal Highway Administration and a Consultant Team experienced in multi-state corridor feasibility studies.

Public Sector

Representatives of the eight participating states and the Federal Highway Administration were organized into a Steering Committee which reviewed study products as the study progressed, made key decisions regarding the directions to be taken, and provided overall guidance to ensure that relevant considerations were addressed. Steering Committee participants are identified in Exhibit 1-2.

The Arkansas State Highway and Transportation Department was the administrative agency for the study.

Consultant Team

The Consultant Team was comprised of:

- Wilbur Smith Associates (WSA), the prime contractor for the study. WSA is an international consulting, engineering, economics and planning firm which specializes in the transportation sector. Mr. James L. Covil, P.E., Senior Vice President, was the WSA Project Manager.
- HNTB Corporation, the principal subcontractor, is an international engineering, architecture, and planning firm. Mr. Joseph W. Guyton, P.E., Vice President, was the Deputy Project Director for the study.

Exhibit 1-2
STEERING COMMITTEE

STATE	PRINCIPAL MEMBER	ALTERNATE MEMBER	FORMER PARTICIPANT
Arkansas	Dan Flowers Director Arkansas State Highway & Transportation Department	Roger Almond Deputy Director & Chief Engineer Arkansas State Highway & Transportation Department	
Indiana	Debra Simmons Wilson Deputy Commissioner, Planning & Intermodal Transportation Indiana Department of Transportation	Steven Wuertz Development Specialist Indiana Department of Transportation	Katherine Lyon Davis Gunnar Rorbakken
Kentucky	John Carr Deputy State Highway Engineer Office of Intermodal Planning Kentucky Transportation Cabinet	Mohammed Taqui Transportation Engineer Specialist Kentucky Transportation Cabinet	David E. Smith Jimmy C. Wilson
Louisiana	Jude W.P. Patin Secretary Louisiana Department of Transportation	Lacey A. Glascock Deputy Secretary Louisiana Department of Transportation	
Michigan	William Hartwig Administrator of the Project Planning Division Michigan Department of Transportation	Gloria Siwek Transportation Planner Bureau of Transportation Planning Michigan Department of Transportation	Robert Kirkbride
Mississippi	James D. Quin Deputy Executive Director/ Chief Engineer Mississippi Department of Transportation	Marlin D. Collier State Planning Engineer Planning Division Mississippi Department of Transportation	Lowell T. Livingston
Tennessee	J. Bruce Saltsman, Sr. Commissioner of Transportation Tennessee Department of Transportation	Carl M. Wood, Jr. Deputy Commissioner Tennessee Department of Transportation	Carl Johnson Diane Thorne
Texas	Al Luedecke Director, Transportation Planning Texas Department of Transportation	Agustin Chavez Engineer of Intermodal Planning Texas Department of Transportation	Robert Cuellar
Federal Highway Administration	Peter A. Lombard Director, Office of Planning & Program Development Ft. Worth, TX Thomas R. Weeks Chief, Planning & Programming Branch Washington, DC	William D. Richardson Division Administrator Little Rock, AR	

- Supporting Team Members included four firms providing special expertise and support for the study:

  - Infrastructure Management Group, Inc. for financing
  - Jackson, Person & Associates for engineering technical support
  - Garver+Garver, P.A. for engineering technical support
  - GOTECH, Inc. for engineering technical support.

Chapter 2
CORRIDOR CONDITIONS

INTRODUCTION

Corridor conditions are discussed in this Chapter in terms of Physical Characteristics and Demographic/Economic Characteristics.

While the study corridor itself contains a number of economically depressed areas, Corridor 18 links two areas (Michigan and South Texas) dominant in trade with our neighbors in Canada and Mexico. North of the study area, Indianapolis is connected by I-69 to major border crossings in the Detroit/Port Huron area. The southern end of the study corridor connects with U.S. 59, a major arterial running between Houston and the major border crossing at Laredo. This chapter, therefore, concludes with a summary of international trade patterns and border crossing facilities.

PHYSICAL CHARACTERISTICS

PHYSICAL CHARACTERISTICS

This section describes physical and environmental characteristics that could affect facility location, constructability and cost. Physiographic regions are used to determine opportunities and constraints due to topography variations. This information is translated into general terrain types and used as a factor in developing construction cost estimates in Chapters 3 and 10.

River and wetland data are particularly important in this study to locate potential alignments because the study area generally follows major river basins. There are extensive wetlands to be avoided.

Inventories of protected forest, park lands, and threatened and endangered species are identified so that general alignments can be located to avoid or minimize impacts. Air quality data includes descriptions of study area cities not in compliance with National Ambient Air Quality Standards. The expected environmental impacts of a Corridor 18 facility are described in Chapter 9.

PHYSIOGRAPHIC REGIONS

The study area is divided into two general physiographic regions: the Interior Plains and the Coastal Plains. These regions, shown in Exhibit 2-1, contain distinct or subtle provinces. Their physical, topographic, geologic and environmental conditions can abruptly or gently blend together.

Interior Plains

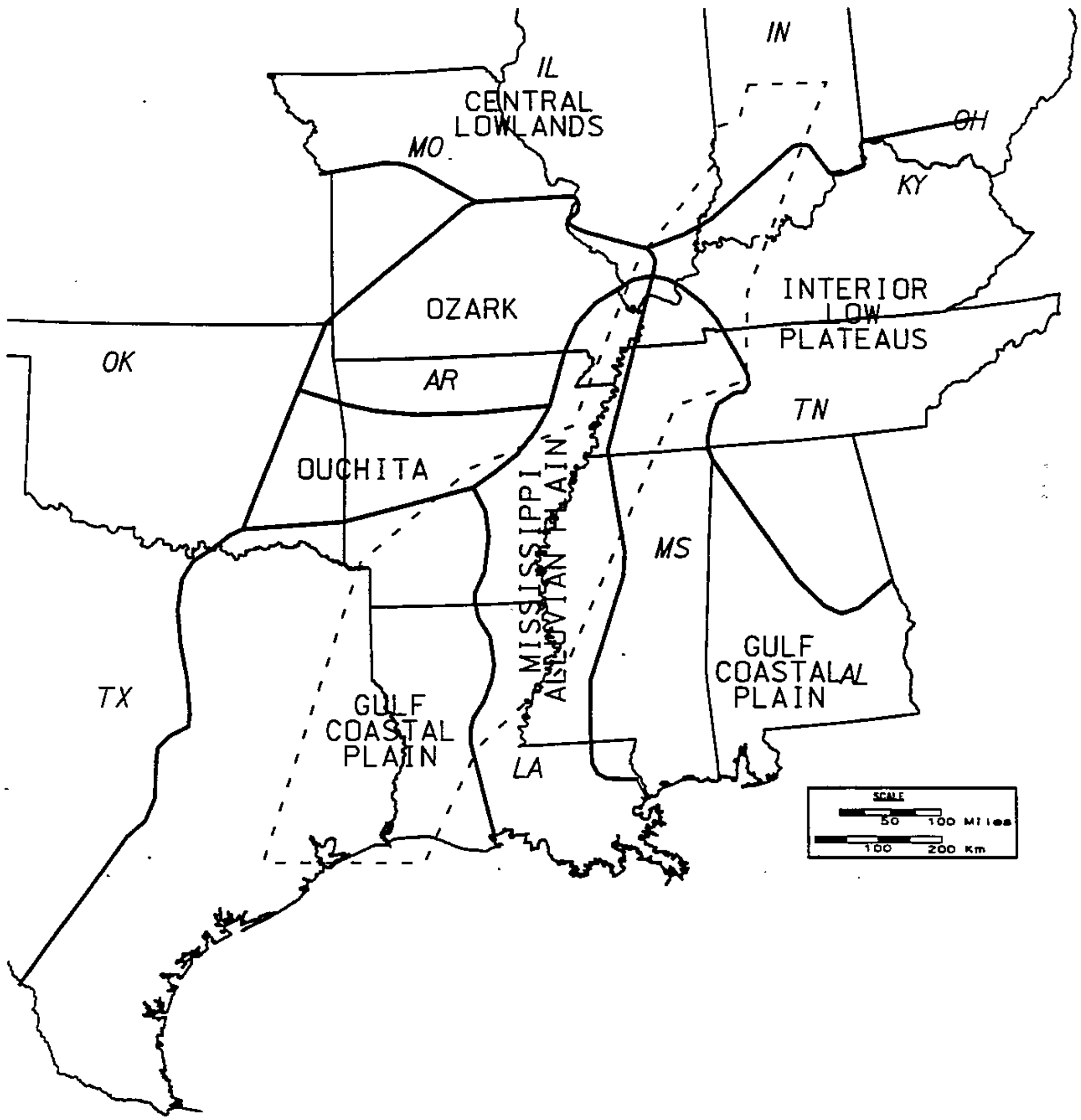
The portion of the Interior Plains that falls within the study area includes two similar provinces, the Central Lowlands and the Interior Low Plateaus. This is an area surrounded by higher land except for the southern gulf coast sediments. Altitudes range from below a hundred meters (300 feet) to a thousand meters (3,000 feet) above sea level. In the majority of the area, relief is measured in a few meters (30 feet) and occasionally up to a hundred meters (300 feet).

Geology is generally characterized by nearly horizontal layers of sandstone, limestone and shale. Domal structures, faulting, folding, igneous intrusions, and ancient mountain remnants are also located in this region.

The northern terminus of the study area (Indianapolis) lies in the Central Lowlands Province which covers generally an area from Mid-Ohio to Mid-Kansas, but in the study area only extends from Indianapolis and south along a line from south of Indianapolis to north of Cairo. This area is characterized by nearly horizontal Paleozoic sedimentary rocks and a topography of gently rolling plains. The landforms, soils and drainage in this region are largely a result of continental glaciation. Major drainages and the current river systems are a result of the massive quantities of melt water and include the Mississippi, Ohio, Missouri, and Wabash Rivers. Events during the glacial period also aided in the process of forming wide valleys and deep alluvial sediments associated with these rivers.

The Interior Low Plateaus lies south of the Central Lowlands. Its southern limit extends from Cairo to near the junction of the states of Mississippi, Alabama and Tennessee. Much of the bedrock is also obscured in this area due to glaciation. The area is structurally characterized as a low dome which has led to the formation of a series of cuestas and scarps.

One of the major cuestas is called the Dripping Springs Escarpment in the southern region of Kentucky. Chert rich layers of limestone and sandstone form the cuestas. Consequently, in limestone areas, water has taken an



Physiographic Provinces

Exhibit 2-1

underground path and the karst plain south of the Dripping Springs Escarpment, in the area of western Kentucky, is an area of thousands of sinkholes and many disappearing streams with caves a common occurrence.

Coastal Plains

The Gulf Coastal Plain, with the large subsection of the Mississippi Alluvial Plain, underlie the remainder of the study area from roughly the junction of the Ohio and Mississippi Rivers to the southern terminus of the study area at Houston.

The plain is underlain by poorly consolidated sediments which dip gently seaward. This is generally an area of low relief, measured in a few meters (ten or so feet) with the major hills extending 60 to 90 meters (200 to 300 ft) above the surroundings. This area also includes the recent sediments of the Mississippi River which over its history has meandered across the landscape creating a valley 40 km (25 miles) to over 160 km (100 miles) wide. The valley contains these various alluvial sediments to depths of nearly 100 meters (300 hundred feet).

This valley has many abandoned channels, oxbow lakes, and wide, marshy, flood-plain flats. It extends southward until it merges with the present delta plain at approximately the head of the Atchafalya River, where the approximate eastern limit of the study area crosses the Mississippi River. The valley sides are marked by prominent bluffs which rise 30 to 60 meters (100 to 200 feet) above the valley floor.

The essentially flat floor of the valley is interrupted by Crowleys Ridge which protrudes about 60 meters (200 feet). The ridge extends in a north-south direction for over 300 km (200 miles) from a point near Commerce, Missouri to Helena, Arkansas.

The remainder of the study area lies within the West Gulf Section of the Coastal Plain. Cuesta ridges with intervening lowlands roughly parallel the coast. In the coastal zone near Houston, there are a number of estuaries and a few alluvial filled valleys. Along eastern Texas the coastal zone is characterized by a complex of relict beach ridges which lie parallel to the present coastline.

TERRAIN TYPES

The physiographic regions directly correspond to terrain type classifications that influence the cost of construction. Terrain type information is used in Chapters 3 and 10 to develop generalized costs estimates. It is typically less costly to construct a facility in a flat plain than in rolling hills. Since most of the study area is in the Mississippi Alluvial Plain Region, it is primarily categorized as flat. North of Tennessee the study area is in the Interior Low Plains, which is the rolling terrain type. The Central Lowlands also fall under the category of rolling terrain.

To the south, the study area is in the Gulf Coastal Region, which is also classified as flat. General terrain types are illustrated in Exhibit 2-2.

SEISMIC CATEGORIES

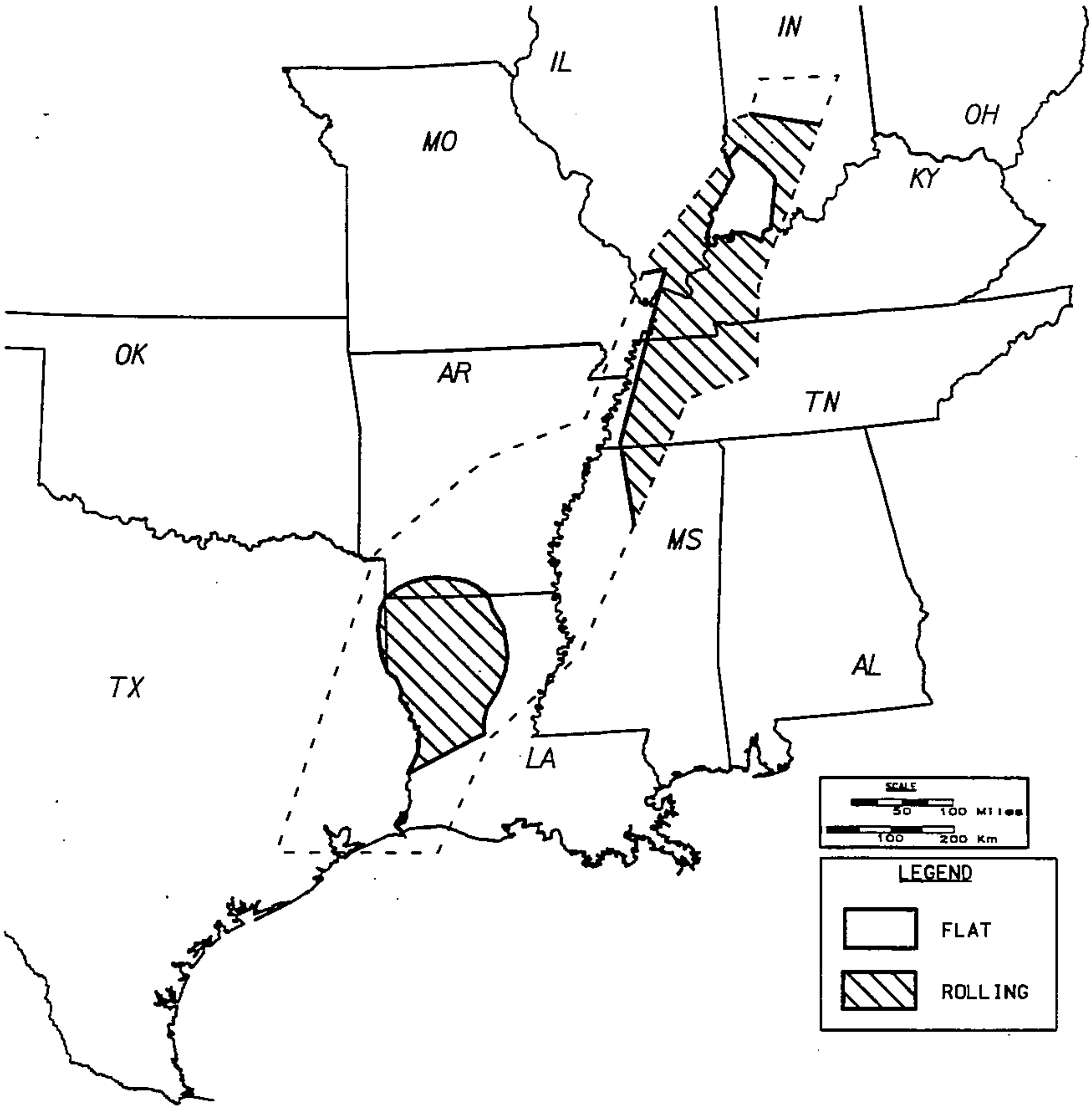
The probability and severity of seismic activity is a significant consideration within the study area. The possibility of seismic activity will impact design. Exhibit 2-3 illustrates the areas where seismic activity is of most concern. Areas delineated are the Seismic Importance Classification zones for the design of essential bridges, as presented in the fifteenth edition of AASHTO's Standard Specifications for Highway Bridges.

While the specific zones relate to bridge design, they also indicate the areas where seismic activity is of most concern. The seismic importance classification range from A to D with D being the most severe condition. The AASHTO bridge analysis procedure requires no detailed seismic analysis for bridges in Seismic Importance Classification A.

The major area of concern within the study area is along the Mississippi River adjacent to Missouri, Illinois, Arkansas, and Tennessee. This area has a Seismic Importance Classification of D. It is commonly known as the New Madrid Fault Zone.

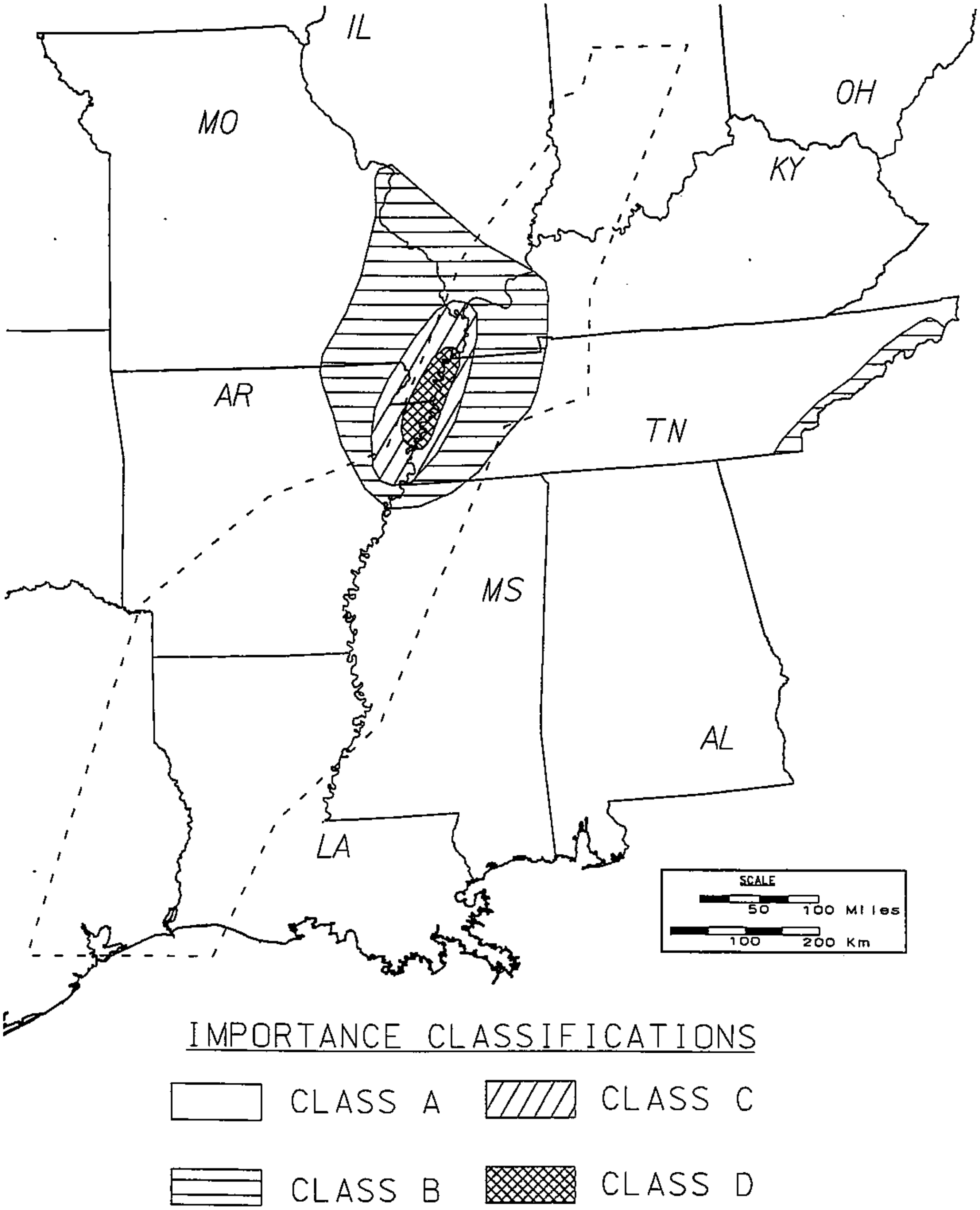
RIVERS AND WETLANDS

The Corridor 18 Study Area includes some of the most extensive river systems in the country. Commencing at its northern terminus, Indianapolis, the corridor proceeds through the Ohio River watershed. To the north of the Ohio River, the orientation of its major tributary rivers, such as the White and the Wabash, is primarily southern (including both southwest and southeast). The Tennessee River, flowing northward, is near the



Terrain Types

Exhibit 2-2



Seismic Performance Categories

Exhibit 2-3

eastern edge of the Corridor 18 study area. The Tennessee along with the Cumberland form the Land Between the Lakes Region of Tennessee and Kentucky.

Continuing southward, the western boundary includes the Bootheel Region of Missouri, an area which includes an extensive man-made drainage system. From this area southward, many of the rivers parallel the Mississippi for some distance before eventually flowing into it, such as the St. Francis River. The White and the Arkansas Rivers drain much of the central and northern portion of the state before terminating at the Mississippi.

Louisiana is bisected by the Red River and this river forms the central watershed for much of the western and central portions of the state. The Sabine river, which forms the boundary between Louisiana and Texas, and the Neches both flow into the Gulf of Mexico.

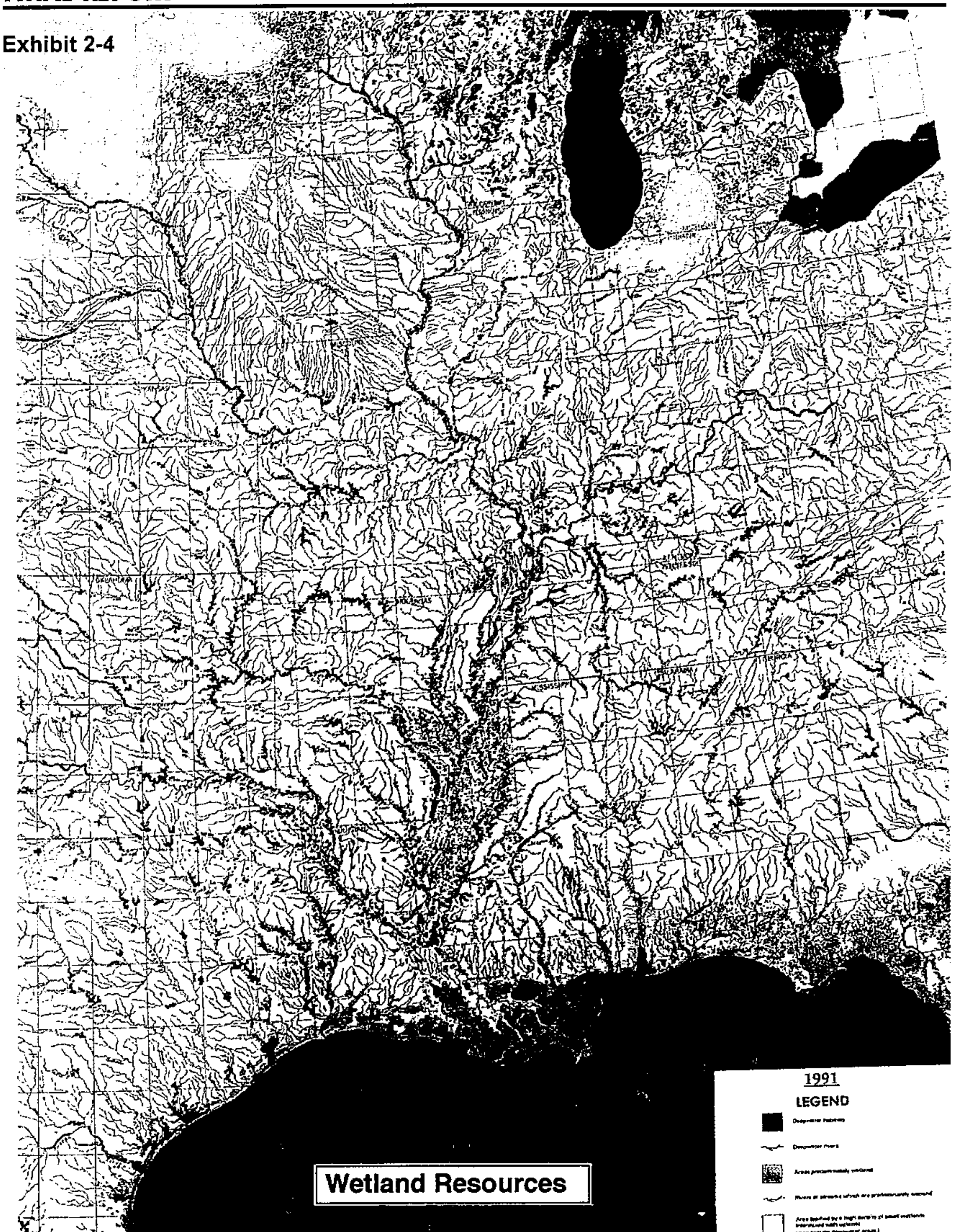
In addition to river systems, the study area includes some of the most extensive wetlands in the country. Generalized wetlands are shown on Exhibit 2-4. These wetlands areas meet the U.S. Fish and Wildlife Service definition of wetlands. It should be considered as a guide to locations of major areas of wetlands in the corridor region and not definitive as to precise locations for roadway alignment purposes.

The Mississippi River bottom lands support extensive wetland systems consisting of bottomland hardwood forests, swamps, sloughs, bayous, marshes, as well as, riverain forest wetlands. There are extensive wetland systems south of the Mississippi/Tennessee state boundary.

The wetland data presented here is general in nature because the representative corridor described in Chapter 3 is a broad band identified to determine feasibility. Additional data would be necessary to determine specific alignment.

The USDA Soil Conservation Service (SCS) has mapped hydric soils, one of the components of a wetlands system, and this data can be overlaid with the National Wetlands Inventory Mapping to refine the wetland areas under consideration. The SCS is also in the process of mapping the farmed wetlands,

Exhibit 2-4



wooded wetlands, and prior converted wetlands. This data would need to be incorporated in later studies if Corridor 18 planning moves forward to more detailed environmental analysis and engineering.

FORESTS AND PARK LANDS

Within the Study Area there are numerous natural resources. The following are the major sites and species protected by Federal law:

Number	Resources
57	National Forests and Recreational Areas (Exhibit 2-5)
130	State Parks, Wildlife Refuges, and Forests (Exhibit 2-6)

There are also smaller sites and historical sites that would be considered to identify specific alignments.

THREATENED AND ENDANGERED SPECIES

There are over 100 species in the study area that are federally protected. Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires Federal agencies, in consultation with and with the assistance of the Secretaries of the Departments of Interior and Commerce, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

Under the law, the Secretary of the Interior acting through the Fish and Wildlife Service (FWS) and the Secretary of Commerce acting through the National Marine Fisheries Service (NMFS) have broad powers to protect and conserve all forms of wildlife, plants, and marine life they find in serious jeopardy.

The Threatened and Endangered Species List shown in Exhibit 2-7 identifies those Federally listed threatened and endangered species which potentially could occur within the study area.

Exhibit 2-5
NATIONAL FORESTS AND RECREATION AREAS IN THE STUDY AREA

Indiana
1. Hoosier National Forest Purchase Area
2. Hardin Ridge Recreation Area
3. Hoosier National Forest Purchase Area

Illinois
4. Shawnee National Forest

Kentucky
5. Land Between the Lakes

Tennessee
6. Cross Creeks National Wildlife Refuge
7. Fort Donelson National Military Park
8. Tennessee National Wildlife Refuge (Duck River Unit)
9. Tennessee National Wildlife Refuge (Big Sandy Unit)
10. Gooch Waterfowl Management Area
11. Reelfoot National Wildlife Refuge
12. Lake Isom National Wildlife Refuge
13. Hatchie National Wildlife Refuge

Mississippi
14. Holly Springs National Forest
15. Sardis Waterfowl Refuge
16. O'Keefe Waterfowl Refuge
17. Malmaison Waterfowl Refuge
18. Morgan Brake National Wildlife Refuge
19. Yazoo National Wildlife Refuge
20. Indian Bayou Waterfowl Refuge
21. Hillside National Wildlife Refuge
22. Panther Swamp National Wildlife Refuge
23. Delta National Forest
24. Vicksburg National Military Park
25. Grand Gulf Military Park

Arkansas
26. Big Lake National Wildlife Refuge
27. Wapanocca National Wildlife Refuge
28. St. Francis National Forest
29. White River National Wildlife Refuge
30. Overflow National Wildlife Refuge
31. Felsenthal National Wildlife Refuge

Louisiana
32. Coulee Refuge
33. Upper Ouachita National Refuge
34. D'Arbonne National Refuge
35. Caney Ranger District
36. Caney Ranger District
37. Caney Ranger District
38. Tensas River National Refuge
39. Catahoula National Refuge
40. Catahoula Ranger District
41. Catahoula Ranger District
42. Catahoula National Preserve
43. Kisatchie Ranger District
44. Red Dirt National Refuge
45. Evangeline Ranger District
46. Vernon Ranger District
47. Sabine Refuge
48. Sabine Refuge
49. Cameron Prairie National Refuge

Texas
50. Davy Crockett National Forest
51. Angelina National Forest
52. Sabine National Forest
53. Big Thicket National Preserve
54. Sam Houston National Forest
55. Texas Point National Wildlife Refuge
56. McFadden National Wildlife Refuge
57. Anahuac National Wildlife Refuge

Exhibit 2-6
STATE PARKS, WILDLIFE REFUGES, AND FORESTS IN THE STUDY AREA

Indiana

1. Raccoon Lake State Recreation Area
2. Lieber State Recreation Area
3. Owen-Putnam State Forest
4. McCormick's Creek State Park
5. Morgan-Monroe State Forest
6. Atterbury Fish and Wildlife Area
7. Driftwood State Fishing Area
8. Yellowwood State Forest
9. Brown County State Park
10. Paynetown State Recreation Area
11. Shakamak State Park
12. Greene-Sullivan State Forest
13. Spring Mill State Park
14. Martin State Forest
15. Glendale State Fish and Wildlife Area
16. Springs Valley State Fish and Wildlife Area
17. Lick Fork State Recreation Area
18. Tillery Hill State Recreation Area
19. Newton-Stewart State Recreation Area
20. Pike State Forest
21. Patoka State Fish and Wildlife Area
22. Ferdinand State Forest
23. Lincoln State Park
24. Harmonie State Park
25. Hovey Lake State Fish and Wildlife Area

Kentucky

26. Yellowbank Wildlife Management Area
27. Hawes State Park
28. John James Audubon State Park
29. Sauerheber Wildlife Refuge
30. Higgins-Henry Wildlife Management Area
31. Pennyrile State Forest
32. Lake Malone State Park
33. Lake Barkley State Park
34. Kenlake State Park
35. Ballard County Wildlife Management Area
36. Peal Wildlife Management Area

Tennessee

40. Stewart State Forest
41. Nathan Bedford Forest State Park
42. Paris Landing State Park
43. Natchez Trace State Park and Forest
44. Chickasaw State Park and Forest
45. Reelfoot Lake State Park
46. Tigret Wildlife Management Area
47. Moss Island State Waterfowl Refuge
48. Meeman Shelby State Park and Forest

Mississippi

49. Upper Sardis Game Management Area
50. John W. Kyle State Park
51. George Payne Cossar State Park
52. Great River Road State Park
53. Malmaison Game Management Area
54. Hugh White State Park
55. Florewood River Plantations State Park
56. Stoneville Game Management Area
57. Winterville Mounds State Park
58. Leroy Percy State Park
59. Leroy Percy Game Management Area
60. Shipland Game Management Area
61. Sunflower Waterfowl Refuge
62. Sunflower Game Management Area
63. Isaquena Game Management Area

Arkansas

64. Big Lake Wildlife Management Area
65. Hampton Museum State Park
66. Dagmar Wildlife Management Area
67. Wattensaw Wildlife Management Area
68 Trusten Holder Wildlife Management Area
69. Bayou Meto Wildlife Management Area
70. Toltec Mounds State Park
71. Lake Catherine State Park
72. Hope Wildlife Management Area
73. Bois D'Arc Creek Wildlife Mgmt. Area
74. Poison Springs Wildlife Management Area

Exhibit 2-6 (continued)
STATE PARKS, WILDLIFE REFUGES, AND FORESTS IN THE STUDY AREA

Louisiana	Louisiana (continued)
82. Poverty Point	109. Ft. Jesup State Commemorative Area
83. Chemin A Haut State Park	110. Sabine Wildlife Area
84. Georgia Pacific Wildlife Area	109. North Toledo Bend State Park
85. Union Wildlife Area	110. Peason Ridge Wildlife Area
86. Lake D'Arbonne State Park	111. Anacoco-Prairie Game and Fish Preserve
87. Lake Claiborne State Park	112. Boise-Vernon Wildlife Area
88. Bodcau Wildlife Area	113. Fort Polk Wildlife Area
89. Black Bayou Game and Fish Preserve	114. Alexander State Forest Area
90. Soda Lake Wildlife Area	115. Bundicks Fish and Game Preserve
91. Lake Bistineau State Park	116. West Bay Wildlife Area
92. Lake Bistineau Game and Fish Preserve	117. Sam Houston Jones State Park
93. Loggy Bayou Wildlife Area	118. Sabine Island Wildlife Area
94. Jackson Bienville Wildlife Area	119. Niblets Bluff Park
95. Cheniere Banks Fish Preserve	
96. Russell Sage Wildlife Area	Texas
97. Ouachita Wildlife Area	120. Atlanta State Park
98. Boeuf Wildlife Area	121. Caddo Lake State Park
99. Big Lake Wildlife Area	122. Martin Creek Lake State Park
100. Sicily Island Hills Wildlife Area	123. Jim Hogg State Park
101. Lake Bruin State Park	124. Rusk/Palestine State Park
102. N.W. Louisiana Game and Fish Preserve	125. Caddoan Mounds State Park
103. Iatt Lake Game and Fish Preserve	126. Martin Dies Jr. State Park
104. Saline Wildlife Area	127. Lake Livingston State Park
105. Fort St. Jean Baptiste SCA	128. Stephen F. Austin State Park
106. Mansfield State Commemorative Area	129. San Jacinto Battleground
107. Revel State Commemorative Area	130. Brazos Bend State Park
108. Los Adeas State Commemorative Area	

Exhibit 2-7
THREATENED AND ENDANGERED SPECIES LIST

Indiana		
Gray myotis	Myotis grisescens	Endangered
Indiana or social myotis	Myotis sodalis	Endangered
Gray wolf	Canis lupis	Endangered
Red wolf	Canis rufus	Endangered
Mountain lion	Felis concolor	Endangered
Bald eagle	Haliaeotus leucocephalus	Endangered
Peregrine falcon	Falco peregrinus	Endangered
Piping plover	Charadrius melodus	Endangered
Interior least tern	Sterna antillarcer athalassos	Endangered
Kirtland's warbler	Dendroica kirtlandii	Endangered
Trumpeter swan	Cygnus buccinator	Endangered
White wartyback pearly mussel	Plethobasus cicatricosus	Endangered
Orange-foot pimpleback	Plethobasus cooperianus	Endangered
Clubshell	Pleurobema clava	Endangered
Rough pigtoe pearly mussel	Pleurobema plenum	Endangered
Eastern fanshell pearlymussel	Cyprogenia stegaria	Endangered
Fat pocketbook pearly mussel	Potamilus capax	Endangered
Pink mucket mussel	Lampsilis abrupta	Endangered
White cat's paw pearlymussel	Epioblasma obliquata perobliqua	Endangered
Tubercled blossom	Epioblasma torulosa torulosa	Endangered
Northern riffleshell	Epioblasma torulosa rangiana	Endangered
Cracking pearlymussel	Hemistena lata	Endangered
Ring pink mussel	Obovaria retusa	Endangered
Purple cat's paw pearly mussel	Epioblasma obliquata obliquata	Endangered
Karner blue butterfly	Lycaeides melissa samuelis	Endangered
Mitchell's satyr	Neonympha mitchellii	Endangered
American burying beetle	Nicrophorus americanus	Endangered
Running buffalo clover	Trifolium stoloniferum	Endangered
Dune thistle	Cirsium pitcheri	Threatened
Mead's milkweed	Asclepias meadii	Threatened
Prairie white-fringed orchid	Platanthera leucophaea	Threatened
Illinois		
Fanshell	Cyprogenia stegaria	Endangered
White cat's paw pearly mussel	Epioblasma obliquata perobliqua	Endangered
Tubercled-blossom pearly mussel	Epioblasma torulosa torulosa	Endangered
Cracking pearlymussel	Hemistena lata	Endangered
Ring pink mussel	Obovaria retusa	Endangered
White wartyback pearly mussel	Plethobasus cicatricosus	Endangered
Orange-footed pearly mussel	Plethobasus cooperianus	Endangered
Rough pigtoe pearly mussel	Pleurobema plenum	Endangered
Fat pocketbook pearly mussel	Potamilus capax	Endangered
Peregrine falcon	Falco peregrinus	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Least tern	Sterna antillarum	Endangered
Gray bat	Myotis grisescens	Endangered
Indiana bat	Myotis sodalis	Endangered
Mead's milkweed	Asclepias meadii	Threatened

Exhibit 2-7 (continued)
THREATENED AND ENDANGERED SPECIES LIST

Kentucky		
Gray bat	Myotis grisescens	Endangered
Indiana bat	Myotis sodalis	Endangered
Eastern cougar	Felis concolor cougar	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Least tern	Sterna antillarum	Endangered
Relict darter	Etheostoma chienensa	Endangered
Pallid sturgeon	Scaphirhynchus albus	Endangered
Orange-footed pearly mussel	Plethobasus cooperianus	Endangered
Pink mucket pearly mussel	Lampsilis orbiculata	Endangered
Purple cat's paw pearly mussel	Epioblasma obliquata obliquata	Endangered
Ring pink mussel	Obovaria retusa	Endangered
Price's potato-bean	Apios priceana	Threatened
Missouri		
Western fan-shell	Cyprogenia aberti	Endangered
Fat pocketbook pearly mussel	Potamilus capax	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Tennessee		
Gray bat	Myotis grisescens	Endangered
Florida panther	Felis concolor coryi	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Least tern	Sterna antillarum	Endangered
Bachman's warbler	Vermivora bachmanii	Endangered
Slender chub	Hybopsis cahni	Threatened
Pygmy madtom	Noturus stanauli	Endangered
Yellowfin madtom	Noturus flavipinnis	Threatened
Birdwing pearly mussel	Conradilla caelata	Endangered
Dromedary pearly mussel	Dromus dromas	Endangered
Fine-rayed pigtoe pearly mussel	Fusconaia cuneolus	Endangered
Green-blossom pearly mussel	Epioblasma torulosa gubernaculum	Endangered
Orange-footed pearly mussel	Plethobasus cooperianus	Endangered
Pink mucket pearly mussel	Lampsilis orbiculata	Endangered
Rough pigtoe pearly mussel	Pleurobema plenum	Endangered
Shiny pigtoe pearly mussel	Fusconaia edgariana	Endangered
White wartyback pearly mussel	Plethobasus cicatricosus	Endangered
Leafy prairie clover	Dalea foliosa	Endangered

Exhibit 2-7 (continued)
THREATENED AND ENDANGERED SPECIES LIST

Arkansas		
Florida panther	Felis concolor coryi	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Least tern	Sterna antillarum	Endangered
Bachman's warbler	Vermivora bachmanii	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
American alligator	Alligator mississippiensis	Threatened
Arkansas fatmucket mussel	Lampsilis powelli	Threatened
Fat pocketbook pearly mussel	Potamilus capax	Endangered
Pink mucket pearly mussel	Lampsilis orbiculata	Endangered
(no common name/plant)	Geocarpon minimum	Threatened
Pondberry	Lindera melissifolia	Endangered
Mississippi		
Louisiana black bear	Ursus americanus luteolus	Threatened
Florida panther	Felis concolor coryi	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Least tern	Sterna antillarum	Endangered
Bachman's warbler	Vermivora bachmanii	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
American alligator	Alligator mississippiensis	Threatened
Bayou darter	Etheostoma rubrum	Threatened
Pondberry	Lindera melissifolia	Endangered
Louisiana		
Louisiana black bear	Ursus americanus luteolus	Threatened
Florida panther	Felis concolor coryi	Endangered
Red wolf	Canis rufus	Endangered
Eskimo curlew	Numenius borealis	Endangered
Bald eagle	Haliaeetus leucocephalus	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Brown pelican	Pelecanus occidentalis	Endangered
Piping plover	Charadrius melodus	Threatened
Least tern	Sterna antillarum	Endangered
Bachman's warbler	Vermivora bachmanii	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
Pallid sturgeon	Scaphirhynchus albus	Endangered
American alligator	Alligator mississippiensis	Threatened
Louisiana pearlshell mussel	Margaritifera hembeli	Threatened
(no common name/plant)	Geocarpon minimum	Threatened

Exhibit 2-7 (continued)
THREATENED AND ENDANGERED SPECIES LIST

Texas		
Louisiana black bear	Ursus americanus luteolus	Threatened
Bald eagle	Haliaeetus leucocephalus	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
Attwater's greater prairie-chicken	Tympanuchus cupido attwateri	Endangered
Artic peregrine falcon	Falco peregrinus tundrius	Threatened
Brown pelican	Pelecanus occidentalis	Endangered
Piping plover	Charadrius melodus	Threatened
Houston toad	Bufo houstonensis	Endangered
Texas trailing phlox	Phlox nivalis var.texensis	Endangered
Prairie dawn	Hymenoxys texana	Endangered
Navasota ladies'-tresses	Spiranthes parksii	Endangered
White bladderpod	Lesquerella pallida	Endangered

AIR QUALITY

Air quality conditions in the study area are factors in determining transportation corridor planning. Exhaust fumes of motor vehicles using a Corridor 18 facility or any highway can greatly affect air quality. The Environmental Protection Agency (EPA) under the 1990 Clean Air Act Amendment (CAAA) has established the National Ambient Air Quality Standards (NAAQS) for the United States to protect the public and the environment from harmful effects of air pollution.

Of particular concern in the transportation sector are smog and carbon monoxide. Smog is made up of ground-level ozone, which is produced by a combination of various pollutants including motor vehicle exhaust fumes. Often the smog forming pollutants blow away from their source to distant areas. Carbon monoxide is a colorless, odorless gas primarily emitted from motor vehicles that reduces the oxygen-carrying capacity of the blood.

The EPA has categorized all areas in the US that are not in compliance with the National Ambient Air Quality Standards. The categories range from "extreme" to "marginal". As shown in Exhibit 2-8 there are seven areas in the Corridor 18 study area that are in the Ozone Non-Attainment Categories ranging from serious to marginal. One location in the study area, the Memphis/Shelby County (Tennessee) metropolitan area, is in the maintenance category for both Ozone and Carbon Monoxide Nonattainment.

Exhibit 2-8
OZONE NON-ATTAINMENT CATEGORIES

Indiana	Marginal - Evansville, Indianapolis,
Kentucky	Marginal -Owensboro, Paducah
Louisiana	Marginal - Lake Charles
Texas	Severe - Houston-Galveston-Brazoria
	Serious - Beaumont-Port Arthur

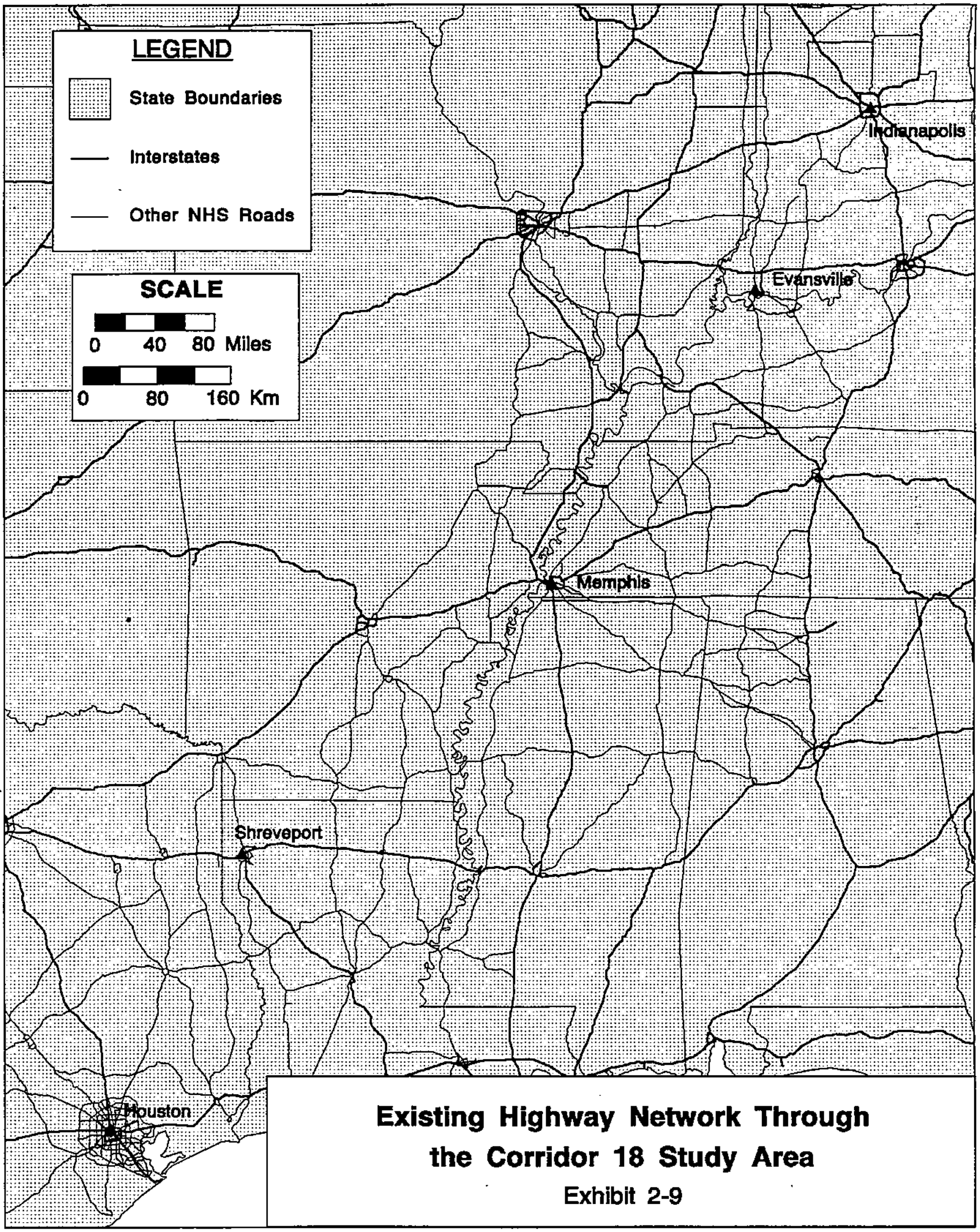
Source: Environmental Protection Agency, provided 8/22/95

EXISTING AND PROPOSED FACILITIES

The existing conditions of the study area include the transportation facilities located throughout the region.

Existing Highway System

The existing highway network through the Corridor 18 Study Area is shown in Exhibit 2-9. Any alignment selection for Corridor 18 must cross at least five major Interstates. The major



Existing Highway Network Through the Corridor 18 Study Area

Exhibit 2-9

interstate facilities and major cities connected include the following :

- I-64 (Louisville, Evansville and St. Louis)
- I-24 (Nashville and I-57)
- I-10 (Baton Rouge and Houston)
- I-40 (Nashville, Memphis and Little Rock)
- I-20 (Jackson, Shreveport, and Dallas)
- I-55 (St Louis, Memphis and Jackson)

Several low and high level design facilities are located throughout the entire study area and provide a significant amount of traffic service to the region. These facilities would include US, State Routes and Parkway systems. Some of these highways could be upgraded to become part of Corridor 18.

High Priority Corridors

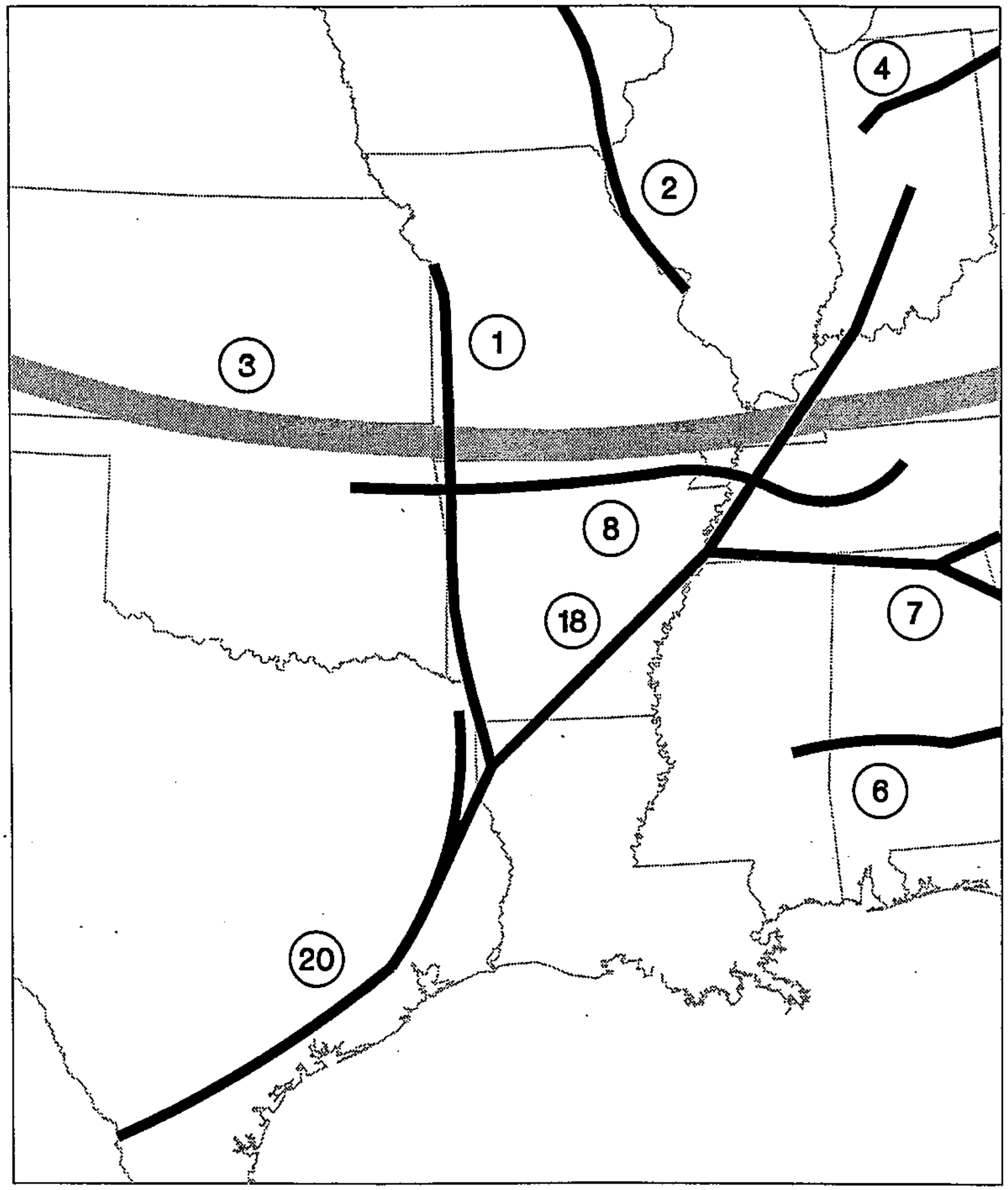
There are 21 High Priority corridors across the nation including several in the Corridor 18 study area. The north/south corridors that will have an impact on Corridor 18 are Corridor 1: Kansas City to Shreveport; and Corridor 20 : Mexico to Texarkana via Houston (US 59).

These corridors will tend to have a more direct impact to the traffic network because of the parallel nature of these alignments, there is a competition between them for the service of traffic traveling in this direction. The relationship between these corridors is shown on Exhibit 2-10. The east-west corridors (3,7,8) are also shown.

The High Priority corridors currently overlap each other from southern Arkansas to Northern Louisiana and Texas. Corridor 1 connects Texarkana with Shreveport, while Corridor 20 connects Houston with Texarkana. Existing Interstate 20 would directly connect Shreveport with Corridor 20 creating an alternate route to Texarkana or Houston.

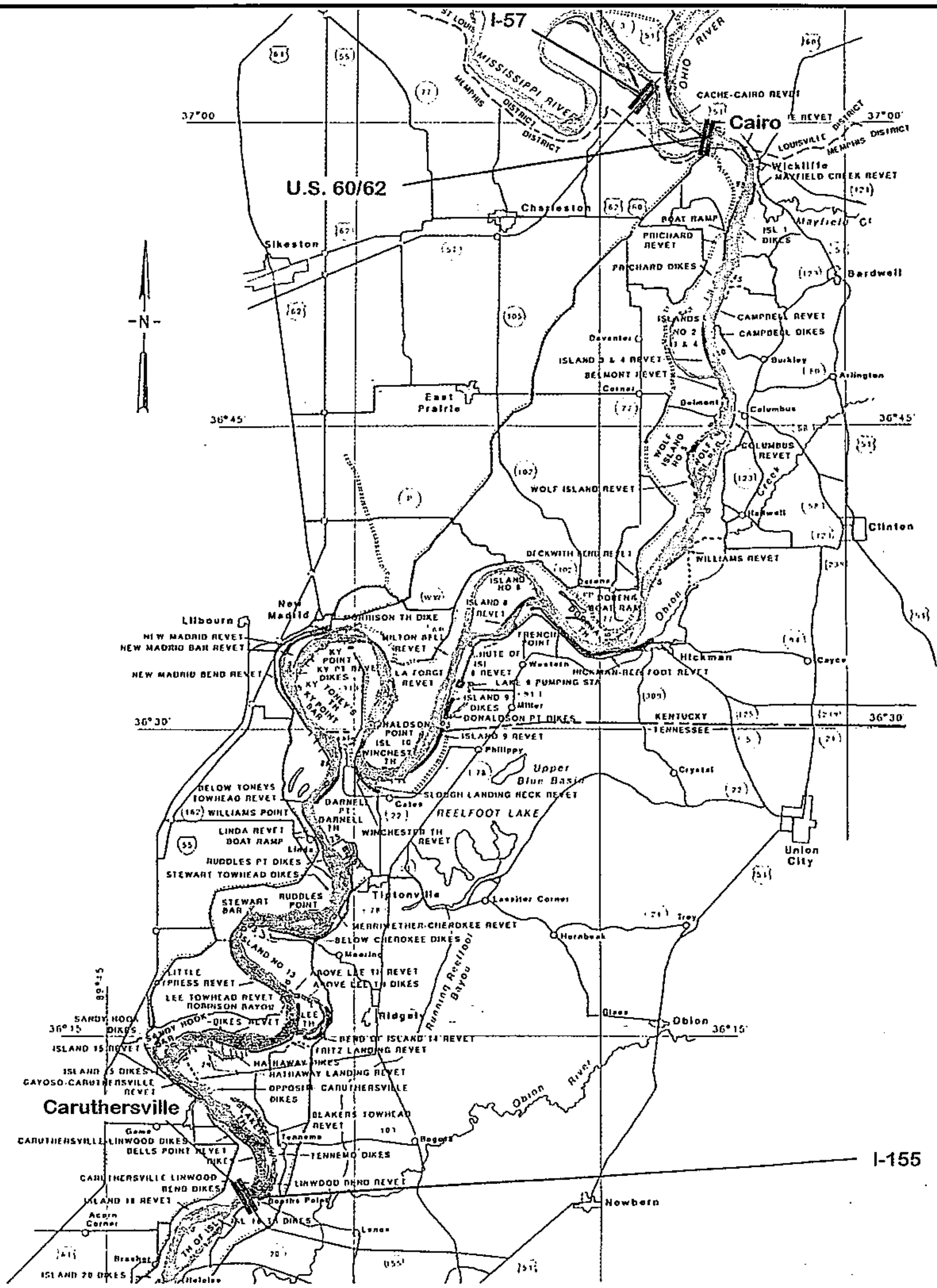
Major River Bridges

Nearly all possible Corridor 18 alignments in the study area will cross 8 to 10 of the major rivers listed in the section on Rivers and Wetlands. Any alignment will have to cross the Mississippi River either at an existing bridge or at a new location that satisfies all location and environmental requirements. Exhibit 2-11 illustrated the existing bridges across the Mississippi River in



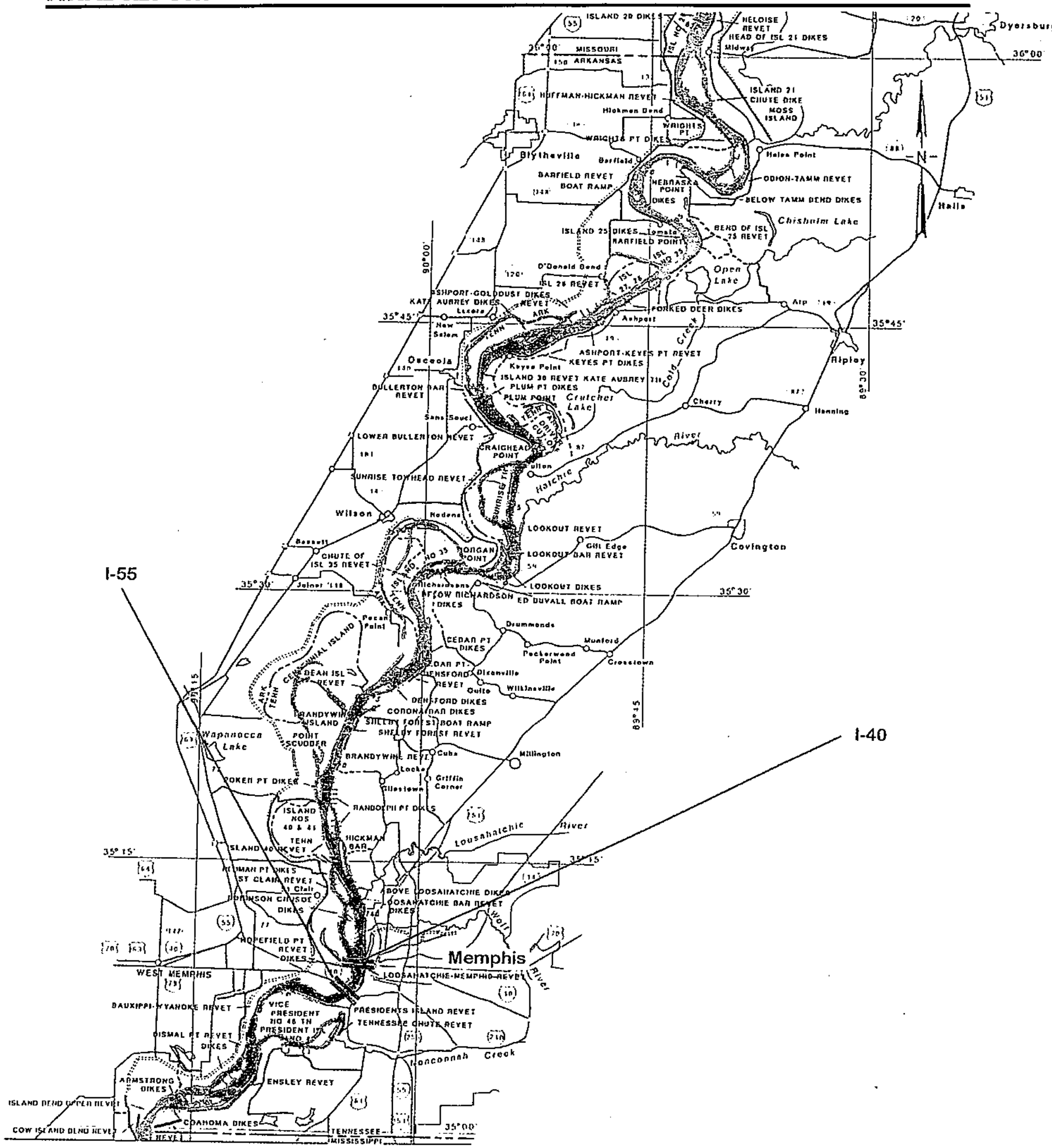
High Priority Corridors

Exhibit 2-10



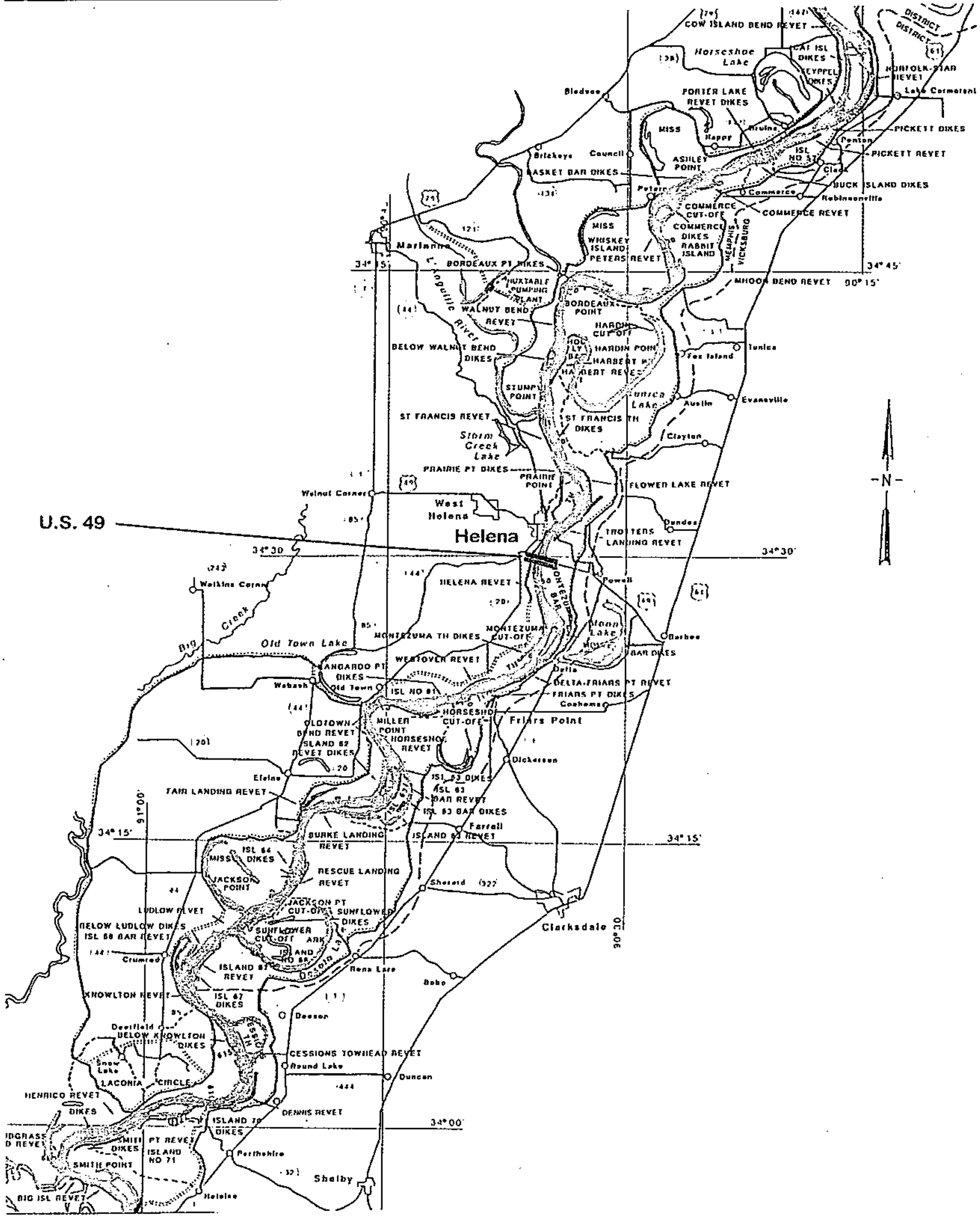
Mississippi River Bridges -- Existing & Proposed (Caruthersville)

Exhibit 2-11



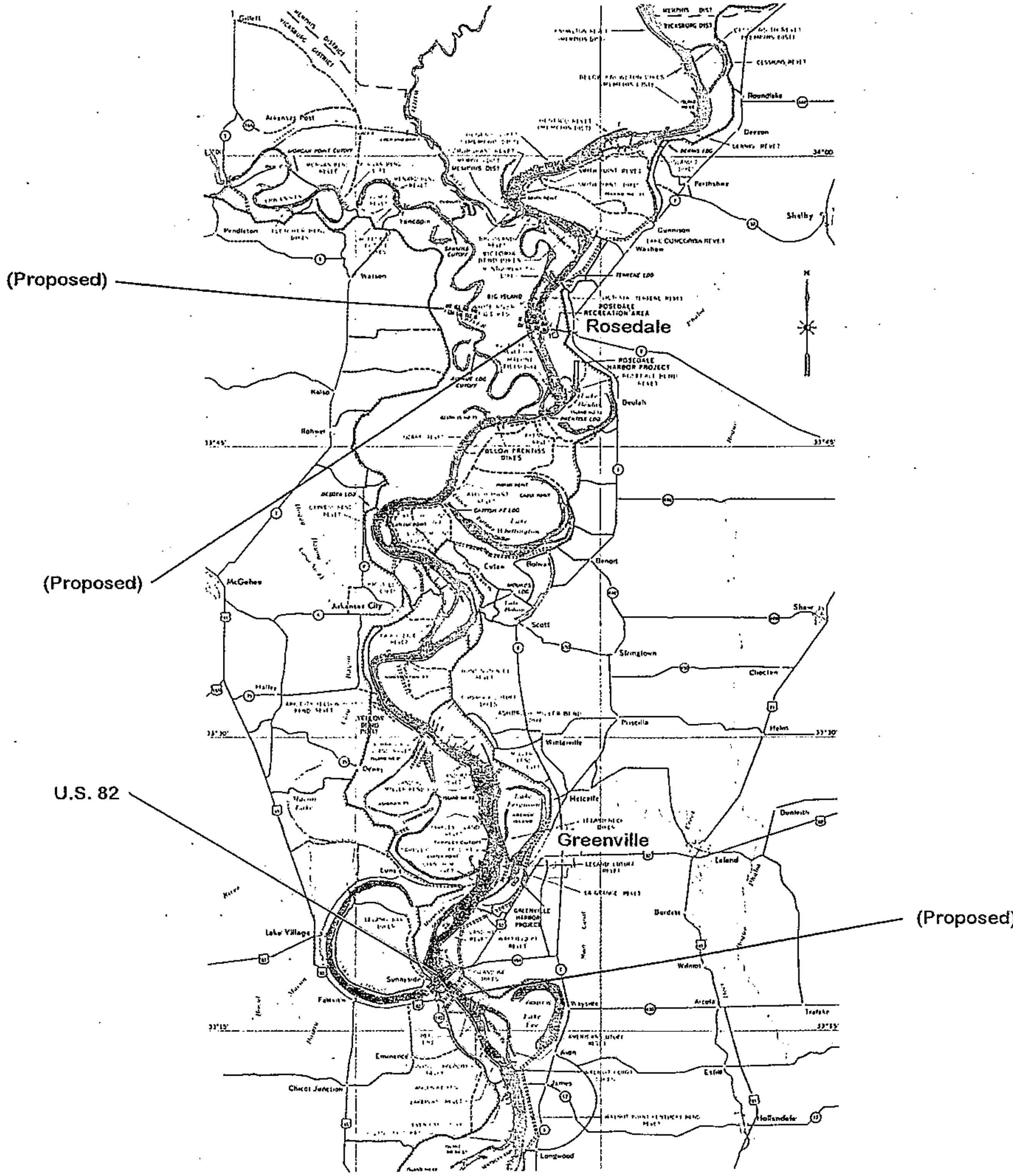
Mississippi River Bridges -- Existing & Proposed (Memphis)

Exhibit 2-11



Mississippi River Bridges -- Existing & Proposed (Helena)

Exhibit 2-11



Mississippi River Bridges -- Existing & Proposed (Rosedale/Greenville)
Exhibit 2-11

the Corridor 18 Study Area as well as proposed bridges currently being planned or designed at Greenville and Rosedale, MS, and at Cape Girardeau, MO.

Traffic and environmental studies have already been conducted on the proposed bridge sites. As the crossing of the Mississippi River is one of Corridor 18's most environmentally sensitive areas this existing research will be helpful in choosing a potential bridge location. For example, the feasibility study for the Great River Bridge at Rosedale crossing the Mississippi and Arkansas Rivers, showed significant benefits in the long term analysis of the project. The need for replacing the Greenville Bridge has been documented. The evaluation of all of the potential bridge crossings will include all previously conducted studies. The selection of a location for a crossing will impact alignment possibilities for the corridor.

DEMOGRAPHIC/ECONOMIC CHARACTERISTICS

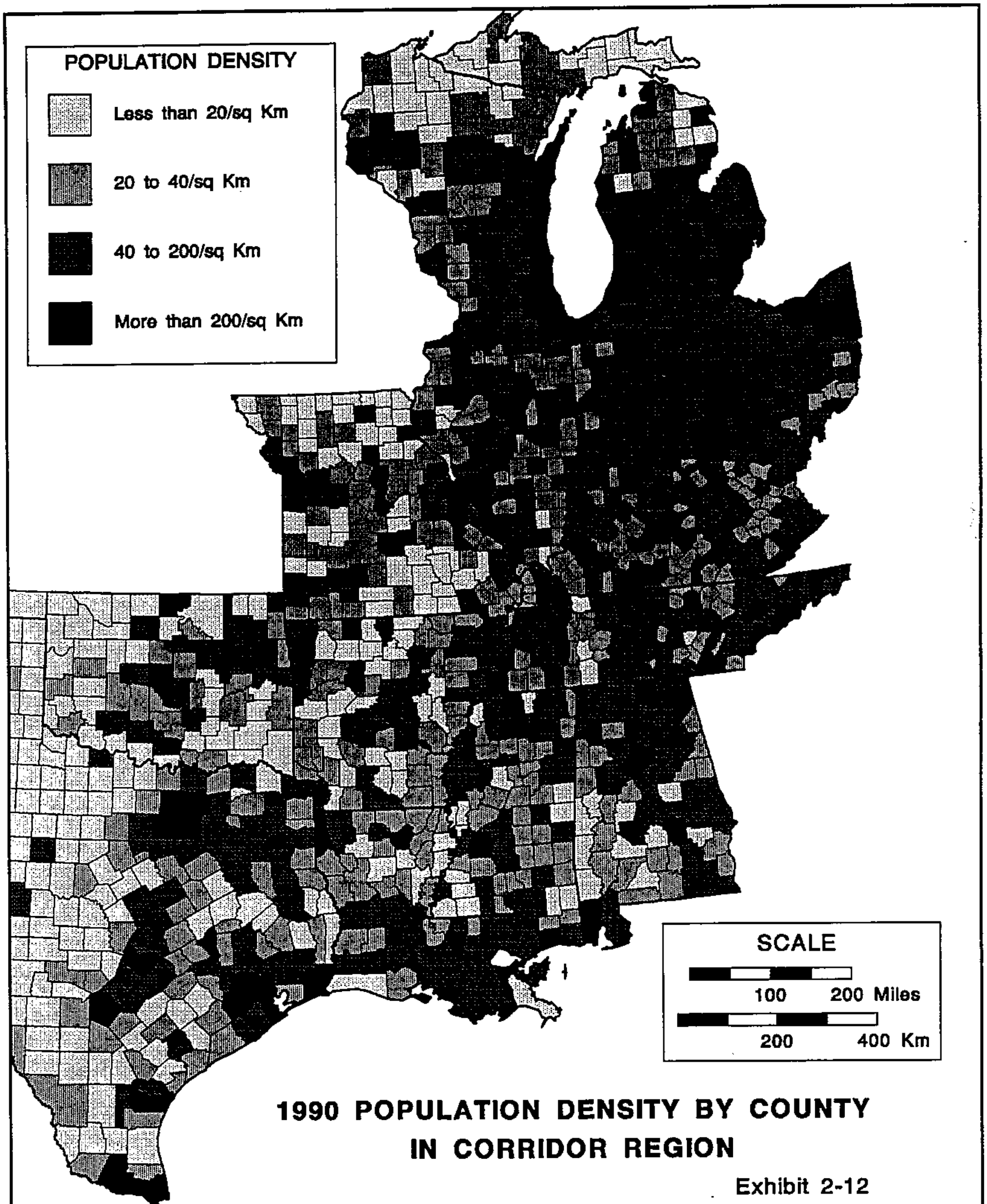
DEMOGRAPHICS

The Corridor 18 Study Area is predominantly rural. This is best illustrated in Exhibit 2-12 (following page) which shows population density by county for the 14 state corridor region.

Within the study area 32.2 percent of the population lives in counties which lie outside Metropolitan Statistical Areas (MSAs). This compares with 28.0 percent for the corridor region and 22.3 percent for the 48 states in the contiguous USA, as shown in Exhibit 2-13.

Exhibit 2-13
STUDY AREA POPULATION, 1990

AREA	POPULATION IN MSA COUNTIES		POPULATION IN NON-MSA COUNTIES		TOTAL POPULATION
Study Area Counties	9,081,064	67.8%	4,310,590	32.2%	13,391,655
8 Corridor States	34,775,556	70.2%	14,756,805	29.8%	49,532,362
14 State Region	64,071,550	72.0%	24,892,495	28.0%	88,964,046
USA (48 States)	191,954,508	77.7%	55,097,093	22.3%	247,051,602



1990 POPULATION DENSITY BY COUNTY IN CORRIDOR REGION

Exhibit 2-12

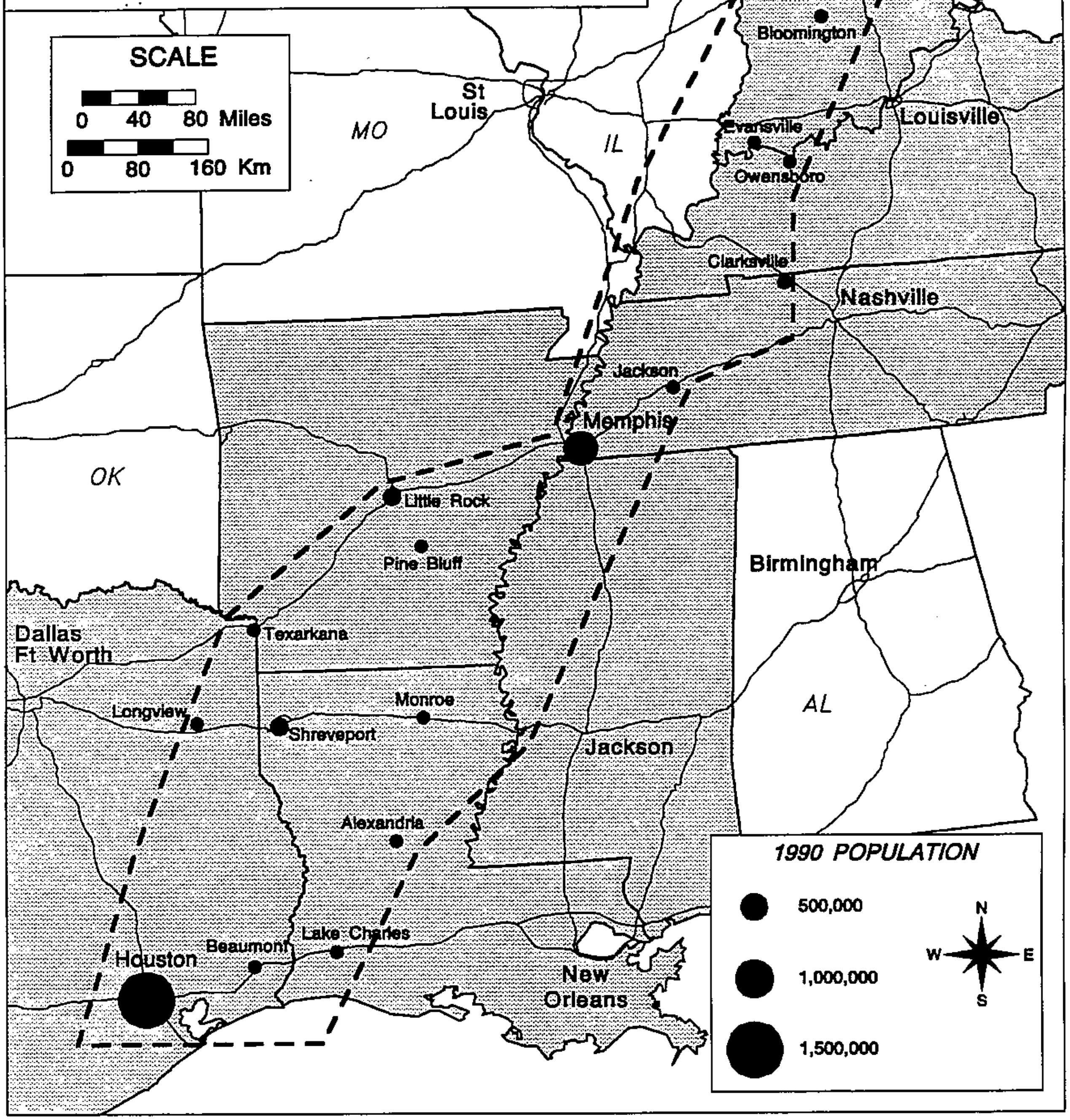
The study area connects two major metropolitan areas, Indianapolis and Houston, which both have MSA (Metropolitan Statistical Areas) populations in excess of one-million. A third MSA, Memphis, in the center of the study area, has a 1990 population just under one-million. The locations of MSAs in the study area are listed in Exhibit 2-14 and shown in Exhibit 2-15.

Exhibit 2-14
MSA POPULATION IN STUDY AREA

MSA LOCATION	1990 POPULATION
Houston, TX	3,301,937
Indianapolis, IN	1,249,822
Memphis, TN/AR/MS	981,747
Little Rock, AR	513,117
Beaumont, TX	361,226
Shreveport, LA	334,341
Evansville, IN/KY	278,990
Clarksville, KY/TN	169,439
Lake Charles, LA	168,134
Longview, TX	162,431
Monroe, LA	142,191
Alexandria, LA	131,556
Texarkana, TX/AR	120,132
Bloomington, IN	108,978
Owensboro, KY	87,189
Pine Bluff, AR	85,487
Jackson, TN	77,982

URBANIZED AREA POPULATION WITHIN STUDY AREA (1990)

Exhibit 2-15



ECONOMIC CONDITIONS

Economic conditions in the Study Area are reviewed in terms of Poverty Status, Per Capita Income and Gross State Product.

Poverty Status

Based on data provided by the Bureau of the Census, for 1990, 17.1 percent of the population in study area counties are defined as having poverty status. This compares with 12.8 percent for the 48 contiguous states, as shown in Exhibit 2-16.

Exhibit 2-16
STUDY AREA POVERTY STATUS, 1990

AREA	POVERTY STATUS	
Study Counties	2,287,282	17.1%
8 Corridor States	8,226,733	16.6%
14 State Region	13,284,320	14.9%
USA (48 States)	31,605,922	12.8%

Five of the eight corridor states are ranked in the top eight states for percentage of population with poverty status. The states are Mississippi (1st), Louisiana (2nd), Arkansas (5th), Kentucky (6th) and Texas (8th).

Per Capita Income

Per capita income in the study area is estimated at $12,415, based on the 1990 census. This is 86.2 percent of the average per capita income for the 48 contiguous states, as shown in Exhibit 2-17.

Exhibit 2-17
STUDY AREA PER CAPITA INCOME, 1989

AREA	PER CAPITA INCOME	
	Dollars	% of USA
Study Counties	$12,415	86.2%
8 Corridor States	$12,496	86.7%
14 State Region	$12,965	90.0%
USA (48 States)	$14,407	100.0%

Gross State Product

Gross state product for each corridor state is shown in Exhibit 2-18. Corridor states account for 18.3 percent of the nation's GDP produced in the 48 contiguous states, while accounting for 20.1 percent of the population. The average annual rate of growth in Gross State Product between 1980 and 1989 was 1.8 percent per year for the corridor states compared to 3.2 percent for the 48 states. Of the corridor states, Tennessee had the highest rate of growth in Gross State Product at 4.0 percent.

Exhibit 2-18
GROSS STATE PRODUCT IN CORRIDOR STATES

State	1989 Gross State Product [1] (billions)	Annual Growth Rate, 1980-1989 [2]	GSP Related to Manufacturing, 1989[1] (billions)	
Michigan	$182	2.2%	$50	27%
Indiana	105	2.5%	30	29%
Kentucky	66	2.6%	15	23%
Tennessee	92	4.0%	22	24%
Mississippi	38	2.8%	11	29%
Arkansas	37	2.5%	9	24%
Louisiana	79	-1.0%	12	15%
Texas	340	1.9%	57	17%
Corridor States	939	1.8%	206	22%
USA (48 States)	$5,119	3.2%	$964	19%

(1) Current Dollars
(2) Based on Constant 1982 Dollars

Source: Statistical Abstract of the United States, 1992.

In each corridor state, the economic sector which contributed most to Gross State Product was Manufacturing, based on a breakdown by nine sectors:

- Farms, Forestry and Fisheries
- Construction
- Manufacturing
- Transportation and Public Utilities
- Wholesale Trade
- Retail Trade
- Finance, Insurance and Real Estate

- Services
- Government

In the case of Louisiana, Manufacturing was tied with Finance, Insurance and Real Estate, and with Services as the dominant sector in the state. In Texas, the Services sector equaled Manufacturing in contributing to Gross State Product.

RURAL EMPOWERMENT ZONES AND ENTERPRISE COMMUNITIES

Three Rural Empowerment Zones and 30 Enterprise Communities have been designated pursuant to the Omnibus Budget Reconciliation Act of 1993.

Empowerment Zones

One of the three Rural Empowerment Zones (EZ) is located within the Corridor 18 Study Area. The Mid-Delta EZ consists of Bolivar, Sunflower, Leflore, Washington, Humphreys and Holmes Counties in Mississippi. The EZ is eligible to receive $40 million as Social Service Block Grants administered by the Department of Agriculture.

Enterprise Communities

Also located within the Study Area are six of the 30 Rural Enterprise Communities (EC) designated under this program. These are: East Central Arkansas in Cross, Lee, Monroe and St. Francis Counties in Arkansas; Mississippi County in Arkansas; Northeast Louisiana Delta in Madison Parish, Louisiana; Macon Ridge in Catahoula, Concordia, Franklin, Morehouse and Tensas Parishes in Louisiana; North Delta Mississippi in Panola, Quitman and Tallahatchie Counties in Mississippi; and, Haywood and Fayette Counties in Tennessee. Enterprise Communities will receive approximately $3 million each in block grants under provisions of this program.

A number of transportation activities could be accommodated or coordinated as a part of the block grants. These include: assistance gaining permits related to grants (including establishing one-stop permitting); developing local plans and programs for airports, highways, transit and water ports; modifying ongoing grant agreements to more effectively coordinate transportation with education, medical, housing or other programs; and, assisting the local governments in the designated areas to develop better internal capability to apply for or effectively utilize existing grant programs.

A Corridor 18 facility could play an important role in facilitating the economic development and revitalization which are the purposes of this program. As noted in Exhibit 2-19, the Mid-Delta EZ and the six Enterprise Communities would have improved north-south transportation via a Corridor 18 facility. This will help make these places more attractive for industries and will enhance achievement of sustainable community development.

IMPLICATIONS OF NAFTA

The North American Free Trade Agreement (NAFTA) was signed on December 17, 1992. It is anticipated that NAFTA will increase freight flows between the U.S., Canada and Mexico in future years. U.S. exports to Mexico are projected to increase between 65 and 70 percent by the year 2000. Imports from Mexico through entry points in South Texas are projected to increase 120 percent.[1]

The northern and southern regions of Corridor 18, namely the State of Michigan and South Texas, already play dominant roles in cross border freight movements. Efficient transportation links between these areas and the nation's transportation infrastructure will benefit importers, exporters and the U.S. economy as a whole.

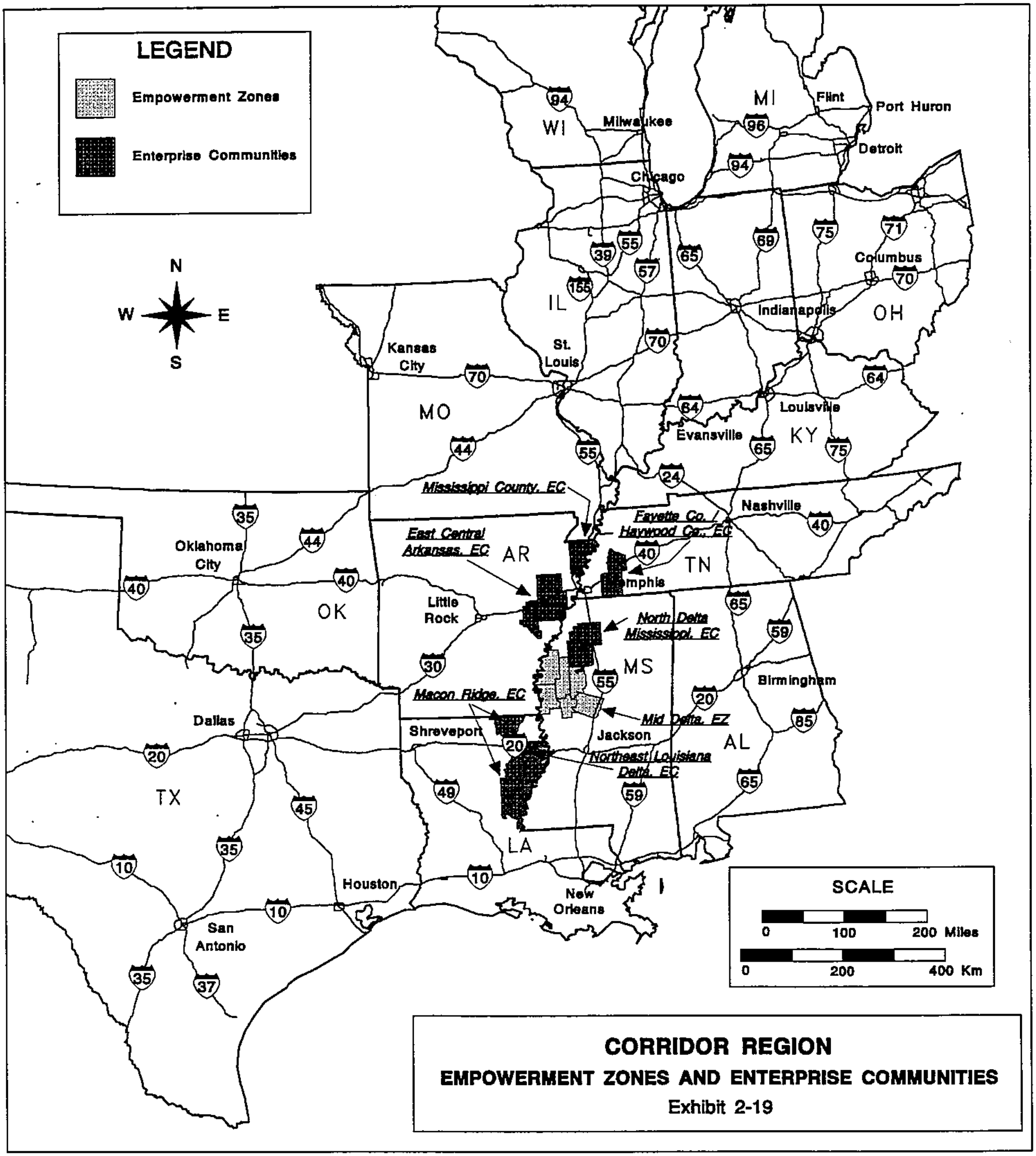
SOURCE OF TRADE DATA

Information on trade between the U.S.A. and Canada and the U.S.A. and Mexico is summarized below. The source for this information is the U.S. Department of Transportation's Bureau of Transportation Statistics (BTS). BTS quantifies trade in terms of value in U.S. Dollars. At present, data is not consistently available in terms of freight tonnage.

BTS data files include information on "U.S. State of Origin" for exports and "U.S. State of Destination" for imports. This information is used to estimate the states of origin and destination for international trade. In the case of exports the origin state may not always be a true representation of the production origin of exports, as the origin state identified may be a consolidation point rather than the state of production.

U.S./CANADA TRADE

Exports to Canada had a total value of $116.0 billion for the twelve months from April 1993 to March 1994. Imports totaled $103.9 billion.



CORRIDOR REGION
EMPOWERMENT ZONES AND ENTERPRISE COMMUNITIES
Exhibit 2-19

Trade by Border Crossing Location

The great majority of this trade involved the movement of freight over the land border crossings between the two countries (78.6 percent of Exports and 90.8 percent of Imports). The remainder involved non-border ports. The U.S./Canada border is 8,892 km (5,525 miles) long and includes 81 U.S. Customs Districts.

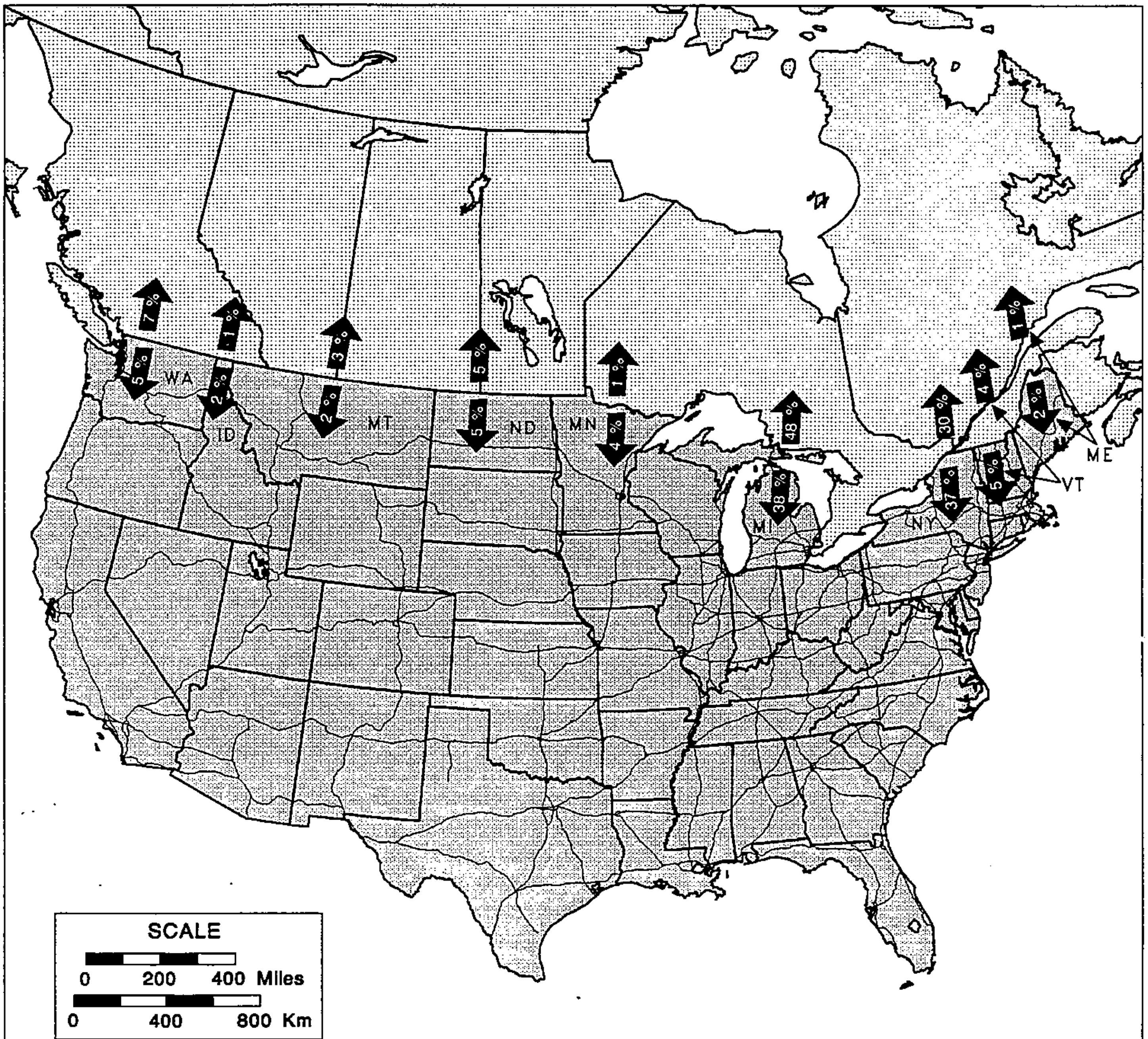
The value of trade through U.S. Customs Districts in each of the U.S. states bordering Canada is listed in Exhibit 2-20. The distribution of trade among border states is illustrated in Exhibit 2-21 Michigan is the leading state in terms of trade value, accounting for 48.1 percent of exports over land borders and 38.1 percent of imports.

Exhibit 2-20
U.S./CANADA TRADE
BY STATE OF U.S. CUSTOMS DISTRICT

STATE OF U.S. CUSTOMS DISTRICT	VALUE OF TRADE, IN MILLIONS OF U.S. DOLLARS[1]			
	Exports to Canada		Imports from Canada	
	Dollars	Percent	Dollars	Percent
Alaska	$71.4	0.1%	$14.3	0.0%
Idaho	335.2	0.4%	1,635.8	1.7%
Maine	1,256.5	1.4%	2,026.9	2.1%
Michigan	43,892.5	48.1%	35,923.7	38.1%
Minnesota	1,251.1	1.4%	3,734.8	4.0%
Montana	2,607.0	2.9%	2,019.4	2.1%
North Dakota	4,319.0	4.7%	4,449.1	4.7%
New York	27,285.4	29.9%	23,759.9	36.8%
Vermont	3,624.5	4.0%	4,966.6	5.3%
Washington	6,532.5	7.2%	4,819.6	5.1%
Sub-Total for Border Crossings	**$91,175.2**	**100.0%**	**$94,350.1**	**100.0%**
Non-Border Ports	24,783.0		9,567.8	
TRADE TOTALS	**$115,958.2**		**$103,917.9**	

(1) From April 1993 to March 1994.

SOURCE: US DOT's Bureau of Transportation Statistics.



DISTRIBUTION OF U.S. / CANADA TRADE BY STATE OF U.S. CUSTOMS DISTRICTS

Exhibit 2-21

Within Michigan, the U.S. Customs District of Detroit dominates, with approximately three-quarters of the trade by value. Port Huron accounts for approximately one-quarter, as shown in Exhibit 2-22.

Exhibit 2-22
U.S./CANADA TRADE
VIA U.S. CUSTOMS DISTRICTS IN MICHIGAN

U.S. CUSTOMS DISTRICT	VALUE OF TRADE, IN MILLIONS OF U.S. DOLLARS[1]			
	Exports to Canada		Imports from Canada	
	Dollars	Percent	Dollars	Percent
Detroit, MI	$32,721.1	74.5%	$25,072.1	69.8%
Port Huron, MI	10,783.4	24.6%	10,021.5	27.9%
Sault Ste. Marie, MI	387.9	0.9%	830.1	2.3%
Algonac, MI	0.2	0.0%	0.0	0.0%
TOTAL	$43,892.5		$35,923.7	

(1) From April 1993 to March 1994.

SOURCE: US DOT's Bureau of Transportation Statistics.

O/D States for U.S./Canada Trade

Based on BTS data, of the $43.9 billion of exports to Canada passing through Michigan Customs Districts, $11.1 billion (25 percent) originated in Michigan. Seven additional states exceeded $1.0 billion of exports to Canada via Michigan, including the Corridor 18 states of Indiana ($3.2 billion), Texas (($1.9 billion) and Tennessee ($1.1 billion).

Almost 53 percent of imports from Canada via Michigan Customs Districts have Michigan as their destination state. Only five other states exceeded $1.0 billion of imports, including Indiana ($1.3 billion) and Kentucky ($1.0 billion). Imports from Canada to Texas, via Michigan, amounted to $903 million.

The distribution among U.S. states of import and export trade with Canada which passes through U.S. Customs Districts in the State of Michigan is illustrated in Exhibit 2-23.

Containerized imports through Michigan account for 3.0 percent of Michigan imports overall. Containerized imports through Michigan predominantly travel by rail. Indeed 19.1 percent of rail imports through Michigan are containerized. Furthermore, rail containerized imports from Canada through Michigan customs districts amount to $932.5 Million, or 98.5 percent of all such imports over all U.S./Canada land borders. Road containerized imports amount to $151.7 Million or 0.5 percent of all road imports through Michigan customs districts.

MICHIGAN BORDER CROSSINGS

Border crossings in the State of Michigan are located in Detroit, Port Huron and Sault Ste. Marie.

Highway Crossing Facilities

Facilities at border crossings for highway traffic are shown in Exhibit 2-25.

Exhibit 2-25
HIGHWAY CROSSING FACILITIES IN MICHIGAN

Location	Facility	Toll Pass. Car	No. of Lanes	1992 Bidirectional Traffic	
				All (thousand)	Trucks (thousand)
Detroit	Ambassador Bridge Windsor Tunnel	$1.50 $1.25	4 2	8,200 7,500	1,700 300
Port Huron-Sarnia	Blue Water Bridge	$0.75	3	6,100	825
Sault Ste. Marie	International Bridge	$1.50	2	3,500	72

Windsor Tunnel connects the downtown business districts of Detroit and Windsor, Ontario. It is used mostly by shoppers and commuters. The Ambassador Bridge, a few miles away from the center of downtown, carries more interregional traffic than does the tunnel. The Blue Water will be doubled to six lanes by 1998. The International Bridge at Sault St. Marie is used primarily by local traffic between the two isolated sister cities.

In addition to the bridges and tunnel listed in Exhibit 2-25, a truck ferry for hazardous goods operates between Detroit and Windsor.

Rail Crossing Facilities

A new rail tunnel has recently been completed between Port Huron and Sarnia in Canada to address the problem of transporting double stacked containers. The new tunnel is located 25 m (80 feet) north of the existing tunnel at Port Huron and has a diameter of 9.4 m (31 feet), as opposed to the old tunnel's diameter of 4.6 m (15 feet). It can handle both double-stack container cars and multi-level rail cars. Double-stack cars carry a wide range of products, while multi-level cars carry assembled automobiles and trucks.

Two rail tunnels currently connect Michigan with Canada, one in Detroit (actually two side-by-side tubes) and the other in Port Huron. Neither can handle double stacked containers nor multi-level rack cars used to transport automobiles and trucks. One of the Detroit-Windsor tunnels is being enlarged to handle the automotive rack cars, but still will not be able to handle double-stacks. Rail equipment needing such clearance now has to be barged across the water. This railroad barge service will be terminated once the tunnel has been enlarged.

Also connecting Michigan and Canada is a railroad bridge located at Sault Ste. Marie.

U.S./MEXICO TRADE

U.S. exports to Mexico totaled $39.5 billion between April 1993 and March 1994. Imports from Mexico amounted to $36.7 billion. A unique and growing component of U.S./Mexico trade is known as Maquiladora.

Maquiladora

Maquiladora (or maquila) trade has become a substantial portion of the trade growth between the United States and Mexico. U.S.-Mexican maquiladora trade is concentrated between the U.S. and Mexican border states and between the Mexico border states and the U.S. industrial northeast.

Maquiladora trade is composed of U.S. exports sent to, and imports from, maquiladora factories in Mexico. Maquiladora factories are manufacturing plants located in Mexico which manufacture products primarily with U.S. components. The products of these maquiladora factories are produced primarily for the U.S. market and become U.S. imports. A large percentage of these products are automotive, electrical component, and consumer goods. The maquiladora program emerged in the mid-1960s through an informal agreement between two Mexican Cabinet officials to relax Mexico's strict foreign investment, customs, and immigration laws. In 1971, it was formalized into law as the Border Industrialization Program.

Value of Maquiladora Trade - In 1992, maquiladora trade represented $16.6 billion compared to $23.9 billion in traditional trade exports. For imports, the maquiladora trade represented $18.2 billion compared to $16.9 billion in traditional trade.

The percentage of maquiladora exports from the United States has grown from 12 percent of the export trade in 1980 to 37 percent in 1989 and 41 percent in 1992. Maquiladora imports to the United States have grown from 20 percent of the import trade in 1980 to 45 percent in 1989 and 52 percent in 1992. Maquiladora trade flows account for the majority of U.S.-Mexican trade flow increases in recent years.

Value of Traditional Trade - In comparison to maquiladora trade, traditional trade has more diverse origins and destinations . Traditional trade consists of products for Mexican consumers and input components for Mexican manufacturers. The percentage of total import value which is traditional has declined in value from 80 percent in 1980 to 48 percent in 1992. Traditional trade exports, as a percent of total trade value, has also declined from 88 percent to 59 percent.

Trade by Border Crossing/Location

Trade through U.S. Customs Districts along the U.S./Mexican border accounted for 94.9 percent of U.S. exports to Mexico and 92.4 percent of imports from Mexico. The remaining trade passed through non-border ports. The U.S./Mexican border is 3,110 km (1,933 miles) long and contains 22 entry points.

The value of trade through U.S. Customs Districts in each of the U.S. states bordering Mexico is listed in Exhibit 2-26. Due to the physical and market dominance of Texas, trade figures are presented for south and west Texas separately. South Texas encompasses the Laredo and Lower Rio Grande Gateways, from Del Rio to Brownsville.

Exhibit 2-26
U.S./MEXICO TRADE
BY STATE OF U.S. CUSTOMS DISTRICT

STATE OF U.S. CUSTOMS DISTRICT	VALUE OF TRADE IN MILLIONS OF U.S. DOLLARS(1)			
	Exports to Mexico		Imports from Mexico	
	Dollars	Percent	Dollars	Percent
Arizona	$2,694.7	7.2%	$4,205.2	12.4%
California	4,537.2	12.1%	5,607.8	16.5%
New Mexico	15.2	0.0%	22.7	0.1%
Texas:	30,218.5	80.7%	24,140.2	71.1%
South Texas	*23,494.2*	*62.7%*	*15,516.2*	*45.7%*
West Texas	*6,724.3*	*17.9%*	*8,624.0*	*25.4%*
Sub-Total for Border Crossings	**$37,465.6**	**100.0%**	**$33,975.9**	**100.0%**
Non-Border Ports	2,019.9		2,781.2	
Trade Totals	**$39,485.4**		**$36,757.1**	

(1) From April 1993 to March 1994.

SOURCE: US DOT's Bureau of Transportation Statistics.

Customs districts in South Texas dominate U.S./Mexico trade, accounting for 62.7 percent of exports and 45.7 percent of imports over land borders. South Texas districts account for over 54 percent of combined export/import trade. Within South Texas, 69.9 percent of exports and 51.7 percent of imports pass through the Customs District of Laredo, as shown in Exhibit 2-27 and illustrated in Exhibit 2-28. Laredo is located 500 km (311 miles) south-west of Houston.

O/D States for U.S./Mexico Trade

Of the $23.5 billion of exports to Mexico passing through U.S. Customs Districts in South Texas, over half, amounting to $12.0 billion, originate in Texas. The only other state to exceed $1.0 billion is Michigan with $1.1 billion. Of the other Corridor 18 states, the next highest exports to Mexico via South Texas are Tennessee with $0.4 billion and Indiana $0.3 billion.

The distribution of trade is similar with imports from Mexico. Of the $15.5 billion of imports via South Texas, $7.7 billion (50 percent) are destined for Texas. Once again the only other state to exceed $1.0 billion is Michigan with $3.0 billion. Tennessee ($0.2 billion) and Indiana ($0.2 billion) are again the next highest Corridor 18 states.

Exhibit 2-27
U.S./MEXICO TRADE
VIA U.S. CUSTOMS DISTRICTS IN SOUTH TEXAS

U.S. CUSTOMS DISTRICT	VALUE OF TRADE IN MILLIONS OF U.S. DOLLARS[1]			
	Exports to Mexico		Imports from Mexico	
	Dollars	Percent	Dollars	Percent
Brownsville-Cameron, TX	$3,106.2	13.2%	$3,226.2	20.8%
Del Rio, TX	553.7	2.4%	684.5	4.4%
Eagle Pass, TX	1,230.8	5.2%	1,155.3	7.4%
Laredo, TX	16,414.9	69.9%	8,022.3	51.7%
Hildago, TX	1,969.5	8.4%	2,295.2	14.8%
Rio Grande City, TX	61.8	0.3%	32.5	0.2%
Progresso, TX	95.5	0.4%	89.4	0.6%
Oroma, TX	61.9	0.3%	10.8	0.1%
Total for South Texas Districts	**$23,494.2**		**$15,516.2**	

(1) From April 1993 to March 1994.

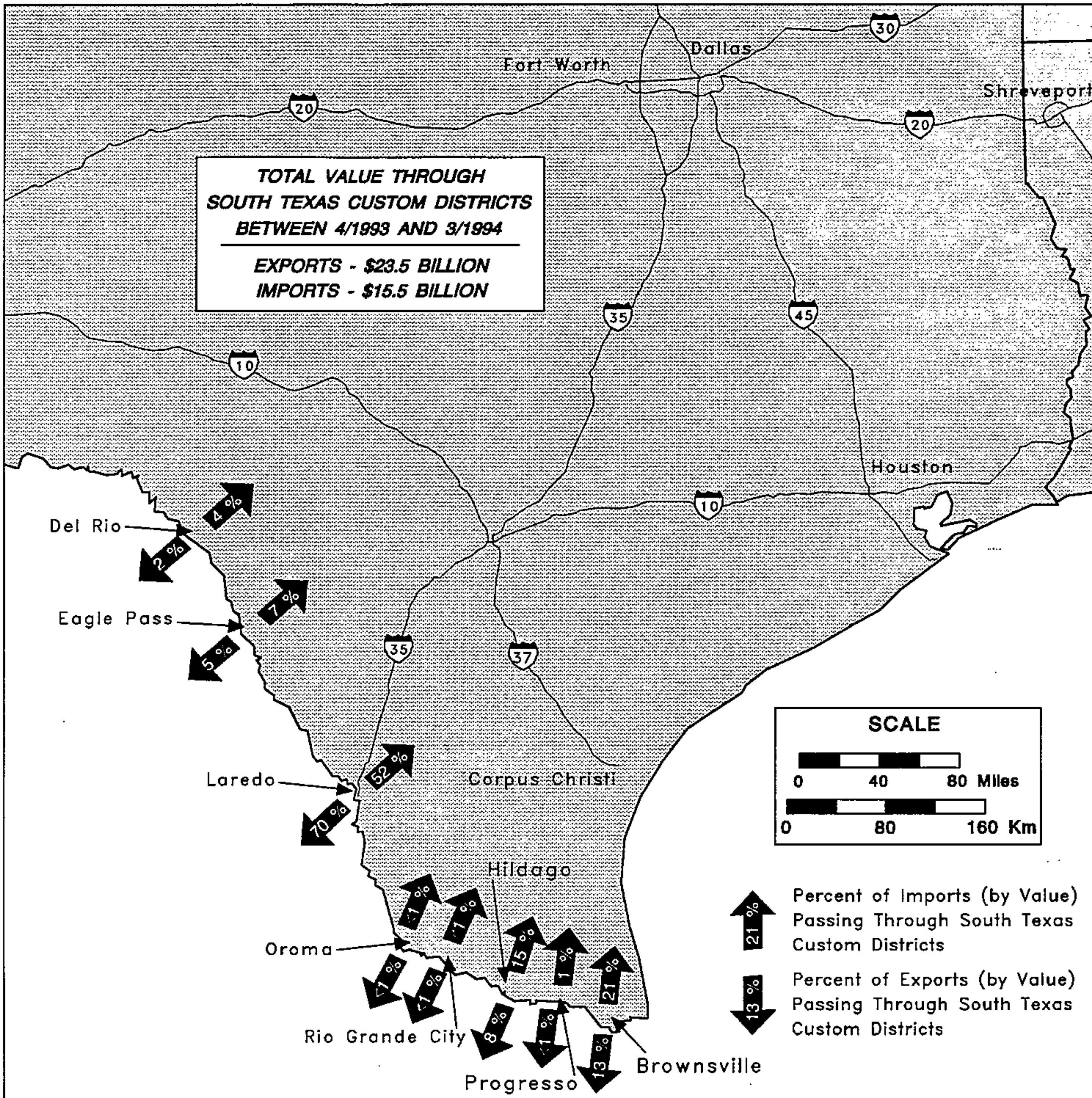
SOURCE: US DOT's Bureau of Transportation Statistics.

The distribution among U.S. States of import and export trade with Mexico which passes through U.S. Customs Districts in South Texas is illustrated in Exhibit 2-29 (following page).

Mode of Transportation

Road transportation dominates U.S./Mexico trade across land borders, accounting for 89.9 percent of exports and 80.4 percent of imports, as shown in Exhibit 2-30. This modal split excludes trade for which BTS indicates the mode as Other or Unknown.

Within South Texas, road transportation is still the most common mode by value of trade, though rail enjoys a greater market share than for the U.S./Mexico border as a whole. Road accounts for 84.9 percent of exports through South Texas, while rail accounts for 15.0 percent. For imports from Mexico, road accounts for 70.3 percent and rail for 29.6 percent.



LOCATION AND DISTRIBUTION OF U.S. / MEXICO TRADE VIA U.S. CUSTOMS DISTRICTS IN SOUTH TEXAS

Exhibit 2-28

Rail Crossings in South Texas

The eight customs districts in South Texas contain three rail border crossing facilities at:

- B&M Bridge, Brownsville,
- Laredo, and
- Eagle Pass.

The B&M Bridge in Brownsville is a combined rail and road bridge. It is privately owned and operated by a subsidiary of Union Pacific Railroad Company (UP) and Ferrocarriles Nacionales de Mexico (FNM). Expansion and remodeling of the border facilities was completed in 1992.

Brownsville is the southern terminus of UP and Southern Pacific (SP) both of which handle only freight. UP traffic passes during the day, while SP passes at night.

The rail bridge at Eagle Pass is owned by SP. It is located 1.1 km (0.65 miles) downstream from the Eagle Pass highway bridge.

Future Crossings in South Texas

Under Construction - One highway bridge is currently under construction. The proposed four lane bridge will extend southward from U.S. 281 in Pharr across the Rio Grande and its flood plain to an industrial area on the east side of the City of Reynosa. The bridge, which will be 4.04 km (2.98 miles) long is due to be open to traffic in 1996.

The Pharr Bridge will be 7.76 km (4.82 miles) from the existing Hidalgo-Reynosa Bridge. The intent is to provide an additional border crossing within a reasonable distance from the Hidalgo-Reynosa Bridge and so relieve the traffic congestion at that facility.

Planned Crossings in South Texas - Many projects have been proposed to add or upgrade border crossing facilities in recent years. Most projects are designed to relieve existing, congested, crossings in urban areas and to take advantage of development opportunities associated with such facilities. Fourteen planned projects were identified by the Center for Transportation Research[2] along the Texas/Mexico border. Ten of these fall within the eight customs districts of South Texas. The official status and likelihood of ultimate construction of these projects varies. It should not necessarily be assumed that all current proposals will be implemented.

Approaches to South Texas Border Crossings

In 1993 Wilbur Smith Associates conducted a survey of highways providing access to border crossings for the Center for Transportation Research, University of Texas at Austin. A summary of the findings from this survey is provided below.

U.S. Roadways - The U.S. roadways surveyed included federal, state and interstate highways. The federal and state highways are generally two-lanes in rural areas and four-lanes in urban areas, with good pavement condition, 3.7 m (12-foot) travel lanes, and on average 2.4 to 3.1 m (8 to 10-foot) paved shoulders. The posted speed limit on these roads is 88.5 km/h (55 mph).

Interstate highways, such as I-35 and I-10, are four-lane divided highways, with good pavement condition, and posted speed limits of 104.6 km/h (65 mph). Most of the roadways surveyed are in rural areas, with grade separated interchanges on major federal and state highways, and on interstates. The U.S. Border Patrol are stationed at certain locations stopping traffic going north for inspection. Such stops generally do not last more than 1 or 2 minutes.

TXDOT is actively linking and maintaining highway infrastructure from border crossings to major U.S. arteries. The Texas Truck System will provide four-lane divided rural highways over 30 years, connecting every Texas city (including border cities) over 20,000 population to the Interstate system. The Border Trade Alliance is also sponsoring a plan to improve border roads and bridges.

Mexican Roadways - Mexican freeways surveyed include free and toll roadways. In general, free highways are two-lane, with fair pavement condition, and mainly with no paved or improved shoulders. Toll roads, as well as a few free roads, are four-lane with good pavement conditions and shoulders. Some overlay construction was observed on some of the surveyed highways to maintain and improve pavement condition.

Lane widths are around 3.7 m (12-foot) in two-lane highways and around 4.3 m (14-foot) in four-lane highways. On the other hand, shoulders, where available, vary considerably in width and paving conditions.

anticipated future demand. However, a true infrastructure needs assessment will require improved data on origins and destinations for commercial and noncommercial traffic in the region, a better understanding of the way different investment strategies or modal alternatives might affect the existing and future flows, and a comprehensive review of the institutional factors which currently affect cross-border flows. In highly urbanized areas, the matter of border infrastructure requirements is interwoven with the entire transportation system serving the region.

Resolution of many of these issues may be necessary before some of the fundamental transportation-related infrastructure problems can be adequately addressed. An integrated, multimodal cross-border planning process should be in place before major infrastructure investment strategies are instituted.

Intermodal Transportation - The Report recognized a strong need for improved freight intermodal facilities on both sides of the border, but the deficiencies are greatest in Mexico. The Union Pacific, Southern Pacific, and Santa Fe railroads are all providing technical assistance in intermodal facility planning, design and construction in Mexico, but funding for improvements in the short-term remains uncertain. Seven new intermodal facilities are in various stages of development in Mexico; at least four of them are under construction. In addition, improvements are underway at the Pantaco Terminal in Mexico City, which is chronically congested.

With the exception of a planned intermodal facility in Santa Teresa, New Mexico, there are no present plans to construct new intermodal hubs in the border zone. Existing facilities in the United States are expected to be able to handle the increased demand for intermodal shipments into Mexico. The substantial infrastructure deficiency in Mexico is recognized and is being tackled in the larger cities, away from the border zone.

The future for intermodal transportation between the United States and Mexico looks bright. Intermodal traffic has been increasing between 20 and 50 percent over the past few years on all carriers, a trend which is widely expected to continue in the short run. These high growth rates are due in part to the fact that intermodalism is in its infancy along the U.S.-Mexican border.

The increasing efficiency of intermodal transportation makes it an ideal solution to congestion at the border crossings. This will be especially true if recent trends towards customs clearance at the destination continues. This will allow a large number of containers which otherwise would be part of the border congestion to bypass it completely.

INSTITUTIONAL ISSUES

Customs clearance procedures, mentioned above, are just one aspect of the many institutional issues which affect border crossings and the efficient movement of people and cargo between the U.S., Canada and Mexico.

Need for Comprehensive Approach

The Report to Congress identifies the most pressing institutional issue as the lack of a comprehensive Federal approach to border management. No single agency has overall responsibility for establishing policies along the border. The rivalry and lack of coordination between the U.S. Customs Service and the Immigration and Naturalization Service (INS) affect all persons and commerce crossing the border. This is often cited as the single most frustrating issue facing users.

Freight Institutional Issues

On the freight side, federal regulations, union contracts, and firm operating practices have led to changing of equipment and crews at or near the borders. This limits the effective use of transportation resources. Recently, individual railroad operating organizations and trucking firms have begun to integrate some of their cross-border marketing and operations.

Immigration and Customs laws and regulations also impose a number of barriers to intermodal efficiency of freight movements. Immigration laws prevent rail crews from operating equipment in the domestic commerce of a country if they are not a resident of that country. Customs laws and regulations require payment of duties and/or entry processing fees on any equipment which might be used in domestic commerce. This requirement results in railroads segregating operating stock for use in cross-border or domestic commerce only and thus decreases utilization rates. These issues would be diminished by some of the provisions of NAFTA or of the Customs Modernization and Informed Compliance Act.

Customs inspection requirements can also lead to problems. There have been instances where cranes have had to be rented and brought to the site in order to lift off upper containers and remove a lower container for inspection. Uniform procedures for inspection of such containers at destination terminals, a measure currently being pursued, would be helpful. Routine processing of container trains can result in unnecessary delays. Intermodal shipments are increasingly time sensitive, requiring expedited processing. Increased use of preclearance shipments should be an objective to ensure certainty of intermodal connections. Lack of sufficient staffing at highway crossings increases the difficulty in diverting staff to rail inspections, causing delays.

Passenger Institutional Issues

Regarding passenger intermodal transportation, the needs are also institutionally oriented. Until the 1960s, Federal inspection staff routinely rode the trains and conducted their business en route. Not enough lines use this practice today. Another option is to implement preclearance procedures at terminals, much as is the case with U.S.-Canadian airline travel.

Specific U.S./Mexico Border Issues

Institutional constraints at the U.S.-Mexican border crossings are associated with Federal security issues and inspection procedures, local shipping practices, public and private sector modal investment responsibilities, and frustration of potential growth of intermodal traffic.

Institutional Arrangements - This border region has developed institutional arrangements to try to address many of the most pressing issues. In addition to the many Federal agencies, each of the four border states (Texas, New Mexico, Arizona, and California) have public institutions which also regulate cross-border trade and transportation. The transportation agency in each state is responsible for the provision of highways to border crossings and to intermodal facilities which serve international movements. Working with metropolitan planning organizations in urban areas, they develop transportation plans, transportation improvement programs, and individual projects and programs.

The state transportation agencies have recently established an organization to improve borderwide planning and they hope to work together with the Mexican border states in coordinating the provision of infrastructure. There are also a number of private sector organizations active along the border.

Truck Standards - Institutional issues affecting U.S./Mexico freight transportation include a lack of standardization in truck weight, registration, and marking requirements, which present obstacles to truck-rail intermodal movements at the borders.

New Mexican trucking rules were published at the end of November, 1994, in which maximum vehicle lengths were increased and weights were decreased. The new rules will take effect in November, 1995, one month before border states open up to foreign competition. When this occurs, U.S. truckers will be able to operate in Mexican border states. Vehicle weights are expected to be on a par with those found in Canada, or about 10 percent greater than those found in the U.S. New length regulations may mean that 16.2 m (53 foot) trailers, which are popular among U.S. transporters, will be permitted on Mexican highways. The new maximum length is still not long enough to accommodate conventional sleeper cars with 16.2 m (53-foot) trailers, but U.S. trucking interests still hope to negotiate over this issue.

Information Systems - The information systems required to service intermodal movements is fairly advanced in the United States and almost non-existent in Mexico. Such systems consolidate billing, customs declarations and other documents, and provide tracking capabilities. The lack of information systems has hindered intermodal developments, and substantial cost has been incurred to overcome this obstacle. Most of the rail managers felt that the ability to track and report shipment status was an important factor in mode choice among shippers.

Border Clearance Process - The customs clearance process is a source of widespread frustration on both sides of the border. However, the situation has improved dramatically in recent years. In cases where preclearance is completed by the U.S. carrier, container shipments on rail can pass unimpeded through the border crossing to Mexico City. This service is only available on a limited basis for single customer trains, but carriers have high hopes that it can be quickly extended to rail traffic with trailers on flatcars.

The potential also exists for preclearance procedures to be applied to sealed containers carried by trucks. Such procedures may draw upon ITS/CVO technologies to enhance the efficiency and security of border crossings.

SUMMARY OF BORDER CROSSING ISSUES

Considerable attention is being paid to the problems imposed by increasing demand for the movement of people and freight across U.S. borders with Canada and Mexico. Crossing capacity is being increased by a combination of infrastructure and institutional initiatives, including:

- Infrastructure:
  - — improvement/expansion of existing facilities
  - — construction of new crossing facilities (away from congested urban areas)
  - — improvements to approach roads
- Institutional:
  - — comprehensive Federal approach to border management
  - — changing regulations and practices which limit effective use of transportation resources
  - — increased inspection of containers at destination, rather than at the border
  - — increased use of preclearance of shipments.

Such initiatives are likely to encourage the continued expansion of intermodal freight movements across the nation's borders with Canada and Mexico.

Impact on Corridor 18 Travel Demand

The importance of efficient border operations to the growth of trade between the U.S., Canada and Mexico is clearly understood by both the public and private sectors. Significant improvements to eliminate infrastructure or institutional related deficiencies have been implemented in recent years and others are ongoing or proposed. It is therefore considered unlikely that border crossing bottlenecks will develop and be tolerated to the point where they negatively impact demand for Corridor 18 freight and passenger movements to a significant degree.

ENDNOTES

1 *Assessment of Border Crossings and Transportation Corridors for North American Trade*, Report to Congress U.S. DOT, FHWA-PL-94-009.

2 *Comprehensive Overview of the Texas-Mexico Border: Background*, Center for Transportation Research, University of Texas at Austin, November 1993.

Chapter 3
ROUTE LOCATION OPPORTUNITIES & CONSTRAINTS

The purpose of this chapter is to describe the screening process used to identify one route location that is representative of the opportunities and constraints in the study area for a conventional Interstate-type highway. The opportunities described herein are factors that maximize certain conditions: the volume of traffic using Corridor 18; traffic relief to other nearby routes, user time savings; and service to intermodal and military facilities. Constraints relate to minimizing potential environmental impacts and development cost.

Three general candidates for a representative corridor are identified: eastern, central and western corridors. Then an examination is made of the twelve various combinations of the three initial corridors. For example, one combination includes the northern portion of the eastern corridor with the southern portion of the western corridor.

This analysis is based largely on the corridor conditions presented in Chapter 2 and travel demand presented in Chapter 4. Representative costs are also presented.

SCREENING PROCESS

The purpose of the screening process is to define a corridor within the study area which provides a high potential to show feasibility while representing many choices for route locations. The actual alignment location is accomplished in later studies if the identified corridor is found to be feasible and decisions are made to proceed with development of Corridor 18.

The process of identifying a representative corridor for Corridor 18 required a screening of numerous possibilities to ensure that a truly representative set of measures of Corridor 18 were developed. Exhibit 3-1 shows the overall screening process schematically and identifies terminology used for alternatives at the different stages of analysis. The screening path led to the identification of a single set of representative data--the Representative Corridor.

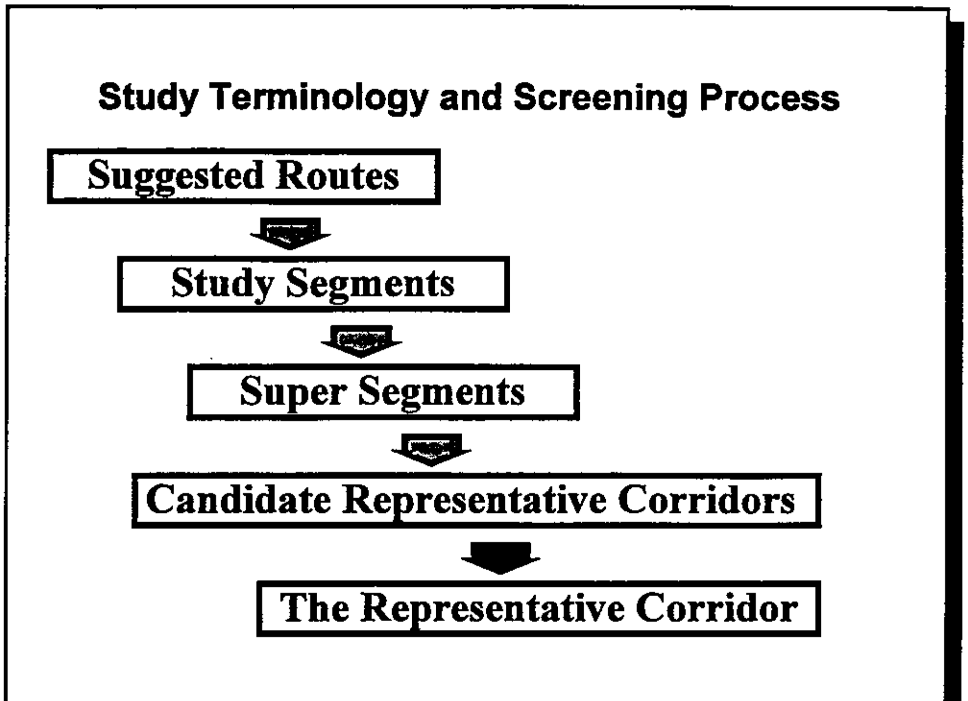


Exhibit 3-1

Suggested Routes

As the study began, a host of suggested routes and portions of routes were received from interested parties. These suggestions ranged from corridor possibilities that were many miles wide to specific alignments of routes using either existing or new highways. Some suggestions were existing routes which could be used in lieu of developing Corridor 18. These were studied as part of a "base case" of existing highways plus committed highway improvements. Exhibit 3-2 shows a composite from the suggested routes and route segments developed at the initiation of the study.

Study Segments

The suggestions received from interested parties and the participating states were reviewed and consolidated into route segments appropriate for further evaluation. This process included a consideration of active studies by the individual states. For example, a combination of I-70/US41 from Indianapolis to Evansville was suggested at the initial public meeting. However, the Indiana Department of Transportation (INDOT) had already compared this alternative to the Southwest Indiana Highway, a suggested route for Corridor 18. Because of

Exhibit 3-2

COMPOSITE OF SUGGESTED ROUTES (NORTH)

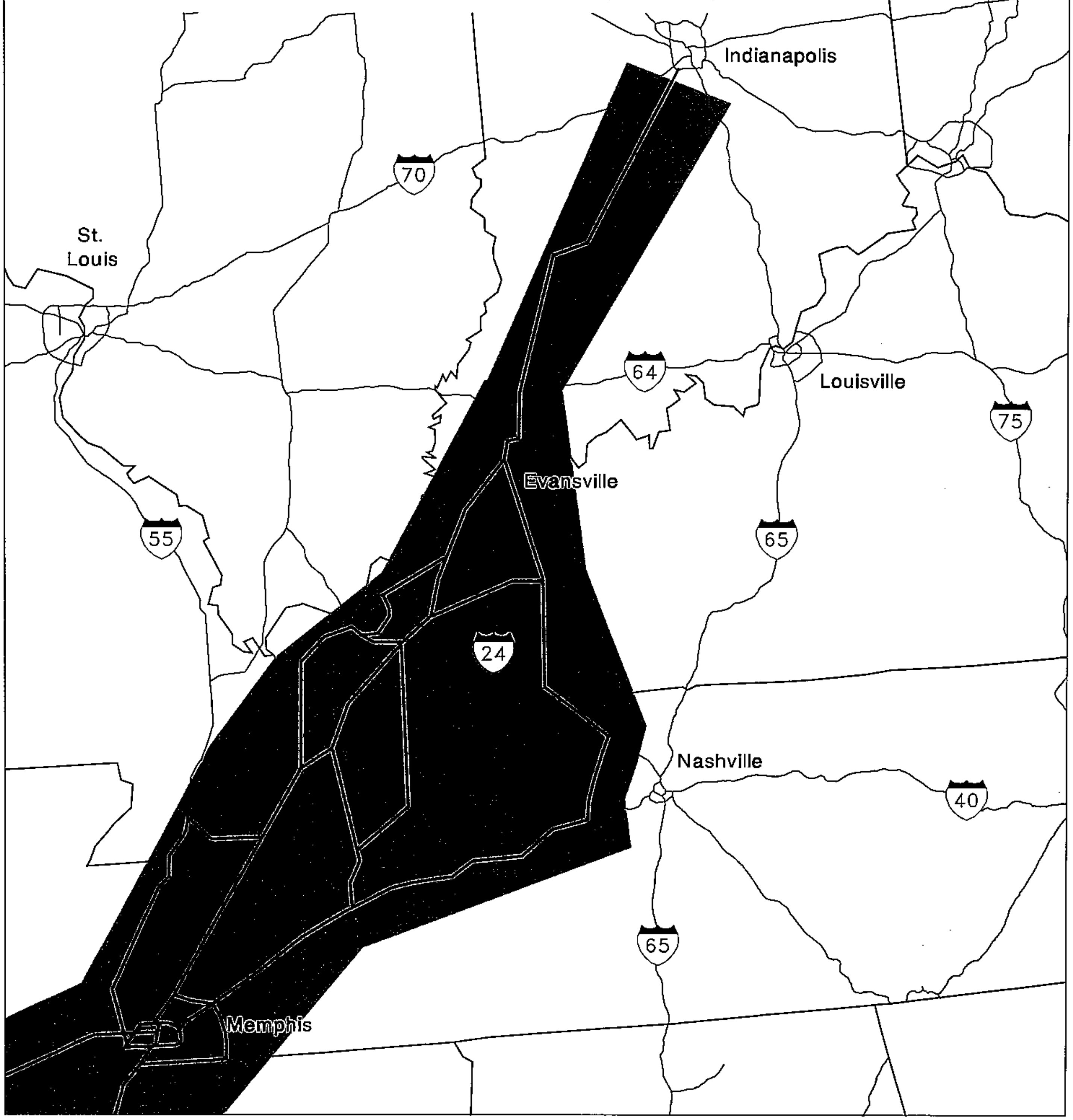
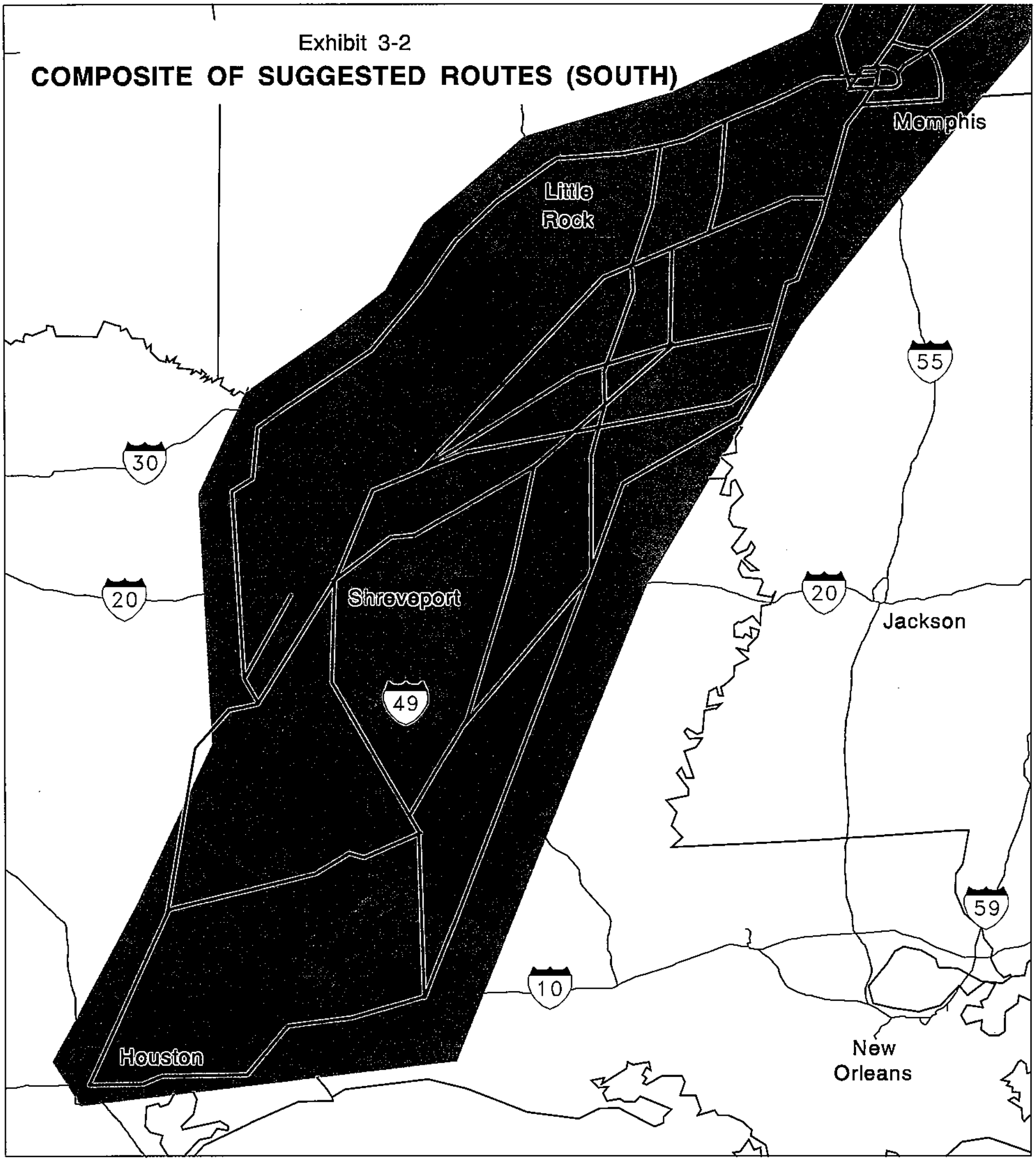


Exhibit 3-2

COMPOSITE OF SUGGESTED ROUTES (SOUTH)

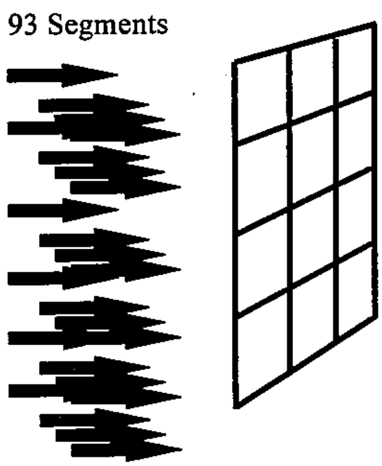


the advanced study stage reached by INDOT in environmental and engineering studies for a route from Bloomington to Evansville, the I-70/US41 route was included in the analyses as an existing facility rather than as specific study segments for Corridor 18.

Following further review, 93 study segments were adopted by the participating states for evaluation. Traffic, environmental, and cost data were collected and described for each of the 93 segments.

This information was used to screen the study segments using criteria illustrated in Exhibit 3-3. The result was a better definition of segments, a combination of segments into longer routes, and establishment of key break points for tabulation purposes. The resulting segment combinations were referred to as Super Segments.

Initial Screening of Study Segments to obtain Super Segments



- Broad Constraints
- Design/Planning Criteria
- Regional Traffic Counts
- Economic Impact Potential
- Population Service Considerations
- General Cost Estimates
- State and Regional Plans
- Public Suggestions

Exhibit 3-3

Super Segments

Super Segments are combinations of the previously identified Study Segments which have been linked to form portions of logical corridors for study. Each Candidate Representative Corridor starts at Indianapolis and continues to Houston. The Super Segments identify break points at state lines, natural features, or route segment crossing points where location options exist. As shown in Exhibit 3-1, the Super Segments were an interim step between Study Segments and Candidate Representative Corridors.

There were two types of Super Segments. One type simply combines two or more Study Segments into a continuous route. For instance, all segments along the I-40/I-30 corridor across Arkansas from the Tennessee line to the Texas line were considered one Super Segment for tabulating costs of that alternative across Arkansas.

The second type of Super Segment involved grouping closely spaced, parallel Study Segments with common termini, such as some of those between Memphis and Shreveport along what became Candidate Corridor One, West. This type of grouping required that the segments have similar characteristics of distance, potential environmental impacts, and development costs which could then be represented by a single set of data for the purposes of the feasibility analysis.

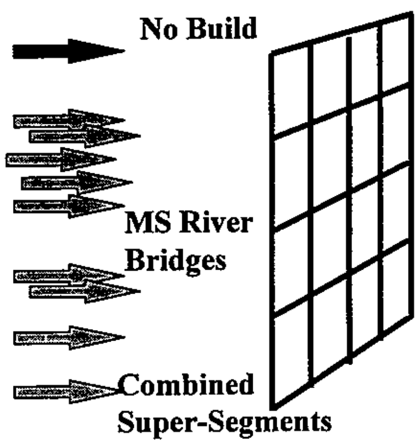
All corridors within the Corridor 18 Study Area must cross the Mississippi River. Thus, in the development of alternative corridors, the Study Segments approaching the Mississippi River could be combined into groups of segments (Super Segments) providing full corridor continuity while using a given crossing of the Mississippi River. There are seven likely corridor locations for crossing the Mississippi River with Corridor 18, and each was analyzed during the feasibility study. These locations involve existing bridges and sites already under investigation for possible new bridges. These corridor crossing possibilities are:

- I-155 at Caruthersville-Dyersburg
- North Memphis
- South Memphis
- Helena
- Rosedale
- North Greenville
- South Greenville

Determinations were made of combinations of Study Segments and Super Segments which could produce a logical, full-length corridor from Indianapolis to Houston. Although a number of continuous alignments can be formed from the segments, some such combinations have shorter distances, lower costs, or less potential for negative impacts. The purpose for initially defining candidate corridors is to find those providing the best opportunities for showing feasibility for Corridor 18.

The result of the screening of the Super Segments (Exhibit 3-4) was a definition of a series of corridors for further study. These alternatives were identified to permit determining the low-end and the high-end capital cost estimates for constructing each technology option in Corridor 18. As might be expected, the lowest cost corridor for one technology was not the lowest cost corridor for the other technologies.

Screening of Super Segments to Identify Alternative Candidates for Representative Corridor



- Engineering Reviews
- Environmental Reviews
- Traffic Data
- Economic Impact Considerations
- General Cost Estimates
- Public Comments
- Reviews with States

Exhibit 3-4

From this analysis, the following observations were noted:

- The best corridor locations for the Conventional Interstate Highway and for the Upgraded

Truck/Highway options were the same for a given bridge location.

- The High Speed Interstate Highway corridor location varied from the other two technology options at a given bridge location and made more use of new location alignments.
- Low costs were related to using or upgrading existing facilities.
- The cost range for the Conventional Interstate Highway was approximately 30 percent overall with some super segments being over twice as expensive as others between common points. For the Upgraded Truck/Highway option, the range was approximately 32 percent.
- Some corridors have multiple, almost parallel segments with small cost differences.
- Some corridors with relatively short alignment options have significantly large variations in cost to connect the same travel points. Where there are reasonable alternatives available, these high cost options could be eliminated from further study.
- Some segments have overly challenging environmental impact questions, and more detailed analysis may find insurmountable concerns. Where there are reasonable alternatives available, these challenging sections could be eliminated from further study.
- Some segments are in close proximity to existing or planned Interstate routes, and this could severely impact the segment's ability to attract sufficient traffic to have adequate benefits.

CANDIDATE REPRESENTATIVE CORRIDORS

After identification of the Super Segments, a screening of the resulting alternatives for corridors was undertaken as summarized in Exhibit 3-4. This review identified three alternative corridors north of Memphis to Indianapolis and three alternatives south of Memphis to Houston. Due to the location and environmental impact analyses already completed by the

Indiana Department of Transportation, each alternative uses the same alignment from Indianapolis to Evansville.

Each corridor was about 20 to 50 miles wide and was generally aligned sufficiently close to a key existing route which could be used for general identification purposes as follows:

- **Candidate Corridor One (West)**
  This western candidate is shown in Exhibit 3-5.
  — North of Memphis to Evansville, it uses the Kentucky Parkways/US 51.
  — South of Memphis it crosses Southeast Arkansas and connects with US 59 in Texas.

- **Candidate Corridor Two (Central)**
  The central candidate is shown in Exhibit 3-6.
  — North of Memphis it uses the Kentucky Parkways/US 45/I-40.
  — South of Memphis it uses US 61/Southeast Arkansas/West-Central Louisiana/US190/US 59

- **Candidate Corridor Three - East**
  This candidate is shown in Exhibit 3-7.
  — North of Memphis, it uses Pennyrille Parkway/I-840/I-40,
  — South of Memphis, it uses US 61/Central Louisiana/US 165/I-10

These initial study corridors were selected to provide a broad review of potential differences.. Where possible, and when such did not jeopardize the feasibility, high ends of cost ranges were used in order to provide maximum reasonable leeway in segment options encompassed by a candidate corridor. This was intended to preserve options and to avoid premature elimination of worthy segments within each corridor alternative.

ANALYSIS OF THE TWELVE CORRIDOR COMBINATIONS

Combinations from those initial candidate corridors were developed to produce a total of twelve Candidate Representative Corridors. Illustrations of the Candidate 4 through 12 are included in Appendix A. For help in identification purposes, each corridor is given an alternative number (1 to 12) as well as a combination number referring to the original corridors 1, 2, and

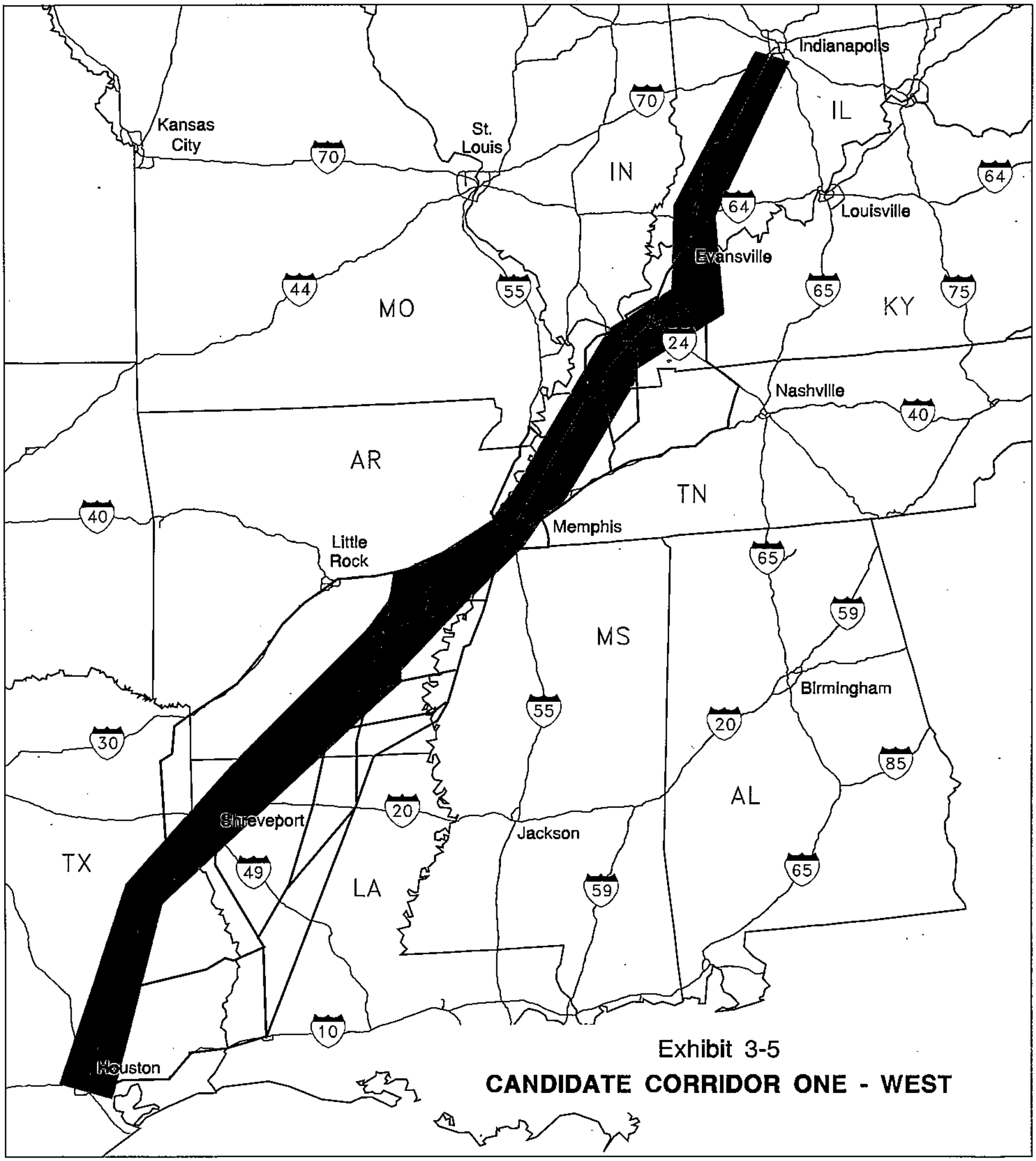


Exhibit 3-5
CANDIDATE CORRIDOR ONE - WEST

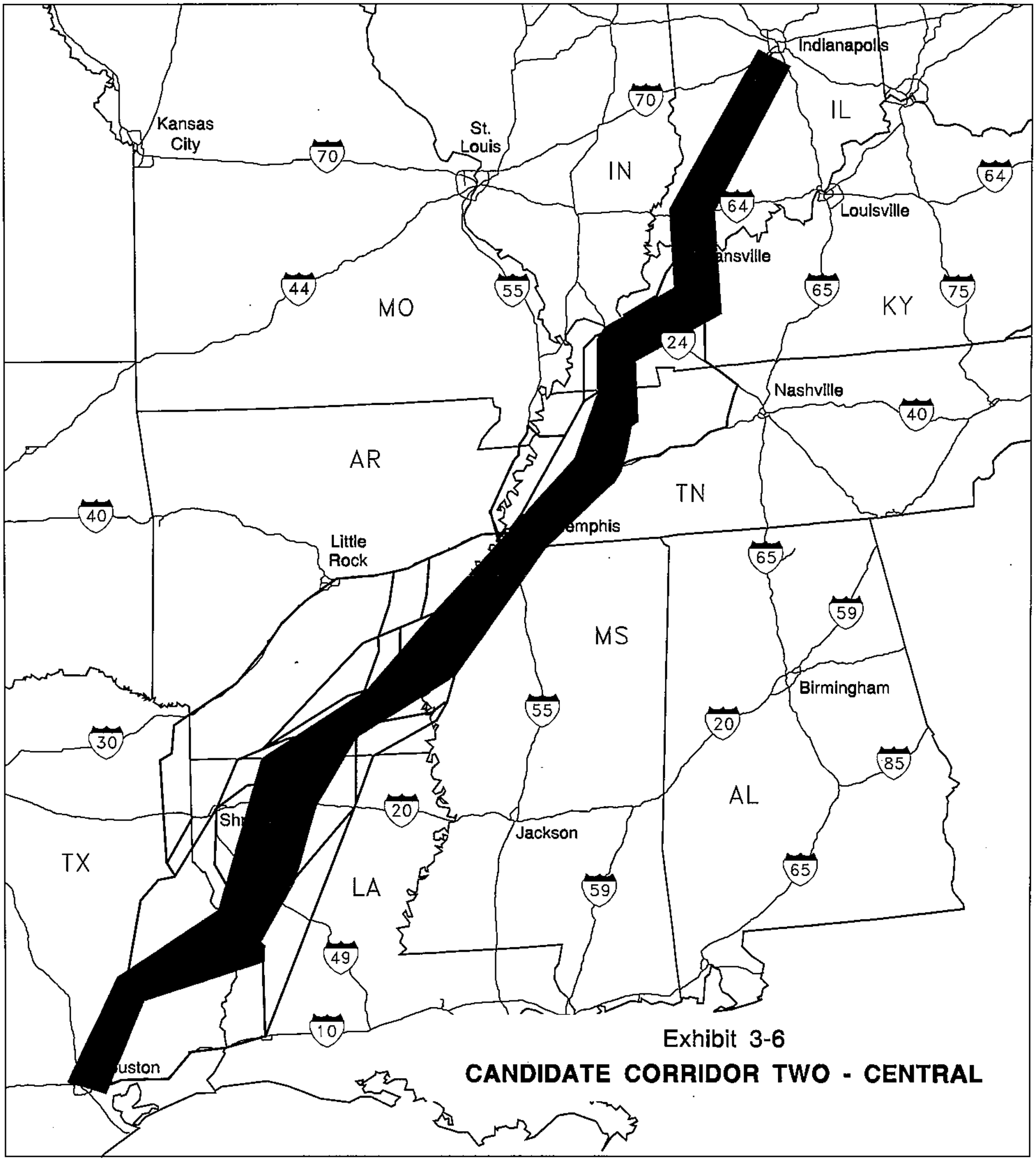


Exhibit 3-6
CANDIDATE CORRIDOR TWO - CENTRAL

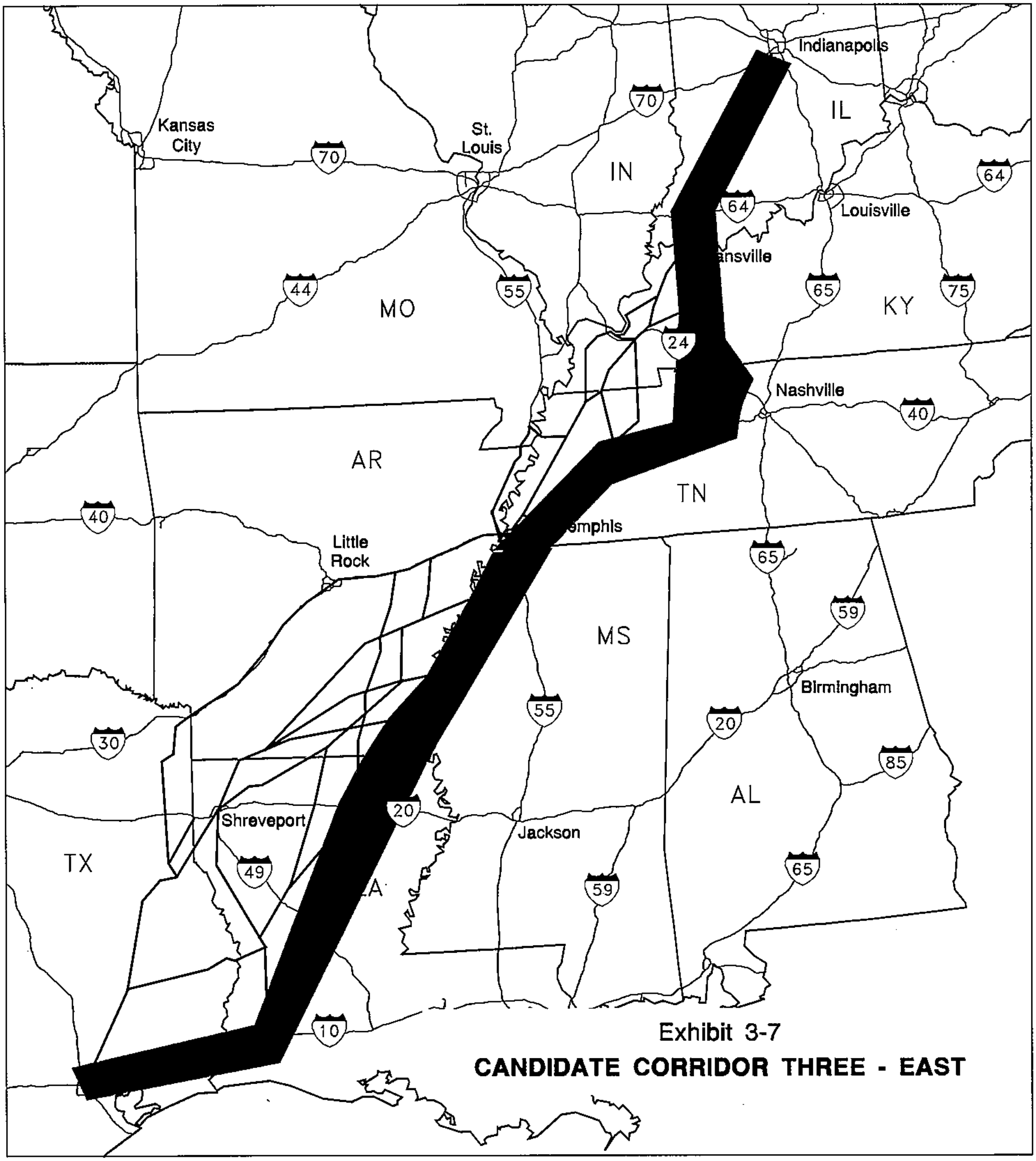
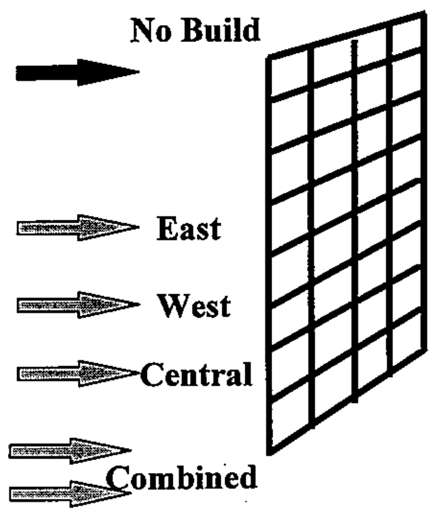


Exhibit 3-7
CANDIDATE CORRIDOR THREE - EAST

3. However, note that Alternative 4 (Combination 2/1) breaks between corridors 1 and 2 at the Arkansas/Louisiana state line while Alternative 7 (Combination 2/1) breaks between corridors 1 and 2 at Memphis.

The twelve candidates were analyzed with respect to several planning criteria in order to determine the Representative Corridor with the best opportunity to show feasibility. Generally speaking, the best opportunity results from minimum costs and maximum benefits. The screening process utilized is illustrated in Exhibit 3-8 and is discussed in detail in the next section of this chapter.

Screening of Candidates to Choose Representative Corridor



- Engineering Reviews
- Environmental Reviews
- Traffic Counts and Projections
- Traffic Service to Ports, Harbors, and Military Installations
- General Cost Estimates
- Economic Impact Considerations
- Population Service Areas
- Reviews with States

Exhibit 3-8

Screening Criteria

For corridor feasibility assessments, there are a number of criteria which most often prove to be the most significant factors in initial determinations. These include the cost for construction and rights of way (including any mitigation costs), the number of daily users attracted to the facility, the travel time savings accrued by users of the facility, and areas of potential major environmental impacts.

The following criteria and criteria measures were established for the screening process in the analysis of the Corridor 18 candidates:

CRITERIA	MEASURE
Maximize the population served by Corridor 18	Population served per route-kilometer Key traffic generators served directly
Maximize the volume of traffic using Corridor 18	ADT and vehicle distance traveled
Maximize the traffic relief to other key routes	ADT diverted to Corridor 18
Maximize the user time savings on Corridor 18	Travel time for the full length of Corridor
Minimize the development cost	Construction and rights of way costs
Minimize the potential environmental impacts	Number of wetlands, wildlife refuges, and parks
Maximize service to military installation	Number of military installations served
Maximize service to intermodal facilities	Number of intermodal facilities served

Comparison of the Candidate Representative Corridors

Summary of Data - Exhibit 3-9 shows the data summary of the criteria and measures listed above. This is done for each of the twelve alternatives.

Comparative Data - Exhibit 3-10 includes a relative raw score for each measure for each corridor. This relative raw score is determined by showing the maximum value under each measure as 100 percent and the other values as a percentage of the maximum value. For example, under "Population Served per Distance", Alternative Corridor 3 has the greatest value at 5,926 and is given a raw score of 100 percent.

Exhibit 3-9
COMPARISON OF THE CANDIDATE CORRIDORS - DATA SUMMARY

CONVENTIONAL INTERSTATE HIGHWAY

CANDIDATE NUMBER -->		ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7	ALT 8	ALT 9	ALT 10	ALT 11	ALT 12
COMBINATION -->		1	2	3	2/1	3/2/1	1/2/1	1/2	1/3	2/1	2/3	3/1	3/2
CRITERIA/Measures													
1. 1990 Population Served													
Population, millions	*	8882	8925	10311	9240	9405	9128	8769	9511	9039	9667	9684	9570
Population per KM,	*	5426	5272	5926	5500	5500	5600	5300	5700	5300	5700	5500	5500
2. 2015 Traffic served by facility													
Average cut line ADT	*	95,100	94,250	94,150	94,225	94,350	95,025	94,900	94,650	94,275	94,050	94,300	94,375
Vehicle KM travel (VKT), millions	*	41.64	38.46	45.90	41.22	45.55	42.25	39.3	39.3	41.7	41.7	46.1	42.8
ADT from VKT/length	*	25,400	22,700	26,700	24,600	26,600	25,900	23,800	23,700	24,700	24,400	26,300	24,700
3. 2015 Traffic Relief to Other Routes													
Increase in study area traffic at cut lines	*	20,900	17,500	17,100	17,400	17,900	20,600	20,100	19,100	17,600	16,700	17,700	18,000
Change in route traffic, cut line average	*	13,275	12,650	9,075	11,300	10,925	12,900	14,150	10,950	11,775	9,450	11,400	12,275
4. Length of Route													
KM	**	1637	1693	1740	1680	1710	1630	1650	1658	1690	1706	1750	1730
Travel time, hours	**	16.1	16.6	17.3	16.5	16.8	16.2	16.3	16.3	16.7	16.8	17.3	17.1
5. Estimated Cost, Millions of Dollars													
Total for conventional Interstate	**	$5,329	$5,697	$4,880	$5,250	$5,320	$5,290	$5,800	$4,840	$5,300	$4,810	$5,400	$5,800
New locations for conventional Interstate	**	$3,654	$4,650	$3,851	$4,420	$3,820	$3,820	$4,650	$3,820	$3,654	$3,820	$3,705	$4,701
Vehicles served per million $	*	4.77	3.98	5.47	4.69	5.00	4.90	4.10	4.90	4.66	5.07	4.87	4.26
Total for High Speed Interstate	**	$12,300	$12,800	$13,300	$12,500	$13,500	$12,100	$12,400	$12,050	$12,700	$12,450	$13,700	$13,800
6. Environmental Mitigation													
Number of wetlands involved	**	47	51	46	49	44	46	48	39	50	43	42	46
Number of Wildlife Refuges/State parks	**	19	26	18	20	21	20	26	17	19	17	20	27
Ozone marginal non-attainment areas	**	4	4	6	4	4	4	4	6	4	6	4	4
7. Military installations served	*	2	3	5	3	4	3	3	3	2	4	4	4
8. Intermodal facilities served	*	19	19	27	19	21	19	19	25	19	25	21	21

* Higher is better for these criteria
** Lower is better for these criteria

Exhibit 3-10
COMPARISON OF THE CANDIDATE CORRIDORS - PERCENT OF MAXIMUM VALUE

CONVENTIONAL INTERSTATE HIGHWAY

CANDIDATE NUMBER -->		ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7	ALT 8	ALT 9	ALT 10	ALT 11	ALT 12
COMBINATION -->		1	2	3	2/1	3/2/1	1/2/1	1/2	1/3	2/1	2/3	3/1	3/2
CRITERIA/Measures													
1. 1990 Population Served													
Population, millions	*	86%	87%	100%	90%	91%	89%	85%	92%	88%	94%	94%	93%
Population per KM,	*	92%	89%	100%	93%	93%	95%	89%	96%	89%	96%	93%	93%
2. 2015 Traffic served by facility													
Average cut line ADT	*	100%	99%	99%	99%	99%	100%	100%	100%	99%	99%	99%	99%
Vehicle KM travel (VKT), millions	*	90%	83%	100%	89%	99%	92%	85%	85%	91%	91%	100%	93%
ADT from VKT/length	*	95%	85%	100%	92%	100%	97%	89%	89%	93%	91%	99%	93%
3. 2015 Traffic Relief to Other Routes													
Increase in study area traffic at cut lines	*	100%	84%	82%	83%	86%	99%	96%	91%	84%	80%	85%	86%
Change in route traffic, cut line total	*	94%	89%	64%	80%	77%	91%	100%	77%	83%	67%	81%	87%
4. Length of Route													
KM	**	94%	97%	99%	96%	98%	93%	94%	95%	97%	98%	100%	99%
Travel time, hours	**	93%	96%	100%	95%	97%	93%	94%	95%	96%	97%	100%	99%
5. Estimated Cost, Millions of Dollars													
Total for conventional Interstate	**	92%	98%	84%	91%	92%	91%	100%	83%	91%	83%	93%	100%
New locations for conventional Interstate	**	78%	99%	82%	94%	81%	81%	99%	81%	78%	81%	79%	100%
Vehicles served per million $	*	87%	73%	100%	86%	91%	90%	75%	90%	85%	93%	89%	78%
Total for High Speed Interstate	**	89%	93%	96%	91%	98%	88%	90%	87%	92%	90%	99%	100%
6. Environmental Mitigation													
Number of wetlands involved	**	92%	100%	90%	96%	86%	90%	94%	77%	98%	84%	82%	90%
Number of Wildlife Refuges/State parks	**	70%	96%	67%	74%	78%	74%	96%	63%	70%	63%	74%	100%
Ozone marginal non-attainment areas	**	67%	67%	100%	67%	67%	67%	67%	100%	67%	100%	67%	67%
7. Military installations served	*	40%	60%	100%	60%	80%	60%	60%	60%	40%	80%	80%	80%
8. Intermodal facilities served	*	70%	70%	100%	70%	78%	70%	70%	93%	70%	93%	78%	78%

* Higher is better for these criteria
** Lower is better for these criteria

The percentage values provide a quick way to compare the alternatives. This follows the same format as Exhibit 3-9 but has developed each data entry (cell) as a percentage. The maximum value in Exhibit 3-10 for any given line is 100 percent, while each other entry on the same line is related to that maximum value. This at times permits an easier and quicker comparison of the data entries, but keep in mind that some lines (such as population served) show data which we desire to *maximize* while other lines (such as cost) we desire to *minimize.*

Ranking - Exhibit 3-11 described for each criteria and candidate corridor a ranking 1=Best to 5=Least. Exhibit 3-13 uses a simple ranking scheme to show relative desirability of each alternative for the data items on each line. The confusion in Exhibit 3-10 of maximum vs. minimum is eliminated by always using "1" as best. For example, Alternative 3 has the highest (best) population service potential and is rated a "1".

Ranking with Variable Weighted Criteria -In order to provide a more comprehensive analysis, different weights were applied to the screening criteria. As shown in Exhibit 3-12,, first, all criteria measures are weighted equally.(item 1). Then 16 different combinations are presented. For example, item 3 give more value to cost and traffic while number 7 give more value to socioeconomic and environmental concerns. This exhibit ranks the alternatives from 1 is best to 5 is least. In this way it is possible to see how the candidate alternative corridors measure up in terms of variable criteria.

The seven primary criteria are wetlands, cost total, length hours, cut line change, km travel, population per km and ozone non attainment.

Alternative 6 Ranks Highest Overall

From the above data and rankings, the combination alternative referred to as Candidate Representative Corridor 1/2/1 (Alternative 6) scores highest overall. This alternative is shown in Exhibit 3-13. Of course, many additional combinations of criteria measures and scorings can be made, and somewhat different rankings could result especially if one applies different weighting to the importance of individual criterion line items. However, the Alternative 1/2/1 continues to provide the overall best opportunity for investigating the feasibility of Corridor 18 for its full length from Indianapolis to Houston.

Exhibit 3-11
COMPARISON OF THE CANDIDATE CORRIDORS - RANKING BY CRITERIA MEASURES

RANKING FROM 1 = BEST TO 5 = LEAST

CONVENTIONAL INTERSTATE HIGHWAY

CANDIDATE NUMBER -->	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7	ALT 8	ALT 9	ALT 10	ALT 11	ALT 12
COMBINATION -->	1	2	3	2/1	3/2/1	1/2/1	1/2	1/3	2/1	2/3	3/1	3/2
CRITERIA/Measures												
1. 1990 Population Served												
Population, millions	5	5	1	4	3	4	5	3	4	3	3	3
Population per KM,	4	5	1	4	4	3	5	2	5	2	4	4
2. 2015 Traffic served by facility												
Average cut line ADT	1	4	5	4	4	1	2	3	4	5	4	4
Vehicle KM travel (VKT), millions	3	5	1	4	1	3	5	5	3	3	1	3
ADT from VKT/length	2	5	1	3	1	2	4	4	3	3	1	3
3. 2015 Traffic Relief to Other Routes												
Increase in study area traffic at cut lines	1	4	5	4	4	1	2	3	4	5	4	4
Change in route traffic, cut line total	2	2	5	3	4	2	1	4	3	5	3	2
4. Length of Route												
KM	1	3	5	3	4	1	2	2	3	4	5	4
Travel time, hours	1	3	5	2	3	1	2	2	3	3	5	4
5. Estimated Cost, Millions of Dollars												
Total for conventional Interstate	3	5	1	3	3	3	5	1	3	1	3	5
New locations for conventional Interstate	1	5	2	4	2	2	5	2	1	2	1	5
Vehicles served per million $	3	5	1	3	2	3	5	3	3	2	3	4
Total for High Speed Interstate	2	3	4	2	4	1	2	1	2	2	5	5
6. Environmental Mitigation												
Number of wetlands involved	4	5	3	4	3	3	4	1	5	2	2	3
Number of Wildlife Refuges/State parks	2	5	1	2	3	2	5	1	2	1	2	5
Ozone marginal non-attainment areas	1	1	5	1	1	1	1	5	1	5	1	1
7. Military installations served	5	4	1	4	2	4	4	4	5	2	2	2
8. Intermodal facilities served	5	5	1	5	4	5	5	2	5	2	4	4

Exhibit 3-12
COMPARISON OF THE CANDIDATE CORRIDORS - RANKING BY WEIGHTED CRITERIA MEASURES

OVERALL RANKING FROM 1 = BEST TO 5 = LEAST												
CONVENTIONAL INTERSTATE HIGHWAY												
CANDIDATE NUMBER -->	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7	ALT 8	ALT 9	ALT 10	ALT 11	ALT 12
COMBINATION -->	1	2	3	2/1	3/2/1	1/2/1	1/2	1/3	2/1	2/3	3/1	3/2
CRITERIA/Measures USED FOR LINE												
1. Equal weight, all 18 criteria measures	2	5	2	3	2	1	4	2	3	2	2	4
2. Equal weight, 7 primary criteria	2	5	5	4	4	1	3	2	5	4	4	4
3. Full cost and traffic factors, 9 measures	1	5	2	3	2	1	4	3	3	3	2	4
4. 7 primary criteria with cost multiplied by 2	2	5	2	3	2	1	4	2	3	2	2	4
5. 7 primary criteria with cost multiplied by 3	2	5	1	2	2	1	4	1	3	1	2	4
6. 7 primary criteria plus two cost and traffic	1	5	3	3	2	1	3	3	4	3	3	4
7. Socio-economic and environmental (SEE)	2	5	2	2	2	1	4	1	3	2	1	3
8. Traffic service only	1	3	5	4	4	1	1	3	4	5	4	3
9. Two cost factors--total and veh/$	2	5	1	2	3	2	4	1	2	1	4	5
10. 7 primary with double cost and traffic	2	5	4	4	4	1	3	2	4	4	4	5
11. 7 primary and full traffic service	1	4	5	4	4	1	2	3	4	5	4	4
12. SEE plus cost and traffic	2	5	2	3	3	1	4	1	3	2	2	4
13. 7 primary; intermodal; military	5	4	2	4	3	1	2	1	4	3	3	3
14. SEE plus cost, traffic, intermodal, military	3	5	2	3	3	1	3	1	4	2	2	4
15. Vehicles served per Million $ (CONV)	3	5	1	3	2	3	5	3	3	2	3	4
16. Vehicles served/Million $, traffic service	1	4	5	4	4	1	2	3	4	5	4	4
17. Traffic service; military; intermodal	2	4	3	5	4	1	2	3	5	4	3	3
AVERAGE RATING	2	4.6	2.8	3.3	2.9	1.2	3.2	2.1	3.6	2.9	2.9	3.9

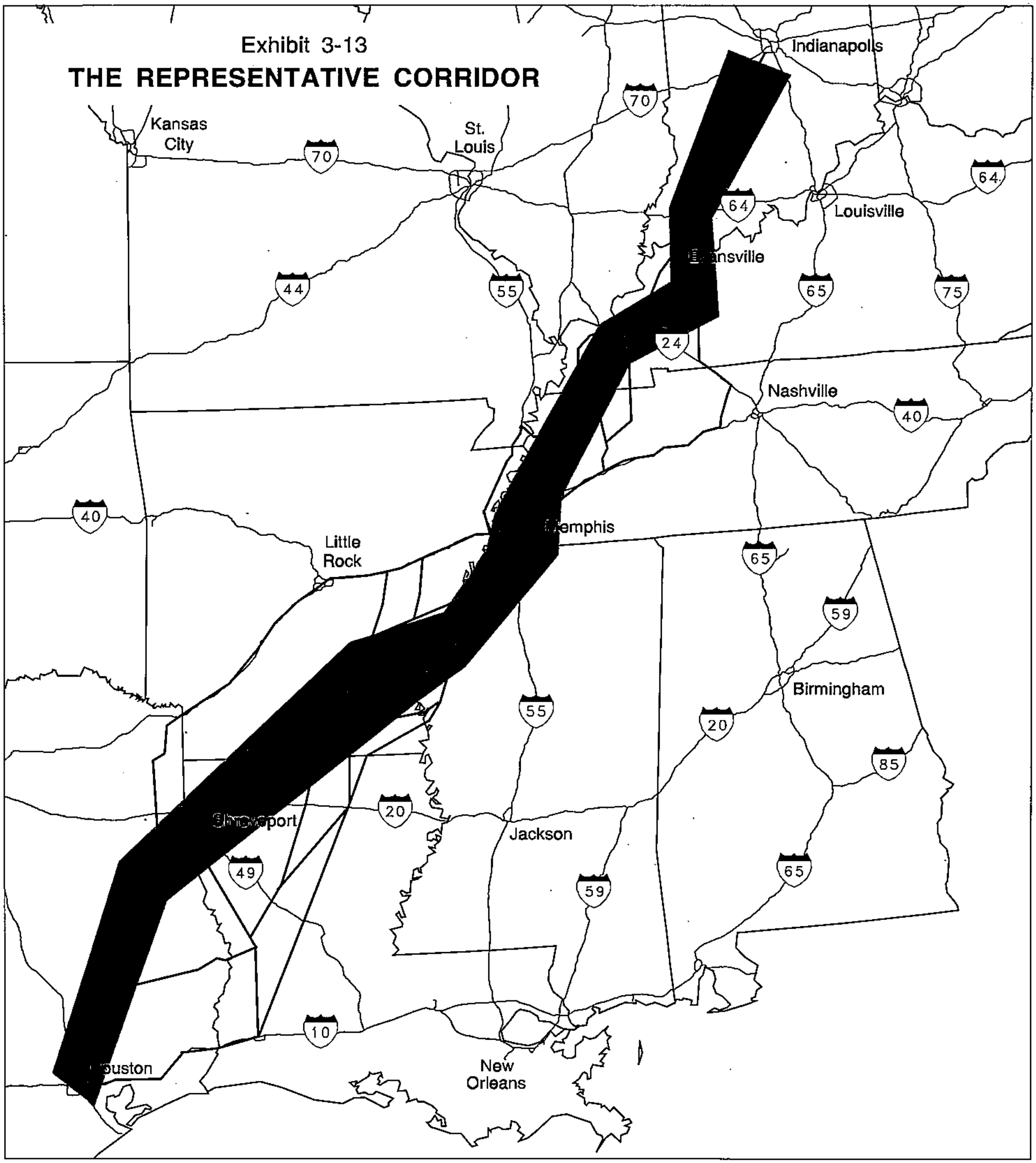


Exhibit 3-13
THE REPRESENTATIVE CORRIDOR

A large part of the high weighted scores for Alternative Corridor 6 (Combination 1/2/1) is due to its relatively short length, short travel time, good traffic service scores (but not the highest or best), and good cost figures. For example, Corridor 6 provides the highest opportunity or is ranked with or near the highest category for several measures as noted below:

- Traffic relief to parallel facilities
- Overall travel time and user cost reduction
- Development cost for the High Speed Interstate option
- Opportunity to avoid key environmental concerns

One should keep in mind that the purpose of choosing a representative corridor is to *represent* the route for feasibility tests rather than to choose a specific route location. In addition, for many measures the data for most if not all corridors are very close. There is not a wide range or separation within many measures. For example, nine of the 12 alternative corridors have construction cost estimates falling within 10% of the least cost value. Corridor 1/2/1 and Corridor 3/2/1 are within 5% of the highest average daily traffic volume for the full length of route.

Regarding the costs, Corridor 1/2/1 is about midway between the highest and least costs for all alternatives for the Conventional Interstate technology option and is among the least two costs for the High Speed Interstate option. The range in costs for the Conventional Interstate is $4.84 billion to $5.8 billion (a range of about 20%).

Other Observations

Based on a review of these data, the following additional observations are noted regarding the overall ranking of the 12 corridors.

- Data for all corridors for most measures are quite close. The range in some instances is less than a 10% spread. These include the cut line total ADT, full length of routes, and travel time for the full length.

- Alternative 3 has the highest number for direct population served.

- The average ADT estimated for Alternative 3 (Corridor 3) is highest, but Alternative 5 (Corridor 3/2/1) is very close, and Alternative 6 (Corridor 1/2/1) is within 5%.

- Alternatives 1 and 6 seem to provide the best opportunities for traffic relief to parallel facilities.

- Alternatives 1 and 6 provide the best overall travel times.

- Alternative11 seems to provide the better overall opportunity to avoid environmental problems with Alternatives 1, 5 and 6 a close second.

- For the conventional highway, Alternatives 8 and 10 have the lowest cost. Nine of the 12 alternatives fall within 10% of the estimated least cost corridor. For the High Speed Interstate Highway, Alternative 6 or 8 is likely to have the lowest development cost.

- Seismic considerations suggest the desirability of having the Mississippi River crossing south of Memphis. Alternatives 2 and 3 at the Mississippi River best meet this consideration. Alternative 1 could include developing a new Mississippi River bridge at Memphis using current seismic design standards.

- Concerns for the natural environment and especially the White River National Wildlife Refuge can impact Alternative 2 for crossings in or near Helena, Arkansas.

- Air quality issues are involved in a number of urban areas, but Alternative 3 adds to this complexity by routing along I-10 in Louisiana and Texas.

- The ISTEA designated urban areas are best served by Alternatives 1,5, 6, and 9.

- Cost estimates for Corridor 18, when it is aligned on an existing Interstate route (such as I-40 in Tennessee), involve an incremental add-on of 20 percent of the cost for a new location. A review of the traffic assignments suggest that the incremental addition of traffic due to Corridor 18 may not be sufficient in most rural areas to require additional laneage or interchange modification for the Conventional Interstate Highway.

- At this level of analysis, specific locations cannot be developed for routing Corridor 18 through urban areas. This would be a proper function of follow-up studies.

On overall balance, the technical data point to the use of Alternative 6 as the representative corridor to develop specific numbers for use in the feasibility tests. For feasibility analyses, each of the three technology options should be given its best, realistic opportunity to show feasibility. Generally speaking, the viable route which is shortest (best opportunity for fastest travel time) and least expensive to construct has the best opportunity to show feasibility. A candidate representative corridor should seek to produce a location with maximum service potential at a minimum cost.

REPRESENTATIVE COSTS

The costs presented in this section are the allowances for the Representative Corridor for the purposes of determining the feasibility of the project. These costs are reasonable under the set of assumptions chosen and permit some latitude in options within the Representative Corridor. Several factors could increase or decrease the costs for Corridor 18. These might include the following:

- Selection of a different route location
- Changing the design standards
- Results of more detailed investigation
- Time delays affecting costs or environment concerns

Any of these factors could alter the costs associated with building this project. The likelihood of any of these factors coming into play can not be determined. The results of the feasibility analysis provide a measuring stick to evaluate the effects of making any changes to the Representative Corridor location for the selection of a Preferred Corridor location.

The cost for each of the major categories used in the estimate of the Representative Corridor are shown in Exhibit 3-14.

Exhibit 3-14
COST BREAKDOWN FOR THE REPRESENTATIVE CORRIDOR
(Millions $)

Construction		R-O-W	Engineering	Mitigation	Contingency	Total
Mainline	Structures					
$3,224	$350	$365	$634	$361	$560	$5,494
58.7%	6.4%	6.7%	11.5%	6.6%	10.2%	100%

From the information provided in Exhibit 3-14 the total cost required for developing Corridor 18 is about $5.5 billion. Excluding R-O-W costs, the construction cost is on the order of $ 5.1 billion dollars. The mainline construction costs were based on unit costs per length of several previously completed highway projects based on terrain type.

The major structures costs, such as for crossing the Mississippi River, are listed separately due to the additional design requirements for a structure crossing a major river. These major rivers were listed in Chapter 2. The costs for most of the structures is included in the mainline construction costs. R-O-W costs were derived from an average cost per area for each general land use type. Contingencies were included to account for unusual factors including unanticipated engineering and environmental mitigation costs. This provides an amount to cover costs that may or may not be encountered when more detailed investigations are performed.

The costs shown were derived from average unit costs developed across the full study area. There will be some variance in the unit costs applicable for each state, which would affect the breakdown of cost on a state by state basis. These unit costs for the conventional Interstate type facility are based on typical interchange spacing for a non-tolled highway.

In Exhibit 3-15 the costs are shown as an allocation by states along with the percentage distribution by states. In addition, for comparison purposes, the length of the representative corridor used in each state is included as a percentage of the total distance.

Exhibit 3-15
COST ALLOCATION FOR
CONVENTIONAL INTERSTATE-TYPE HIGHWAY
(State by State)

States	Cost Millions $	Percent of Cost	Percent of Length
Indiana	$1,026	18.7%	15.9
Kentucky	$565	10.3%	16.4
Tennessee	$380	6.9%	12.9
Mississippi	$765	13.9%	10.8
Arkansas	$1,065	19.4%	12.4
Louisiana	$983	17.9%	10.9
Texas	$710	12.9%	20.7

Although a specific route location was not selected during the feasibility analyses, certain assumptions about a possible location were needed in order to arrive at reasonable cost estimates. For example, the total cost estimated for the bridge over the Ohio River at Evansville was included in the state of Kentucky because both sides of the river are in Kentucky at the current crossing on US 41. At least two possibilities exist for a new bridge corridor in this area, a crossing parallel to US 41 or a new corridor using some extension of I-164 on the east side. For the purposes of this feasibility analysis, use of I-164 (upgraded as needed) was included along with costs to develop a new bridge and upgrade US 41 to connect with the Pennyrile Parkway in Kentucky. The costs for the Corridor 18 bridge crossing of the Mississippi River were split at the state line between Mississippi and Arkansas.

Note in Exhibit 3-15 that a much higher cost per length is incurred in the states of Indiana, Mississippi, Arkansas, and Louisiana due to the need for more new alignment locations. Locations in Kentucky, Tennessee, and Texas are more likely to be able to make use of existing facilities which already have high design standards.

To better demonstrate the reasons for the cost variability by state, Exhibit 3-16 shows the costs based upon the length of facility on new location and the cost for upgrades of existing facilities. The use of existing facilities already constructed to a design close to Interstate standards can provide significant cost savings. However, Corridor 18 is providing a highway link that currently does not exist to Interstate standards in many locations and, accordingly, often must be located on new alignment. The states of Mississippi, Arkansas, and Louisiana are using larger portions of new alignment due to the lack of adequate existing facilities within the Corridor 18 study area.

Exhibit 3-16
ALLOCATION OF COSTS BY STATE FOR UPGRADE/NEW FACILITIES

	Upgrade			New			Total		
	Cost	Length		Cost	Length		Cost	Length	
	$ M	Miles	KM	$ M	Miles	KM	$ M	Miles	KM
Indiana	250	49	78	776	113	183	1,026	162	261
Kentucky	542	159	256	23	9	14	565	168	270
Tennessee	381	132	212	0	0	0	381	132	212
Mississippi	0	0	0	765	110	177	765	110	177
Arkansas	0	0	0	1065	126	203	1,065	126	203
Louisiana	4	3	5	979	108	174	983	111	179
Texas	511	171	275	199	40	64	710	211	339
Total	**$ 1,688**	**514**	**826**	**$3,807**	**506**	**815**	**$ 5,495**	**1,020**	**1,641**

The annual operations and maintenance costs (O&M) are derived from current unit costs for such things as pavement repairs, bridge maintenance, upkeep of rights of way, and sign replacement. These unit values can be applied to the length of Corridor 18 in each state to provide an indicator of relative O&M costs that each state is likely to incur for this facility. Exhibit 3-17 summarizes this information.

Exhibit 3-17
ANNUAL OPERATIONS AND MAINTENANCE COSTS FOR CONVENTIONAL INTERSTATE-TYPE HIGHWAY

	Length		Operation and Maintenance Costs ($ M per year)
	KM	Miles	
Indiana	261	162	$ 5.44
Kentucky	270	168	$ 5.63
Tennessee	212	132	$ 4.42
Arkansas	177	110	$ 3.69
Mississippi	203	126	$ 4.23
Louisiana	179	111	$ 3.73
Texas	340	211	$ 7.09
Total	**1,642**	**1,020**	**$34.23**

Chapter 4
TRAVEL DEMANDS

This chapter on Travel Demands is divided into four main areas:

- Existing Passenger Transportation Facilities;
- Existing Freight Transportation Facilities;
- Travel Demand Models; and
- Travel Demand Projections.

The section on Travel Demand Projections focuses on demand for implementation of a toll-free Conventional Interstate-type Facility (Option A) within the study area. The potential impact of tolls is addressed at the end of this section. Travel demand estimates for Option B (Truckway) and Option C (High Speed Interstate) are discussed later in this Report.

EXISTING PASSENGER TRANSPORTATION FACILITIES

Existing transportation systems in the Corridor States are described in the following sequence:

- Highways;
- Railroads;
- Airports; and
- Waterways.

This section focuses on transportation systems in the eight corridor states of Arkansas, Indiana, Kentucky, Louisiana, Michigan, Mississippi, Tennessee, and Texas. Facilities in other states are mentioned where of particular interest to the study corridor - such as the role of Chicago, Illinois in the region's rail network.

HIGHWAYS

The eight corridor states contain 1,397,532 km (868,386 miles) of roadways,[1] of which 70,159 km (43,595 miles) are in the Principal Arterial System (PAS). The PAS, shown in Exhibit 4-1 for the corridor region, consists of Interstates, Other Freeways and Expressways, and Other Principal Arterial functional systems. The network shown is based on the Oak Ridge National Highway Network (ORNHN), developed at the Oak Ridge National Laboratory.

PRINCIPAL ARTERIALS IN CORRIDOR REGION

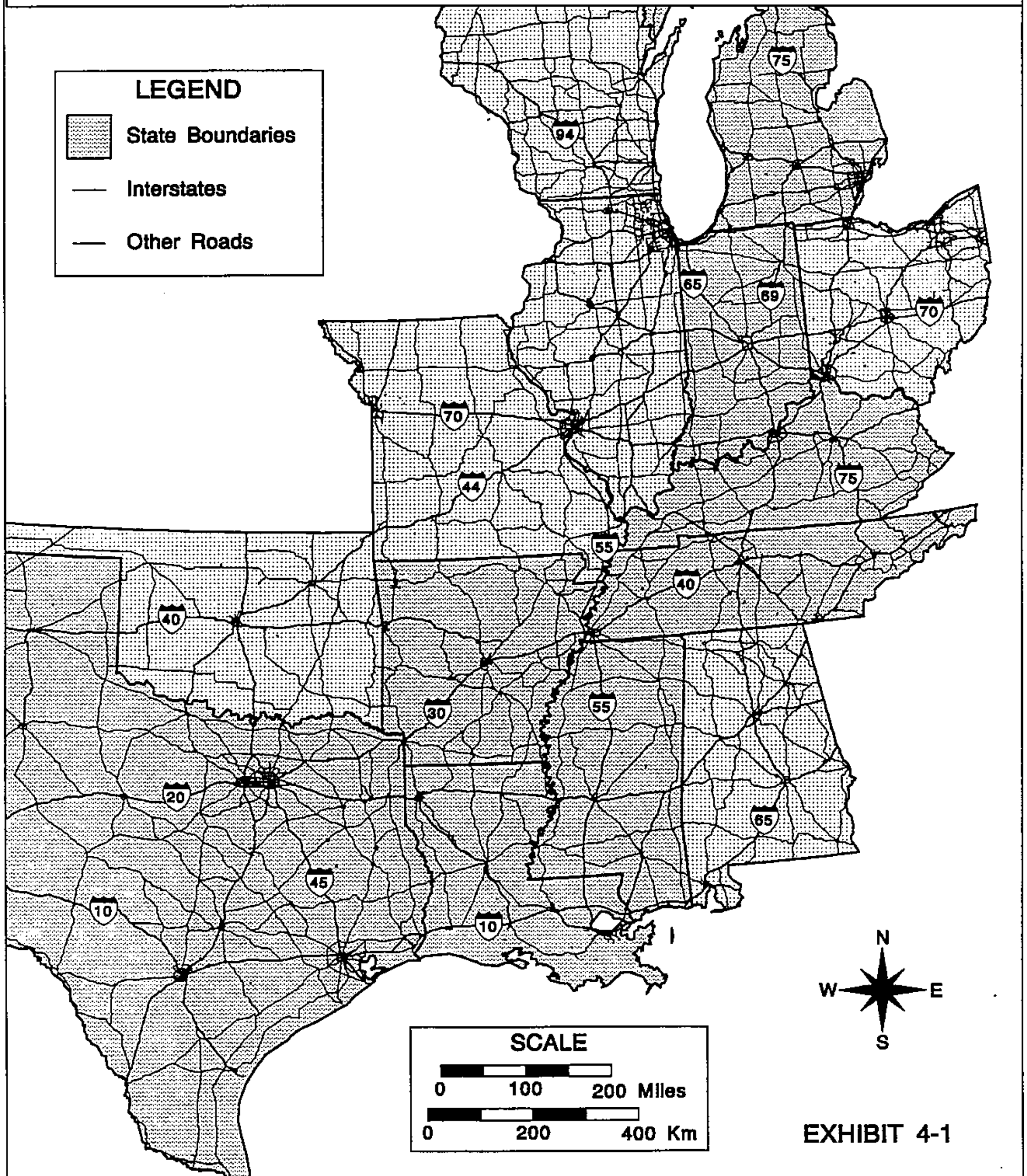


EXHIBIT 4-1

Existing Facilities

The principal highways in the Corridor States include:

Rural Highways

- Interstates: 10,873 km (6,756 miles) - 15.5 percent.
- Other Principal Arterials: 33,490 km (20,809 miles) - 47.7 percent.
- Total Rural: 44,363 km (27,565 miles) - 63.2 percent.

Urban Highways

- Interstates: 4,465 km (2,775 miles) - 6.4 percent.
- Other Freeways and Expressways: 2,532 km (1,574 miles) - 3.6 percent.
- Other Principal Arterials: 18,798 km (11,681 miles) - 26.8 percent.
- Total Urban: 25,795 km (16,030 miles) - 36.8 percent.

The eight states contain 20.9 percent of all Interstate highways in the USA and 21.7 percent of the Principal Arterials and higher classification roadways.

Mississippi River Crossings

The Mississippi River presents a natural barrier to east-west movements by road and by rail in the Study Area. Between Cape Girardeau, Missouri and Natchez, Mississippi, a distance of approximately 710 km (440 miles), there are five Interstate highway crossings and four additional crossings carrying U.S. or State routes. Two of the Interstate crossings, for I-40 and I-55, are located close together in Memphis, Tennessee. The I-57 and U.S. 60/62 crossings between Missouri and Illinois are also within a few kilometers of each other.

Mississippi highway crossings are listed in Exhibit 4-2. The location of both rail and highway crossings are illustrated in Exhibit 4-3.

Highway Travel Demand

Highway travel demand in the study corridor is characterized by vehicle-km (vehicle-miles) of travel and Average Daily Traffic (ADT) volumes. In general these data combine passenger and freight vehicles, with passenger vehicles accounting for approximately 75 percent of ADT in rural areas of Corridor States and 84 percent in urban areas.

Exhibit 4-2
MISSISSIPPI RIVER HIGHWAY CROSSINGS

Bridge Location	Connecting States[1]	Highway	Distance [2]		Lanes	Service Volume		ADT
			km	miles		LOS C	LOS E	
Cape Girardeau, MO	MO - IL	IL 146	–	–	2	5,600	20,200	11,640
Urbandale, IL	MO-IL	I-57	40	25	4	49,100	64,900	9,190
Cairo, IL	MO-IL	US 60/62	6	4	2	5,600	20,200	6,340
Caruthersville, MO	MO - TN	I-155	129	80	4	49,100	64,900	5,450
Memphis, TN	AR - TN	I-40	113	70	6	72,800	97,400	36,790
Memphis, TN	AR-TN	I-55	<1	<1	4	49,100	64,900	36,250
Helena, AR	AR-MS	US 49	84	52	2	5,600	20,200	2,100
Greenville, MS	AR-MS	US 82	146	91	2	5,600	20,200	10,000
Vicksburg, MS	LS-MS	I-20	105	65	4	49,100	64,900	17,256
Natchez, MS	LA-MS	US 84	87	55	4	41,700	59,200	24,000

(1) AR - Arkansas, KY - Kentucky; LA - Louisiana; MO - Missouri; MS - Mississippi; TN - Tennessee.
(2) Approximate straight line distance from next upstream highway crossing

Road and Railroad Crossings of the Mississippi River

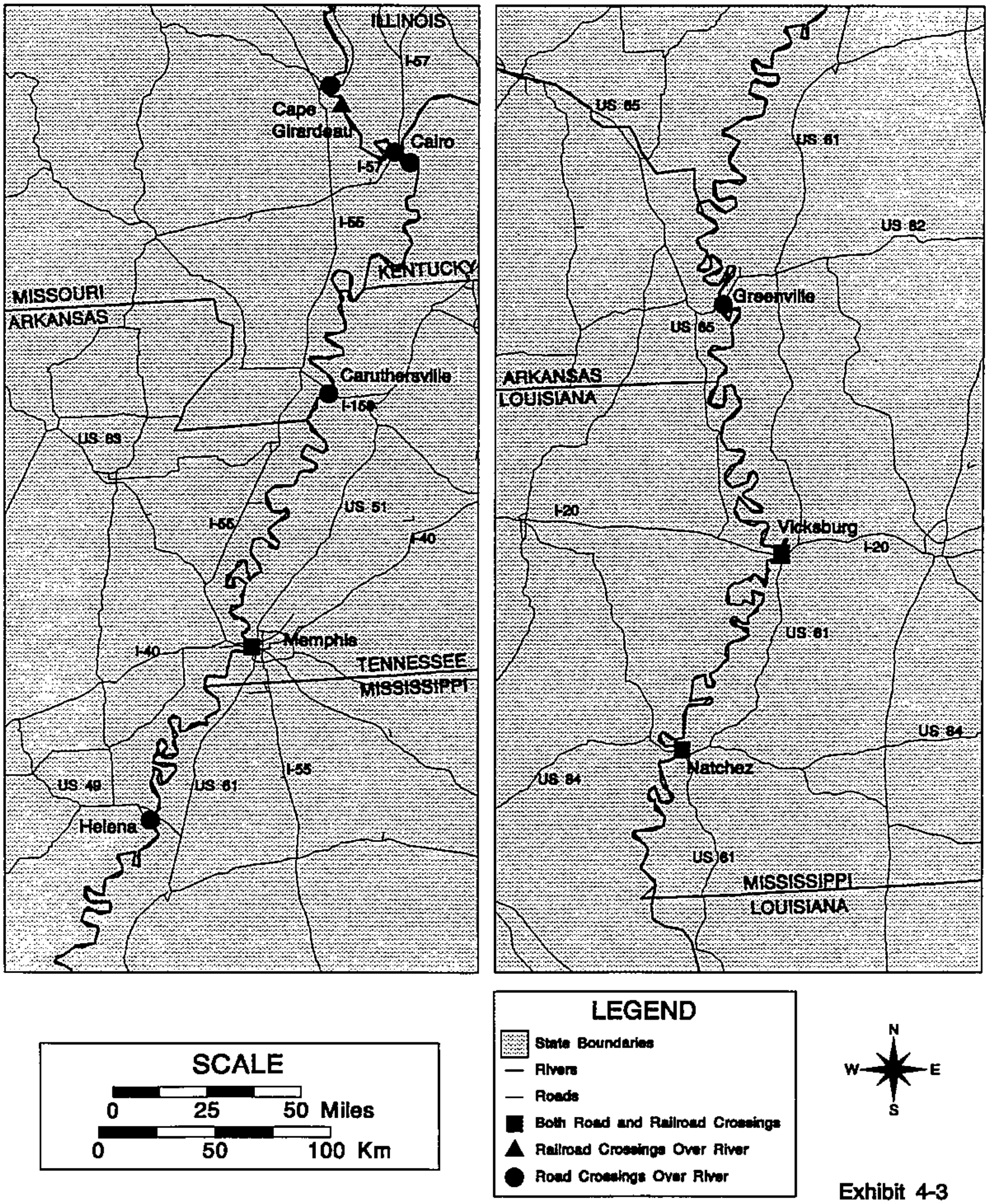


Exhibit 4-3

The eight corridor states account for 21.0 percent of vehicle-km on the Nation's Interstate highways. This percentage matches the 21.0 percent of Interstate km located in the corridor states. On the Nation's PAS, 20.6 percent of vehicle-km occur in corridor states. The corridor states contain 21.7 percent of the nation's highways in the PAS.

Exhibit 4-4 shows the distribution of rural Interstate ADT by volume ranges in the eight states[2]. The distribution over the total corridor and the USA as a whole is also shown. In the corridor states 41.7 percent of Interstate kilometers have an ADT in excess of 20,000 compared to 32.5 percent for the USA.

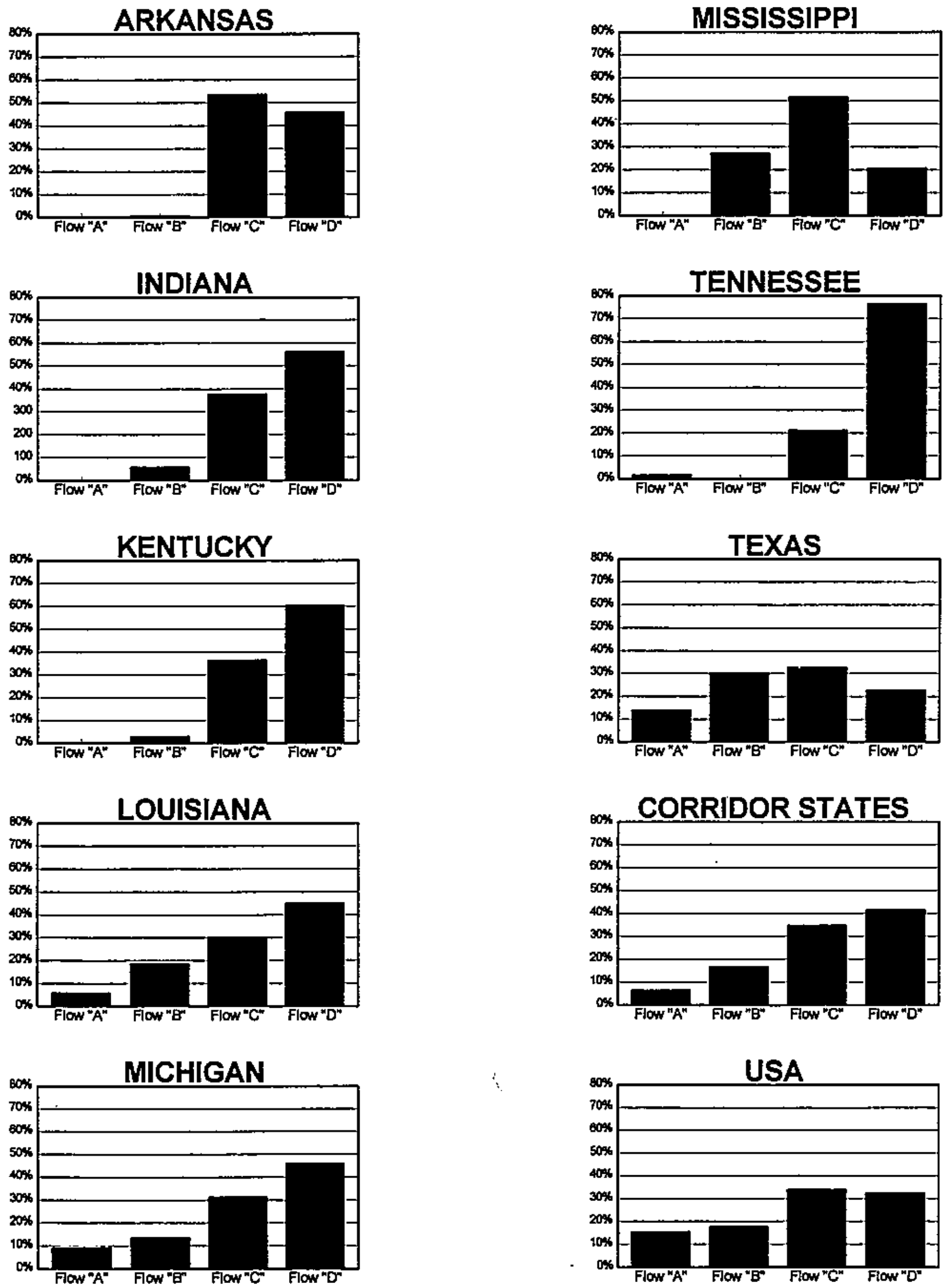
On rural highways classified as Other Principal Arterials, 47.3 percent of road kilometers in corridor states have an ADT of 5,000 or more, compared to 39.1 percent for the USA. The distribution of ADT on Other Principal Arterials is shown in Exhibit 4-5.

RAIL PASSENGER SERVICES

Two passenger services operated by AMTRAK follow the general north-south orientation of the corridor region, as shown in Exhibit 4-6. Both services, which operate daily, originate in Chicago. The principal cities served by these routes are shown in Exhibit 4-7. The overall average speed of travel between Chicago and New Orleans is 80 kph (50 mph) and between Chicago and Houston is 71 kph (44 mph). For long distance travel between cities lying directly within the study area, rail passenger service is slower due to the need to change trains in Chicago. For example, to travel from Indianapolis, IN to Houston, TX would take 34 hours and 5 minutes, using existing AMTRAK services (including a 6 hour 30 minute wait in Chicago). Based on an estimated direct road distance of 1,667 km (1,042 miles) between Indianapolis and Houston, the rail mode provides an effective travel speed of 43 kph (27 mph).

AIRPORTS

Airport locations within the corridor region with passenger enplanements in excess of 50,000 in 1990 are shown in Exhibit 4-8. Airport locations are identified by their three character airport codes. The airports current role in long distance travel is indicated by classifying into three ranges the longest non-stop commercial service flight scheduled from the airport. Information for airport facilities was obtained from the airports database developed by the Services Assessment Division of the

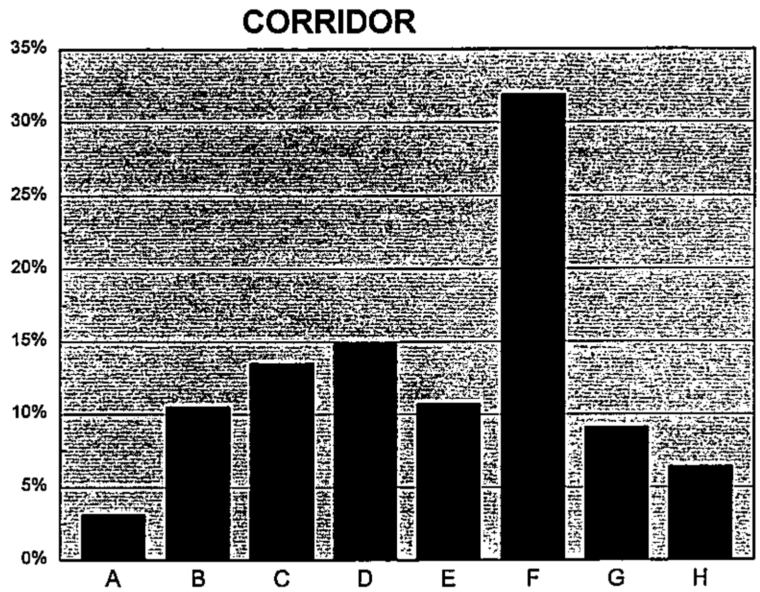


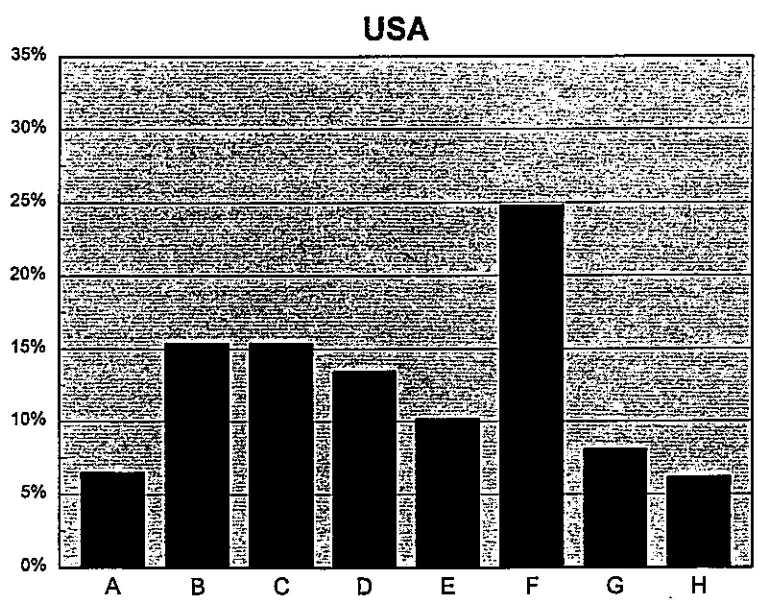
Flow "A" - Less than 6,000 ADT
Flow "B" - 6,000 to 9,999 ADT

Flow "C" - 10,000 to 19,000 ADT
Flow"D" - 20,000 ADT and over

DISTRIBUTION OF RURAL INTERSTATE
AVERAGE DAILY TRAFFIC VOLUMES

Exhibit 4-4





ADT RANGES

A - Less than 1,000

B - 1,000 to 1,999

C - 2,000 to 2,999

D - 3,000 to 3,999

E - 4,000 to 4,999

F - 5,000 to 9,999

G - 10,000 to 14,999

H - 15,000 and over

DISTRIBUTION OF RURAL AVERAGE DAILY TRAFFIC VOLUMES ON OTHER PRINCIPAL ARTERIALS

Exhibit 4-5

Corridor Passenger Rail System

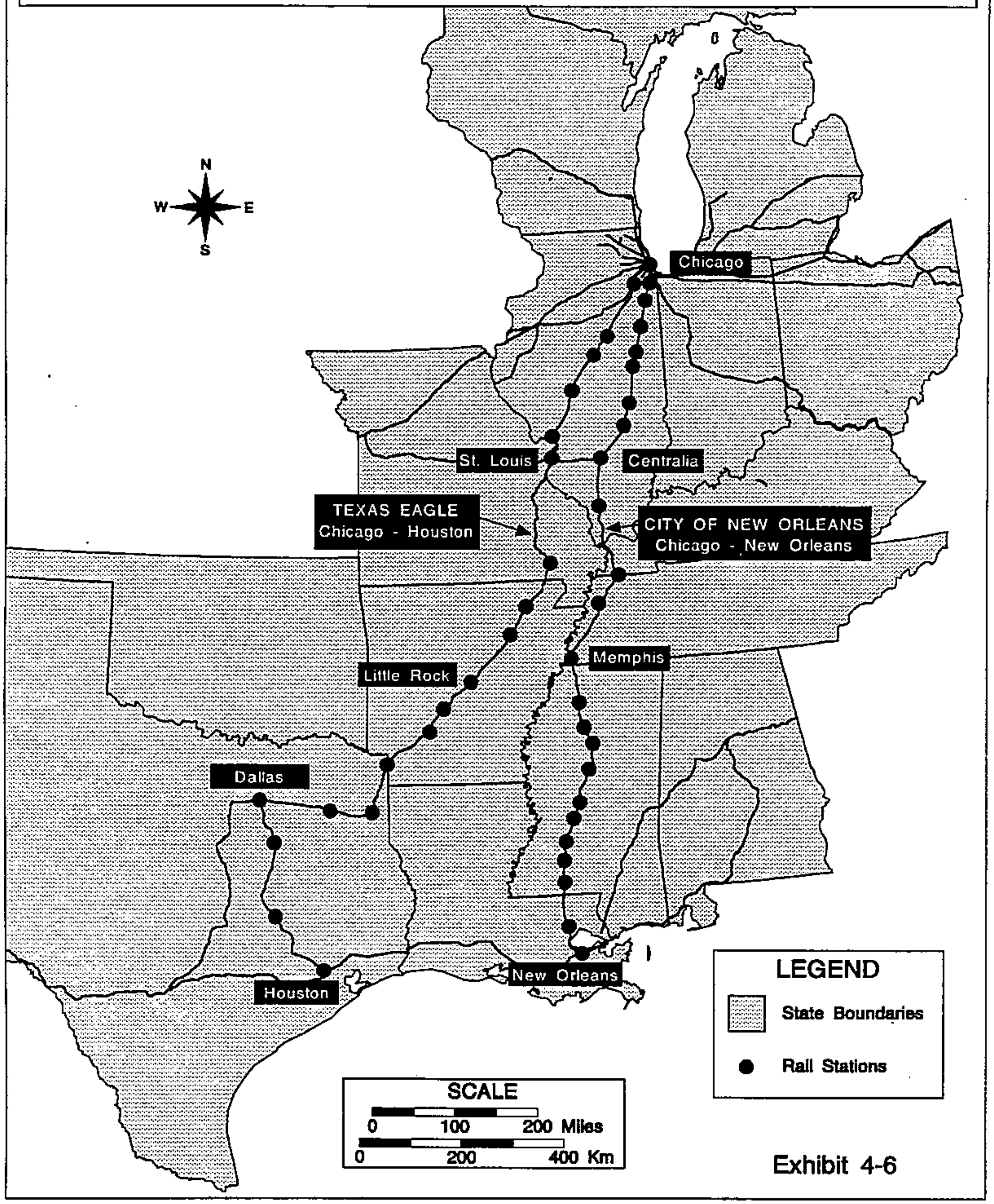


Exhibit 4-6

Exhibit 4-7
AMTRAK PASSENGER SERVICES IN CORRIDOR

CITY OF NEW ORLEANS				TEXAS EAGLE			
City	Distance		Travel Time (h:m)	City	Distance		Travel Time (h:m)
	km	miles			km	miles	
Chicago, IL				Chicago, IL			
	405	253	4:31		451	282	5:45
Centralia, IL				St. Louis, MO			
	442	276	5:51		558	349	7:53
Memphis, TN				Little Rock, AR			
	339	212	4:18		578	361	7:01
Jackson, MS				Dallas, TX			
	293	183	3:48		422	264	7:36
New Orleans, LA				Houston, TX			
TOTALS	**1,479**	**924**	**18:28**	**TOTALS**	**2,009**	**1,256**	**28:15**

CORRIDOR REGION AIRPORTS

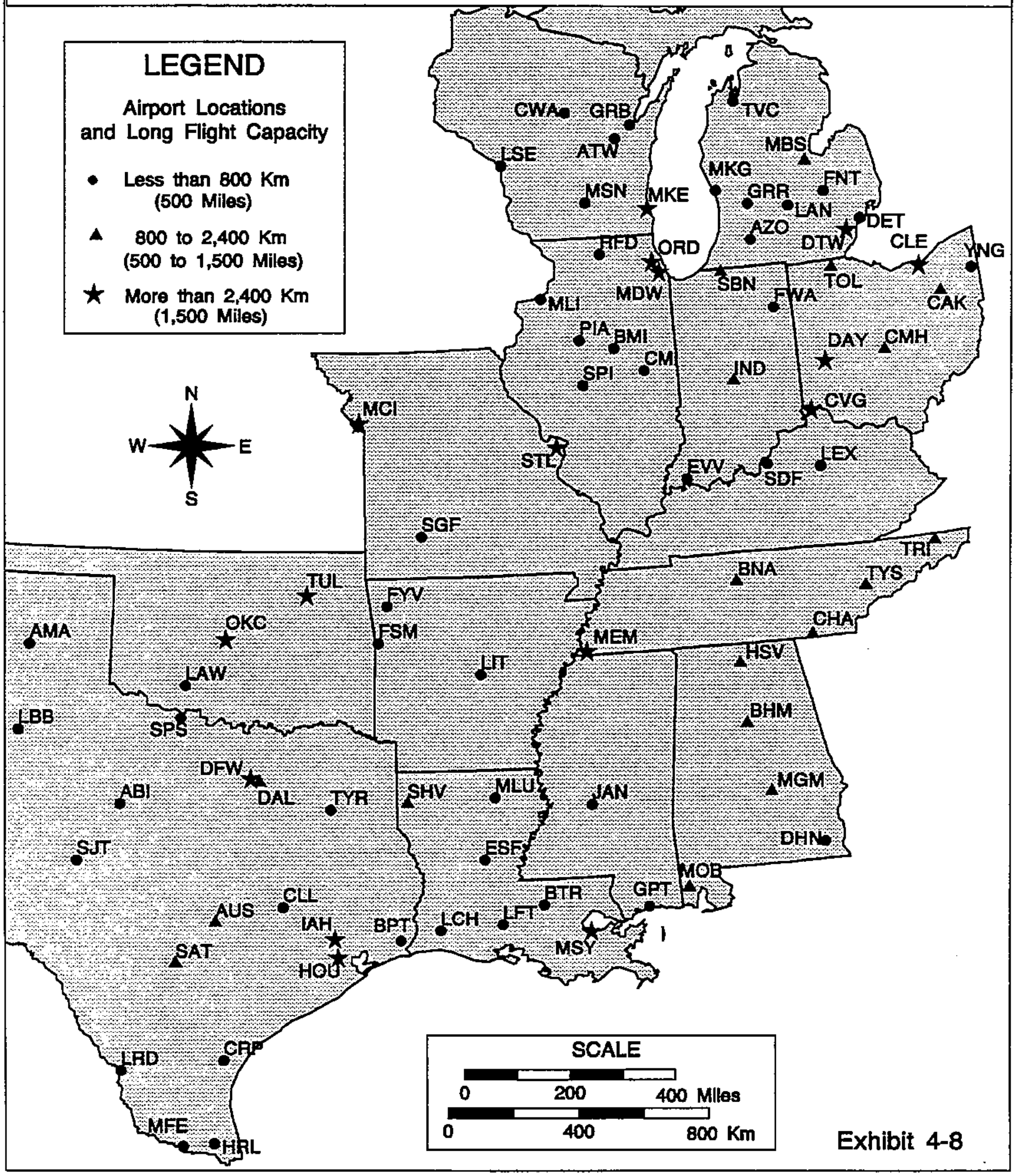


Exhibit 4-8

EXISTING FREIGHT TRANSPORTATION FACILITIES

If a new transportation corridor were to reduce the total cost of shipping/receiving cargo in the U.S., the chief beneficiary would be the U.S. (and the corridor's) economy. Total cost, in this sense, includes the cost of carrying and handling the cargo, the time involved, and delivery reliability; that is, the total cost of the physical distribution process.

RATIONALE FOR FREIGHT CONSIDERATIONS

It is important that freight needs and opportunities be recognized in the evaluation of Corridor 18 feasibility simply because freight transportation plays such an important role in serving the U.S. (and the corridor's) economy.

The Nation's Freight Bill

In 1992, the U.S. freight bill was $375.1 billion, and constituted 6.2 percent of the U.S. GNP, as shown in Exhibit 4-11.[3]

Exhibit 4-11
U.S. TRANSPORTATION OUTLAYS
($ Billion)

	1960	1970	1980	1990	1992
Freight Transport	$47.8	$84.0	$213.7	$352.0	$375.1
Passenger Transport	60.5	114.3	338.1	630.4	638.4
GNP	515.3	1,015.5	2,742.1	5,524.5	6,045.8
Freight % of GNP	9.3%	8.3%	7.8%	6.4%	6.2%

These statistics suggest that a transportation corridor that creates efficiencies in the movement of goods might be as important to the economy as similar efficiencies in the transport of people. The statistics also suggest that freight efficiencies are occurring at a considerable rate, given freight transportation's declining share of the nation's GNP.

Over three-fourths of this U.S. freight bill is spent on trucking, as shown on Exhibit 4-12.

Exhibit 4-12
U.S. FREIGHT BILL BY MODE
($ Billion)

	1960	1970	1980	1990	1992
Trucking	$32.2	$62.4	$155.1	$270.6	$292.8
Bus	.04	.12	.24	.13	.13
Rail	9.0	11.9	27.9	30.4	30.5
Water	3.5	5.2	15.5	20.9	19.9
Oil Pipeline	.9	1.4	7.5	8.4	8.5
Air	.3	1.2	4.0	13.7	15.0
Other Costs	1.8	1.8	3.5	7.8	8.3
Total	$47.8	$84.0	$213.7	$352.0	$375.1

SOURCE: Transportation in America, ENO Transportation Foundation, Inc., 12th Edition, 1994.

Clearly, if a new highway corridor could save as little as 1 percent of trucking costs, the savings could be several billion dollars annually.

Average Trip Length

The average length of haul of domestic interstate freight varies considerably by mode, ranging from 453 km (283 miles) for truckload truck movements to 2,226 km (1,391 miles) for air cargo. Exhibit 4-13 summarizes average length of haul for domestic interstate freight in 1992.

Truck Traffic in Corridor States

Based on FHWA's Highway Performance Monitoring System (HPMS) data for 1990, over 30 percent of vehicle-km (vehicle-miles) on Interstates in Arkansas and Tennessee result from truck traffic. Throughout the eight corridor states truck traffic accounts for approximately 25 percent of Interstate travel, as shown in Exhibit 4-14.

Exhibit 4-13
DOMESTIC INTERSTATE LENGTH OF HAUL
1992

MODE	AVERAGE HAUL LENGTH	
	Kilometers	Miles
LTL Trucks	978	611
Truckload Trucks	453	283
Railroads	1077	673
Air Carrier	2226	1391
Rivers/Canals	720	450
Great Lakes Carriers	861	538

SOURCE: Transportation in America, ENO Transportation Foundation, Inc., 12th edition, 1994.

Exhibit 4-14
INTERSTATE TRUCK PERCENTAGES
IN CORRIDOR 18 STATES

	RURAL	URBAN
Arkansas	31%	19%
Indiana	27%	23%
Kentucky	28%	16%
Louisiana	21%	18%
Michigan	16%	11%
Mississippi	23%	19%
Tennessee	31%	18%
Texas	27%	14%
All Corridor 18 States	25%	16%
All States, Rural and Urban Combined	20%	

SOURCE: FHWA HPMS data for 1990.

Truck Sizes

There are a variety of truck (trailer) types designed to fit particular commodities transported over the nation's highways.

Trailer Size and Number - The size of truck trailers has continued to grow over time. The standard 12.2 m (40-foot) trailer became 13.7 m (45 feet) long, then 14.6 m (48 feet), and now 16.2 m (53 feet), although the latter is still not legal in some states. The heights and widths have also grown over time as the desire to increase cubic capacity has continued.

Increasing the number of trailers which can be pulled by a tractor is another means of increasing truck capacity. These longer combination vehicles (LCVs) are discussed further in Chapter 10. Within the Corridor 18 states, LCVs are currently only permitted to operate on the Indiana Toll Road. To use the toll road, LCVs require annual permits and are limited to a maximum weight of 57,780 kg (127,400 lbs). Other conditions also apply.

Weights - Along with increased size, higher allowable weights in excess of the typical single-trailer of 36,287 kg (80,000 lbs.) are also possible. Weights up to 61,235 kg (135,000 lbs.) are possible with turnpike doubles, 52,163 kg (115,000 lbs.) with Rocky Mountain doubles, and 49,895 kg (110,000 lbs.) with triples.

RAIL FREIGHT SYSTEM

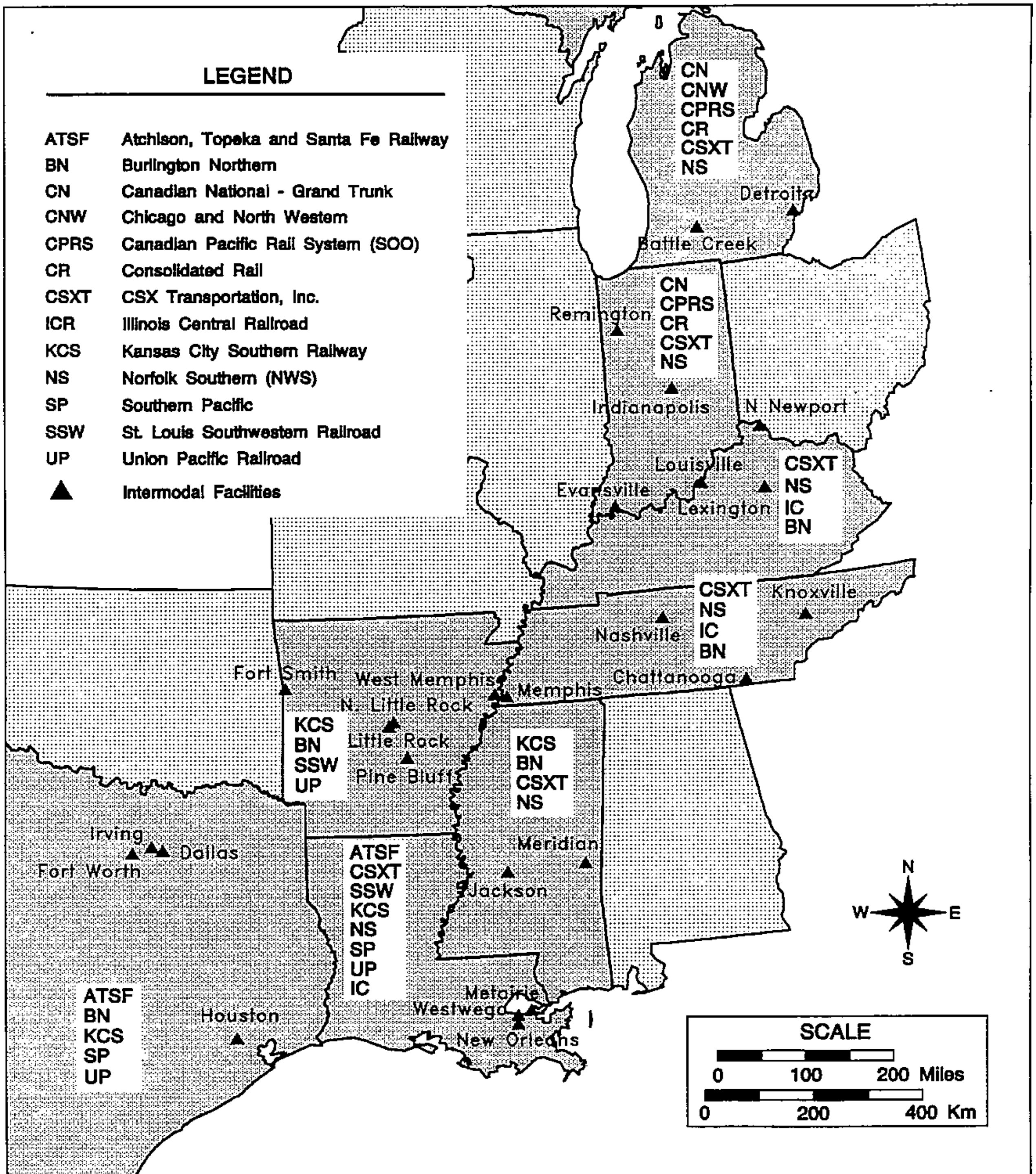
The rail freight network is an important element in the region's overall transportation system. Of particular relevance to Corridor 18 is the potential for intermodal freight movements and the closer integration of highway and rail networks.

Corridor states are served by many of the nation's major railroads. The corridor includes a large portion of the Mississippi River, which has served as the traditional dividing line between eastern and western railroads. Modern railroad mergers have crossed this barrier in places, but corridor cities such as St. Louis and Memphis are still functioning as "gateways."

Class I freight railroads serving corridor states are identified in Exhibit 4-15. Railroads are classified by the Interstate Commerce Commission as follows:

Type	Annual Gross Freight Revenue
Class I	Exceeding $250 Million
Class II	$20 Million to $250 Million
Class III	$20 Million and Less

Exhibit 4-15 also illustrates the location of some of the intermodal facilities within the Corridor States. Locations shown



CLASS 1 FREIGHT RAILROADS IN CORRIDOR STATES

Exhibit 4-15

are those identified by states as "major intermodal facilities," or similar classification. Many other intermodal facilities are located in the corridor states which play significant roles in local and regional economies.

PORTS AND WATERWAYS

Water transportation through the study corridor consists primarily of the Mississippi River and its tributaries, as illustrated in Exhibit 4-16. Great Lake ports, such as Saint Clair and Detroit serve the northern end of the corridor, while Gulf Coast ports, such as those in the Houston/Galveston area serve the southern end. These port and waterway facilities not only contribute to the transportation infrastructure of the corridor, but also play a large role in corridor transportation as traffic generators.

Study Area Ports

Freight tonnage moved through ports in the vicinity of the study area are listed in Exhibit 4-17. The principal commodity group shipped through Great Lake ports is iron ore and other crude materials. Crude petroleum and other petroleum products are the leading commodities at the Gulf Coast ports.

Inland Waterways

Data from the Army Corps of Engineers for 1989 indicate that 365.9 billion ton-km (250.6 billion ton-miles) of transportation were generated on the inland waterway system. Transportation on corridor waterways totaled 254.1 billion ton-km (174.0 billion ton-miles) or 69.4 percent of the national total. The dominance of the Mississippi River in the nation's inland waterway system is illustrated in Exhibit 4-18.

Of the five inland waterways listed in Exhibit 4-18, three (the Ohio River, Cumberland River, and the Tennessee Tombigbee Waterway) converge near Paducah, Kentucky. Eighty km (50 miles) downstream the Ohio River joins the Mississippi River near Cairo, Illinois.

Due to the speed of inland waterway travel, the waterways are used principally for the movement of heavy, bulk commodities which are not time sensitive, such as coal, petroleum, chemicals; construction materials and grain.

PORTS AND WATERWAYS

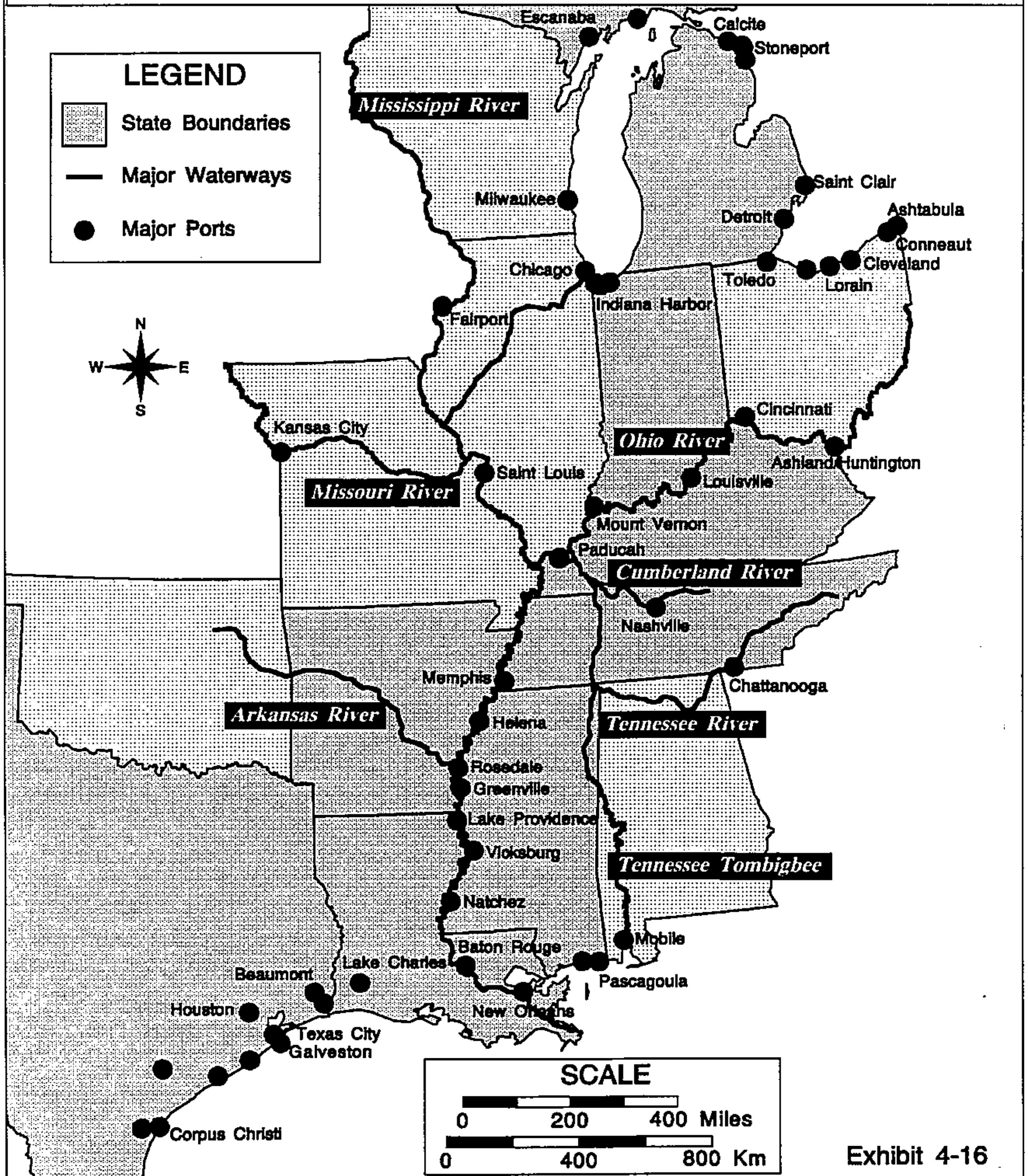


Exhibit 4-16

Exhibit 4-17
FREIGHT TRAFFIC THROUGH PORTS, 1990

PORT LOCATION	WATERWAY	1990 TONNAGE (thousands)	
		Metric Tons	Short Tons
Mount Vernon, IN	Ohio	5,064	5,582
Nashville, TN	Cumberland	3,015	3,324
Memphis, TN	Mississippi	10,558	11,638
Helena, AR	Mississippi	1,546	1,704
Rosedale Harbor, MS	Mississippi	416	459
Greenville, MS	Mississippi	2,137	2,356
Vicksburg, MS	Mississippi	2,766	3,049
Natchez, MS	Mississippi	385	424
Lake Providence, LA	Mississippi	540	595
Baton Rouge, LA	Mississippi	70,863	78,113
Lake Charles, LA	Gulf Coast	37,087	40,882
Port Arthur, TX	Gulf Coast	27,832	30,680
Beaumont, TX	Gulf Coast	24,248	26,729
Houston Ship Channel, TX	Gulf Coast	114,467	126,178
Texas City Channel, TX	Gulf Coast	43,609	48,071
Galveston Channel, TX	Gulf Coast	8,726	9,619
Freeport, TX	Gulf Coast	13,149	14,494
Matagorda Ship Channel, TX	Gulf Coast	4,624	5,097
Victoria, TX	Gulf Coast	3,393	3,740
Harbor Island, TX	Gulf Coast	1,723	1,899
Corpus Christi, TX	Gulf Coast	54,569	60,152

SOURCE: MV-GC Regional Freight Traffic Tables, U.S. Army Corps of Engineers, Navigation Data Center, Waterborne Commerce Statistics Center, November 1992.

Exhibit 4-18
CORRIDOR WATERWAY FREIGHT TRANSPORTATION
(Millions)

WATERWAY	TON-KM	TON-MILES	METRIC TONS	TONS	GROWTH IN TONS, 1980-1989
Mississippi (Ohio River - Baton Rouge)	164,842	112,908	165	182	24%
Ohio	75,329	51,596	184	203	30%
Tennessee	9,507	6,512	39	43	46%
Arkansas System (McClellan-Kerr)	2,612	1,789	7	8	- 6%
Cumberland	1,774	1,215	12	13	8%
TOTAL	254,064	174,020			

SOURCE: Army Corps of Engineers for 1989, excluding oceangoing movements.

AIR CARGO

The movement of freight by air is different from the other modes in a number of respects, principally tonnage, speed and value. While the other modes move 18.1 metric tons (20 + tons) per trailer, 90.7 metric tons (100 tons) per rail freight car, 1,361 metric tons (1,500 tons) per barge, air cargo shipments tend to be much smaller. There is an 2.4 x 2.4 x 6.1 m (8 x 8 x 20-foot) air-surface intermodal container (lighter than the marine container of the same size), but most air freight containers tend to be much smaller than that. The small freight capacity, relative to the other modes, and the speed of transport, place typical air cargo in the premium transport category.

Exhibit 4-19 shows 1992 passenger enplanements and enplaned revenue tons of freight for air traffic hubs in the study area. The major role played by Memphis, and its Federal Express hub, in air cargo movements is clearly seen from this Exhibit.

As stated above, the value of air transportation is not a function of tonnage. The air industry transported approximately 1.9 million metric tons (2.1 million tons), or 0.04 percent of the total freight in the United States in 1992. Instead, the nature of the air transportation promotes the carriage of low-bulk, high-priced goods.

Exhibit 4-19 STUDY AREA AIR TRAFFIC HUBS				
AIRPORT	CODE	ENPLANED PASSENGERS	ENPLANED REVENUE TONS	
			Metric Tons[1]	English Tons[2]
Indianapolis, IN	IND	2,803,504	139,460	153,728
Memphis, TN	MEM	3,329,210	723,264	797,263
Little Rock, AR	LIT	995,424	4,697	5,178
Shreveport, LA	SHV	224,223	6,678	7,361
Houston Int., TX	IAH	8,308,479	82,970	91,459
William P. Hobby, TX	HOU	4,001,769	5,154	5,681

(1) Metric ton (1,000 kg)
(2) Short ton (2,000 lb)
SOURCE: FAA Statistical Handbook of Aviation, Calendar Year 1992 (FAA APO-94-5)

FREIGHT TRANSPORT DEMAND

Freight transportation has been quantified earlier in this section in terms of expenditures, revenues, ton-kilometers etc. Tonnage estimates are summarized below for the Year 1992. These estimates[4] exclude pipeline transport.

National Transport Demand

In 1992 freight tonnage totaled 4.7 billion metric tons (5.2 billion tons). Of this, almost half was transported by the trucking industry, as shown in Exhibit 4-20. Rail was the next highest mode by tonnage transported with 30 percent of the market, followed by water with 20 percent. Air transportation accounted for 0.04 percent of freight tonnage nationwide.

Corridor Freight Transportation

Freight transportation within the study area is summarized below.

<u>Corridor 18 Transport by Mode</u> - Within the study area, 36 and 38 percent of freight tonnage moves by road for inbound and outbound movements respectively. Rail accounts for 34 and 27 percent for inbound and outbound flows. The modal share for road is lower than national figures, as a result of water capturing 40 and 37 percent for traffic inbound to and outbound from the study area. These figures shown in Exhibit 4-21 confirm the major role played by the Mississippi River and its tributaries in the movement of freight in the study area.

Exhibit 4-20
NATIONAL FREIGHT TRANSPORT, 1992

MODE	METRIC TONS (millions)	TONS (millions)	PERCENT OF TOTAL
TRUCK			
Truckload	1,014	1,118	21.7%
LTL	74	82	1.6%
Private	1,215	1,339	26.0%
TOTAL TRUCK	2,303	2,539	49.3%
RAIL			
Carload	1,333	1,469	28.5%
Intermodal	93	103	2.0%
TOTAL RAIL	1,426	1,572	30.5%
AIR	2	2	<0.1%
WATER	943	1,040	20.2%
TOTAL	**4,674**	**5,153**	**100.0%**

SOURCE: Reebie Associates, 1992

Exhibit 4-21
CORRIDOR INBOUND AND OUTBOUND FREIGHT TRAFFIC BY MODE

MODE	INBOUND (millions)			OUTBOUND (millions)		
	Metric Tons	Tons	Percent of Total	Metric Tons	Tons	Percent of Total
TRUCK						
Truckload	121	133	16.6%	130	143	18.2%
LTL	8	9	1.1%	10	11	1.4%
Private	132	146	18.2%	132	145	18.5%
TOTAL TRUCK	261	287	35.9%	272	298	38.0%
RAIL						
Carload	235	259	32.4%	179	197	25.1%
Intermodal	10	11	1.4%	11	12	1.5%
TOTAL RAIL	245	270	33.8%	190	210	26.8%
AIR	0	0	0.0%	0	0	0.0%
WATER	220	242	30.2%	251	277	35.3%
TOTAL	**726**	**800**	**100.0%**	**713**	**785**	**100.0%**

SOURCE: Reebie Associates, 1992

Freight traffic shown in Exhibit 4-21 were derived by grouping together all data for Bureau of Economic Analysis (BEA) zones which lie completely or in part in the study area.

Corridor 18 Transport By BEA Zone - Exhibit 4-22 depicts freight tonnage originations (outbound) from BEA zones in the corridor region. Exhibit 4-23 shows freight tonnage terminations (inbound).

TRAVEL DEMAND MODELS

MODEL OBJECTIVES

Models used to estimate travel demand in the study area are described in this section of the report. The purpose of these models is to provide input to economic and financial feasibility assessments. These inputs are in terms of travel speeds, vehicle-km and vehicle-hours of travel resulting from a particular highway investment scenario.

Model Concepts

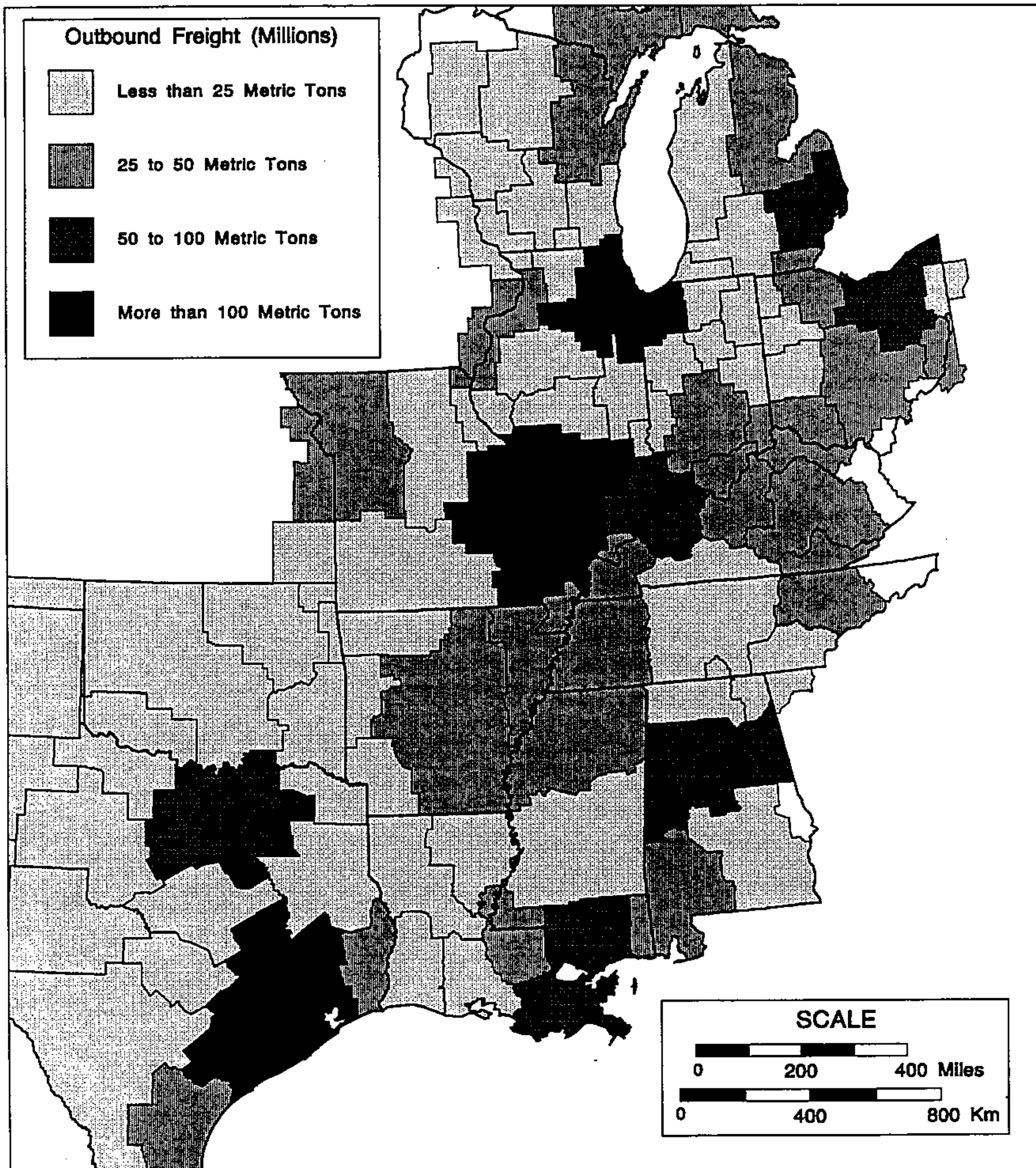
Efficient and effective modeling of transportation networks requires that the level of detail contained within the model be consistent with the overall study and model objectives. Urban area models may contain all roads with a functional class of "Collector" or higher and may define traffic analysis zones as groupings of census tracts. A national strategic study may use a network based on Interstate highways and a zone system based on states or convenient subdivisions of states.

HIGHWAY NETWORK

Corridor 18 serves local, regional, national and international demands for transportation. To reflect such a wide range of impacts a Corridor 18 model is used which provides a higher level of detail within the study area than outside the study area.

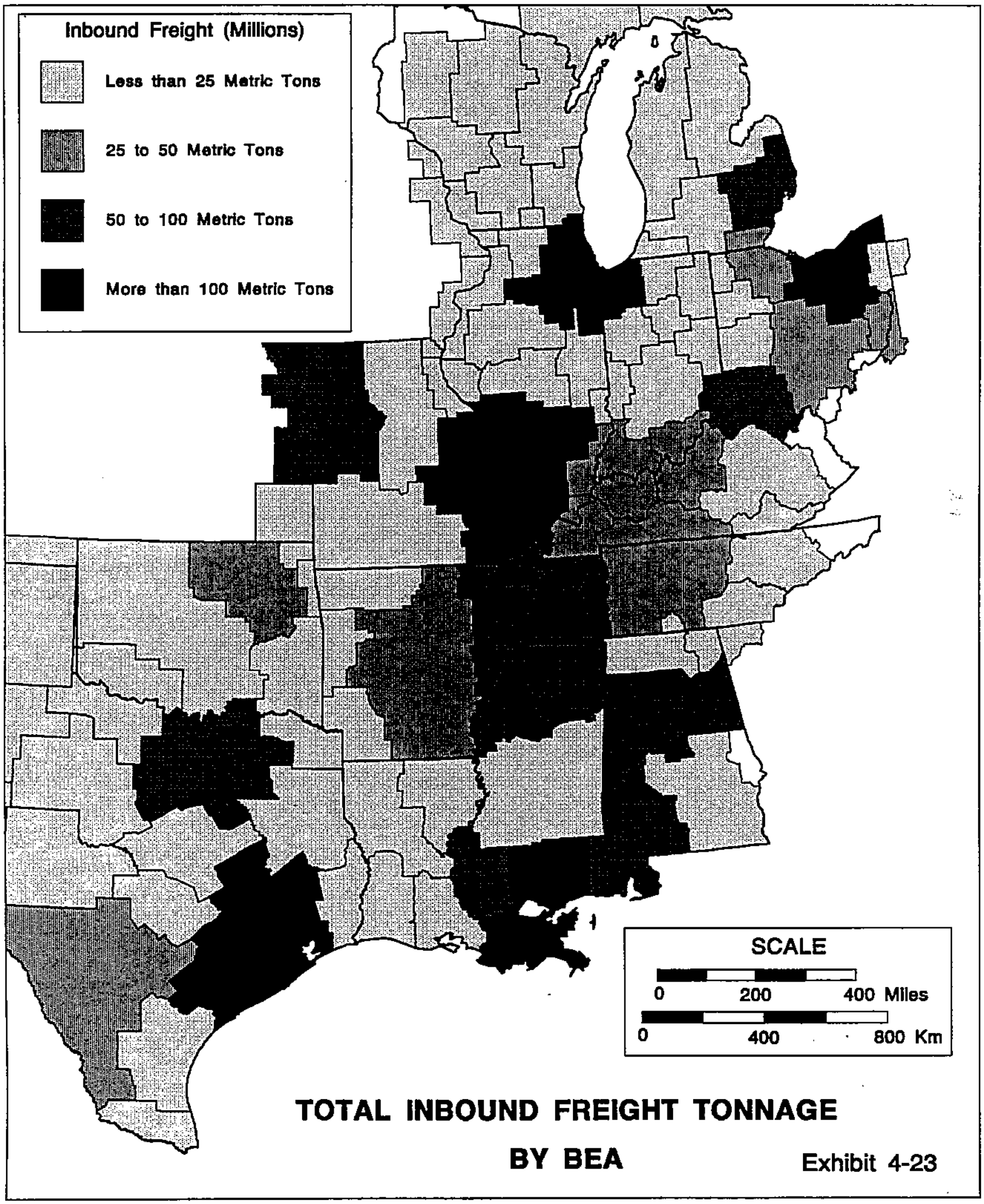
Inside the Study Area

Inside the study area all roads in the proposed National Highway System (NHS) are included in the highway network model. The reasons for selecting the NHS as the basis for the network model relate to the stated role of the NHS and the similarity between this role and the overall objectives of Corridor 18. Including all highways in the NHS ensures that the main existing routes for intercity travel in the study area will be included in the model process. These existing routes act as the principal "competitors" to a new (or improved) Corridor 18 facility.



TOTAL OUTBOUND FREIGHT TONNAGE BY BEA

Exhibit 4-22



TOTAL INBOUND FREIGHT TONNAGE BY BEA

Exhibit 4-23

The NHS

The proposed NHS as originally transmitted to Congress by the US DOT comprised approximately 256,000 km (159,000 miles). At that time the NHS was viewed as the first major component of a larger, fully coordinated and integrated National Transportation System (NTS) [5]

> *"The NTS has as its goal the creation of a unified, interconnected system of modal facilities and services that accommodates national and regional transportation demands, both freight and passenger. The NTS will embrace the principles of ISTEA which encourage those investments that innovatively address transportation needs, support national defense, enhance the quality of life, and support commerce crucial to the nation's economic growth and competitive posture in a global economy."*

Since that time, much discussion regarding the NTS has altered its concept. For instance, spatial representation of the NTS in terms of existing (and future) transportation facilities no longer is receiving major consideration. There is much discussion about NTS being a process and/or mechanism for achieving national goals and objectives, for identifying issues and for formulating national strategies. The Office of the Secretary of Transportation has various activities underway to define the NTS concept and content.

NHS Components - The proposed NHS includes:

- The Interstate System (including mileage added pursuant to Title 23, U.S.C. 139);
- Other principal arterials, both urban and rural, and highways providing access to major intermodal facilities (e.g., ports, airports, public transportation, railroad terminals);
- The Strategic Highway Network (STRAHNET) and major STRAHNET connectors important for the essential movement of defense-related personnel, materials, and equipment; and
- High-priority corridors identified in Section 1105(c) of ISTEA, as amended.

<u>Trade Routes</u> - In developing the proposed NHS, the FHWA gave substantial attention to including significant trade routes linking the United States with Canada and Mexico. Specifically, the proposed NHS connects with the Canadian National Highway System at U.S./Canadian border crossings and with major north-south corridors leading into the heartland of Mexico at U.S./Mexican border crossings. In addition, the proposed NHS connects with nonborder ports of entry such as major ports and airports.

NHS Network Boundary

The NHS network which is currently open to traffic in the study area is shown in Exhibit 4-24. This is referred to as the "Existing Study Area Network." It includes all elements of the NHS, regardless of the reason for its inclusion (Interstate, STRAHNET, intermodal connector, high priority corridors, etc.) except for segments not yet open to traffic. This network provides the basis for modeling activities in this study.

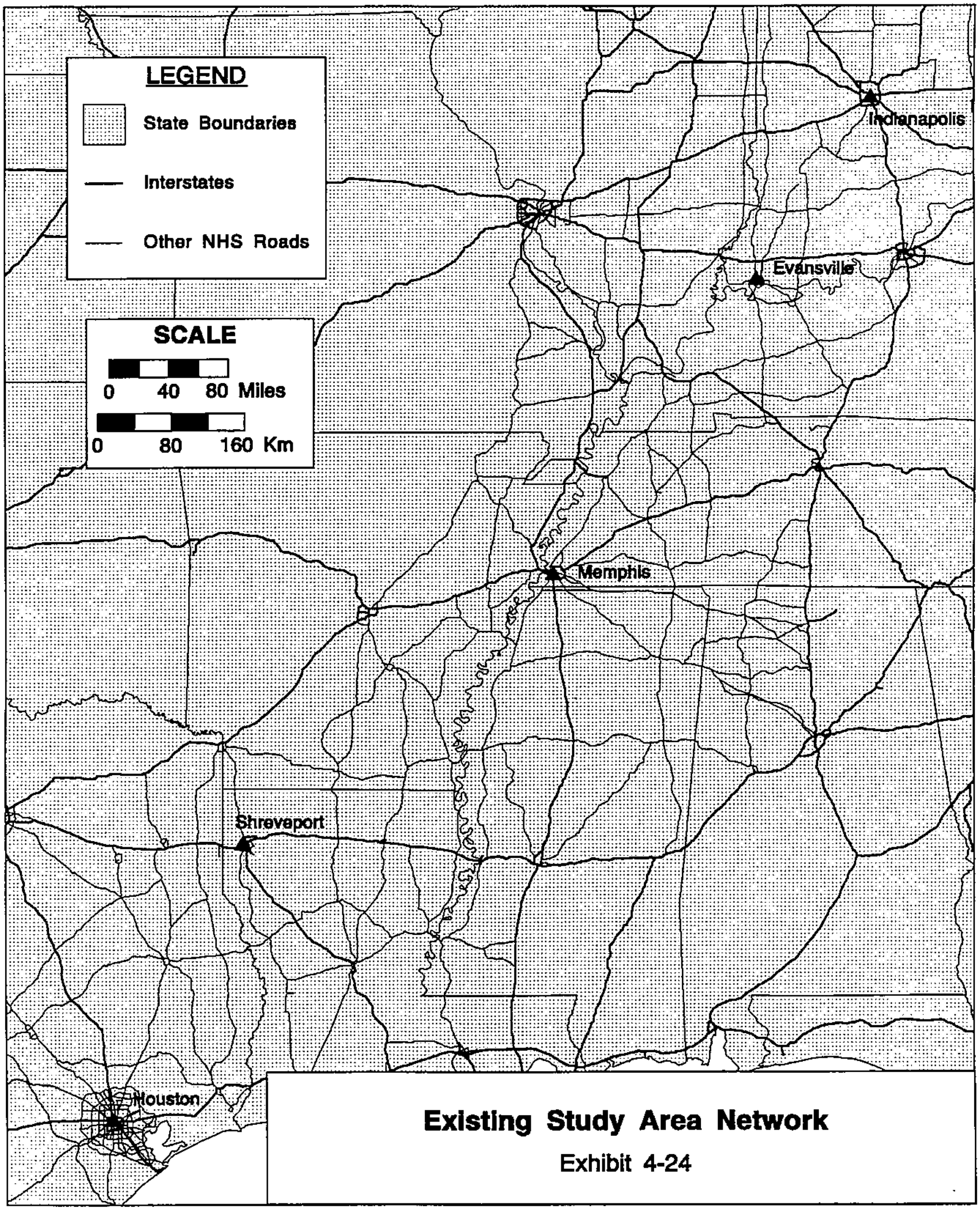
To provide a smooth interface with the remainder of the highway network, the NHS network extends beyond the area defined as the Study Area. In general terms the boundary of the area, within which the NHS network is used in study models, follows existing interstate routes. Between Little Rock, Arkansas and St. Louis, Missouri, the boundary follows U.S. 67. The area also includes all of the states of Indiana and Michigan, to ensure the principal trade routes extending north from Indianapolis to the Canadian border are included.

Outside the Study Area

The potential impact of Corridor 18 extends beyond the immediate study area. For example, movements between the northeast of the United States and south Texas/Mexico will pass through a portion of the corridor. The feeder routes connecting other areas of the United States to the study corridor are based upon the existing Interstate system. The highway network outside the study area, for use in modeling activities, is shown in Exhibit 4-25.

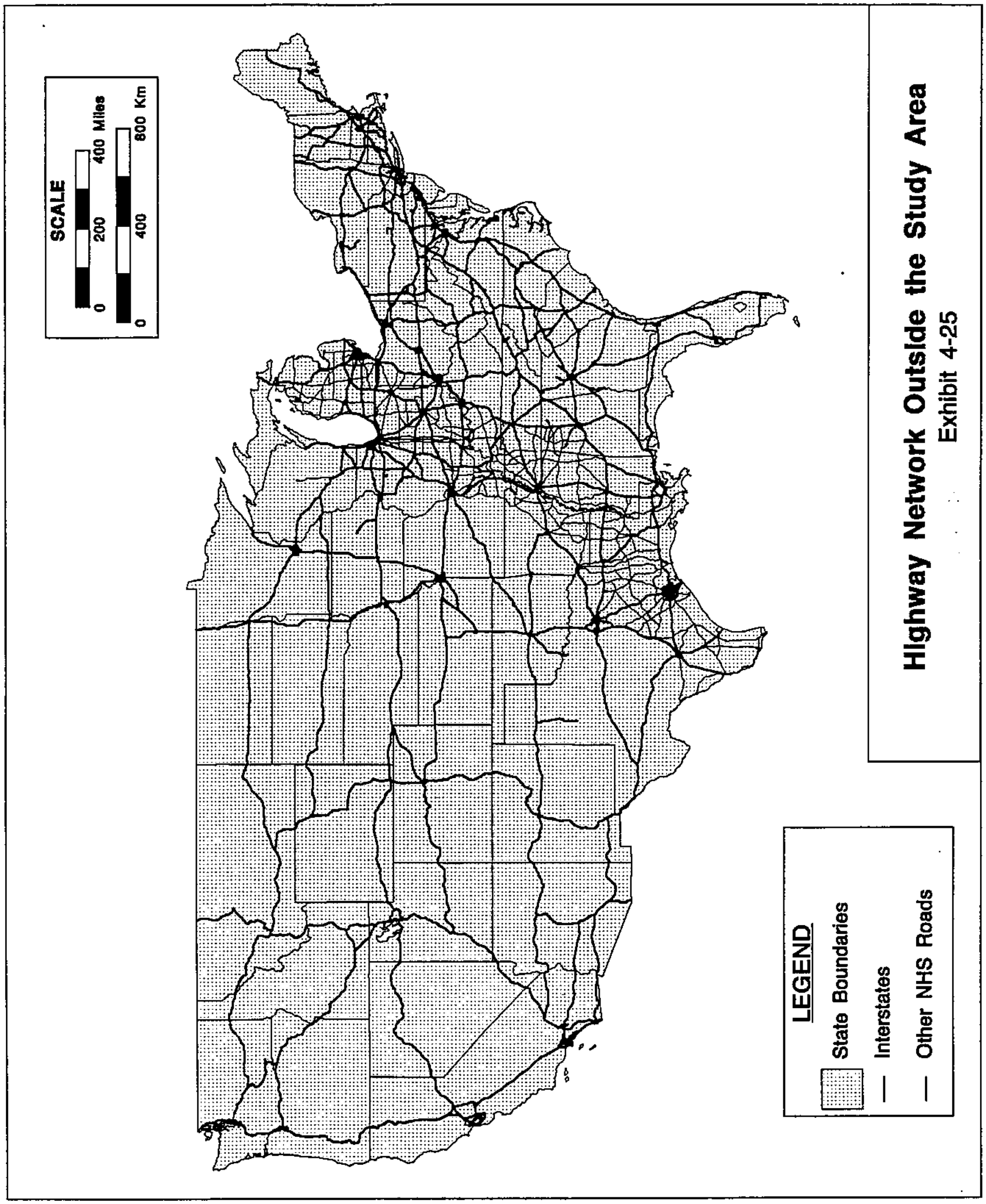
National Highway Planning Network

The highway network models used in this study are based on FHWA's National Highway Planning Network Version 2.0 (NHPNV2).



Existing Study Area Network

Exhibit 4-24



Highway Network Outside the Study Area
Exhibit 4-25

The NHPNV2, which is the cornerstone of the FHWA GIS, is a 676,000-km (420,000-mile), centerline network representing rural arterial, urban principal arterial and remaining National Highway System roads, plus limited miscellaneous roads. Recent FHWA efforts have focused on the NHS portion of the network, for which functional class has been verified.

TRAFFIC ANALYSIS ZONES

In parallel with the two levels of detail used to model the highway network, two levels of traffic analysis zones were used.

Inside the Study Area

Within the study area, traffic analysis zones (TAZs) were based on counties or parishes. Socioeconomic and other data are readily available by county. The average size (in area) of counties is also consistent with the level of detail of the highway network. Most counties in the study area are directly served by at least one NHS roadway. Study area zones are shown in Exhibit 4-26.

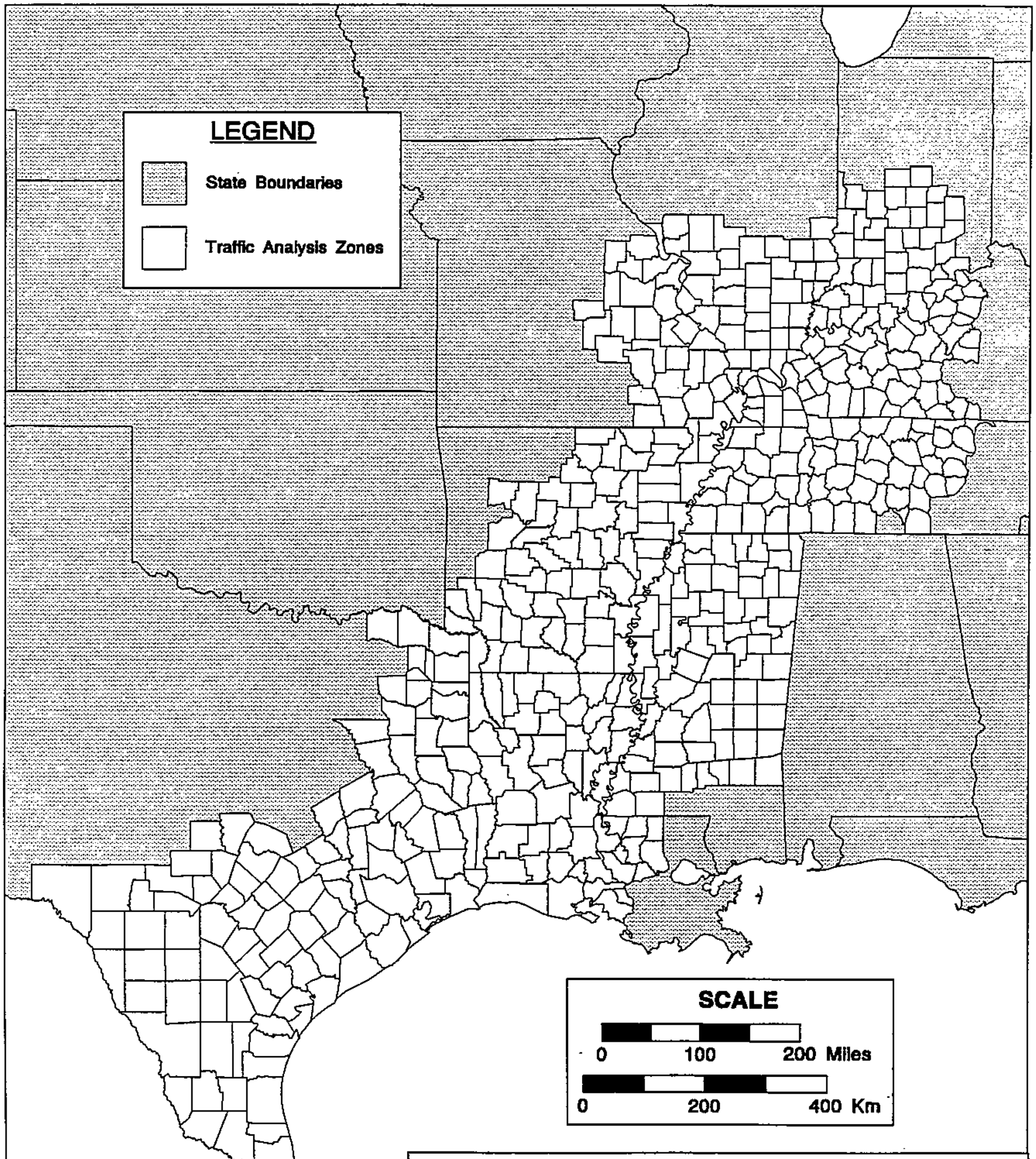
Outside the Study Area

Outside the study area TAZ boundaries followed the zoning system defined by the Bureau of Economic Analysis, and are referred to as BEA zones. BEAs are economic areas defined to facilitate regional economic analysis. Each zone consists of a metropolitan statistical area (MSA) or a similar area that serves as a center of economic activity, and the surrounding counties that are economically related to the center.

The 48 contiguous states contains 181 BEA zones. Of these 158 lie completely outside the study area. The remaining 23 BEAs are represented by their constituent counties as described previously. The zone system outside the study area is shown in Exhibit 4-27.

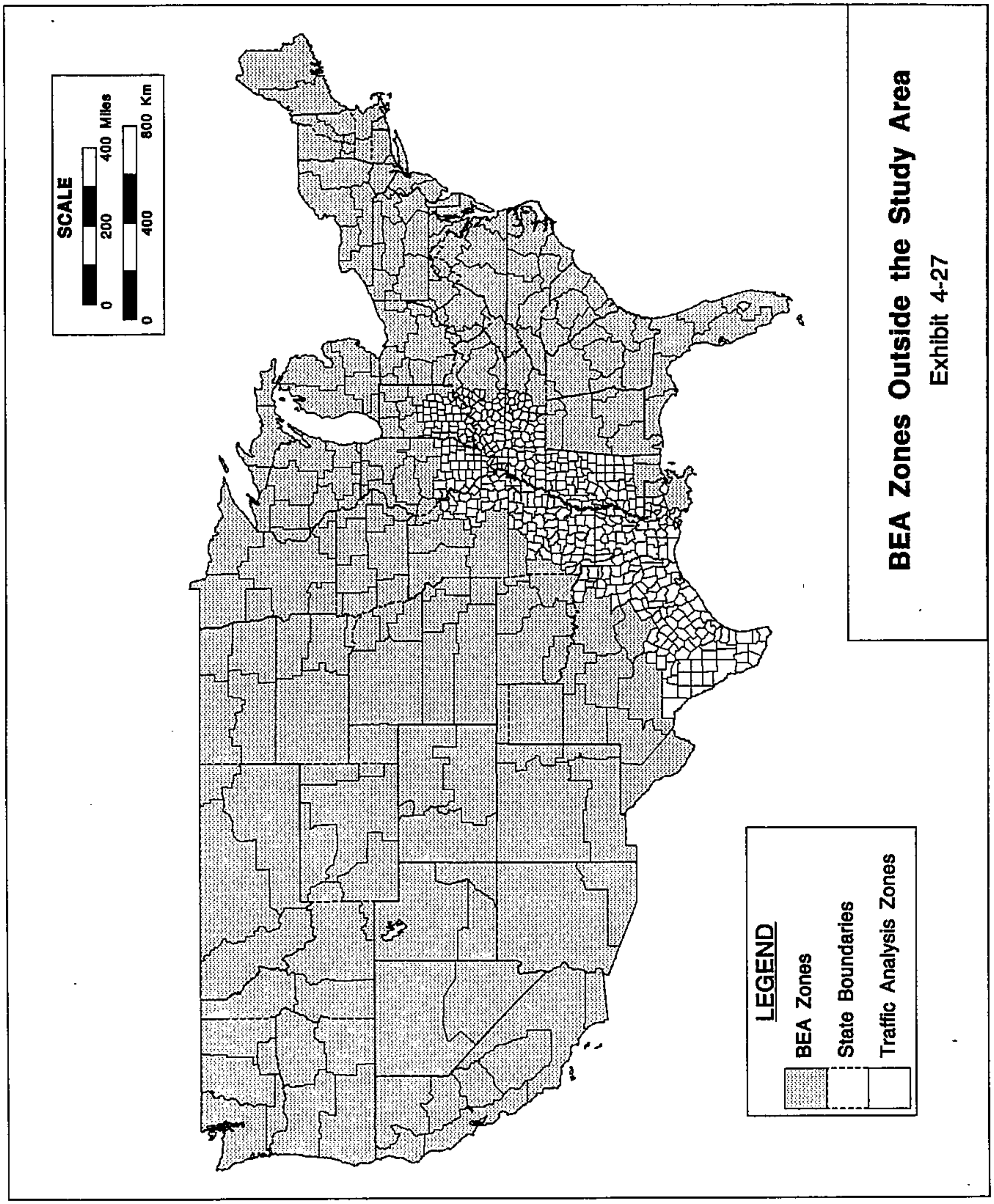
External Zones

To model international movements a number of "external" zones have been defined. These generally connect to the Interstate highway network at the U.S./Canadian or U.S./Mexican borders. Five external zones connect to non-Interstate segments of the NHS in South Texas, at Del Rio, Eagle Pass, Laredo, Hildago and Brownsville.



Study Area Traffic Analysis Zones

Exhibit 4-26



BEA Zones Outside the Study Area
Exhibit 4-27

DEVELOPMENT OF TRIP MATRICES

Separate trip matrices were developed for auto and truck traffic for subsequent assignment to the highway network model.

Auto Trips

An initial estimate of auto trips between Traffic Analysis Zones (TAZs) was calculated using a model developed by the Volpe National Transportation Systems Center (VNTSC) for inter-urban travel up to distances of 725 km (450 miles). For longer trips the results were adjusted to match the trip length distribution obtained from the 1990 National Personal Travel Survey (NPTS). The initial trip matrix was further adjusted to better match the ground counts at calibration points throughout the network.

Truck Trips

National truck trips with origin and destination within the United States were estimated based on 1992 truck tonnages transported to and from Bureau of Economic Analysis (BEA) zones.[6] A gravity model was used to transform this data into a truck trip matrix, yielding an average trip length of approximately 560 km (350 miles). The resulting matrix, based on 181 BEA zones, was then expanded to the 692 zones used in the study network.

International truck trips across the U.S./Mexico and U.S./Canada borders were estimated using cross border truck volumes and data provided by the Bureau of Transportation Statistics (BTS).

The national and international truck trip matrices were combined and the resulting matrix adjusted to better match the ground counts of truck volumes at all calibration points.

CALIBRATION

The base year auto and truck trip matrices were assigned to the base year highway network. Assigned traffic volumes at 591 calibration points were compared with classified ADT counts at those locations. Where classified counts were not available for a specific location a statewide estimate of truck percentage on rural highways was used.

The results of the model calibration process are summarized in Exhibit 4-28.

Exhibit 4-28
SUMMARY OF CALIBRATION RESULTS
Corridor 18 Feasibility Study

COMPARISONS OF FLOWS ACROSS CUT LINES

2-Way 24-Hour Traffic Volumes

	Traffic Count	Model Estimate	Ratio
Cut Line A	98,900	94,100	0.95
Cut Line B	81,900	83,900	1.02
Cut Line C	59,300	55,500	0.94
Cut Line D	78,300	77,800	0.99
Cut Line E	36,600	36,000	0.98

ALL CUT LINES AND OTHER CALIBRATION POINTS

	Autos	Trucks	Combined
Number of Calibration Points	591	591	591
Number of Points with Maximum Desirable Deviation	581	581	571
Percentage within Maximum Desirable Deviation	98%	98%	97%
Ratio of Total Count to Assigned Volumes at all Calibration Points	0.99	0.99	0.99

Study Corridor "Cut" Lines

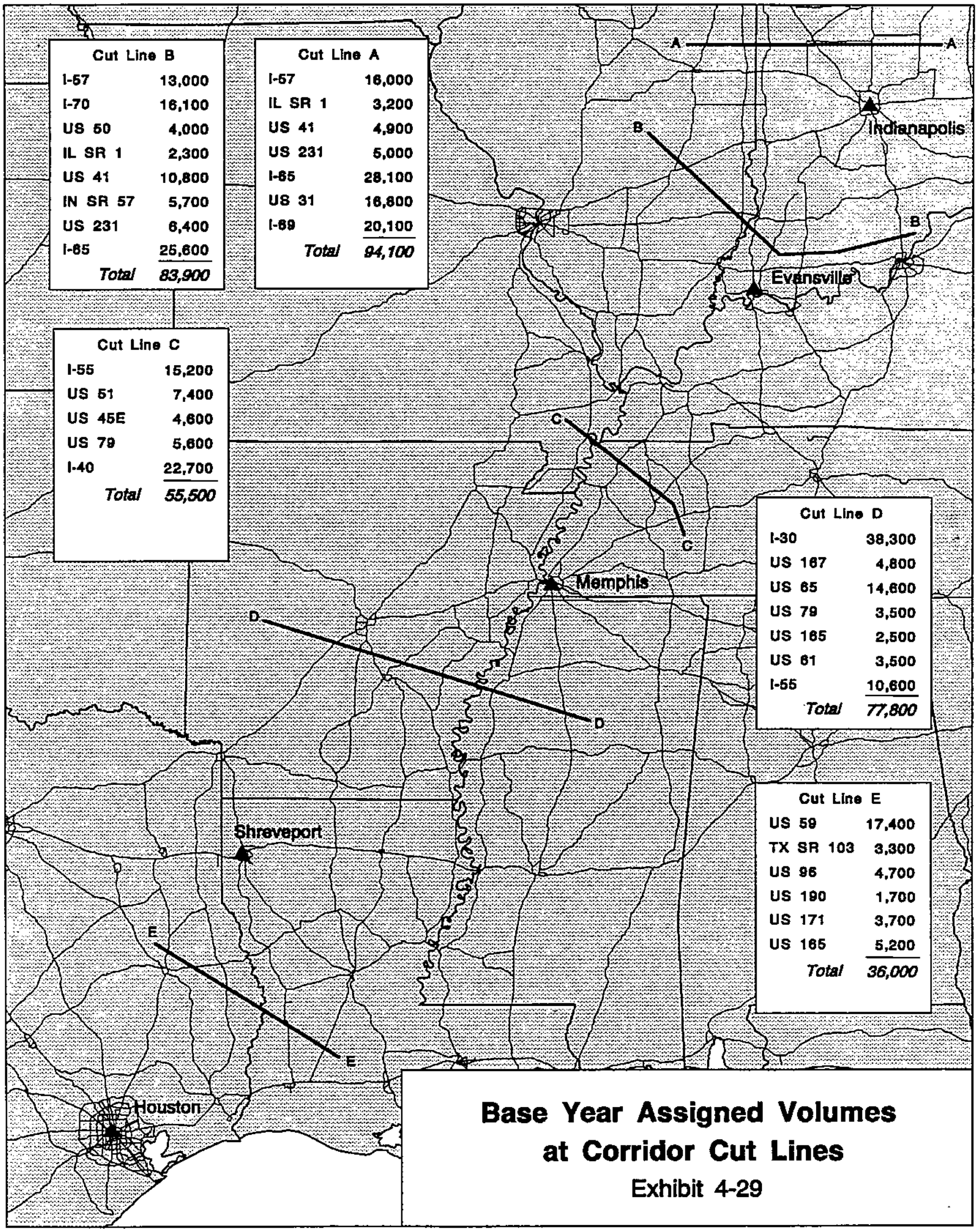
The volume of traffic crossing a number of "cut" lines across the study corridor was compared to assigned volumes. The base year assigned volumes at five cut lines are shown in Exhibit 4-29. The total assigned volume across each cut line was within ten percent of the actual volume.

Total Counts

The total assigned volume of traffic at all calibration points amounts to 99 percent of actual traffic.

Acceptable Levels of Deviation

The percentage deviation between assigned volumes and actual counts which is considered acceptable varies as a function of total volume. Of the 591 calibration points, 97 percent fell within the range of acceptable values,[7] as shown in Exhibit 4-30.



Cut Line B

I-57	13,000
I-70	16,100
US 50	4,000
IL SR 1	2,300
US 41	10,800
IN SR 57	5,700
US 231	6,400
I-65	25,600
Total	*83,900*

Cut Line A

I-57	16,000
IL SR 1	3,200
US 41	4,900
US 231	5,000
I-65	28,100
US 31	16,800
I-69	20,100
Total	*94,100*

Cut Line C

I-55	15,200
US 51	7,400
US 45E	4,600
US 79	5,600
I-40	22,700
Total	*55,500*

Cut Line D

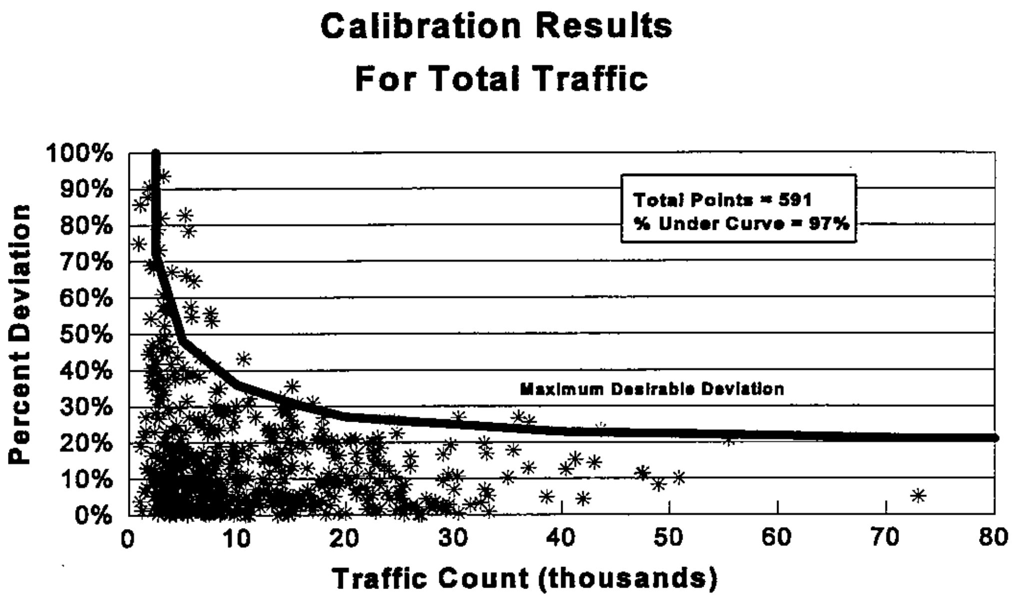
I-30	38,300
US 167	4,800
US 65	14,600
US 79	3,500
US 165	2,500
US 61	3,500
I-55	10,600
Total	*77,800*

Cut Line E

US 59	17,400
TX SR 103	3,300
US 96	4,700
US 190	1,700
US 171	3,700
US 165	5,200
Total	*36,000*

Base Year Assigned Volumes at Corridor Cut Lines

Exhibit 4-29



Sources: Curve: NCHRP 255
Points: Wilbur Smith Associates

Percent Deviation = (Assignment-Traffic Count) / Traffic Count

Exhibit 4-30

TRAVEL DEMAND PROJECTIONS

TRIP PROJECTIONS

The base year auto and truck trip matrices were independently projected to the year 2015. Auto trips were projected to increase as a result of two factors - population growth and the trend towards increasing vehicle-km of travel per person.

Population Growth

Population estimates for 2015 were derived from BEA projections for the years 2010 and 2020. A constant annual rate of population growth between these two years was assumed to determine a value for 2015.

Between 1980 and 1990 the overall population of the United States increased by 9.8 percent from 226.5 to 248.7 million. While population growth in many of the corridor states was considerably lower than the national average, Texas population increased by 19.4 percent during the decade. During the 1980s the overall increase in population in the eight corridor states amounted to 6.2 percent, as shown in Exhibit 4-31. This represents an average increase of 0.60 percent per year.

Exhibit 4-31
POPULATION AND VMT GROWTH, 1980 TO 1990

	Population Increase	Rural VMT Increase	
		Interstate	Principal Arterial
Corridor States	6.2%	40.5%	40.5%
Rest of the USA	10.9%	51.9%	28.0%
Total USA	9.8%	49.1%	30.7%

BEA projects a slower rate of population growth during the 25 years between 1990 and 2015. During this period the population in corridor states is anticipated to grow at an average rate of 0.41 percent per year, resulting in an overall increase of 10.7 percent by 2015.

Vehicle-Km of Travel

During the 1980s rural Vehicle Miles of Travel (VMT) grew considerably faster than population. In the Corridor States rural VMT increased by 40.5 percent on both Interstates and Other Principal Arterials. To develop a future year auto trip matrix, base year trips to and from each zone were increased according to the projected population increase in each zone, using BEA's projections for each county in the study area. Trips were then further increased to reflect the projected growth in rural VMT.

The increase in rural VMT in Corridor States between 1980 and 1993 is illustrated in Exhibit 4-32. Based on a continuation of this trend, moderated by the slower growth in population between 1990 and 2015, it is projected that rural VMT in Corridor States on Interstates and Other Principal Arterials may reach 140.6 billion by 2015. This compares with 93.7 billion in 1993 and represents an overall increase of 50.0 percent.

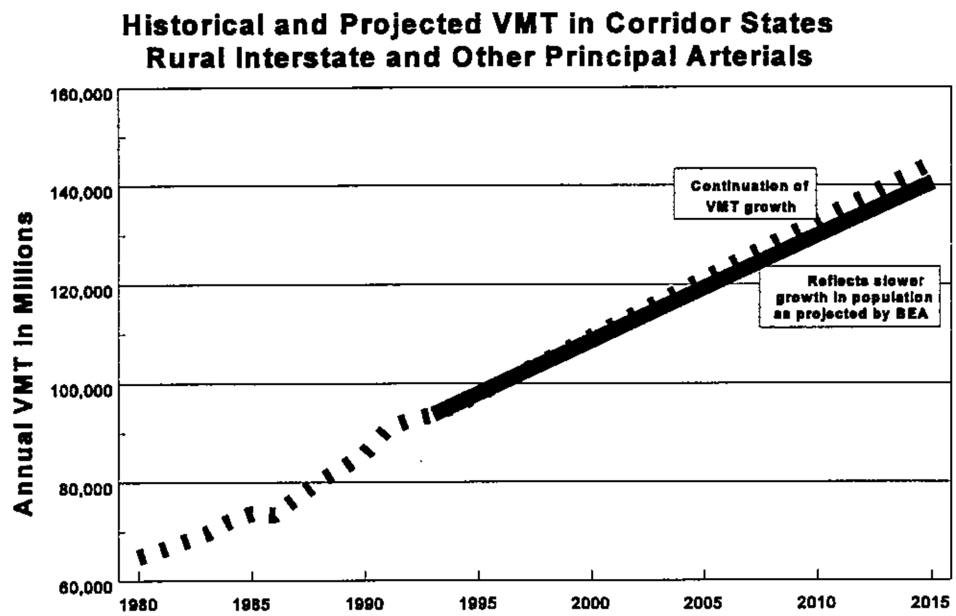


Exhibit 4-32

This projection of rural VMT is generally consistent with a 1991 Report of the Secretary of Transportation[8] which assumes that the average rate of growth in highway travel will decline gradually beyond 1990 to a level slightly above one percent by 2009, to achieve an average over the period of about 2.5 percent per year through 2009.

The report notes that:

"Although these overall growth rates may seem low when compared to historic rates, several factors contribute. Demographic changes, especially the increasing number of older Americans, who tend to drive fewer miles than the population as a whole, and the "saturation effect" in the driver licensing rates of male drivers and number of vehicles on the road will be important moderating influences. (Saturation means that virtually all people of driving age have driver's licenses and access to personal vehicles.) Countering these influences, but not expected

to outweigh their effects, will be a continuing growth of licensing and travel rates by female drivers, as well as increasing truck travel."

The report estimates an average increase in travel on rural roads of 2.58 percent per year. Using this growth rate to 2009 and a rate of 1.00 percent from 2009 to 2015, rural travel may be expected to increase a total of 63.7 percent between 1992 and 2015. This is generally consistent with the 50.0 percent assumed in this study given the historically lower growth rates of VMT in the corridor states compared to the USA and the slower projected growth in population for corridor states compared to the country as a whole.

Truck Trip Projections

Truck trips with origin and/or destination in the 672 zones within the USA were projected to increase in line with U.S. Gross National Product (GNP). Cross border truck trips were forecast separately.

Domestic Truck Movements - The Bureau of Economic Analysis provide projections of Gross National Product through to the year 2040. Based on BEA projections, GNP is anticipated to grow between 1992 and 2015 by approximately 37.2 percent. This rate of growth has been used to estimate the growth in truck travel due to freight movements within the United States.

Cross Border Truck Movements - Trade between the United States and Mexico has increased rapidly during the 1980s and early 1990s. Further increases are anticipated as the provisions of NAFTA are implemented and take effect. Although the general trend may be clear, the future rate of growth in trade and resulting truck traffic to and from border crossings in East Texas are difficult to predict.

A study conducted by the Center for the New West[9] projected growth in exports to Mexico of 69 percent and growth in imports from Mexico of 121 percent via South Texas border crossings between 1992 and the Year 2000. These different growth rates would lead to a more even balance of exports and imports (54 percent to 46 percent), compared to the present situation (60 percent to 40 percent). The overall increase in trade via South Texas would amount to 90 percent based on these projections.

For feasibility analysis purposes, this study assumed that freight movements will increase with total trade, but that this level of increase (90%) will not be achieved in truck traffic volumes until the Year 2005 for the following reasons:

- the recent severe devaluation of the Mexican Peso may slow the rate of investment in Mexico and may slow the rate of growth in total trade; and

- increasing use of intermodal transportation may reduce the percentage (modal share) of movements currently using trucks to and from the border area.

A 90 percent increase in truck traffic over a 13-year period (1992-2005) represents an average annual increase of 5.06%. It is assumed that continued growth in traffic between 2005 and 2015 will occur at half this rate, i.e., at 2.53 percent per year. This results in an overall projected increase in U.S./Mexico cross border truck traffic of 143 percent between 1992 and 2015.

The impact of NAFTA on U.S./Canada trade is not anticipated to be as significant as for U.S./Mexico trade. For the purpose of this study it is assumed that U.S./Canada trade may grow slightly faster than the projected growth of 37 percent for U.S. GNP between 1992 and 2015. An increase of approximately 50 percent is assumed, in line with the overall projected growth in rural vehicle miles of travel.

FUTURE YEAR NETWORKS

Future year trip matrices were assigned to an "Existing + Committed " network and to a Representative Corridor 18.

Existing + Committed Network

The Existing + Committed (E+C) Network is a future year highway network against which a network containing Corridor 18 is compared. The E+C network consists of the base year network plus any new major highways for which a reasonable degree of commitment exists at the state level. Corridor states were requested to provide information on such projects.

Information was received in a variety of forms and at varying levels of detail. Most major projects involve the addition of lanes and other improvements to existing highways on the NHS, rather than construction of totally new facilities. Other projects involved improvements to roads not on the NHS.

Information received did not reveal any major new highway facilities critical to the study corridor network.

The E+C network was created from the base year network by re-defining 2-lane roads involved in major improvement projects. These roads were re-defined as 4-lane highways, with a consequent increase in capacity.

It should be noted that for analysis purposes it was assumed that Corridor 20 (a proposed interstate facility between Texarkana and Laredo, Texas) would not be part of the Existing + Committed Network. Similarly, a proposed Interstate-type facility around the northwest quadrant of Nashville, Tennessee was not assumed to be part of the E+C network.

Representative Location

Links which form part of the representative location were assumed to have the characteristics of an Interstate-type facility, with four lanes in rural areas and six lanes in urban areas. Consequently for the Conventional Interstate option, free-flow speeds on the representative corridor were set to 105 km/h (65 mph) on rural links and 89 km/h (55 mph) on urban links.

FUTURE YEAR ASSIGNMENTS

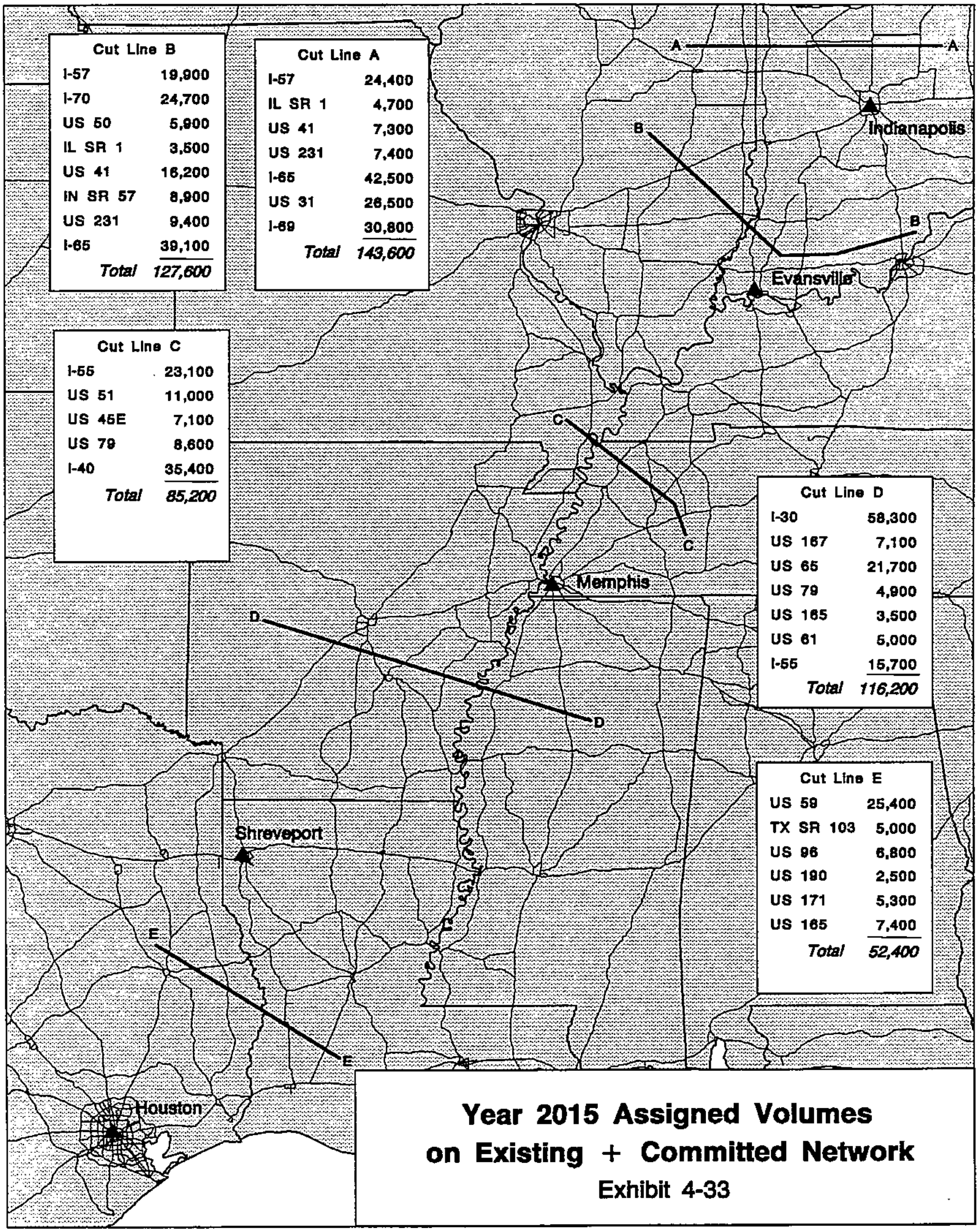
Future year trips were assigned to highway networks using an equilibrium capacity restraint technique. Year 2015 projected ADT volumes at Corridor Cut lines with the Existing + Committed Network are shown in Exhibit 4-33.

Induced Travel

Implementation of an Interstate standard highway through the study corridor may give rise to some induced travel, which would not have occurred otherwise. For the purpose of feasibility assessments induced traffic is assumed to amount to two percent of non-induced traffic in the representative corridor.

Toll Free Projections

Based on the assumptions described above, traffic projections at corridor cut lines are shown in Exhibit 4-34 for the network containing the representative corridor. This assignment assumes no tolls are charged for use of Corridor 18. Exhibit 4-35 compares assigned totals across these cut lines for the base year and the two future year cases.



Cut Line B	
I-57	19,900
I-70	24,700
US 50	5,900
IL SR 1	3,500
US 41	16,200
IN SR 57	8,900
US 231	9,400
I-65	39,100
Total	*127,600*

Cut Line A	
I-57	24,400
IL SR 1	4,700
US 41	7,300
US 231	7,400
I-65	42,500
US 31	26,500
I-69	30,800
Total	*143,600*

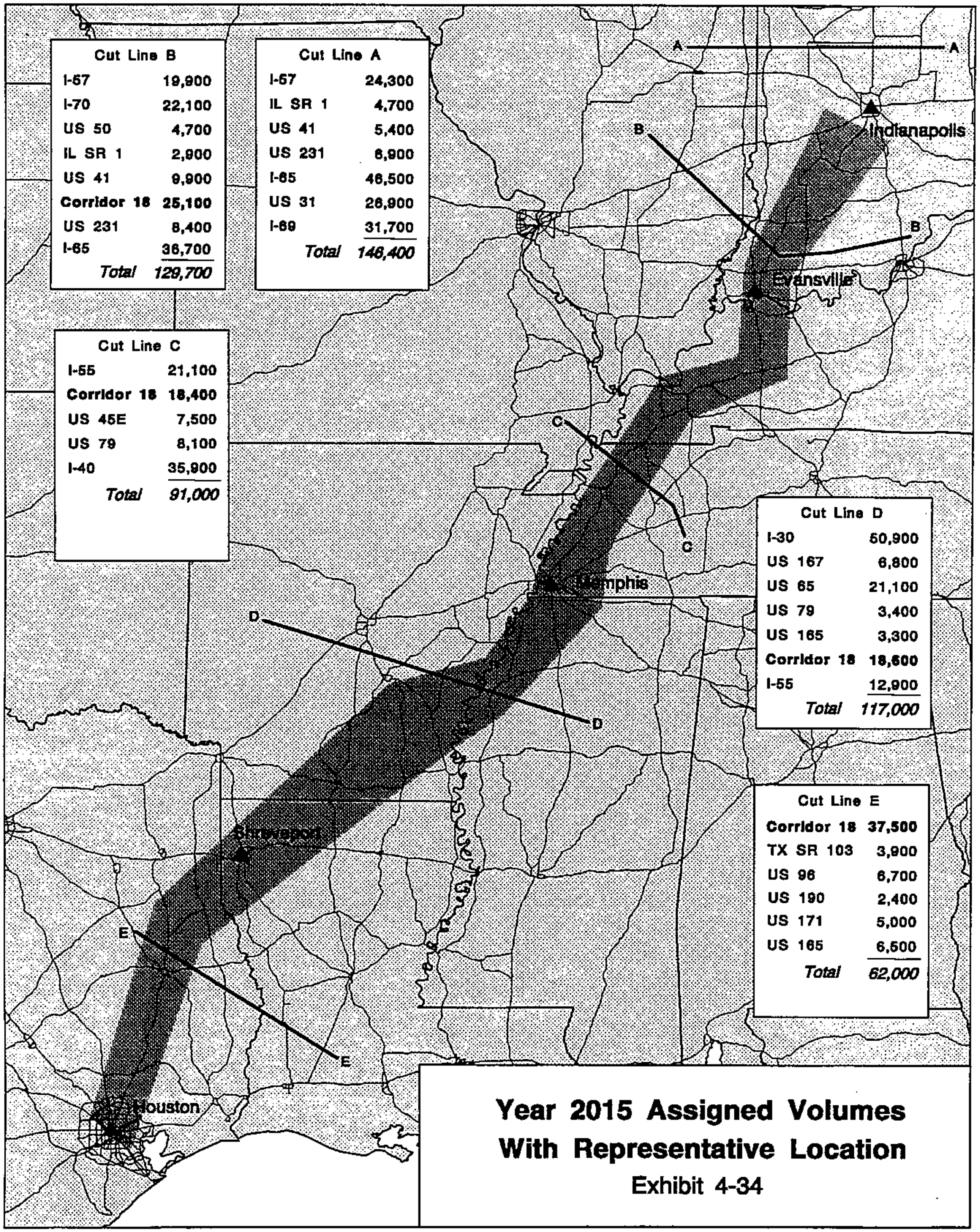
Cut Line C	
I-55	23,100
US 51	11,000
US 45E	7,100
US 79	8,600
I-40	35,400
Total	*85,200*

Cut Line D	
I-30	58,300
US 167	7,100
US 65	21,700
US 79	4,900
US 165	3,500
US 61	5,000
I-55	15,700
Total	*116,200*

Cut Line E	
US 59	25,400
TX SR 103	5,000
US 96	6,800
US 190	2,500
US 171	5,300
US 165	7,400
Total	*52,400*

Year 2015 Assigned Volumes on Existing + Committed Network

Exhibit 4-33



Cut Line B	
I-57	19,900
I-70	22,100
US 50	4,700
IL SR 1	2,900
US 41	9,900
Corridor 18	**25,100**
US 231	8,400
I-65	36,700
Total	*129,700*

Cut Line A	
I-57	24,300
IL SR 1	4,700
US 41	5,400
US 231	6,900
I-65	46,500
US 31	26,900
I-69	31,700
Total	*146,400*

Cut Line C	
I-55	21,100
Corridor 18	**18,400**
US 45E	7,500
US 79	8,100
I-40	35,900
Total	*91,000*

Cut Line D	
I-30	50,900
US 167	6,800
US 65	21,100
US 79	3,400
US 165	3,300
Corridor 18	**18,600**
I-55	12,900
Total	*117,000*

Cut Line E	
Corridor 18	**37,500**
TX SR 103	3,900
US 96	6,700
US 190	2,400
US 171	5,000
US 165	6,500
Total	*62,000*

Year 2015 Assigned Volumes With Representative Location

Exhibit 4-34

Exhibit 4-35
ASSIGNMENT TOTALS ACROSS CUT LINES

Cut Line	Base Year	2015 PROJECTIONS			
		E+C Network		Representative Location	
		Total	Inc(1)	Total	Inc(1)
A	94,100	143,600	53%	146,400	56%
B	83,900	127,600	52%	129,700	55%
C	55,500	85,200	54%	91,000	64%
D	77,700	116,200	50%	117,000	51%
E	35,600	52,400	47%	62,000	74%

(1) Estimated growth in comparison to the Base Year, 1992.

Travel Characteristics

By the year 2015 daily travel demand on the representative location is estimated at 37.6 million vehicle-km (23.3 million vehicle-miles). Of this demand trucks are estimated as contributing approximately 26 percent, with the balance (74 percent) being passenger vehicles. Approximately 81 percent of travel on the representative corridor will be in rural areas, with 19 percent in urban areas.

Impact of Cross Border Truck Movements

It is projected that truck travel demand on the representative location may reach 9.9 million vehicle-km (6.1 million vehicle-miles) per day by 2015. It is estimated that approximately 15 percent of this demand is attributable to cross border traffic. This traffic has an origin or destination in either (or both) of Mexico or Canada. This estimate is based on the representative corridor linking Indianapolis to Houston.

If the corridor is extended with an Interstate-type facility from Houston to the border crossings at Laredo, truck travel demand on the representative location between Indianapolis and Houston may increase to 10.7 million vehicle-km (6.6 million vehicle-miles). Of this demand, approximately 20 percent is estimated to relate to cross border truck movements.

With Toll Projections

An analysis was performed to estimate the percentage of projected vehicle-km (miles) of travel which would be retained if tolls were charged on Corridor 18. These estimates were developed to provide input to the Financial Feasibility analysis described later in this report.

A review was conducted of toll rates currently charged to cars and five-axle trucks on intercity toll facilities in the United States. Based on this review, a weighted average toll rate per km (mile) was computed for cars and trucks as follows:

- Cars – $0.0215 per km ($0.0345 per mile)
- Trucks – $0.0732 per km ($0.1178 per mile)

Exhibit 4-36 lists selected toll facilities from which the average rates were computed.

As a result of the analysis undertaken, it is estimated that 66 percent of vehicle-km (vehicle-miles) on a toll free Corridor 18 would be retained if tolls were charged at the rates indicated above. Daily vehicle-km (vehicle-miles) of travel in these two cases on Corridor 18 are projected at:

CONVENTIONAL INTERSTATE-TYPE FACILITY	DAILY TRAVEL (millions)			
	1992		2015	
	VKmT	VMT	VKmT	VMT
TOLL FREE				
Passenger Vehicles	17.92	11.14	27.72	17.22
Trucks	6.79	4.22	9.86	6.12
TOTAL	24.71	15.35	37.57	23.35
WITH TOLLS				
Passenger Vehicles	11.65	7.24	18.02	11.19
Trucks	4.61	2.87	6.70	4.16
TOTAL	16.26	10.11	24.72	15.36

Exhibit 4-36
TOLL RATES FOR SELECTED INTER-CITY TOLL FACILITIES

TOLL FACILITY (1)	Length		TOLL CHARGES (2)		PER KM RATE		PER MILE RATE		Year of Last Change
	km	(miles)	Passenger Vehicles	Five-Axle Truck	Passenger Vehicles	Five-Axle Truck	Passenger Vehicles	Five-Axle Truck	
Barrier System									
Delaware Turnpike	18.0	11.2	$1.00	$4.00	$0.0556	$0.2222	$0.0893	$0.3571	1989
Northwest Tollway - Illinois	122.8	76.3	$2.00	$6.25	$0.0163	$0.0509	$0.0262	$0.0819	1983
Tri-State Tollway - Illinois	124.1	77.1	$2.40	$7.50	$0.0193	$0.0604	$0.0311	$0.0973	1983
East-West Tollway - Illinois	155.0	96.3	$2.70	$8.50	$0.0174	$0.0548	$0.0280	$0.0883	1983
North-South Tollway - Illinois	28.1	17.4	$1.00	$3.00	$0.0356	$0.1068	$0.0573	$0.1720	1989
Central Turnpike - New Hampshire	71.9	44.7	$1.50	$6.00	$0.0209	$0.0834	$0.0336	$0.1342	1989
Spaulding Turnpike - New Hampshire	53.4	33.2	$1.00	$5.00	$0.0187	$0.0936	$0.0301	$0.1506	1989
Blue Star Turnpike - New Hampshire	25.9	16.1	$1.00	$3.50	$0.0386	$0.1351	$0.0621	$0.2174	1989
Atlantic City Expressway - New Jersey	70.8	44.0	$1.25	$5.00	$0.0177	$0.0706	$0.0284	$0.1136	1967
H.E. Baily Turnpike - Oklahoma (3)	139.0	86.4	$3.50	$10.00	$0.0252	$0.0719	$0.0405	$0.1157	1995
Cimarron Turnpike - Oklahoma (3)	109.0	67.7	$2.25	$7.75	$0.0206	$0.0711	$0.0332	$0.1145	1995
Indian Nation Turnpike - Oklahoma (3)	169.3	105.2	$4.00	$12.25	$0.0236	$0.0724	$0.0380	$0.1164	1995
Muskogee Turnpike - Oklahoma (3)	85.5	53.1	$2.25	$6.25	$0.0263	$0.0731	$0.0424	$0.1177	1995
Cherokee Turnpike - Oklahoma (3)	52.8	32.8	$2.00	$5.75	$0.0379	$0.1089	$0.0610	$0.1753	1995
Chickasaw Turnpike - Oklahoma (3)	25.9	16.1	$0.50	$1.75	$0.0193	$0.0676	$0.0311	$0.1087	1995
West Virginia Turnpike	141.6	88.0	$3.75	$12.00	$0.0265	$0.0847	$0.0426	$0.1364	1981
Garden State Parkway - New Jersey (5)	278.4	173.0	$3.85	$10.50	$0.0138	$0.0621	$0.0223	$0.1000	1989
Closed Ticket System									
Florida's Turnpike	426.5	265.0	$13.10	$32.75	$0.0307	$0.0768	$0.0494	$0.1236	1993
Indiana Toll Road (4)	252.5	156.9	$4.65	$14.55	$0.0184	$0.0576	$0.0296	$0.0927	1985
Kansas Turnpike	379.8	236.0	$7.00	$18.75	$0.0184	$0.0494	$0.0297	$0.0794	1986
Maine Turnpike	170.6	106.0	$3.10	$9.30	$0.0182	$0.0545	$0.0292	$0.0877	1989
Massachusetts Turnpike	198.4	123.3	$4.70	$15.15	$0.0237	$0.0764	$0.0381	$0.1229	1990
New Jersey Turnpike	189.9	118.0	$4.60	$18.20	$0.0242	$0.0958	$0.0390	$0.1542	1991
New York State Thruway - Mainline Sec.	627.6	390.0	$12.10	$46.80	$0.0193	$0.0746	$0.0310	$0.1200	1988
New York State Thruway - Erie Section	107.8	67.0	$2.10	$8.10	$0.0195	$0.0751	$0.0313	$0.1209	1988
New York State Thruway - Berkshire Sec.	38.6	24.0	$0.75	$2.90	$0.0194	$0.0751	$0.0313	$0.1208	1988
Ohio Turnpike (6)	388.2	241.2	$4.90	$19.15	$0.0126	$0.0493	$0.0203	$0.0794	1982
Pennsylvania Turnpike - East-West Sec.	577.6	358.9	$14.70	$55.50	$0.0255	$0.0961	$0.0410	$0.1546	1991
Pennsylvania Turnpike - Northeast Ext.	178.8	111.1	$4.15	$15.75	$0.0232	$0.0881	$0.0374	$0.1418	1991
Turner Turnpike - Oklahoma (3)	138.4	86.0	$3.00	$11.00	$0.0217	$0.0795	$0.0349	$0.1279	1995
Will Rogers Turnpike - Oklahoma (3)	142.4	88.5	$3.00	$11.00	$0.0211	$0.0772	$0.0339	$0.1243	1995
			Weighted Average Toll Rates:		$0.0215	$0.0732	$0.0345	$0.1178	

(1) Barrier System: Tolls are assessed one or more times with drivers passing through toll facilities placed on the mainline of the roadway. Closed Ticket System: Toll facilities are placed at all entrances and exists to the tolled roadway. Tolls are assessed once on exiting the facility.
(2) Full-length trip on the facility
(3) Reflects cash toll rate. PIKEPASS rates are approx. 10 percent less.
(4) Includes the barrier system portion.
(5) Trucks are authorized from Interchanges 0 to 105.
(6) Five-axle truck rates represent 45,000 to 65,000 pound classification.

ENDNOTES

1 *Highway Statistics 1992*, Office of Highway Information Management, FHWA.

2 Table HM-37, *Highway Statistics 1992*, Office of Highway Information Management, FHWA.

3 *Transportation in America*, ENO Transportation Foundation, Inc., 12th Edition, 1994.

4 1992 Transearch Summaries, Reebie Associates.

5 *Report to Congress on the Proposed National Highway System*, US DOT, December 1993.

6 Source: 1992 Transearch Summaries, Reebie Associates.

7 NCHRP Report 255

8 Report of the Secretary of Transportation to the United States Congress, September 1991.

9 *Making Things Work: Transportation and Trade Expansion in Western North America*, Volume 7, prepared by Center for the New West, September 1993.

Chapter 5
ECONOMIC ASSESSMENT METHODOLOGY

A major public investment such as a new highway in Corridor 18 is "economically feasible" if the economy is better off with the new highway than without it. Without question, a well planned Corridor 18 investment will be a significant economic asset to the corridor areas through which it passes, and will be of help to the economic future of communities and activities located in proximity to the facility. Ample evidence exists to support the contention that corridor economies benefit from the existence of well used surface transportation systems.

Government is often asked to make investments, particularly highway investments, for "economic development" purposes. The rationale, and it is correct from the corridor perspective, is that the corridor area will be better off due to greater transport efficiency, the possible attraction of new businesses, and the overall improved ability of the corridor region to compete for economic activity. If the improvement in the economy is greater than the cost of the transportation facility, then the Corridor 18 highway is an "economically feasible" investment.

ECONOMIC ASSESSMENT OVERVIEW

For purposes of the Corridor 18 Feasibility Study, economic benefit is defined as "an increase in the prosperity and incomes of people and institutions." Economic gains of this nature occur when the net incomes and net product generated in the area are caused to increase. Such net increases occur in either of two ways:

Types of Economic Effects

1. **Efficiency**- Transportation cost savings that result from improvements to a corridor are true benefits to the Nation. When travelers experience time savings, greater safety, or reduced vehicle operating costs, their gain is not offset by losses to other people. Cost reductions act exactly the same as income increases by making resources available for other purposes. If the effective increase in income brought about by the project exceeds its cost, the project is said to be "efficient." It makes the Nation better off.

2. **Attraction of Resources (referred to as corridor economic development)** - Reduced transportation costs

in the corridor, relative to costs at other locations, can encourage economic activity to shift to the corridor. If output increases in the area, the increased output will require more resources (land, labor, materials, capital) which can mean that more people are employed and net income within the area increases. If the Corridor 18 investment enables the attraction of additional business in the corridor (new firms, or expanded firms), then the transportation investment can aid the economic development process, to the benefit of the corridor area.

It is important to distinguish between these two economic effects of transportation improvements. Efficiency improvements benefit users of the transportation facility and others with no corresponding losses to others. They are, therefore, net gains to the nation. Resources attracted to the improved corridor are, in essence, transferred from other locations in the U.S. because they will be more productive in the improved corridor. These transfers are not necessarily net gains to the Nation; increases in income and property values along the corridor often occur at the expense of other people elsewhere.

Throughout the Corridor 18 analysis, a clear distinction is drawn between these two types of economic impacts. How one defines economic impact depends on the geographic perspective one takes.

Economic Basis for an Efficient Transportation Project

Highway facilities are essentially "tools" used in transporting goods and people from one place to another. Investment in highways contributes to economic development in that the improved or new highway lowers transportation and/or logistics costs and/or improves people's perceptions of the corridor or nation, thereby causing the people or firms to want to settle or invest there. Such transportation-caused changes may be due to faster travel speeds, more reliable travel, improved safety, decreases in fuel and other vehicle operations costs, revised logistics or agricultural patterns, reductions in noise or air pollution, or for other reasons. But in the final analysis, all of the direct benefits of a highway, and therefore the justification for investing in it, flow from using it for transportation.

Benefits from a new highway in Corridor 18 may not only accrue to persons and businesses who use the facility. Lower transportation costs may be passed on to consumers as lower prices for consumer goods, to workers as higher wages, or to owners of businesses as higher net income. Persons may thus benefit from a Corridor 18 highway without actually traveling on it.

It is important to keep in mind that, for any of these benefits to occur, the Corridor 18 investment must either enable significant reductions in transportation costs or cause revised perceptions of the area. If the amount of these savings is small for each trip, if the number of travelers or amount of freight using the highway is not sufficiently large, or if peoples' perceptions do not change dramatically, the investment will not produce benefits that exceed its cost. Therefore economic feasibility conclusions must be based on reasonable estimates of the travel volumes that will use the new highway, the cost savings travelers and freight will experience, and a realistic assessment of how the Corridor 18 investment might influence industrial location decisions, logistics patterns, other investment decisions, peoples' perceptions of the corridor and the transportation investment, etc.

Investing in a major transportation improvement that produces benefits which are less than the associated costs of the improvement operates counter to economic development. The costs will be paid by users and other taxpayers in the form of higher taxes than otherwise would be the case, or would be paid in a lost opportunity (an alternative transport facility or other facility would not get built). These higher taxes work against economic growth within the taxing jurisdictions because they reduce post-tax return to businesses and households, and investment in the "wrong" transport project or corridor similarly retards economic growth. Therefore it is imperative that the Corridor 18 investment be economically feasible; if it is not, it is economically counterproductive.

Impact Area and Transfer Effects

By reducing the costs of transporting people and goods along a corridor, a highway investment can make locations along the corridor more attractive to businesses. Two general types of economic development effects can result from improvements that lower transportation costs along the corridor relative to other places: improved competitive position and growth in businesses serving travelers.

- <u>Improved Competitive Position</u> - The Corridor 18 highway improvements could remove one impediment to economic activity attraction and growth. Reduced transportation costs should enable the corridor area to better compete for economic activities, meaning that business activity will be expanded in, or otherwise attracted to, the local economies. The primary impact area receives these benefits, the states receive some of them, but the U.S. as a Nation does not benefit in this way unless it allows the U.S. to improve its competitive position vis-à-vis other Nations.

- <u>Growth in Businesses Serving Travelers</u> - The Corridor 18 highway improvements will divert highway traffic to the corridor, and this additional traffic will increase the local economy revenues of such businesses as gasoline stations, motels, restaurants and others. All of these are beneficial at the local level, some are impacts at the state level, none are valuable at the national level since revenues attributable to traffic are merely diverted from one transportation facility to another.

Both of these effects transfer income and property value to owners of land and businesses along the improved corridor. Corresponding losses will occur at other places where this economic activity otherwise would have been located. Transfers resulting from improving a corridor might include:

- New businesses being formed along the corridor.
- Expansion of existing businesses along the corridor.
- Existing businesses along the corridor remaining there that otherwise would have departed.
- Businesses from other locations moving to the corridor.

A final type of transfer effect is economic activity related to the act of transportation facility construction. This effect is, of course, temporary in that when construction is complete, economic activity it stimulated along the corridor will gradually subside. During the period of construction, state, Federal or private money spent in the corridor (the primary impact area) to build the Corridor 18 highway improvements is of economic value to the area. Wages are paid, gravel and other materials are purchased, etc. From the perspective of the corridor, the effect of construction-related expenditures is positive. At the national level there is no net effect from these expenditures, per se, because they are transfer payments at that level.

<u>Geographic Perspective</u> - How one values these transfer effects is very much a function of geographic perspective. If one's perspective is that of a rather narrow belt along the new highway, an increase in economic activity is almost certain. Stated differently, the corridor will be the recipient of economic activity that transfers to it as a result of reductions in relative transportation costs.

If instead the impact area of interest is the entire multistate region, the overall amount of economic development resulting from the highway investment might be less. A certain number of businesses within the region, especially those that are relatively mobile, will relocate to higher access sites along Corridor 18. While an increase in economic activity may be evident near the corridor, it may not be a net gain to a state if it is only a relocation from elsewhere within the state. From a single state perspective, the Corridor 18 highway investment contributes to economic growth if travel costs within the state are reduced or if it creates economic activity within the state. Lower travel costs help improve productivity which, in turn, increases income to firms and individuals. Productivity gains also help enable one state's produced goods to be more competitive in other states and even in international markets. The key point here is that for a highway investment to contribute to state economic growth, it must significantly reduce transportation costs, or draw economic activity to the state from other states. Transfers from one location in a state to another location in the same state are of little or no net gain to the statewide economy.

Similarly, if the Corridor 18 investment is to help the U.S. economy, it must either create travel efficiencies or enable U.S. goods and services to be more competitive internationally, or both. The fact that the investment might allow the corridor or corridor states to better compete with non-corridor states is of little or no net benefit to the nation as a whole.

In this study, economic impacts and economic feasibility are examined for two impact areas: 1) the Corridor 18 primary impact area, and 2) the U.S. as a whole. The primary impact area comprises those counties within approximately 80 km (50 miles) of each route location option.

Overview of the Economic Evaluation Process

The economic approach used to analyze the Corridor 18 highway investment options, while being tailored to the study, is one which has been used on other corridor studies, and one which has evolved over the years. The methodology is reasonably comprehensive and credible, and it is one which utilizes accepted economic principles. Exhibit 5-1 summarizes the approach. It includes:

- A definition of the highway type facilities considered in Corridor 18.
- Development of a "base case" (existing highway system plus committed improvements) against which all Corridor 18 options can be compared.
- A generalized estimate of each option's life cycle cost.
- Estimated use (passenger and freight) that will be made of each option (existing and future use).
- Quantification of estimated travel efficiency economic benefits believed to be attributable to a Corridor 18 investment.
- Quantification of estimated corridor area economic development impacts believed attributable to a Corridor 18 investment.
- A comparison of the economic costs and economic benefits attributable to a Corridor 18 investment.
- Sensitivity tests of key parameter values.
- Conclusions concerning the economic impact and feasibility of investing in Corridor 18.

ECONOMIC EVALUATION PROCESS

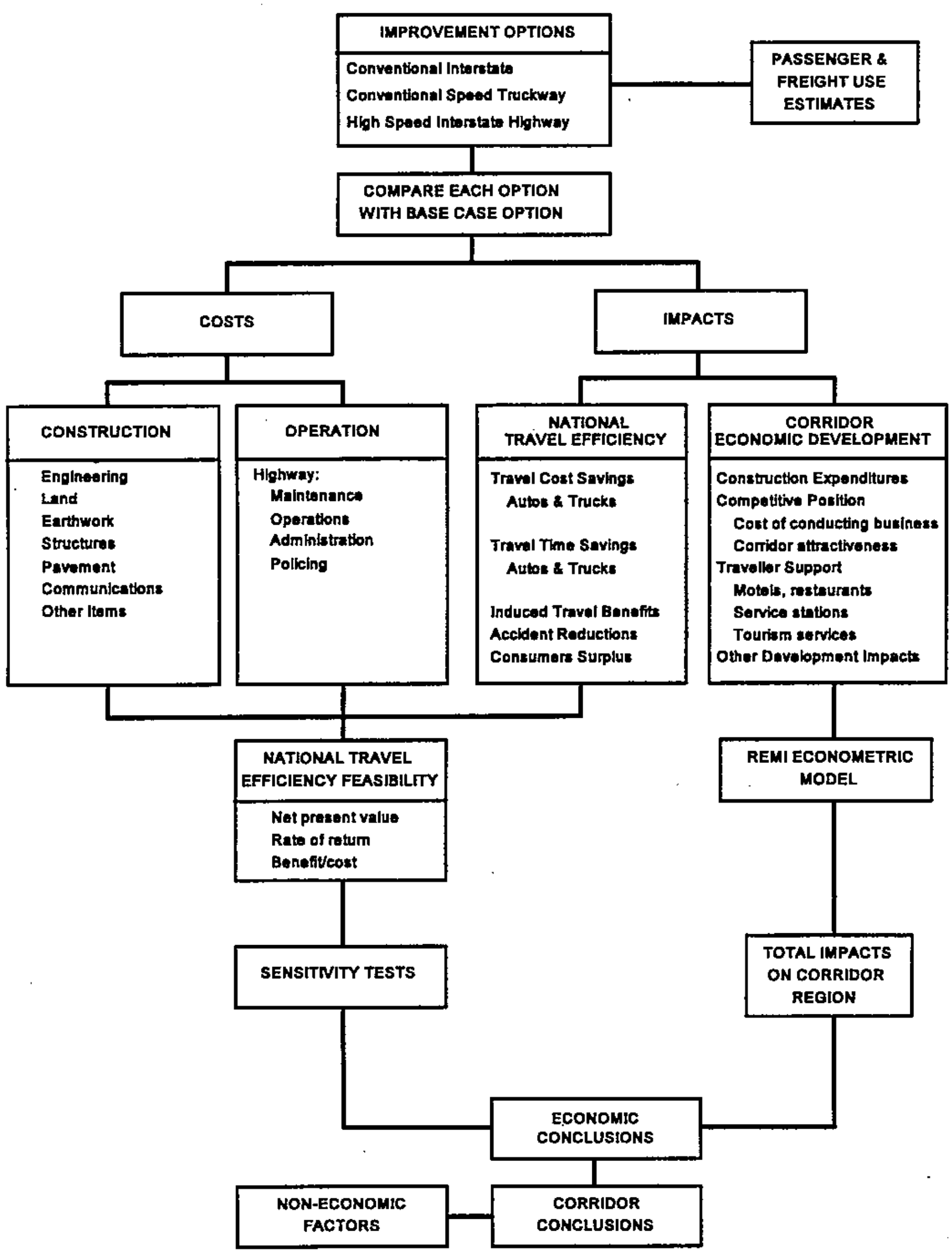


Exhibit 5-1

ECONOMIC EVALUATION PRINCIPLES

The economic analysis of each Corridor 18 alternative follows a consistent set of evaluation principles.

Comparisons With "Do-Nothing" Base Case

To calculate each Corridor 18 alternative's costs and benefits, each of the candidate alternatives is compared with the "base case." The economic benefits for each Corridor 18 option are calculated by comparing each "improved case" highway situation with the "base case" situation. In this manner each alternative's "feasibility" is determined and, implicitly, the Corridor 18 alternatives can be compared one with the other.

Treatment of "Transfer" Impacts

Only "net" changes and impacts are recognized. Transfers of economic value from one part of the corridor to another part of the corridor (from one group of people or firms to another), or from one part of the U.S. to another part of the U.S., are excluded from the national efficiency calculations.

Underinvestment vs. Overinvestment

One objective of this study is to determine if a large capital investment in the corridor is warranted. There are economic consequences of either underinvesting or overinvesting in U.S. transportation infrastructure and in the corridor. If the U.S. underinvests in transportation, economic development will be inhibited because real and perceived travel costs will be greater, competitive position will be retarded, etc. There is therefore an economic cost associated with underinvestment in transportation. However, if the Nation overinvests in transportation, overall efficiency will suffer because those funds could have been put to better use elsewhere (put to more efficient use) in the U.S. There is therefore an economic cost associated with overinvestment in transportation in the corridor.

Recognizing these facts, this study seeks to determine whether or not any of the investments make economic sense, and whether any of those levels of investment are efficient (neither underinvested nor overinvested). This implies efficient and feasible use of tax dollars. The proper level of investment is calculated in terms of national travel efficiency feasibility and corridor economic development impact.

Indicators of "Economic Feasibility"

To determine whether a new Interstate highway investment is economically feasible, the costs of building and operating a new highway are compared with the economic benefits estimated to be attributable to that highway. This cost and benefit comparison yields three indicators of "economic feasibility" for the proposed Interstate highway.

- <u>Net Present Value</u> - All costs and benefits in future years are discounted back to the base year using a seven percent real (constant dollar) discount rate. The future stream of discounted costs is subtracted from the future stream of discounted benefits. When the sum of the discounted benefits is greater than the sum of the discounted costs, the "net present value" is positive and the Corridor 18 highway is deemed to be "economically feasible." The net present value is the best indicator of whether or not the highway is economically feasible.

- <u>Discounted Benefit/Cost Ratio</u> - After the future streams of costs and benefits are discounted, the sum of the discounted benefits are divided by the sum of the discounted costs. When the result is 1.0 or greater, the highway is considered to be "economically feasible."

- <u>Internal Rate of Return</u> - This calculation determines that discount rate at which the net present value difference between costs and benefits is zero. If the rate of return, expressed as a percentage, is equal to or greater than seven percent, then the investment is deemed to be "economically feasible."

Included in the above economic feasibility calculations are all quantifiable direct economic costs attributable to the highway project (cost of planning, designing, building, maintaining and operating the highway) and all quantifiable economic benefits relating to efficiency, including user benefits (operating cost savings, value of time savings, accident cost savings). Excluded from the national economic cost-benefit calculations are the corridor economic development impacts, as well as those implications that cannot reasonably be tabulated in monetary terms (environmental or social implications, impacts on other modes of transportation, etc.). As a result, the economic feasibility calculation should be important to the Corridor 18 investment decision, but should not be viewed as the only criterion.

Discount Rate

Benefits and costs (present and future) are tabulated in constant dollars (inflation is not factored in). At the same time, it is important to recognize that future benefits and costs do not have the same value in the future as they do today. Therefore, all future costs and benefits are "discounted back" to a base year. Because future inflation is not included, the selected discount rate should also exclude future price level changes (inflation). A constant dollar discount rate of seven percent is used in this study, as recommended by the U.S. Office of Management and Budget (OMB).

Residual Value

A 30-year study analysis period is used from the first year of operation. However, some components of the highway investment can be expected to last longer than 30 years. To recognize this, the cost portions of each Corridor 18 alternative that will last longer than 30 years are added as economic benefits in year 30. For example, a bridge might be expected to have a life of 75 years, and therefore a residual value equal to 45/75ths of its original price. Similarly, earthworks and other cost components have considerable remaining life for residual purposes, while pavement has little or no residual value after 30 years.

ECONOMIC EFFICIENCY EVALUATION

Economic efficiency is a legitimate local corridor, regional, state and even national goal. If a Corridor 18 highway improvement creates transportation cost savings that, over time, exceed the cost of the investment needed to generate the efficiencies, then that transportation investment should be made. Therefore, economic efficiency is relevant to the funding decision for the U.S. Department of Transportation, the U.S. Congress, the state departments of transportation, and local agencies.

Transportation Investment Costs

The cost side of the cost-benefit calculation includes two costs: 1) the net "capital costs" of constructing a Corridor 18 highway, and 2) the annual net change in administration, operation, and maintenance costs. Only the net costs attributable to the new highway are included, e.g., there are no costs associated with the Base Case.

- <u>Capital Costs</u> - Capital costs comprise the cost of implementing the Corridor 18 highway project, including right-of-way acquisition, planning, design, and construction.

- **Annual Maintenance and Operations Cost** - Once the highway is in place, it must be operated and maintained. The resulting net change in maintenance and operations cost is estimated.

Economic Efficiency Benefits Attributable to the Corridor 18 Highway Alternatives

The travel efficiency benefits of the highway improvement are of three types: vehicle operating cost savings, travel time savings, and accident reduction savings. Such benefits are calculated for two highway vehicle types (cars and trucks). All benefits are assumed to start in the second year following the capital cost outlays and are expressed by year of occurrence. Benefits are estimated for two analysis years (a base year and a forecast year); intermediate year benefits are interpolated between the two analysis years in straight line fashion.

- **Vehicle Operating Cost Savings** - Corridor 18 will divert some people from other highways in the region. This will reduce vehicle km of travel on these highways, and should reduce some congestion. Resultant operating cost savings estimates are made using standard procedures recommended by the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA). The vehicle operating cost changes reflect differences in vehicle-km of travel, travel speed changes, and other changes that affect vehicle operations.

- **Travel Time Savings** - Corridor 18 will decrease travel distance and increase travel speeds, thereby decreasing overall travel time in the Corridor. The travel time savings due to the alternative improvements are estimated using the Study's regional traffic model. To include time savings in the travel efficiency valuation, a monetary value is placed on the amount of time saved. The value of time varies by person and situation. For purposes of this study, the following values of time were used:

  — $18.90 per commercial truck hour,
  — $6.00 per auto business passenger hour, and
  — $3.00 per auto non-business passenger hour.

In addition, average wage rates in the U.S. have, over time, increased in real terms (excluding inflation). To account for this, the per hour time values were increased by one percent per year. All values of time are based on FHWA Statistics updated to 1995.

- Accident Cost Savings - A Corridor 18 highway should reduce accident risk by diverting traffic from lower classes of road to higher (safer) road types. Accident savings are based on FHWA average accident rates per hundred million vehicle-km of travel which vary by road type.

  Monetary values per accident type (fatal, injury, property damage) consist of the following FHWA suggested values:

ACCIDENT TYPE	COST
Per Fatality	$2,904,000
Per Injury Accident	$58,000
Per Property Damage Accident	$5,000

- Residual Value - The portion of the Corridor 18 highway improvement that will still have useful remaining life after the analysis period is taken as a benefit in year 30.

CORRIDOR IMPACT EVALUATION

A major highway investment such as that envisaged for Corridor 18 will make travel faster, easier and more efficient. In the process it will divert people and freight from other highways, and it could also generate traffic. All of these events would be most welcome to the Corridor 18 area, not only because of the travel efficiencies and the improved perception of the area, but also because of what these travel efficiencies and perceptions could mean to the economies along the highway.

It is believed by some Corridor 18 residents and by portions of the business community that the region, and the states through which the new highway passes, will be better off economically if the highway is built. The economic issues are: 1) what magnitude of economic impact can be expected? 2) is that impact sufficient cause to warrant a major highway investment in the corridor? and 3) which of the economic impacts are true economic values to be used in the analysis, and which are merely economic transfers?

REMI Econometric Model

The economic impact portion of the economic feasibility study relies on an interregional model of the U.S. and of the counties located within the defined primary economic impact area. The "REMI" set of models are private sector models owned by Regional Economic Models, Inc. of Amherst, Massachusetts. This model package, which has previously been applied to a number of corridor evaluations, has the advantage that it is dynamic in nature.

The REMI model is a comprehensive forecasting and simulation system useful for policy and investment analysis in a wide array of issues. The REMI model does have some similarities to Input-Output models. The model is structured to incorporate inter-industry transactions along with feedback from final demand activities. The proportion of intermediate and final demand that is fulfilled by producers in the corridor primary impact area is determined by the model. Demand not fulfilled by local production leads to imports. The REMI model differs from regular Input-Output models in its ability to allow substitution among factors of production in response to changes in relative factor costs over time; that is, it is dynamic. Within the model, wages are responsive to changes in labor market conditions, migration is responsive to changes in expected income, and the share of local and export markets responds to changes in regional profitability and export costs.

Simulations with the model can be used to estimate the economic and demographic effects of policy and investment interventions such as economic development programs, infrastructure investments such as new highway construction, energy and natural resource conservation programs, state and local tax changes, and other policies. The policy simulation compares the performance of the corridor region after a policy intervention with the projected performance of the region based on national forecasts of industry growth, changing technology and estimates of the shifting competitive position of each industry in the corridor region compared to that industry elsewhere in the country and elsewhere in the primary impact area.

Corridor Impact Terms and Definitions

A major new highway will yield many different forms of impact on local economies within the corridor region. In order to recognize these diverse impacts in a consistent fashion, a single set of "indicators of impact" is used throughout the economic impact calculations. The economic impacts are expressed in terms of three "indicators of economic impact:"

- **Value Added** - The value of each firm's output minus the value of the inputs it purchases from other firms. In a corridor study it is the value added by firms located in the defined corridor impact area, including employee compensation, proprietary income, indirect business taxes, and other property income that is used in the impact calculation.
- **Wages**- Total increases in payroll costs (wages and salaries and benefits) paid by local industries due to the new Corridor 18 highway.
- **Jobs** - Job impacts are expressed as "full-time equivalents" (FTE's) and include the number of person job years due to Corridor 18 highway construction and use, plus the share of those that are employed in sectors that directly or indirectly support the construction process, the highway users, and the firms that might expand in or locate to the corridor region.

CORRIDOR IMPACT TYPES

The Corridor 18 investment and associated travel efficiencies could cause a number of events to occur, all of which will be beneficial to local economies along the corridor. These events are categorized into four types.

- Act of Highway Construction
- Corridor Competitive Position
- Traveler Expenditure/Tourism Impacts
- Other Efficiencies

Economic Impacts of Corridor 18 Highway Construction

A Corridor 18 highway will cost billions of dollars to build. The very act of spending large sums of externally generated construction money in an area is of economic value to that area, since contractors and construction workers are hired, gravel is purchased, etc. Economic value that is created in the corridor due to the act of spending such construction funds in the primary impact area is estimated.

The Corridor 18 highway capital costs are estimated and the construction costs are treated as increases in final demand and input into the REMI model. The construction costs are assumed to be spent, initially, within the corridor's defined primary impact area. The economic impacts due to the act of construction comprise the monies spent in the corridor and the flow of those monies in terms of respending. The impacts include the labor and expenses associated with planning, design and construction, plus the respending of those funds to the extent that such respending occurs within the corridor's impact area.

Impact on the Corridor Region's Competitive Position

There is a desire for the corridor's communities to expand existing businesses, to attract new businesses, and to diversify the area's economic base. To attract business, the corridor must be competitive with other areas in the U.S.

The question arises as to whether and to what extent a highway investment in the corridor would benefit the businesses already in the corridor. A related question is what a Corridor 18 highway could do to help foster growth of other, emerging industries. It is clear that competition will be great among regions to maintain as high a level of economic activity as possible and to attract activities demonstrating growth potential nationally and internationally. Keeping transportation costs as low as possible is one way that government can help to make any corridor region competitive.

Stated differently, the major economic transition that is taking place internationally creates unique opportunities because previous centers of economic activity will not necessarily continue to dominate. By reducing the cost of doing business, a nation or state or region strengthens its business climate. Facilitating faster, safer travel along the corridor represents a logical means for increasing the competitive advantage of communities along it.

The ability to attain such economic growth is a function of many things, one of which is the ability of the corridor region to compete for such diversification and growth. The ability to compete is also a function of many things, one of which is the cost of doing business in the corridor, and the cost of doing business is a function of many things, one of which is the cost of transportation. By tracing this relationship, it is apparent that transportation does have a role in achieving the Corridor 18 region's economic development goals.

Exhibit 5-2 presents a sequential flow of activities involved in moving from a new highway improvement itself to the economic impact of that improvement in terms of what it does for competitive position. The activities themselves are described as follows:

1. **The Corridor 18 Highway is Built** - The act of building the highway has a short-term economic impact; that impact is assessed.

2. **The Corridor 18 Highway is Used** - The new highway will be used by existing and diverted and possibly induced users. Passenger and freight transport estimates with and without the Corridor 18 highway are developed.

3. **Reduced Transportation Cost** - The Corridor 18 highway leads to increased travel efficiency in the form of reduced travel time, increased travel reliability, reduced accidents and revised vehicle operating costs. The efficiencies themselves are quantified in the "user analyses" for cars and trucks.

4. **Reduced Costs of Doing Business in the Corridor** - Transportation cost is one factor in the cost of doing business in the corridor. If transportation costs decline in the corridor, this means that the total costs of doing business in the corridor will also decline.

5. **Reduced Prices of Goods and Services** - If costs of production decline due to transportation cost reductions, the result will be reduced prices of goods and services, or increased profits, or both. Such reductions apply to goods produced in the corridor as well as goods shipped through and into the area.

COMPETITIVE POSITION PRINCIPLES

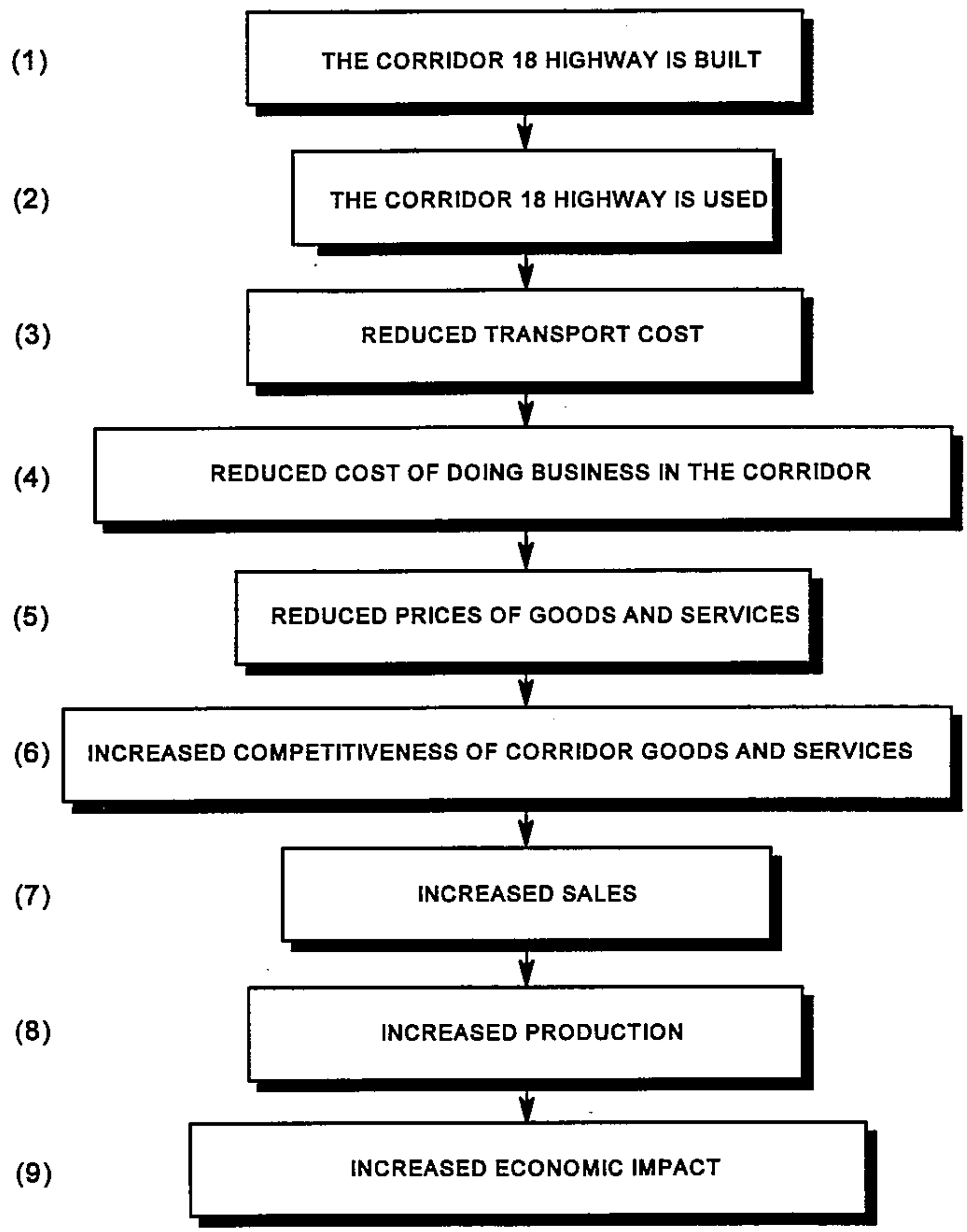


Exhibit 5-2

6. Increased Competitiveness of the Corridor's Goods and Services - With slightly reduced costs and therefore prices, the goods and services produced in the corridor should be slightly more competitive with a Corridor 18 highway in place than without it.

7. Increased Sales - If the region's goods and services become more competitive due to price decreases, the region's businesses should be able to make additional sales of those goods and services.

8. Increased Production - If sales increase, production of goods and services will increase by a like amount (by either expanding existing firms or by attracting new firms to the corridor region).

9. Increased Economic Impact - Increased production generally implies increased payroll, additional jobs, increased tax revenue and increased final demand, value added and output.

Traveler Expenditures/ Tourism Impacts

In addition to development caused by improved competitive position, a Corridor 18 highway will require goods and services that cater to the users of the new highway. The new highway would increase sales for businesses that cater to traffic. For highway economic evaluation purposes, "roadside services" are defined as businesses that serve the cars and trucks and their drivers/passengers such as gasoline stations, hotels/motels, restaurants, tourist visitation places, gift shops, etc. There is a general relationship between traffic density (volume), trip characteristics, and the number of roadside service establishments that exist, e.g., the higher the traffic volume, the greater the number of motels, etc. Construction of highway improvements will cause greater traffic density and consequently the attraction of additional roadside services to serve those increased traffic volumes.

The issue to consider is, what increase might be expected due to new/diverted traffic associated with a Corridor 18 highway, and whether that development represents a net increase suitable for use in the economic impact calculations.

Transportation service increases will be due to traffic increases. Over the next 30 years there will be normal traffic growth, even if the Corridor 18 highway is not built. In addition, there will be increased traffic due to the new highway, which will principally be diverted from other highways. The change in traffic use is calculated. These changes will bring with them comparable percent increases in roadside business in the form of increased roadside gas station, motel and restaurant activities. This increase could involve the attraction of new businesses, or could accrue in the form of increased sales by existing businesses, or both. In either event, however, the business increases are drawn from other U.S. highways and therefore from other U.S. businesses.

The direct impacts caused by increased traveler expenditures are run through the REMI model, to gauge the value of those expenditures to the corridor (primary impact area) economy. Such impacts at the corridor area level, however, do not represent net gains to the U.S. economy because they are transfer effects (gains in the corridor are offset by losses elsewhere in the U.S.).

Other Efficiencies

In addition to the above effects on the corridor region, the new highway will also offer travel cost savings, personal travel time savings and reduced numbers of accidents. These also have economic value to the corridor region and are, therefore, added to the impact total. These savings were not included in the other impact types and can, therefore, be added as corridor regional impacts, without double counting the impacts.

IMPACT ON EMPLOYMENT

The retention of existing jobs and the attraction of new job opportunities is an important goal of all jurisdictions in the corridor. A Corridor 18 highway will aid in the achievement of this goal. Jobs will be created in the corridor impact area in four ways.

- **Construction Jobs** - The firms engaged to construct a Corridor 18 highway will spend large sums of money in the area. These expenditures will be used to pay contractors and suppliers of goods and services. These construction caused jobs will exist only during the construction process itself.

- <u>Competitive Position Jobs</u> - By making the corridor area more competitive, output will increase and with it existing firms might be expanded and new firms attracted. Both forms of business activity expansion will employ additional people.

- <u>Traveler Expenditure Jobs</u> - Increased travel in the corridor will lead to increased business along the route for businesses that cater to those using the new facility. These businesses will therefore employ increasing numbers of people.

- <u>Consumer Respending Jobs</u> - In each of the above cases, the people in the new jobs will spend much of their income within the corridor region. This respending will in turn create additional jobs.

PRESENTATION OF ECONOMIC RESULTS

The results of the economic analyses are presented in three chapters:

- Chapter 6 presents the economic feasibility and benefit/cost analysis of the conventional Interstate-type highway option from the National efficiency perspective.

- Chapter 7 presents the estimated economic development impacts in the Corridor 18 primary impact area for the conventional Interstate-type highway option.

- Chapter 10 presents the economic feasibility and benefit/cost analysis of the Truckway option and the High Speed Interstate-type Highway option from the National efficiency perspective.

Chapter 6
ECONOMIC FEASIBILITY -- NATIONAL PERSPECTIVE

As described in Chapter 5, there are two general types of economic implications that arise from new highways: increases in transportation efficiency, and economic development effects. This feasibility study examines both types of impacts. Chapter 6 presents the results of the travel efficiency analysis; Chapter 7 presents the results of the economic development analysis.

Transportation efficiency excludes any potential economic development effects from a new highway (the economic development topic is addressed in Chapter 7). Potential economic development effects arising from Corridor 18 would most likely come from other areas of the Nation and would not constitute a net gain for the nation as a whole. Consequently, the funding decision should be based more on the transportation efficiency improvements of Chapter 6, and less on the more localized economic development effects of Chapter 7.

Chapter 6 determines, from an efficiency benefit/cost perspective, whether or not a new conventional (non-toll) Interstate-type highway is economically feasible in one example representative corridor. It finds that the Interstate-type highway is economically feasible in the "representative location." It does not examine the other alternative routes but, given the excellent results for the "representative location," the other routes may also be economically feasible.

In this assessment of economic feasibility, a life cycle cost approach is used. The costs of planning, designing, building, and maintaining a conventional (non-toll) Interstate-type highway in the Corridor 18 area over a 31 year period (1995-2026) are estimated. Then, the transportation efficiency gains over that period are estimated, and the efficiency gains are compared with the costs in a benefit/cost calculation in order to determine whether or not a Corridor 18 Interstate-type highway is economically feasible.

ECONOMIC COSTS

The cost side of the benefit/cost evaluation comprises the costs of constructing, operating, and maintaining an Interstate-type highway in Corridor 18. The costs include all life cycle costs regardless of the funding source.

Interstate-type Highway Construction Costs

The total construction costs for the Interstate-type highway option include right-of-way acquisition, planning, design, and construction, as listed in Exhibit 6-1. For benefit/cost purposes only, the capital costs were assumed to be spent in the study's initial analysis year (1995).

Exhibit 6-1
INTERSTATE-TYPE HIGHWAY CAPITAL COST SUMMARY
($ million)

COST ITEM	COST
Construction	$3,574
Right-of-Way	365
Engineering	634
Mitigation	361
Contingency	560
TOTAL COST	**$5,494**

SOURCE: HNTB

Residual Value

The economic analysis period for this study is 31 years (1995 to 2026). By the year 2026 some of the Interstate-type highway's cost elements will have depreciated (used some or all of their useful life) while other elements have longer lifespans. To account for these differences, a residual value was assigned in the year 2026 as a benefit. Residual is the same as a salvage value without the cost of removing the structures. The residual lives for the major improvement cost components are as follows:

Cost Component	Useful Life
Bridges and Overpasses	75 years
Earthworks	100 years
Road Base	50 years
Pavement and Shoulders	30 years
Right-of-Way	Infinite

To estimate the residual values, composite residual factors were developed based on the useful lives of the various construction cost elements within each construction item. The resultant residual value of the Interstate highway which cost $5.49 billion to build is $1.79 billion. This is based on the capital costs, exclusive of engineering, administration and contingencies costs.

Annual Highway Operating and Maintenance Costs

In addition to the costs of constructing the Interstate-type highway, there will be additional highway lanes to maintain. The estimated annual operations and maintenance costs were developed from average historical costs for various state highway agencies across the country on a per route km basis. The historical data used were those for a four-lane interstate type facility. Exhibit 6-2 lists the annual cost averages for the various operations and maintenance cost items.

Exhibit 6-2
ANNUAL OPERATION & MAINTENANCE UNIT COSTS
Interstate-type Highway

ITEM	COST/KM	COST/MILE
Administration	$3,210	$5,166
Maintenance	9,567	15,396
Highway Patrol	7,208	11,600
Communications	873	1,405
TOTAL COST	**$20,858**	**$33,567**

SOURCE: HNTB

ECONOMIC EFFICIENCY BENEFITS

Interstate highways are best thought of as "tools" for moving goods and people from one place to another. These facilities generate benefits only to the extent that they improve transportation efficiency. Stated differently, the predominant way that transportation investments can contribute to economic growth within an area is by reducing the cost and improving the efficiency of moving people and goods.

The transportation efficiency benefits of Corridor 18 are of three types: vehicle operating cost savings, travel time savings, and accident reduction. The transportation efficiency benefits are calculated for two vehicle types: passenger vehicles (automobiles) and commercial vehicles (trucks). The benefits are based on highway network travel, rather than merely travel on the Corridor 18 itself, and include induced traffic. All benefits are assumed to start in the year 1997 (the second year following the capital outlays) and are expressed by year of occurrence.

The network model was used to estimate benefits in 1992 and 2015; intermediate year benefits were interpolated between the two years in straight line fashion, and benefits following 2015 were extrapolated in the same manner. Efficiency benefits were calculated through the year 2025. These benefits, for the years 1992 and 2015, are presented in Exhibit 6-3.

Exhibit 6-3
TOTAL ANNUAL TRAVEL EFFICIENCY BENEFITS
New Interstate-type Highway Option
($ million)

	YEAR 1992			YEAR 2015		
	Autos	Trucks	Total	Autos	Trucks	Total
Annual Vehicle Operating Cost Savings	$23.1	$78.7	$101.8	$55.7	$167.7	$223.4
Value of Time Savings	82.7	61.0	143.7	243.1	105.3	348.4
Accident Cost Savings	—	—	181.8	—	—	272.0
TOTAL CORRIDOR 18			**$427.3**			**$843.8**

SOURCE: Wilbur Smith Associates

Vehicle Operating Cost Savings

The costs of operating motor vehicles can be a significant portion of the total cost of transportation. Vehicle operating costs are comprised of a number of components, some of which are use related and others that are time related (e.g., insurance and license fees). It is the use related costs--engine oil, gasoline, maintenance, and tires--that are most directly affected by an improved highway. For each cost component, different levels of impact result when highway attributes are changed. These attributes include distance, grades, horizontal curves, roadway surface, running speeds, and speed change cycles. Comparisons between current and forecast conditions and those that would result with Corridor 18 constitute the basis for estimating vehicle operating cost savings. Annual savings due to a Corridor 18 Interstate-type highway of $102 million (1992) and $223 million (2015) are not inconsequential.

Travel Time Savings

One objective of a Corridor 18 highway is to reduce the time required to travel through the corridor. With just-in-time (JIT) manufacturing becoming increasingly common, the importance of certain goods arriving when expected is taking on greater importance. Therefore, reducing travel time and increasing the reliability of arrival times is a potential transportation efficiency benefit.

Transportation time savings created by the proposed new Interstate-type highway were estimated using the study's traffic model. To include time savings in the transportation efficiency evaluation, it was necessary that a monetary value be placed on time saved. Although the value of time may vary by person and situation, it is certain that everyone, at one time or another, is willing to pay something to reduce the amount of time spent on travel.

Most non-business travelers are less concerned about time, and hence value their savings less, than those on business trips. To account for the difference in "willingness to pay" for time savings, different monetary values were placed on time for business and non-business travelers. For auto business travelers, a value of $6.00 for each passenger-hour saved was used. For non-business travelers a value of $3.00 per passenger-hour was used. All values were adjusted to reflect 2.238 persons per auto. In addition, average wage rates in the U.S. have, over time, increased in real terms (excluding inflation). To account for this, the per hour time values were increased by one percent per year. Commercial truck time savings were valued at $18.90 per truck hour (1995). This value is predominantly the driver's total cost to the employer. All values of time are based on FHWA statistics, updated to 1995.

Total annual time savings are estimated to be valued at $144 million (1992), increasing to $348 million (2015), as summarized on Exhibit 6-3.

Accident Reduction Cost Savings

Improvements in highway safety are another reason for considering a new Interstate-type highway. Because an Interstate-type highway tends to be safer than roadways of a lesser standard, Corridor 18 should reduce accident potentials compared to the existing highway system in the Indianapolis to Houston Corridor.

Accidents were categorized by three types: 1) fatal, 2) injury, and 3) property damage only. National average accident rates by type of accident and highway facility were used to estimate accident potentials in the highway corridor with and without Corridor 18.

To include the impact of reducing accidents in the transportation efficiency evaluation, it was necessary that a monetary cost be established per accident. Monetary values by accident type per recent FHWA statistics are as follows:

Accident Type	Cost
Per Fatality	$2,904,000
Per Injury Accident	$58,000
Per Property Damage Accident	$5,000

Accident cost savings of $182 million (1992), increasing to $272 million (2015), are estimated, as shown on Exhibit 6-3.

Total Transportation Efficiency Benefits

Total estimated transportation efficiency benefits over the analysis period, discounted at seven percent per year, are listed in Exhibit 6-4. It is estimated that by the end of 30-years, Corridor 18 as an Interstate-type highway will have saved national highway users approximately $8.0 billion.

Exhibit 6-4
TOTAL EFFICIENCY BENEFITS OVER 30-YEAR ANALYSIS PERIOD[a]
New Interstate-type Highway Option

Vehicle Operating Cost Savings	$2,050.3
Time Savings	3,134.0
Accident Savings	2,740.5
TOTAL USER BENEFITS	$7,924.8

(a) 29 years of economic benefits, discounted at 7 percent per year.

SOURCE: Wilbur Smith Associates

ECONOMIC FEASIBILITY

To calculate the Interstate-type highway's economic feasibility in transportation efficiency terms, all costs and benefits in constant (1995) dollars are determined by year 1995 through 2026, and then discounted back to 1995 using a discount rate of 7 percent. The benefits are then compared with the costs using conventional feasibility indicators.

Indicators of "Economic Feasibility"

To determine whether Corridor 18 is economically feasible, the costs of building and operating the highway improvement are compared with the economic benefits estimated to be attributable to the highway improvement. This cost and benefit comparison yields three indicators of "economic feasibility."

- **Net Present Value** - All costs and benefits in future years are discounted back to the base year using a seven percent discount rate (the constant dollar rate suggested by the Office of Management and Budget of the U.S. Congress). The future stream of discounted costs are subtracted from the future stream of discounted benefits. When the sum of the discounted benefits is greater than the sum of the discounted costs, the "net present value" is positive and the highway improvement is deemed to be "economically feasible."

- **Discounted Benefit/Cost Ratio** - After the future streams of costs and benefits are discounted, the sum of the discounted benefits is divided by the sum of the discounted costs. When the result is 1.0 or greater, the highway improvement is "economically feasible."

- **Internal Rate of Return** - This calculation determines that discount rate at which the net present value difference between costs and benefits is zero. If the rate of return, expressed as a percentage, is equal to or greater than seven percent, then the highway improvement is deemed to be "economically feasible."

Transportation Efficiency Feasibility Results

Exhibit 6-5 presents the National perspective economic feasibility indicators for a conventional Interstate-type highway for Corridor 18. These indicators are interpreted as follows:

- An economically feasible project is one which has a positive Net Present Value (NPV), an Internal Rate of Return (IRR) equal to or exceeding the discount rate, and a Discounted Benefit/Cost Ratio (B/C) of 1.0 or higher.

- The higher the NPV, IRR, and B/C, the more feasible the project.

The Exhibit 6-5 calculations suggest that Corridor 18, from Indianapolis to Houston, constructed as an Interstate-type highway facility, is economically feasible. Corridor 18 has a benefit/cost ratio of 1.39, indicating that $1.39 in transportation benefit is derived for each $1.00 invested. Corridor 18 also has a very large Net Present Value, revealing that National productivity will be increased by $2.2 billion. The Internal Rate of Return of nearly 10 percent also indicates a feasible project.

Exhibit 6-5
INTERSTATE-TYPE HIGHWAY
ECONOMIC FEASIBILITY RESULTS
Travel Efficiency Feasibility

	FEASIBILITY INDICATOR
Net Present Value[a]	$2,207,000,000
Internal Rate of Return	9.9%
Discounted Benefit/Cost Ratio[a]	1.39

(a) Discounted at 7 percent per year.

NOTE: An investment with a positive NPV, an IRR of 7 percent or greater, and a B/C of 1.0 or greater, is viewed as an economically feasible project.

SOURCE: Wilbur Smith Associates

Included in the above economic feasibility calculations are all quantifiable public sector financial costs attributable to the highway project (cost of planning, designing, building and maintaining the road improvements) and all quantifiable road user benefits (vehicle operating cost savings, value of time savings, accident cost savings). Excluded from the cost-benefit calculations are the economic development impacts (see Chapter 7) and the road improvement implications that cannot accurately be tabulated in monetary terms (environmental or social implications). As a result, the economic feasibility calculation should be important to the improvement and investment decision, but should not be viewed as the only criterion.

SENSITIVITY TESTS

The National perspective feasibility test is based on a number of calculations, estimates, and assumptions. Sensitivity tests were conducted to determine the extent to which study findings might be dependent on these approximations. These sensitivity tests are as follows:

1. 25 percent reduction in capital costs,
2. 25 percent increase in capital costs,
3. Determination of that capital cost at which the investment is economically feasible (B/C=1),
4. Use of a 4 percent discount rate,
5. Use of a 10 percent discount rate,
6. Exclusion of the 1 percent per year increase in per hour value of time,
7. 25 percent increase in benefits,
8. 25 percent decrease in benefits.

The sensitivity tests varied some of the estimates and assumptions used in the feasibility analysis. Overall, varying the assumptions and estimates had a minimal impact on the conclusion that Corridor 18 is economically feasible. Only increasing the discount rate from 7 percent to 10 percent lowered the benefit/cost ratio of Corridor 18 below 1.0 (the B/C ratio decreased to 0.99). All other sensitivity tests revealed that Corridor 18 is a feasible and viable project from the National perspective. Results of the sensitivity tests are summarized in Exhibit 6-6.

Exhibit 6-6
TRAVEL EFFICIENCY SENSITIVITY TESTS

	B/C RATIO	NPV ($ million)	IRR
Study Results	1.39	$2,207	9.9%
25% Less Capital Cost	1.82	$3,580	12.8%
25% More Capital Cost	1.12	$834	7.9%
Capital Cost for a 1.0 B/C Ratio	+40%	—	—
4% Discount Rate	2.09	$6,146	9.9%
10% Discount Rate	0.99	($58)	9.9%
Constant Time Value	1.32	$1,932	9.5%
25% More Benefits	1.73	$4,188	12.2%
25% Less Benefits	1.04	$226	7.3%

SOURCE: Wilbur Smith Associates

ECONOMIC FEASIBILITY CONCLUSIONS

This chapter analyzed the Interstate-type highway option from the economic perspective to determine whether or not it represents a good, reasonable project in the Corridor 18 area. The analyses conclude the following:

1. An Interstate-type highway built in the "representative corridor" between Indianapolis and Houston is an economically feasible project.

2. It appears that an investment of the Nation's tax dollars in the corridor is a prudent use of those tax dollars.

3. The project is economically feasible and justified from the Federal funding and state funding perspectives.

4. The Interstate-type highway is sufficiently feasible that the sensitivity tests find that the project is feasible under almost any future scenario.

5. This feasibility conclusion applies to an Interstate-type highway in the location which was analyzed (i.e., the "representative location"). The other alternative routings may be more feasible, or less feasible, than the representative location.

Chapter 7
ECONOMIC DEVELOPMENT IMPACTS

The Chapter 6 transportation efficiency analysis found that Corridor 18 built as a conventional Interstate-type highway is economically feasible from the National perspective. It would increase the Nation's economic productivity by nearly $2.2 billion over 30 years.

However, Corridor 18 could accomplish more than improve the Nation's productivity. A new Interstate-type highway in the Corridor could also help facilitate economic development in the corridor communities, by attracting firms and economic activity to the corridor area and by generally helping the corridor's communities to better compete with other communities in the U.S.

Two economic development oriented questions related to Corridor 18 are relevant:

1) Will a Corridor 18 facillity cause much economic development to occur within the corridor region?

2) Are there significant redistributive (social equity) arguments for Corridor 18, to the extent that the region it serves is comparatively disadvantaged economically?

This chapter examines these two separate but interrelated questions.

PRIMARY IMPACT AREA

To gauge the economic development and redistributive effects of a new Corridor 18 Interstate-type highway on its region, the effects or impacts are estimated for a defined "Primary Impact Area." That area is shown on Exhibit 7-1, and comprises counties in proximity to the alternative corridor routes. The economic development impacts of this chapter refer to the economic gains estimated to occur within this defined primary impact area if an Interstate-type highway is built.

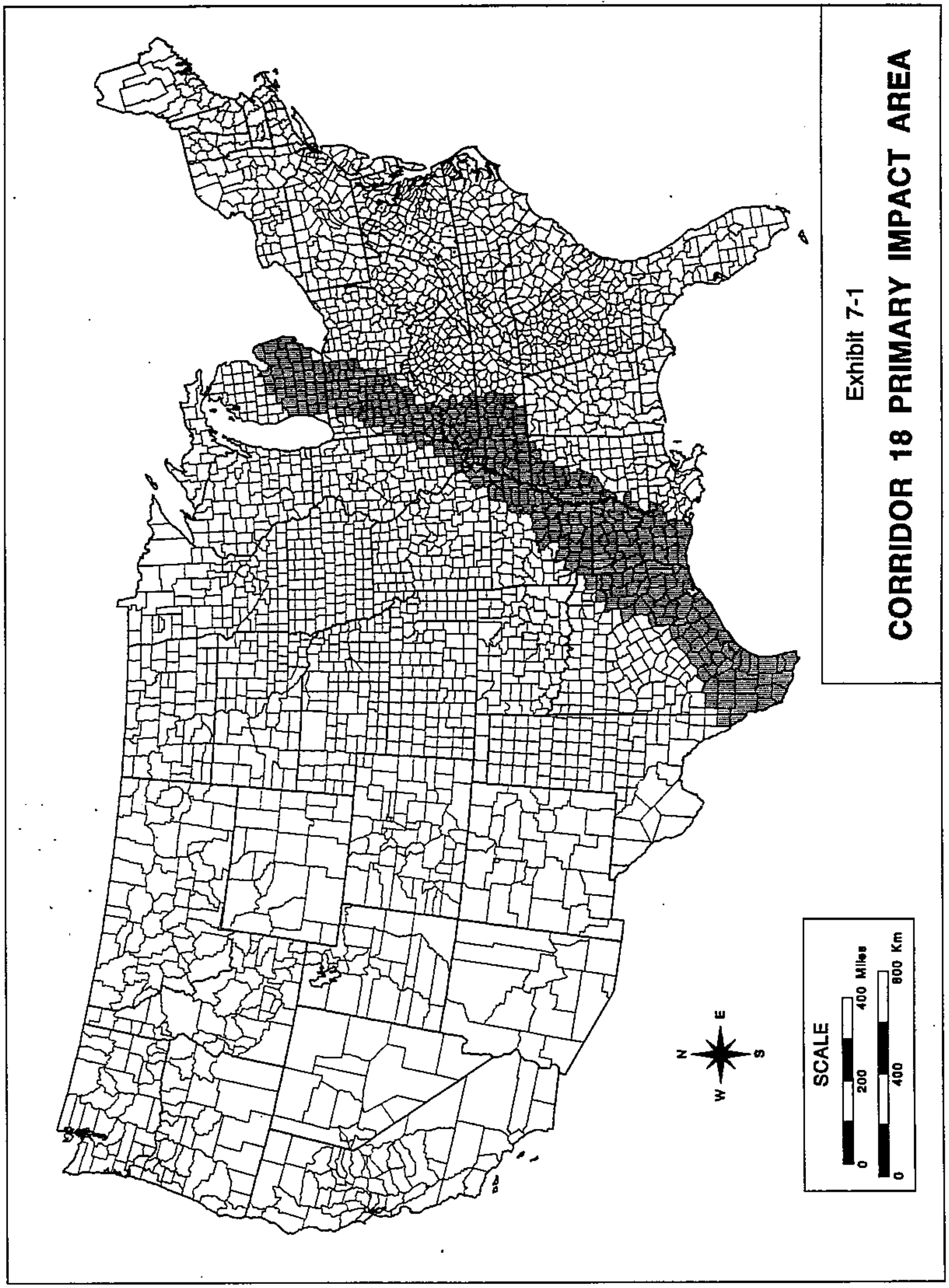


Exhibit 7-1
CORRIDOR 18 PRIMARY IMPACT AREA

NET GAINS VS. TRANSFER EFFECTS

Most of these economic development gains within the corridor area will be due to helping the corridor to develop economically at the expense of other places in the U.S. For example, the calculations suggest that if Corridor 18 is built, this corridor will be better able to compete with other places in the U.S. for economic activity. This means that firms may choose to locate in the primary impact area, because of Corridor 18, rather than to relocate elsewhere in the U.S. Such an impact will benefit the Corridor 18 primary impact area, but at a loss to other U.S. locations external to the primary impact area.

THREE INDICATORS OF ECONOMIC DEVELOPMENT IMPACT

Corridor 18 could yield many different forms of impact to the corridor area. In order to recognize these diverse impacts in a consistent fashion, a single set of "indicators of impact" and a single set of definitions are used throughout the economic impact calculations. The economic impacts are expressed in terms of three "indicators of economic development impact."

These indicators are all produced by the REMI Model; they should not be added together because they are alternative measures of the same thing: economic growth.

Value Added

"Value added" is the value of the corridor firms output minus the value of the inputs they purchase from other firms. In the corridor study, it is the value added by firms located in the defined corridor impact area, including employee compensation, proprietary income, indirect business taxes, and other property income. The value added component is the most comprehensive and accurate measure of economic development impact.

Wages

This measure of economic impact includes increases in payroll costs (wages and salaries) plus income from self-employment.

Employment

Employment comprises "new" jobs attributable to Corridor 18 including the number of person job years due to construction and use, plus the share of those that are employed in sectors that directly or indirectly support the construction process, Corridor 18 users, and the firms that might expand in or locate to the region.

FOUR ECONOMIC DEVELOPMENT CAUSES

A new Interstate-type highway could help to create additional economic development for the residents and businesses of the primary impact area. These effects were categorized into four types, and economic development impacts were estimated for each.

Act of Construction

The act of spending money in the corridor region to build the highway will increase economic activity in the corridor area. The construction impacts are temporary in nature, since they exist only during the construction period and end when the construction is complete. Such construction expenditures, however, are net gains to the corridor only if they represent "new" monies, from elsewhere (federal funds). For economic impact purposes, the costs of construction are assumed to occur in equal annual amounts over a 10-year period. As a result, these impacts cease after year ten.

Corridor Competitive Position Impacts

A new highway will make this corridor region more attractive to business. Corridor 18 will cause reductions in the cost and time of transportation, which could lead to reduced costs of production, which in turn could lead to reduced prices and/or increased profits, which could lead to increased production (expansion of existing firm production and/or attraction of new firms), which in turn generates economic impact value. These lower transportation costs could help the region to compete with other areas of the country for economic development opportunities.

Traveler Expenditures and Tourism Impacts

Significant improvements to the corridor could lead to changes in traffic patterns as more travelers select this highway. Additional vehicle movements along the corridor would stimulate businesses that serve travelers to locate along this particular highway. Among the types of roadside businesses likely to relocate if traffic volumes increase are motels, restaurants, and gas stations.

Other Efficiencies

In addition to the above described economic development effects, Corridor 18 will also create an assortment of productivity changes. These include travel efficiencies for people on non-business travel. The personal business efficiency (time saved, accidents avoided, etc.) are not included elsewhere; hence, they are included here as "other efficiencies."

REMI ECONOMETRIC MODEL

To gauge the economic impact of a new Interstate-type highway built in the Corridor 18 area on the primary impact area economy, the REMI econometric model (Regional Economic Models, Inc.) was used. The REMI model is a multi-regional dynamic economic and demographic forecasting model that estimates regional and national effects from various governmental or private policy changes or investments. The REMI model simulates a regional economy that predicts demand and supply conditions across 53 sectors, 94 occupations, 25 final demand sectors, and 202 age/sex cohorts.

Corridor 18 would create freight transportation cost savings, business cost savings, roadside expenditures, tourism expenditures, and others. These direct changes, in monetary terms, serve as inputs into the REMI economic model. For example, the model estimates the regional economic effect from increased profits for businesses and firms in the region created by more efficient truck travel on the highway. The model utilizes price levels and output levels for the year 1987; all results are then increased to 1995 price levels utilizing appropriate producer price inflators.

The direct monetary impacts of each of the four categories of impact (construction expenditures, competitive position, traveler expenditures, and other efficiencies) were estimated external to the REMI model. Then the construction expenditures, competitive position impacts, and a portion of the other efficiencies were input into the REMI model. Some components of economic development effects such as willingness to pay for non-business time savings, are not increases in final demand. Therefore, these effects are added to the REMI results. All of the impact categories are net impacts within the primary impact area; they should not be construed as net impacts for the U.S. as a nation.

ESTIMATED ECONOMIC DEVELOPMENT IMPACT ON THE PRIMARY IMPACT AREA

The people and businesses located in proximity to the new highway stand to gain the most if Corridor 18 is constructed. The communities that are served by the new highway will be better able to compete for industrial and commercial businesses, more money may be spent in the area, and the regional economy should benefit in the following ways.

Economic Impact of Construction

The spending of construction money is of economic value to the primary impact area, because construction contractors and workers will be hired, construction materials will be purchased, etc. To assess the construction impacts, the estimated cost for Corridor 18 was input into the REMI model. The model was then used to estimate the economic development impacts that might occur in the primary impact area associated with the construction process itself.

The highway's capital cost was treated as an increase in final demand and was input into the REMI model. This is proper since the REMI model determines which construction purchases can be acquired in the area and which involve expenditures outside the primary impact area. The REMI model determines the amount of materials, labor, etc. that could be supplied locally and estimates the total economic development impacts to the corridor area created by the construction outlays. For feasibility purposes, the construction expenditures were assumed to be spent entirely in one year. However, for economic development analysis purposes, it was assumed that construction would take approximately 10 years to complete, and that construction expenditures would be spent in equal amounts over the 10-year period. This technique provides for a more reasonable estimate of the impact of construction on the primary impact area.

The economic impacts due to construction comprise the expenditures spent in the primary impact area, the extent to which those funds employ local people and buy local goods and services, and the flow of those expenditures in terms of respending. The REMI model determines what is needed for Corridor 18 construction and determines how many local contractors can be hired, what materials can be purchased locally, etc. The impacts include labor and expenses associated with planning, design and construction, plus the respending of those funds to the extent that such respending occurs within the primary impact area.

The estimated economic impacts in the corridor attributable to Interstate-type highway construction in the Corridor 18 area are listed in Exhibit 7-2.

Exhibit 7-2
HIGHWAY CONSTRUCTION ECONOMIC IMPACTS
Primary Impact Area

	Impact Per Year for 10 Years	Total Construction Impact [a]
Value Added ($ million)	$517.8	$3,951.3
Wages ($ million)	$413.3	$3,082.3
Employment (jobs)	9,800	9,800

(a) discounted at 7 percent.
NOTE: This exhibit depicts economic impacts in the primary impact area due to the act of constructing Corridor 18. This impact occurs over a 10-year period, and then ceases.

SOURCE: Wilbur Smith Associates, REMI Model.

According to the Exhibit 7-2 calculations, the residents and businesses of the primary impact area will benefit significantly if "outside" funds are used to construct Corridor 18. These jobs and impacts include not only those engaged in construction, highway, but also include jobs that serve the construction process plus those created by the respending of money.

Because these construction effects result from the expenditure of capital investment funds, the greater the project cost, the greater the impact on the corridor region. Construction expenditures are transfers from those paying user fees or taxes to those deriving income from construction activity. Therefore, these impacts should not and cannot be thought of as justification for the investment.

Competitive Position Impacts

The improved competitive position impacts are directly related to increased productivity. To quantify the anticipated competitive position impacts attributable to a new conventional Interstate-type highway, the reduced costs of doing business were estimated and input into the REMI model. These lower costs may be passed on to consumers as lower prices for consumer goods, to workers as higher wages, or to owners of businesses and firms as higher net income. Persons may thus benefit from the highway without personally traveling on it.

To the extent that it lowers transportation costs along the corridor, Corridor 18 also increases the probability that the corridor will be able to attract new industry to the region. The magnitude of this effect depends on four factors:

1) The importance of transportation costs to an industry. If the industry is transportation intensive, reductions in such costs constitute a significant savings.

2) The magnitude of the transportation cost savings. If average flow speeds along the corridor are increased substantially, or if the certainty of arrival time is greatly improved (i.e., the time en route becomes less variable), more sizable cost savings are possible.

3) How "footloose" are various industries for which the region could be competitive. Industries with major and immobile capital assets (e.g., factories) are less able to relocate to lower cost sites than are industries whose resources tend to be mobile (e.g., workers in rented office space).

4) The extent to which other required resources are available. Industries vary in their needs for factors of production such as skilled labor, natural resources, and a favorable climate. Good transportation often is a necessary but not sufficient condition for regional growth and development.

Exhibit 7-3 summarizes the estimated economic impacts in the primary impact area due to the increased competitive position of that region if Corridor 18 is built.

The competitive position effects of Exhibit 7-3 suggest a number of things:

- It is estimated that a new Interstate-type highway will have a significant impact on improving the competitive position of the primary impact area. Over the analysis period, it is estimated that nearly 17,000 jobs would be added to the region with a value added of approximately $5.5 billion due to increased competitive position of Corridor 18.

Exhibit 7-3
HIGHWAY CAUSED COMPETITIVE POSITION ECONOMIC IMPACTS
Primary Impact Area

	Annual Impact		Total 1995-2025[a]
	Year 2000	Year 2025	
Value Added ($ million)	$560.4	$1,476.8	$9,290.3
Wages ($ million)	$351.5	$801.5	$5,543.5
Employment (jobs)	8,500	17,000	17,000

(a) discounted at 7 percent.
NOTE: This exhibit depicts economic value of the Corridor 18 primary impact area being better able to compete with other regions of the U.S. for economic activity. These impacts are economic transfers from elsewhere in the U.S. economy.

SOURCE: Wilbur Smith Associates, REMI Model.

- The effects of the primary impact area being better able to compete will occur gradually, over time. The impacts are low in the early years, but as businesses are attracted to the region, the impact values are more sizable later.

- For all practical purposes, all of these competitive position impacts are drawn from elsewhere in the U.S. The Corridor 18 primary impact area communities gain, but at a loss to the rest of the U.S.

Increased Traveler Expenditure Impacts

In addition to development caused by improved competitive position, a new Interstate-type highway will also increase business for businesses along the highway that cater to traffic. For economic evaluation purposes "roadside services" are defined as businesses that serve the cars and trucks and their drivers/passengers such as gasoline stations, hotels/motels, restaurants, gift shops, etc., and that are located within sight distance of the highway. There is a general relationship between traffic density (volume), trip characteristics, and the number of roadside service establishments that exist, e.g., the higher the traffic volume, the greater the number of motels, etc.

The increased traveler expenditure impacts presented in Exhibit 7-4 indicate that a significant amount of traffic will be diverted to the new Interstate-type highway. The additional motorists will spend money on roadside services and tourism items. This increase in traveler expenditures is estimated to equate to over 8,500 new jobs and $2.1 billion in value added for the primary impact area over the analysis period.

Exhibit 7-4
HIGHWAY CAUSED
TRAVELER EXPENDITURE IMPACTS
Primary Impact Area

	Annual Impact		Total 1995-2025[a]
	Year 2000	Year 2025	
Value Added ($ million)	$157.2	$372.0	$2,543.8
Wages ($ million)	$132.8	$324.4	$2,106.2
Employment (jobs)	4,000	8,600	8,600

(a) discounted at 7 percent.
NOTE: This exhibit depicts economic value of increased tourism and traveler expenditures in the primary impact area due to increased traffic. These impacts are economic transfers from elsewhere in the U.S. economy.

SOURCE: Wilbur Smith Associates, REMI Model.

The increased traveler expenditure impacts are due to traffic diversion to Corridor 18. As a result, the business that is gained along the route is lost business elsewhere. This implies a transfer from one beneficiary (business) to another, and does not represent a net increase in total National impact. Consequently, such travel expenditure impacts are important to the Corridor 18 primary impact area, perhaps are relevant to the corridor states, but Nationally are a transfer.

Other Efficiencies Impacts

The "other efficiency impacts" comprise transportation cost savings that accrue to impact area residents that were not input into the REMI model in the other impact categories. The actual cost savings were input into REMI as income increases (greater disposable income), while the accident savings and non-business time savings were not input through REMI but instead are added as value added (without accompanying wage or jobs impacts). The results are presented in Exhibit 7-5. Great care was taken to avoid the double counting of benefits and impacts.

Exhibit 7-5
HIGHWAY CAUSED OTHER EFFICIENCIES
ECONOMIC IMPACTS
Primary Impact Area

	Annual Impact		Total 1995-2025[a]
	Year 2000	Year 2025	
Value Added ($ million)	$242.0	$394.4	$3,441.0
Wages ($ million)	$18.7	$56.6	$340.6
Employment (jobs)	600	1,500	1,500

(a) discounted at 7 percent.

SOURCE: Wilbur Smith Associates, REMI Model.

TOTAL ECONOMIC IMPACTS ON THE CORRIDOR 18 PRIMARY IMPACT AREA

The total estimated economic impacts on the defined Corridor 18 primary impact area are the sum of the construction, competitive position, traveler expenditures, and other efficiencies impacts.

Exhibit 7-6 summarizes the value added impacts, the increased wages impacts, and the estimated new jobs attributable to a new conventional Interstate-type highway built in the Corridor 18 region.

Several points regarding the exhibits should be emphasized.

- Few of these impacts actually constitute net improvements in the U.S. economy. Most involve transfers from elsewhere in the U.S. to the Corridor 18 primary impact area.
- The impacts would be distributed over a large corridor area. As is discussed later in this chapter, these impacts would not be evenly distributed. The greatest transfers would occur in industries that are particularly sensitive to changes in transportation costs.

Exhibit 7-6
TOTAL HIGHWAY CAUSED ECONOMIC DEVELOPMENT IMPACTS
Primary Impact Area

	VALUE ADDED ($ million)	WAGES ($ million)	EMPLOYMENT (jobs)
YEAR 2000			
Construction	$517.8	$413.3	9,800
Competitive Position	560.4	351.5	8,500
Traveler Expenditures	157.2	132.8	4,000
Other Efficiencies	242.0	18.7	600
TOTAL YEAR 2000	$1,477.4	$916.3	22,900
YEAR 2025			
Construction	--	--	--
Competitive Position	$1,476.8	$801.5	17,000
Traveler Expenditures	372.0	324.4	8,600
Other Efficiencies	394.4	56.6	1,500
TOTAL YEAR 2025	$2,243.2	$1,182.5	27,100
TOTAL 1995-2025[a]			
Construction	$3,951.3	$3,082.3	--
Competitive Position	9,290.3	5,543.5	--
Traveler Expenditures	2,543.8	2,106.2	--
Other Efficiencies	3,441.0	340.6	--
TOTAL 1995-2025	$19,226.4	$11,072.6	--

(a) Discounted at 7 percent.

SOURCE: Wilbur Smith Associates, REMI Model.

Types of New Jobs Attracted

Corridor 18 is forecast to attract a sizeable number of new jobs to the primary impact area. However, not all of these new jobs will be the higher paying manufacturing type. Exhibit 7-7 illustrates that the largest percentage of new jobs attracted to the primary impact area will be more service/retail type.

Exhibit 7-7
TYPES OF NEW JOBS ATTRACTED DUE TO HIGHWAY
Primary Impact Area

	Number of Jobs	Percent
Manufacturing	4,433	16.4
Construction	1,222	4.5
Transportation	928	3.4
Finance	1,133	4.2
Retail/Wholesale Trade	6,275	23.2
Service	10,047	37.1
Other	3,062	11.2
TOTAL	**27,100**	**100.0**

SOURCE: Wilbur Smith Associates, REMI Model

Net Economic Impacts in Perspective

A new Interstate-type highway in the Corridor 18 area is estimated to attract a sizeable amount of economic activity to the primary impact area. While these are large economic effects, as a percentage of the total economic activity already in the region, they represent a small increase. Exhibit 7-8 presents the economic impact of Corridor 18 compared to the forecast total economic activity in the primary impact area for the year 2025. Corridor 18 is estimated to increase value added and employment in the primary impact area by less than two-tenths of one percent. These are very small increases which, in many of the larger communities, might not be noticeable.

Exhibit 7-8
HIGHWAY CAUSED ECONOMIC IMPACT COMPARED WITH TOTAL CORRIDOR ECONOMIC ACTIVITY
Year 2025[a]

	Without Corridor 18	With Corridor 18[b]	Percent
Value Added ($ billion)	$1,296.9	$2.2	0.17%
Employment (thousand)	17,689.8	27.1	0.15%

(a) Year 2025 estimates at constant 1995 dollars.
(b) Net increment in year 2025 estimated to be attributable to Corridor 18.

SOURCE: Wilbur Smith Associates, REMI Model

SOCIAL EQUITY IMPLICATIONS

One of the reasons Corridor 18 is being proposed is to facilitate economic development in areas in need of economic assistance. Through the Rural Empowerment Zone and the Enterprise Communities programs, the Federal government has identified areas in need of economic assistance. A number of these areas are located within the Corridor 18 primary impact area, as shown on Exhibit 7-9.

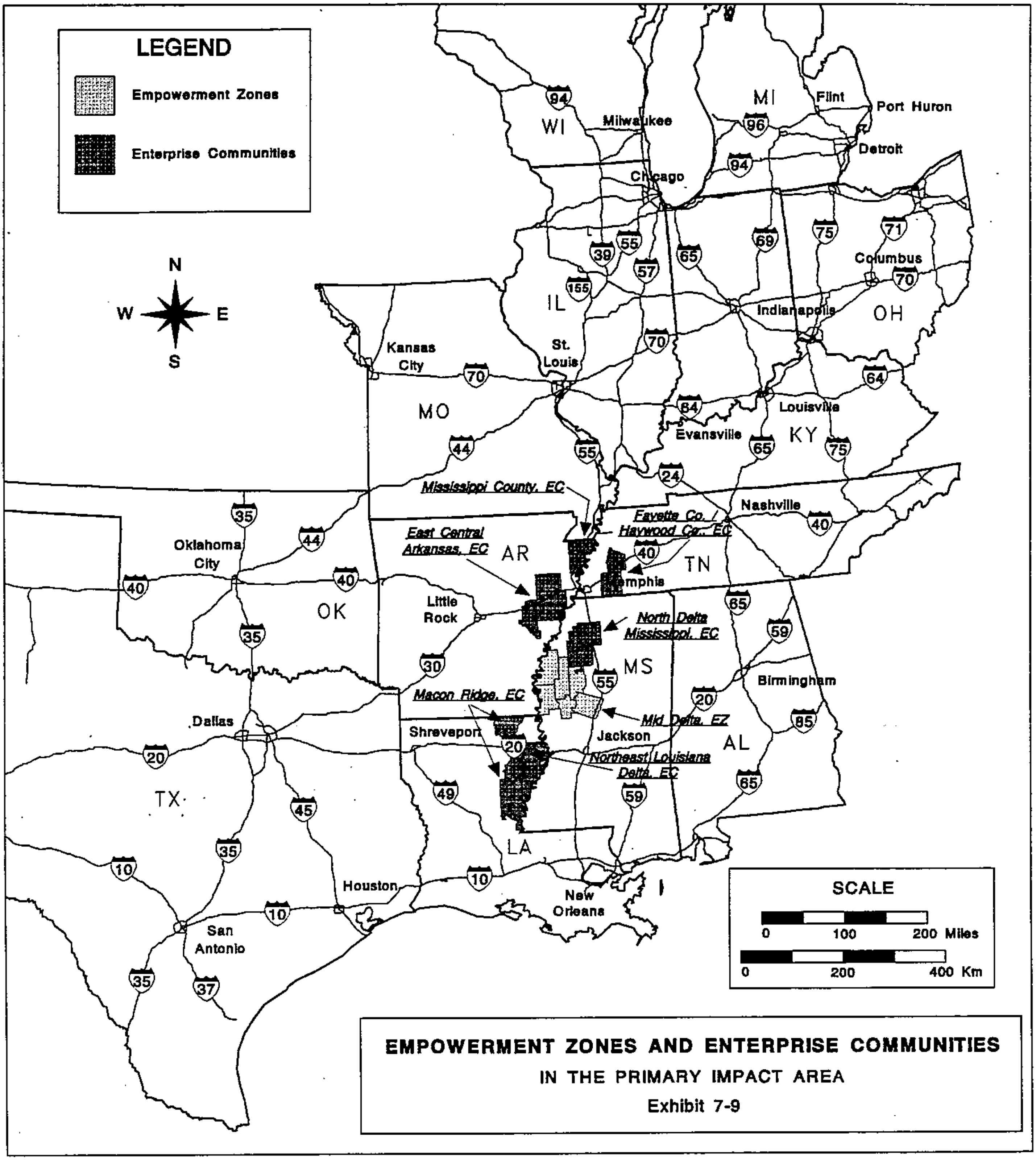
Exhibit 7-10 compares average median income per household by major segment of Corridor 18 with the National average and Exhibit 7-11 graphically illustrates median income for all counties in the primary impact area. Overall, the Corridor 18 primary impact area has an average median household income slightly less than the National average. However, this value is heavily influenced by the larger average income of residents between Indianapolis and Evansville. The remaining three segments all have average household incomes less than the National average.

Exhibit 7-10
MEDIAN INCOME PER HOUSEHOLD
(1990)

Segment	Income Per Household
Indianapolis - Evansville	$25,800
Evansville - Memphis	20,900
Memphis - Shreveport	17,700
Shreveport - Houston	20,900
Total Corridor 18 Primary Impact Area	$22,500
U.S. Median Household Income	$23,900

SOURCE: U.S. Department of Commerce, Bureau of Census (1990).

The area most in need of economic assistance in the Corridor 18 primary impact area lies between Memphis and Shreveport. This segment has the lowest median household income of all the segments. Nearly all of the Federal Empowerment and Enterprise zones in the Study Corridor lie within this segment.



EMPOWERMENT ZONES AND ENTERPRISE COMMUNITIES
IN THE PRIMARY IMPACT AREA
Exhibit 7-9

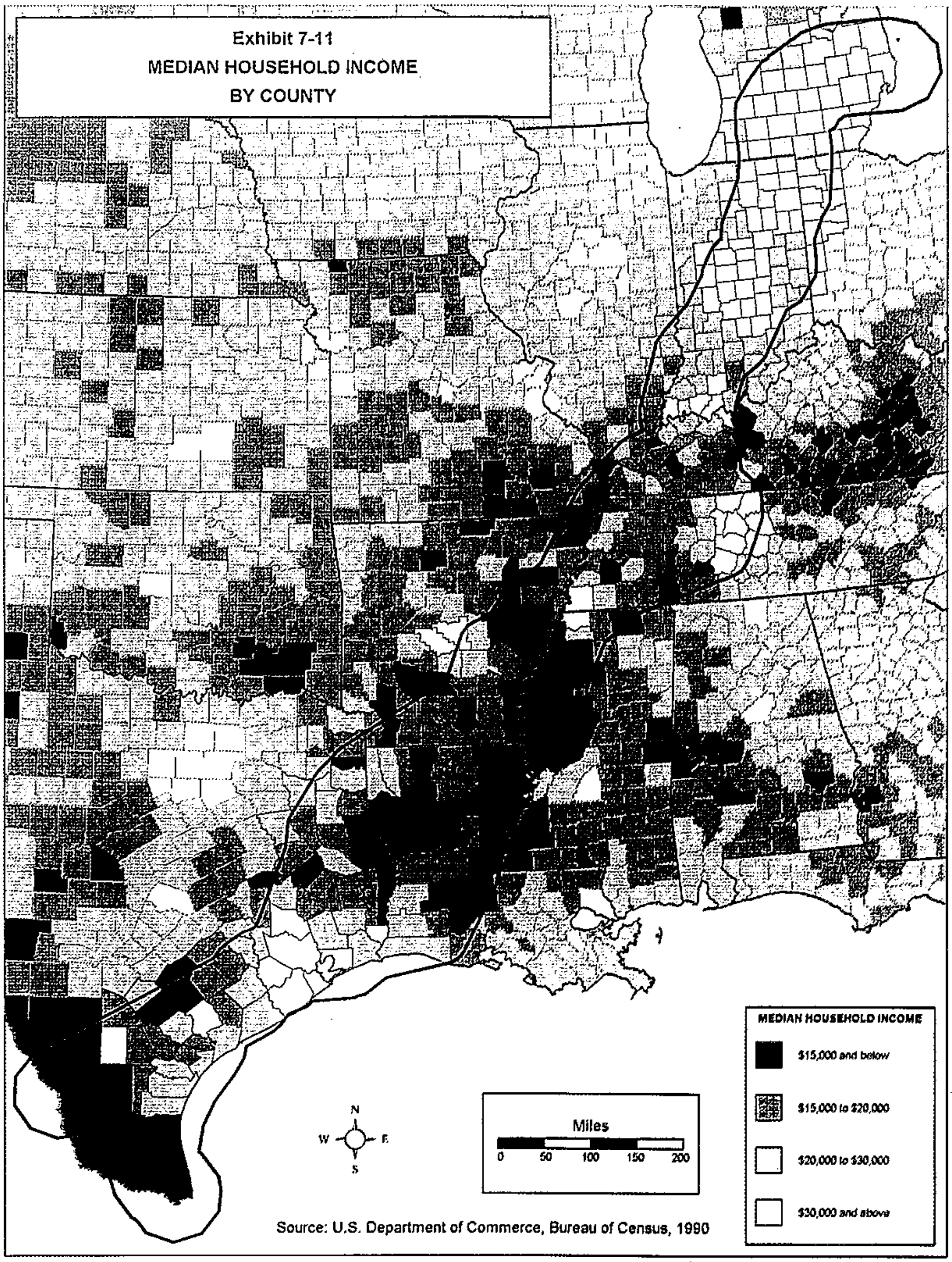


Exhibit 7-11
MEDIAN HOUSEHOLD INCOME
BY COUNTY
MEDIAN HOUSEHOLD INCOME
$15,000 and below
$15,000 to $20,000
$20,000 to $30,000
$30,000 and above
Miles
0 50 100 150 200
N
W E
S
Source: U.S. Department of Commerce, Bureau of Census, 1990

ECONOMIC DEVELOPMENT CONCLUSIONS

This chapter analyzed the Interstate-type highway option to determine its potential economic effect on its corridor region (the primary impact area). The analyses conclude the following:

1. An Interstate-type highway built in the "representative location" between Indianapolis and Houston will have a significant economic development effect on the region and communities which are served. Cumulative impacts of $19 billion in increased value added, $11 billion in wages, and over 27,000 net new jobs are significant.

2. The bulk of these net gains in the corridor region, while valuable to the corridor's communities, are transfers from elsewhere in the U.S. The corridor will benefit from the economic development; the Nation will benefit from travel efficiency gains (as explained in Chapter 6). Either way, this is an economically feasible project.

Chapter 8
FINANCIAL FEASIBILITY

INTRODUCTION

The purpose of the Financial Feasibility Analysis was to assess the total public funding requirement for a Representative Location, and to assess options for closing any funding gaps. The assessment included:

- Analysis of project costs for toll and non-toll options;
- Estimated Corridor traffic;
- Potential project revenues in a toll scenario; and
- Staging of Corridor construction given cost structure and revenue generating capacity.

The following sections outline the methodology and key assumptions underlying the financial assessment. The Financial Assessment section concludes with a determination of the public funding requirement for the Representative Location.

METHODOLOGY AND ASSUMPTIONS

The financial feasibility of the Representative Location is based on the following elements:

- Analysis of the costs of construction and operations and maintenance for a Corridor 18 facility;
- Choice between building a toll facility versus a non-toll facility; and
- Staging and segmentation of the Corridor.

The pro forma financial model calculates the annual public funding requirement for toll and non-toll scenarios. The pro forma was developed in the following manner:

- Analyzing cost data for construction and operations and maintenance;
- Calculating potential toll revenues based on estimated toll rates for each vehicle type, vehicle km traveled (VKmT) and estimated annual VKmT growth; and
- Analyzing the alternatives for staging and segmentation of the construction of the Corridor.

Several assumptions were made in developing this analysis. The key underlying assumptions are as follows:

- Revenue projections for the toll scenario are based on estimated vehicle km traveled and assumed toll rates; and

- Revenue growth and inflation of costs.

Corridor Segmentation

The Representative Corridor Location was chosen from several alignment scenarios. The Location is a combination of the most promising alternatives based on costs, accessibility, flexibility and greatest economic benefits.

The Corridor was further analyzed and divided into four segments that constitute the most basic staging option. Segment 1 is Indianapolis to Evansville which runs 261 km (162 miles) through Indiana. Segment 2 is Evansville to Memphis which runs 270 km (168 miles) through Kentucky and 201 km (125 miles) through Tennessee. Segment 3 is Memphis to Shreveport which runs 203 km (126 miles) through Arkansas, 140 km (87 miles) through Louisiana, 177 km (110 miles) through Mississippi and 11 km (7 miles) through Tennessee. Segment 4 is Shreveport to Houston which runs 37 km (24 miles) through Louisiana and 340 km (211 miles) through Texas.

Exhibit 8-1 shows the costs of each segment for toll and non-toll scenarios. It does not take into consideration the impact of staging or inflation on costs. These factors are considered in the Financial Assessment section.

Exhibit 8-1
CORRIDOR SEGMENTATION - STATES, LENGTH, AND COSTS
Representative Corridor
Conventional Interstate-type Highway

Segment	States	Length		Project Costs (millions)	
		Km	Miles	Without Tolls	With Tolls
1	Indiana	261	162	1,026	1,052
2	Kentucky, Tennessee	472	293	902	925
3	Arkansas, Louisiana, Mississippi, Tennessee	531	330	2,686	2,753
4	Louisiana, Texas	378	235	879	901
	TOTAL	**1,642**	**1,020**	**5,493**	**5,630**

Construction Costs

Construction costs for the Representative Corridor include right-of-way, engineering, structure and contingency. For the purposes of the analysis, it was assumed that a factor of 2.5 percent should be added to the Segment costs to account for the additional capital necessary to build Corridor 18 as a toll facility.

Operations and Maintenance

Operations and Maintenance costs include administration, maintenance, highway patrol and communications costs. It was assumed that these costs will commence at the beginning of Phase 2 construction (Segment 4) in 1999 at which time Phase 1 (Segment 1) will be completed and in operation.

Operations and Maintenance costs will increase as each Segment is put into operation. The annual Operations and Maintenance costs were calculated by taking the estimated Operations and Maintenance cost per km of $21,000 ($34,000 per mile) and then multiplying by the number of km (miles). In 1999, for example, Operations and Maintenance will be provided for 261 km (162 miles) of the Representative Corridor.

The costs per km applied in the previous example pertain to the non-toll options. The increase in Operations and Maintenance costs for a toll facility is substantially more than the corresponding increase in capital costs. Using information obtained in several turnpike studies it was determined that the cost of maintaining a toll facility is about 225 percent higher than comparable costs for a non-toll facility. Operations and Maintenance costs for the toll option were calculated in the same manner as the non-toll option. The cost per km is $68,000 ($109,000 per mile).

Corridor Traffic Forecasts

As noted in Chapter 4, vehicle km traveled were calculated for two target years, 1992 and 2015. Vehicle km traveled were interpolated linearly between these two years. Exhibit 8-2 shows the base line information used for forecasting the annual vehicle km traveled.

Corridor traffic was estimated for the toll and non-toll scenarios. The toll option yields less estimated vehicle km traveled due to the introduction of tolls. By 2015 total vehicle km traveled for cars and trucks combined is 65 percent of the corresponding non-toll estimates.

Exhibit 8-2
BASELINE ANNUAL VEHICLE DISTANCE TRAVELED
Representative Corridor

		CONVENTIONAL INTERSTATE-TYPE HIGHWAY	
Toll Rates:		**Per Vehicle Km**	**Per Vehicle Mile**
Cars		$0.0215	$0.0345
Trucks		$0.0732	$0.1178
Annual Vehicle Distance Traveled in 1992:		**Vehicle Km** (millions)	**Vehicle Mile** (millions)
Car:	**Toll Option**	4,252	2,642
	No Toll	6,543	4,065
Truck:	**Toll Option**	1,684	1,046
	No Toll	2,477	1,539
Annual Vehicle Distance Traveled in Year 2015:		**Vehicle Km** (millions)	**Vehicle Mile** (millions)
Car:	**Toll Option**	6,576	4,086
	No Toll	10,116	6,286
Truck:	**Toll Option**	2,447	1,520
	No Toll	3,597	2,235
Growth in Vehicle Distance Traveled:			
Car:	**Toll Option**	1.91%	1.91%
	No Toll	1.91%	1.91%
Truck:	**Toll Option**	1.64%	1.64%
	No Toll	1.64%	1.64%

Projected Toll Revenue

Toll rates are based on the average of non-urban toll rates throughout the US. Toll rates used for these analyses are \$0.0215 per km (\$0.0345 per mile) for cars and \$0.0732 per km (\$0.1178 per mile) for trucks. Using the forecasted vehicle km per year and the estimated toll rates, annual revenues for the toll scenario were calculated. This analysis assumes that toll rates will increase at the rate of inflation, and increases will be effective every five years beginning in 2000.

Each Segment has the capacity to generate a certain level of revenue based on the level of traffic anticipated for that Segment. Each Segment is assumed to represent a percentage of the total vehicle km traveled. The rate at which revenue generating capacity increases as each Segment is built and then opened for operation is based on those percentages.

FINANCIAL ASSESSMENT

This section presents the results of the pro forma analysis for the toll and non-toll scenarios. The goal of the pro forma financial models and the analysis is to provide an estimate of the public funding requirement for all scenarios. This section also further develops the staging analysis presented earlier in the revenue section.

Calculating the Public Funding Requirement

The public funding requirement is the level of funding needed on an annual basis to implement Corridor 18. In the **Without Tolls Scenario** the *total* public funding requirement is the sum in 1995 dollars of the construction and Operations and Maintenance costs for each year, discounted at the real rate of 4 percent per year assuming 3 percent inflation. In the **With Tolls Scenario** the *net* public funding requirement is the sum of the construction costs and the Operations and Maintenance costs net of toll revenues in each year; toll rates used to calculate revenue are assumed to increase at the rate of inflation, 3 percent and the revenue streams are discounted at 7 percent (the inflated cost of capital).

Pro Forma Results

The financial modeling includes a non-toll and toll scenario. The focus of the results will be the *net* (i.e., net of what could be paid for with tolls) public funding requirement in the toll scenarios and the *total* (i.e., 100% of construction and operating funds required) public funding requirement in the non-toll scenarios.

Without Tolls Scenario

The Without Tolls Scenario has a total public funding requirement in 1995 dollars of $5,567.24 million. The construction cost portion -- as opposed to the Operations and Maintenance cost portion -- (94 percent) of the funding requirement ranges on an annual basis from a low of $359 million to a high of $829 million. Operations and Maintenance costs range from a low in the early years of the project of $5.23 million to a high in later years of $30.20 million.

Exhibit 8-3 presents the results of the pro forma financial models used to calculate the public funding level. Decreases in Operations and Maintenance costs over time reflect the discounting of the cash outflows.

The staging of construction will play a role in the potential financing plan of the Without Toll scenario. In this case, the project sponsors will carefully have to consider the timing of the construction phases and their relative costs in order to best match the availability of funds for each State. If, for instance, the most expensive segment is constructed in the fourth phase, the project sponsors face the impact of rising costs due to inflation on anticipated construction expenditures. On the other hand, constructing the most expensive segment last may afford the project sponsors the needed time to exercise more creative and innovative financing opportunities that generally require more lead time to execute.

There will be tradeoffs associated with the staging of construction that affect the potential financing plan. Those tradeoffs will also affect the cost-benefit ratio for the project; building segments with the best cost-benefit ratios first may improve the cost-benefit ratio for the entire project.

With Tolls Scenario

The With Tolls scenario incorporates the incremental increase in both project costs and Operations and Maintenance costs as a result of constructing and maintaining toll facilities. The increase in the *total* public funding requirement is mitigated by the revenues generated. In the With Tolls scenario the project sponsors can leverage the toll revenues generated. Leveraging tolls is the ability to create financing opportunities (through issuing debt) that decrease the overall level of funds that the project sponsors will need to raise.

Exhibit 8-3
FINANCIAL ANALYSIS CONVENTIONAL INTERSTATE-TYPE HIGHWAY, WITHOUT TOLLS
($ in millions)

Year	Project[(1)] Costs	Operations &[(1)] Maintenance	Public Funding Surplus/ (Requirement)
1996	359.34		(359.34)
1997	342.96		(342.96)
1998	305.92		(305.92)
1999	290.35	5.23	(295.58)
2000	287.56	5.18	(292.74)
2001	284.79	5.13	(289.92)
2002	289.43	12.45	(301.89)
2003	286.65	12.33	(298.99)
2004	283.89	12.22	(296.11)
2005	837.26	21.03	(858.29)
2006	829.21	20.83	(850.04)
2007	821.24	20.63	(841.86)
2008		30.20	(30.20)
2009		29.91	(29.91)
2010		29.62	(29.62)
2011		29.33	(29.33)
2012		29.05	(29.05)
2013		28.77	(28.77)
2014		28.50	(28.50)
2015		28.22	(28.22)
TOTAL	5,218.61	348.63	(5,567.24)

(1) Discounted at 7 percent

The total public funding requirement is $6,482.13 million. Defraying a portion of the capital costs and subsequently the Operations and Maintenance costs with the toll revenue generated reduces the total public funding requirement by $2,042.79. This results in a new funding requirement of $4,439.33, a 32 percent decrease.

Exhibit 8-4 presents the results of the pro forma financial models used to calculate the public funding level as well as the level of revenues generated. Decreases in Operations and Maintenance costs reflect the discounting of the cash outflows. The discounting effect for revenues is offset by anticipated increases in toll rates.

In the case of the toll scenarios, the staging of construction is important as it relates to costs but it also plays a key role in determining both the timing and level of toll revenues generated from the Corridor, as well as the ability to cover construction costs.

Staging of construction allows the sponsors to weigh project funding requirement levels and timing against the availability of funds. In the With Tolls case, however, financing options are expanded and staging becomes more important because the construction of one segment will influence the toll revenue in adjacent corridors. The key consideration may be to determine which segments linked together have the greatest revenue generation capacity, and when adding that capacity would have the greatest impact on overall financial feasibility.

There are many options and considerations for both the toll and non-toll options. It will be crucial that the project sponsors fully consider and understand the importance of the staging and timing of the construction.

Toll vs Non-Toll Cost Differential

Exhibit 8-5 calculates the project cost differential between the toll and non-toll scenarios. The increase in costs as a result of building a toll facility is more than offset by the toll revenue generated. Toll revenues cover the entire increase in project costs but only cover a percentage of the total project costs.

Exhibit 8-4
FINANCIAL ANALYSIS CONVENTIONAL INTERSTATE-TYPE HIGHWAY, WITH TOLLS
($ in millions)

Year	Project[1] Costs	Operations &[1] Maintenance	Toll[2] Revenue	Public Funding Surplus/ (Requirement)
1996	368.32			(368.32)
1997	351.54			(351.54)
1998	313.57			(313.57)
1999	297.61	17.00	36.22	(278.39)
2000	294.75	16.84	41.12	(270.46)
2001	291.91	16.68	39.11	(269.48)
2002	296.67	40.48	92.03	(245.11)
2003	293.82	40.09	87.52	(246.38)
2004	290.99	39.70	83.23	(247.46)
2005	858.19	68.34	146.63	(779.90)
2006	849.94	67.68	139.45	(778.18)
2007	841.77	67.03	132.61	(776.19)
2008		98.14	162.73	64.59
2009		97.20	154.76	57.56
2010		96.26	170.62	74.36
2011		95.34	162.26	66.92
2012		94.42	154.31	59.89
2013		93.51	146.75	53.24
2014		92.61	139.56	46.95
2015		91.72	153.87	62.14
TOTAL	5,349.08	1,133.05	2,042.79	(4,439.33)

(1) Discounted at 7 percent
(2) Toll Rates increased at the rate with inflation (3 percent), with increases effective every 5 years. Revenue items are discounted at 7 percent.

Exhibit 8-5
TOTAL COST DIFFERENTIAL
TOLL VS. NON-TOLL
Representative Corridor
($ in millions)

	Conventional Interstate-type Highway
Toll Option	
Total Project Costs	$6,482
Toll Revenue Contribution	$2,043
Non-Toll Option	
Total Project Costs	$5,567
Cost Differential	$915

PRELIMINARY FINANCING PLAN STRATEGY

In order to develop a viable financing plan for Corridor 18, two factors have to be considered. The first consideration is to develop a hierarchy of funding sources for Corridor 18 that takes into consideration the availability and accessibility of various strategic funding options. The second is the coordination of a financing plan that encompasses the fiscal capacity facing each of the sponsor States.

The next sections will describe both of these factors and offer preliminary recommendations on how to address these issues.

Strategic Financing Options

As demonstrated in the Financial Assessment section, Corridor 18 would not have the traffic capacity to be self-sustaining. Therefore, in order to successfully develop the entire Corridor it is necessary to examine a variety of financing options. Of utmost importance will be the development of a strategic financing plan that considers all possible funding sources and the prioritization of the individual segments that make up Corridor 18. The following section provides an overview of financing options, as well as a discussion of how those options may meet the timing and staging needs of Corridor 18. Finally, the section will provide recommendations for further study for financing Corridor 18.

Financing Options Overview - The primary components available for a Corridor 18 financing plan are as follows:

- Project-generated revenues - tolls, concessions and advertising;
- Innovative financial instruments - debt instruments, credit support, leases;
- Value capture techniques;
- Governmental funds; and
- Private contributions and investments.

Project-generated revenues include tolls, concessions and advertising. **Innovative financial instruments** include various types of delayed payment bonds, leases, credit support and private investment. **Value capture** refers to techniques whereby the economic benefit of the project is captured through neighboring property. **Governmental funding** sources refer to federal, state and local funds in the form of intergovernmental grants and direct state and local programs designated for certain types of transportation projects. Finally, **private contributions and investments** refer to voluntary land proffers, other forms of contributions that reduce the amount of the project's construction cost that must be financed from tolls, and direct investments via full or partial private ownership.

Each of these financing components is explained below.

Project Toll Revenues - If Corridor 18 is a toll facility, its toll revenues will provide a substantial source of funds for the project. As described earlier in this chapter, the project will be constructed in phases, and those phases will be built in segments, which offers the opportunity to build the most financially feasible segments first. After completion, revenue capacity is expected to continue to increase along with the anticipated growth in vehicle km traveled and inflation increases in toll rates which will occur every five years beginning in 2000 (inflation assumed to be 3 percent per year).

An issue for further study on the Corridor is the "optimal" toll rates to be charged. Optimal rates refer to the rates that maximize total revenues, not the rates that reflect either the project's costs or public acceptance.

Project Non-Toll Revenues - In addition to tolls, the project could also yield revenue from concessions and advertising. Nationally, non-toll revenues generate between one percent and six percent of total revenue.

Careful development of concessions opportunities, including incorporating concessions into the design and location of rest stops and leasing excess right of way around interchanges to fuel, food and hotel concessionaires, could provide additional annual revenues. These revenues could also be capitalized to provide funds for construction, but only if substantial credit supports were offered by the project sponsors. Similarly, revenues could be generated through roadside and concession-area advertising. Advertising space can be sold or leased along the Corridor, at high traffic rest stops and other system focal points.

Governmental Funding - Direct funding from the federal, state and local governments presents three options for closing funding gaps in the project.

First, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 allows states to use their Federal-aid highway funds in conjunction with toll projects. These funds can also be *loaned* to the project. Toll revenues from Corridor 18 can be used as state matching funds.

Second, non-Federal-aid state transportation funds (collected from state gas taxes and other transportation taxes and fees) could also be used to close funding gaps. These funds could provide debt-service reserves or other types of credit support so that a larger amount of capital might be raised from a given amount of toll revenues. Without credit support, the toll revenue stream would be able to support no more than (and probably less than) 80 percent of the debt offering that it otherwise would.

The only weakness in a strategy that relies upon Federal-aid funds and state transportation funds is that such funds are in perennially short supply. Almost no States have chosen to use their Federal-aid highway funds to support toll projects in the four years that they have been allowed to do so. Similar constraints apply to state transportation funds, although there are a number of instances in which state gas tax revenues were used to supplement toll revenues. Moreover, the magnitude of funds required to close the financial gaps for Corridor 18 is very large compared to the total Federal-aid and State funds currently available.

Finally, local governments along the Corridor that will benefit from its construction could be asked to contribute to the financing. This is unusual for a large highway project that would span a number of a States, but further study into the transportation plans and budgets of these localities is warranted to determine their capacity to contribute funds or land to the successful development of the Corridor segments that will run through or adjacent to their jurisdictions.

Value Capture - Value capture is a mechanism by which Corridor 18 garners a portion of the economic benefits that accrue to the private sector as a result of the public investment in the project. This helps defray some of the capital costs of providing the infrastructure. The ability of the project sponsors to utilize value capture techniques will depend upon state law, local cooperation (the value garnered by value capture techniques is usually assumed to belong to the local government's tax base) and the estimated increase in land values as a result of Corridor 18. Various techniques can be used to apply value capture, including: special assessment districts, tax increment financing, and impact fees.

A special assessment district is defined as the area or properties that directly benefits from Corridor 18. Special assessment districts offer a number of advantages as a revenue source for Corridor 18 development, including:

- Ability to target specific groups that directly benefit from the infrastructure;
- Linking the costs of the projects to the benefits received; and
- Providing insulation from politics (after the fact) by ensuring a steady flow of funds.

Under the special district framework, several other approaches can also be used to apportion the cost of Corridor 18 to the beneficiaries. The project sponsors might create tax increment financing (TIF) districts to capture the additional value that results from infrastructure through incremental increases in tax revenue. Property values are assessed and fixed at a base value that reflects the unimproved land's value. As property values rise, the incremental increases in property taxes are dedicated to Corridor 18. Similarly, incremental increases in sales taxes can also be dedicated to the project.

The use of TIF districts will only be suitable in areas where significant development and redevelopment are assured. TIF districts require enabling legislation and may be in competition with other local property tax uses.

Another alternative is an impact fee on new development in the Corridor (and within the impact fee-gathering jurisdiction). Impact fees are politically attractive since they provide a means for "growth to pay for growth." Application of impact fees on the Corridor would be limited to areas adjacent to the Corridor with high development potential.

One critical success factor for value capture is the degree to which the new road would create local development. It is likely that in urban and suburban areas, the development impact and the potential value capture revenues could be extensive (although still only a fraction of the potential toll revenue). In the past however, rural areas have often remained virtually unaffected by major new highways. Value capture in those areas is speculative at best.

In sum, it is unlikely that value capture could contribute much more than 5 percent of the total funding requirement, and even then such a contribution would be far beyond the scale of any previous transportation-related value capture amount. However, value capture may still be relatively important for individual projects within the Corridor.

Private Funding Sources - Many businesses and individuals will have a strong interest in promoting Corridor 18 as illustrated in the economic impact analysis. There may be those entities willing to contribute money, real property or services to enhance the feasibility of Corridor 18 although, such contributions are usually associated with much smaller roads with clear beneficiaries. Private entities may also be interested in developing various types of partnerships to advance those projects that directly benefit their business development and investment goals. The project sponsors can seek out any enterprises along the Corridor that can be solicited for some level of project participation.

Some private developers may have an interest in encouraging the completion of major projects along Corridor 18, some may be willing to construct or pay for access roads and the project-related public facilities for certain types of concessions. The project sponsors should determine the level of interest by publishing a solicitation or notice to developers as the projects along the Corridor get underway.

The project sponsors may also wish to consider using a public-private partnership as an instrument for developing Corridor 18 or some of its segments. Because Corridor 18, like many other transportation projects, is experiencing high levels of competition for public funds on the local, state and federal levels, the project sponsors may find private infrastructure developers to be valuable partners in finding both cost-saving innovations and capital for the Corridor and/or projects within it.

As with value capture, private contributions are likely to play a role only on certain projects within the Corridor, and even then their role will be relatively small.

Debt and Credit Support Instruments - Although not a funding source, financial instruments can be an important part of the financing strategy, particularly for leveraging toll revenues or in anticipation of intergovernmental grants and other funding sources.

Financial instruments include various forms of debt financing, early capitalization of revenue streams or anticipated funds, and credit enhancement that make the offerings more attractive to bond buyers.

The simplest financial instrument for Corridor 18 is a traditional type of debt offering, with the bonds supported by toll revenues from the project itself, or other dedicated revenue streams, or both. With the projected toll revenues and the possible contribution from other dedicated sources, Corridor 18 could support a solid level of bond financing relatively early on in the project. A good concessions and commercialization plan for rest areas and some value capture revenues could help enlarge the offering a bit.

Given the long period that it will take for toll revenues to grow to a stable level, a successful bond financing structure may have to include delayed-payment instruments, such as zero-coupon bonds, as well as short-term bonds that come due in a balloon payment sometime between year six and year twelve after the road is completed.

A toll collection system for all or part of Corridor 18 could provide an opportunity for using another category of innovative financing: asset-backed financial instruments. These include equipment leases, vendor financing, and Certificates of Participation. Vendor financing for equipment usually takes the form of the equipment vendor offering in-house financing along with the equipment. This usually takes the form of a long-term lease of up to 80 percent of the life of the equipment. Alternatively, a third party lessor may purchase the equipment and offer it for lease. In both cases, the cost of the equipment does not have to be covered by the overall bond issue. The project sponsors could also investigate the use of sale-leaseback transactions for building and other structures other than the roadway itself. This approach works best when there is an alternative use for the facility. Otherwise, the lease would be counted against the total indebtedness. Note, however, that asset-backed financial instruments do not create new revenue; rather, they may help move some small portions of the funding requirement off of the project's balance sheet.

Among all of the categories of financial instruments available, however, credit support instruments may be the most valuable for Corridor 18 if the project is built with tolls. In a toll scenario it is very difficult to finance a stand-alone toll road even with very high traffic forecasts. Credit support is essential to Corridor 18 if it is to maximize the amount of capital that it can support on its own revenues.

These instruments might include the following:

- Letters of credit from banks and third parties (in exchange for a fee);

- Using state transportation funds as a debt service reserve for a bond offering; and

- Using the states' general credit as a guarantee for the bonds.

It is also possible that a pending change in federal transportation funding programs could allow states to use their Federal-aid highway funds as credit support for the bond issue, particularly if it is a public-private partnership.

FINANCIAL IMPLEMENTATION STRATEGY

The ability of Corridor 18 to be financially viable will depend on its sponsors' success in balancing construction costs with projected revenues and funding from all sources. Additionally, much consideration should be given to strengthening the match of capital expenditures with available funds. The most effective way to achieve this match is through the staging of the various projects. This section presents the issues to be considered in structuring a financial plan for the Corridor.

A Hierarchy of Financial Options

The financial planning process for Corridor 18 will involve developing and assessing mechanisms for capturing the new economic value created by the Corridor, including tolls, if relevant. These options can be viewed in a hierarchical manner, with the most productive and broad-based financial resources (e.g., tolls and governmental funds) to more difficult and more targeted sources (e.g., value capture and private contributions). The hierarchy of potential financing options is depicted in Exhibit 8-6.

- **Project-Generated Revenues** - The most reliable category of financial resources is from project-generated revenues (*i.e.*, tolls from highway users, concessions and advertising and other fees and charges from the use of Corridor 18 facilities). For these sources, the case for economic value is made directly to the potential users of the facility. These revenues can be collected when a substantial portion of the Corridor has been constructed. By 2002, it is estimated that almost half of the Corridor will be completed. These resources are particularly crucial during Phase I development and construction and will also be utilized when the other three phases of construction of Corridor 18 are undertaken.

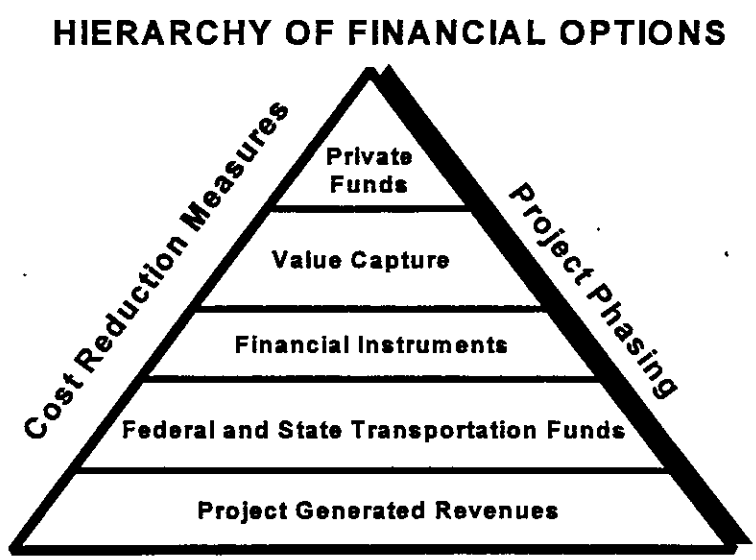


Exhibit 8-6

- **Federal and State Transportation Funds** - After project-generated revenues, potentially the most predictable financial resources over the short term are federal and state governmental transportation funds. Due to the nature of these gas-tax and other transportation-related funds, they are efficient at capturing a portion of the value accruing to the users of the transportation system. These resources are also equitable because the project is both a regionally and nationally-important Corridor; all jurisdictions that benefit, through federal grants, state funds and local funds would help pay for the project. The ability of Corridor 18 participants to access these funds depends largely on the strength of the economic case to be made for the Corridor. Governmental funds will be a crucial component of the financing of Corridor 18 throughout all phases of construction.

- **Financial Instruments** - The third component of the hierarchy of financing options is financial instruments. These instruments capitalize the revenue capacity of the Corridor through bond issues, leases, land banking sales, etc. Different financial instruments will be required for different phases of the project. The flexibility of this level will enable the project sponsors to tailor financing options to very specific and time sensitive financing needs for discreet projects along the Corridor. Selecting among the various combinations of instruments should depend mostly upon the magnitude and sources of funds available.

- **Value Capture Techniques** - The fourth level includes various value capture techniques. The goals on this level are to capture the economic value of the project from the indirect beneficiaries (e.g., businesses who are directly linked to the project), maximize corridor-specific revenues and share in the project's costs. Due to the time investment necessary to effectively develop value capture strategies, this type of financing will be better suited for the later Phases of construction of the Corridor. At that time, the economic benefits accruing to various individuals and jurisdictions will be more apparent and quantifiable.

- **Private Contributions** - The fifth and most speculative financial resource is direct private contributions. In order to effectively utilize private funding, the planning must begin during the construction of Phase I, but private funding will be most useful as the project develops and the benefits are more obvious. In terms of private investment via a public-private partnership, it is important to develop concrete cost and demand information that support the potential financial success of Corridor 18 in order to attract private interest, as well as a "user-friendly" process for initiating and negotiating a public-private agreement.

- **Cost Reduction Measures** - The sixth component, although not included on the diagram, is cost reduction measures. Of all the methods for improving financial feasibility, this is the most important. Cost reduction begins with using the existing roads and right-of-way where possible, extends through regular value-engineering exercises, and ends with innovative construction techniques, including new materials and design-build contracting.

- **Project Staging** - The final component is project staging. Further study will be required to determine the optimum staging sequence and to evaluate the effect this has on the financial and economic feasibility of the project.

CORRIDOR STATES FISCAL CAPACITY AND RESPONSIBILITY

The first step in devising a comprehensive financing strategy is to estimate the fiscal capacity of each State and then to devise a way to divide fiscal responsibility among the States involved. Particular issues that will drive the financing strategy are:

- Including Corridor 18 in current and future transportation plans of each Corridor State;
- Level of State and Federal resources available to each project sponsor from which to make a determination of fiscal capacity for each State;
- Each State's experience in obtaining non-traditional sources of funding such as private capital; and
- Types of innovative financing techniques which are best suited for the project sponsors' goals and financial profiles.

Fiscal Capacity

The most readily available measure of fiscal capacity is the level of State expenditures on highway projects as presented in FHWA's *1993 Highway Statistics*. Below is a table of the Corridor States and their 1993 spending levels on highway projects. Exhibit 8-7 illustrates total State spending on highways and total State spending on construction and Operations and Maintenance.

Exhibit 8-7
1993 STATE SPENDING ON HIGHWAYS BY CORRIDOR 18 PROJECT SPONSORS
($ in millions)

State	Total Highway Expenditures	Construction & Maintenance Spending	Annual Corridor 18 Funding Requirement By State	Ratio of Corridor 18 Funding to 1993 Construction and O&M Spending
Arkansas	583.20	473.78	88.67	18.71%
Indiana	1,302.70	1,195.40	85.50	7.15%
Kentucky	1,127.20	710.24	47.08	6.63%
Louisiana	980.36	720.25	81.92	11.37%
Mississippi	684.70	490.97	63.75	12.98%
Tennessee	1,116.93	754.41	31.67	4.20%
Texas	3,379.82	2,653.34	59.17	2.23%
Total	**9,174.91**	**6,998.38**	**457.75**	**6.54%**

Source: Federal Highway Administration, 1993 Highway Statistics.

State highway expenditures range from a high of $3,379.82 million in Texas to a low of $583.20 in Arkansas. The seven project sponsor States have a total fiscal capacity of $9,174.91 million of which $6,998.38 or 76 percent was spent on construction and O&M. This means that one year's spending on Corridor 18 would constitute 5 percent of total annual highway expenditures in the Corridor.

Exhibit 8-7 also shows by how much each State would have to increase Construction and Operations and Maintenance spending over 1993 levels in order to meet the annual funding requirement for Corridor 18.

This estimate of fiscal capacity is not comprehensive. This only serves as a starting point for determining each State's ability to pay and the resources it has available. Fiscal capacity estimates from this section are for illustrative purposes only.

Fiscal Responsibility

With an estimate of fiscal capacity and the public funding requirement, it is important to determine how each State will share in the responsibility of meeting the public funding requirement. There are a number of ways to allocate the fiscal responsibility of that requirement:

- percentage of total Corridor 18 route km;
- percentage of total project costs allocated to each State;
- percentage of estimated vehicle km traveled; and
- fiscal capacity.

In using any of the above methods, consideration of the economic benefits accruing to any given State should be assessed and included in the determination of fiscal responsibility. Below is a discussion of each allocation method.

Total Corridor Route Kilometers - Exhibit 8-8 shows the number of route km by State and by segment. If fiscal responsibility were allocated according to total route km, States with longer portions of the route would have a greater level of fiscal responsibility. This method, however, would not account for the higher costs attributable to mountainous terrain or cost advantages attributable to flat terrain. In addition, States that experienced high traffic and high revenues, would pay the same per km as low-traffic States. In a toll road scenario, high-traffic States would reap a far greater share of the toll revenues, but not necessarily the equivalent share of the project costs.

Exhibit 8-8
CORRIDOR LENGTH BY STATE
Representative Corridor

State	Segments	Length	
		Km	Miles
Arkansas	3	203	126
Indiana	1	261	162
Kentucky	2	270	168
Louisiana	3	140	87
	4	39	24
Mississippi	3	177	110
Tennessee	2	201	125
	3	11	7
Texas	4	340	211
TOTAL		**1,642**	**1,020**

Total Project Costs - Total project costs will be determined by whether or not Corridor 18 will be constructed as a toll road. Allocating fiscal responsibility to each State according to project costs, however, captures the effects of terrain on costs as well as the effects of total Corridor length within the borders of each State, but it does not take into account the national and regional benefits. Indeed, it is possible and even likely that States with the highest share of construction costs will not, by themselves, reap the equivalent share of benefits or project revenues. Exhibit 8-9 illustrates the proportions of project costs for each State.

Exhibit 8-9
TOTAL PROJECT COSTS BY STATE
Representative Corridor
Conventional Interstate-type Highway
($ in millions)

State	Project Costs (millions)	
	Without Tolls	With Tolls
Arkansas	1,064	1,091
Indiana	1,026	1,052
Kentucky	565	579
Louisiana	983	1,008
Mississippi	765	784
Tennessee	380	390
Texas	710	728
TOTAL	**5,493**	**5,630**

Estimated Vehicle Kilometers Traveled - Fiscal responsibility for Corridor 18 may be allocated according to VKmT in each State. This allocation method would have States with more traffic pay more than those with lower traffic. In the case that Corridor 18 is a toll facility, high traffic States would be able to defray a portion of their burden by the use and leverage of the higher toll revenue generating capacity. Exhibit 8-10 shows estimated vehicle km traveled in 2015 for each State.

Exhibit 8-10
REPRESENTATIVE CORRIDOR VEHICLE TRAVEL (2015)
(millions)

	VEHICLE KM	VEHICLE MILES
Texas	3,527	2,192
Louisiana	1,103	686
Kentucky	2,184	1,357
Tennessee	1,806	1,122
Arkansas	1,009	627
Mississippi	1,175	730
Indiana	2,640	1,640

Fiscal Capacity - Each State's ability to pay could be the measure by which to allocate fiscal responsibility. This method would allocate greater responsibility to those States that have greater resources and ability to pay. A fiscal capacity assessment, in this case, would require a greater level of detail regarding current and future budgets, current and future transportation plans, accessibility and flexibility of funds and ability to raise additional funds. The fiscal capacity assessment using only historical data would not be sufficient.

Conclusion

No matter what the ultimate choice is regarding developing Corridor 18 as a toll road, it is clear that there is a very large public funding requirement that stretches the limits of the Corridor states' respective financial capacities. The national nature of the benefits make the case for a significant federal sharing of the cost. Once this contribution is framed, the States will be better able to determine the level of funds that can be reasonably taken from their current budgets and then set about the task of closing the funding gaps through other financing options. Fiscal capacity and fiscal responsibility will both be pivotal issues.

NEXT STEPS

First, a detailed financing plan will depend upon whether the project will be a toll facility. This will determine the *net* public funding requirement and begin development of the final financial strategy.

The segments will need to be refined in terms of developing an analysis of their interdependencies and how their relative benefit/cost ratios are affected by the order in which they are developed. There may also be some implications regarding VKmT as a result of the ordering of the segments. If, in fact, the ordering of the segments can impact the level of VKmT and therefore potential toll revenues, this information will be helpful in assessing the financial impact of a toll facility on project costs and potential financing options and capacity.

In addition to enhancing the information from which conclusions can be drawn about revenues, additional cost information should also be developed. The effect of further segmentation should be assessed. Also the effect of a longer construction period should be analyzed. Every attempt should be made to assess the impact of maximizing the use of existing road networks throughout the Corridor which would minimize construction costs.

A more in-depth assessment of the construction strategy and staging plan will have to be undertaken. The emphasis will be on the timing of construction expenditures as they relate to the availability of funds. The staging plan will have to consider further segmenting the Corridor in order to have more control over the level and timing of expenditures.

If the project sponsors proceed, a great deal of coordination and cooperation will be needed to develop the best strategic financing plan for the project. The assessment of fiscal capacity and responsibility will be the driver for a successful financing plan. In-depth analysis of current and future transportation projects in each State will be a key determinant of the level of commitment for Corridor 18. The implementation of Corridor 18 will only be as successful as the strategic financing plan that is developed.

Chapter 9
OTHER IMPACTS AND IMPLICATIONS

The feasibility assessments made in the previous chapters focus primarily on the economic considerations for construction of Corridor 18. This section addresses the safety and environmental impacts of building a conventional interstate highway in the Corridor 18 study area. Since a consensus has not been reached on a specific Corridor 18 alignment location, the environmental analyses are presented from the viewpoint of a macro evaluation. Wetlands mitigation is the major focus at this level of analysis because that factor is expected to be a potential major environmental consideration for any of the Corridor 18 alignments.

Corridor preservation is discussed as a possible method of minimizing environmental impacts. The relationship between Corridor 18 and study area intermodal facilities/military installations is also described.

SAFETY

The implementation of Corridor 18 is expected to reduce fatalities, injuries, and property loss from accidents in the region. The reduction would be due to the decrease in vehicle distance traveled in the overall study area. Since Corridor 18 would provide a more direct route to major destinations, automobiles and trucks could travel shorter distances. Exhibit 9-1 describes the estimated reductions in the number of accidents estimated per year. Exhibit 9-2 describes the monetary value of those savings that have been used in the feasibility determination.

Exhibit 9-1
ESTIMATED SAFETY IMPROVEMENT REDUCTION IN THE NUMBER OF ACCIDENTS PER YEAR

	1992	2015
Fatalities	32	47
Injuries	1,365	2,044
Property Damage Only	1,911	2,861

Exhibit 9-2 MONETARY VALUE OF ACCIDENT REDUCTION PER YEAR (in Millions)		
	1992	2015
Fatalities	$93	$139
Injuries	$79	$119
Property Damage Only	$ 10	$ 14
Total	$182	$272

It is anticipated, as part of a national trend, that the mix of increasingly smaller passenger automobiles and larger combination trucks will add to safety problem in the future on all conventional interstate highways. It is estimated that in the next few decades, the ratio of large truck travel to travel by all vehicle types will increase. Truck travel is estimated to grow by 3.3 percent compared to 2.3 percent for other vehicle types. Drivers of large trucks are estimated to be 50 percent less likely to be involved in a crash than an automobile drivers; however, a crash with a large truck is more likely to cause serious injuries or a fatality.

ENVIRONMENTAL

A full study of potential impacts on the natural and the man-made environment will be required before a decision is made on a route location for Corridor 18. This would be undertaken after this corridor feasibility study if a decision is made to proceed with development of a facility in Corridor 18. For this feasibility analysis, a number of potentially significant environmental impacts were evaluated. These included infringement on wetlands; impacts on wildlife refuges, national, and state parks; disruption of farmlands and urban development; and impacts on air quality.

The major environmental impact for any alignment serving the Corridor 18 objectives is expected to be to area wetlands. A comprehensive strategy for wetland mitigation will be key to the implementation of Corridor 18. An overview of mitigation strategies is presented in this section. The advance preservation of corridors is discussed as a means to minimize environmental impacts.

WETLANDS

Study area wetlands are illustrated in Chapter 2. Once a decision is made on the location of Corridor 18, more detailed wetlands mapping would need to be undertaken. The USDA Soil Conservation Service (SCS) is in the process of mapping the farmed wetlands, wooded wetlands, and prior converted wetlands.

Comprehensive Approach Needed for Wetlands Mitigation

Due to the magnitude of wetlands in the Corridor 18 Study area a comprehensive approach to wetlands mitigation would be undertaken if the project proceeds to implementation. Typically wetlands mitigation consist of replacing harmed or destroyed wetlands by the conversion of existing non-wetland lands to wetlands through flooding. Land is purchased adjacent to highways and flooded.

While there have been successes to this approach to wetland replacements the following disadvantages can occurred.

1. Other (non-wetland) natural habitats can be destroyed by the flooding/wetland creation process.

2. The health of the created wetland may be compromised by locating it adjacent to major highways where road kill are likely and air pollution is high.

3. The future of the wetland may be compromised by locating it in or near a transportation corridor where highway expansion needs and pressure of development would be the highest.

There are two alternative approaches to wetland mitigation. The first and more commonly used alternative is Mitigation Banking. Mitigation banking consists of the following: A wetland is created or a degraded wetland is restored, typically off site, by one party, such as a government agency or an investor, and is designated as a bank. The value of the restored wetland is somehow quantified and used as a "credit" that can later be withdrawn, at a price, to compensate for unavoidable wetlands fills. The price of the credit covers the cost of acquisition, restoration, and operation.

Preservation of Existing Wetlands in Lieu of Creating New Wetlands

A second alternative is an innovative approach to wetlands mitigation that has been successfully used in northeast Texas where instead of creating new wetlands adjacent to high traffic areas, or in an off site bank, the State Transportation Department in cooperation with the Fish and Wildlife Department has made possible the purchase of an existing threatened wetland. The Nature Conservancy assisted in this mitigation/ preservation activity. Planning for wetlands mitigation would begin with a review of existing wetlands protection programs in the Corridor States. Exhibit 9-3 provides a preliminary summary of such programs. Many of the wetland impacts are expected to occur at the major river crossings. A listing of those are included in Exhibit 9-4.

Exhibit 9-3
WETLAND PROTECTION PROGRAMS IN THE CORRIDOR STATES

Indiana	No specific wetlands protection program
Illinois	No specific wetlands protection program. Regulates some activities in floodway under its Rivers, Lakes and Streams Act of 1911.
Kentucky	No specific wetlands protection program
Tennessee	No specific wetlands act, but the state regulates any alteration to "waters of the state" including wetlands, under its Water Quality Control Act. No development allowed in outstanding wetlands, Most agricultural activities exempt.
Mississippi	Regulates dredging, dumping, filling, destruction of flora, and construction in coastal wetlands. Many activities exempt. Fresh-water wetlands unregulated.
Arkansas	No specific wetlands protection program
Louisiana	Under its State and Local Coastal Resources Management Act. State and/or local permits required for activities (dredging and filling) in coastal wetlands.
Texas	No specific wetlands protection program

Source: Wetlands, Mitigating and Regulating Development Impacts, The Urban Land Institute, 1994

Exhibit 9-4
MAJOR RIVER CROSSINGS

STATE	RIVERS
Kentucky	Ohio River at Evansville Cumberland and Tennessee Rivers
Tennessee	Obion River
Arkansas	Mississippi River and Arkansas River The Quachita River The Saline River
Louisiana	The Red River
Mississippi	Mississippi River
Texas	The Sabine River The Nanchez and Angelina Rivers

Threatened and Endangered Species, Forest and Parklands

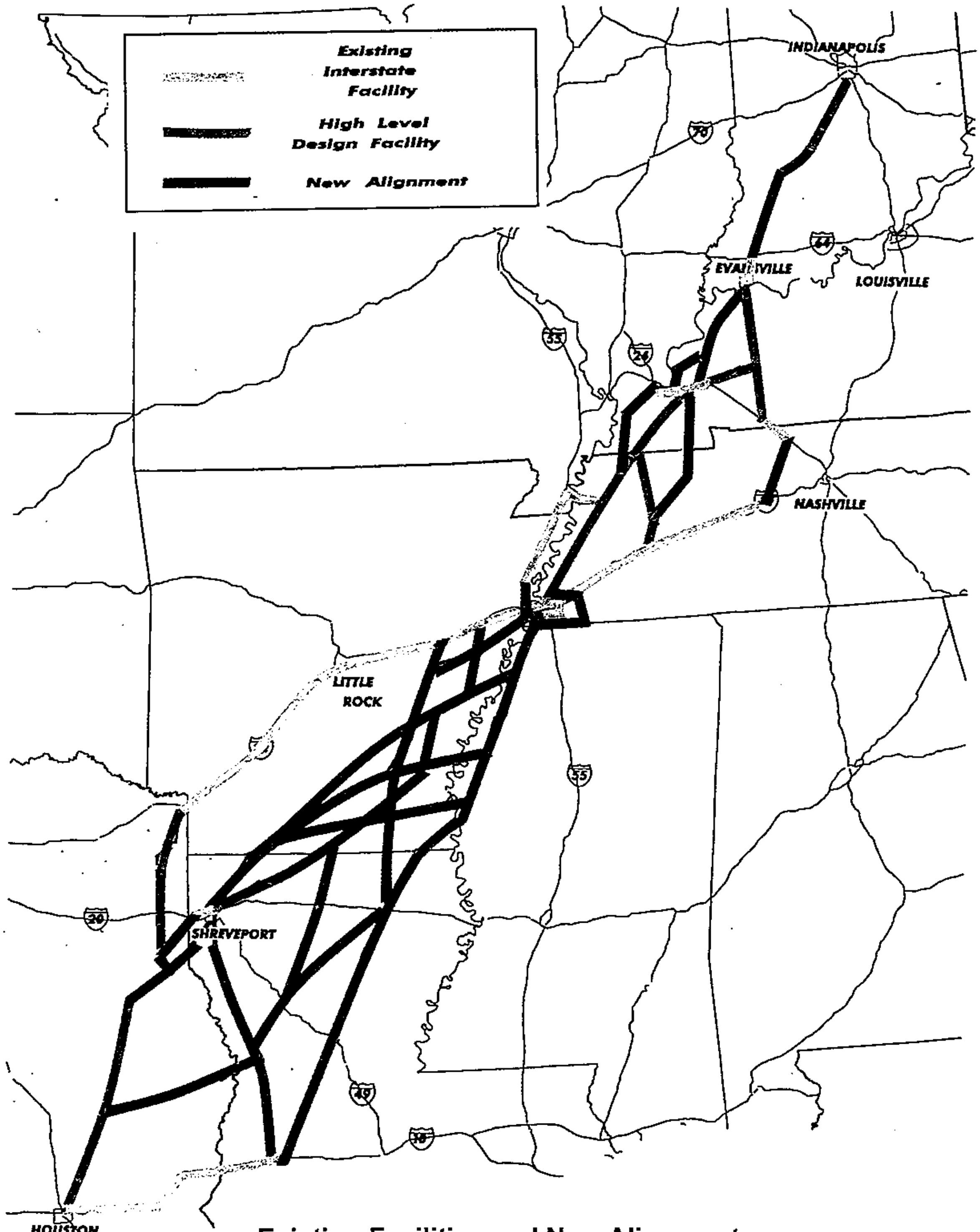
The impact to threatened and endangered species depends on the specific characteristics and design of the chosen alignment. Impacts are expected to be greatest where Corridor 18 would be constructed on totally new alignment where there has been little to no development. Major environmental impacts are not expected were the alignment is constructed along existing highway right of way. Exhibit 9-5 illustrates the locations of new alignment and existing highway. Design must take into consideration roadside habitats that support threatened and endangered species. Chapter 2 identifies the Federally listed threatened and endangered species which potentially could occur within the study area. National Forests and Recreational Areas, State Parks, Wildlife Refuges, and Forest are also identified.

This data was used in the screening process to identify representative corridors.

INTERMODAL FACILITIES

In discussing travel demands in Chapter 4 the locations of various intermodal transportation facilities in the study area were identified, including:

- Road/rail intermodal facilities;
- Airports; and
- Ports.



Existing Facilities and New Alignment

Exhibit 9-5

The locations of existing intermodal facilities are shown in Exhibit 9-6, together with a composite of all suggested route segments. This Exhibit also identifies four highway facilities in an approved TIP/STIP or proposed routes already under study. These facilities may provide opportunities for benefits to the study corridor.

Exhibit 9-6 combines transportation facilities identified previously in Chapter 4 (in Exhibit 4-15 for road/rail intermodal, Exhibit 4-8 for airports and Exhibit 4-16 for ports). Many other intermodal facilities are located in the corridor states which play significant roles in local and regional economies.

Corridor 18 will serve a considerable number of intermodal facilities in the study area. The number and location of facilities served directly by Corridor 18 will be dependent upon the candidate corridor being considered.

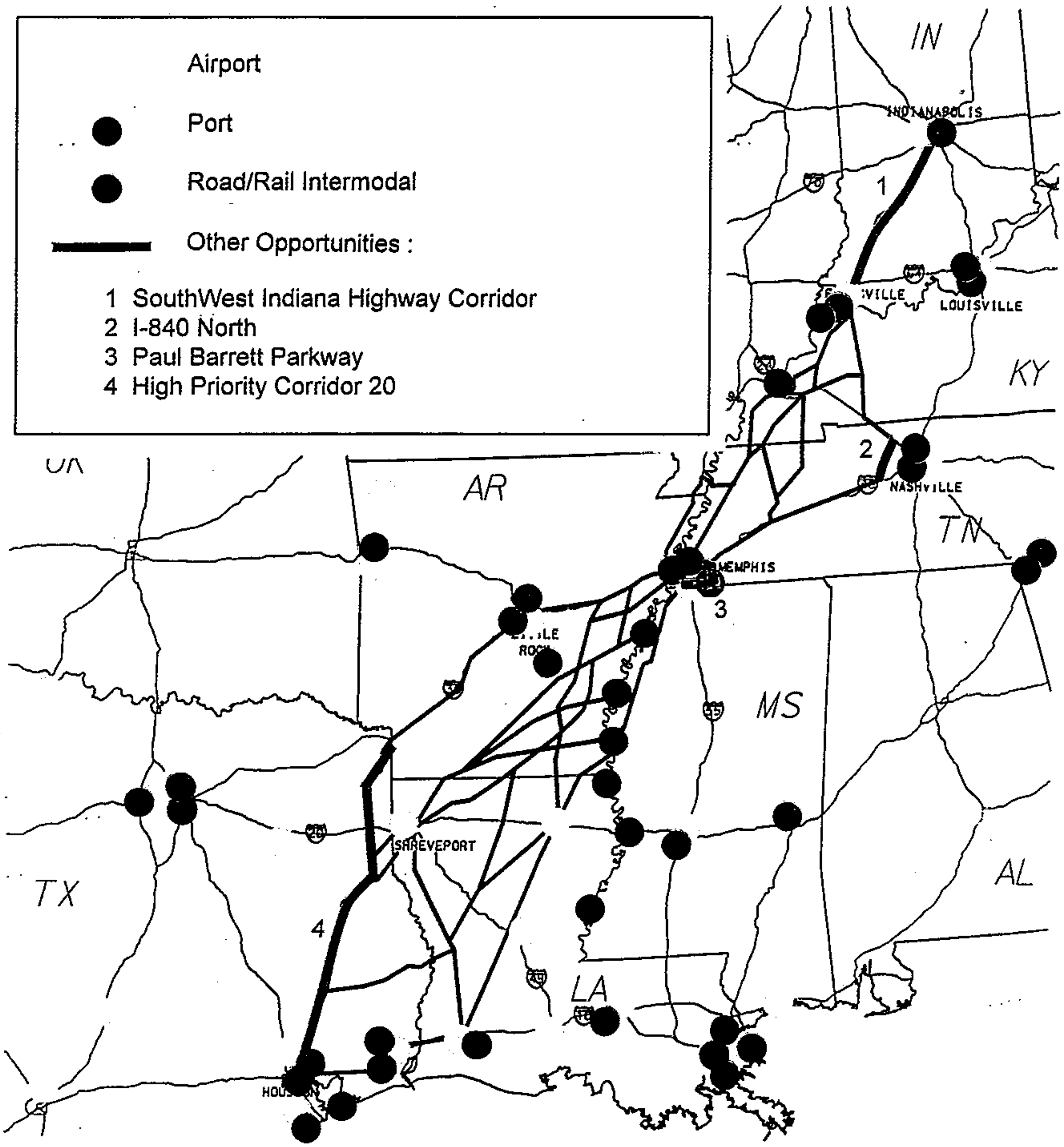
MILITARY INSTALLATIONS

Corridor 18 will directly or indirectly serve a number of key military installations in the study area. The number served directly varies with the candidate corridor being considered and ranges from one to five facilities. Two of the Rapid Deployment Centers in the study area are Fort Campbell and Fort Polk. The Eastern Candidate Corridor in Tennessee would directly serve Fort Campbell better than the Central or Western Corridors. The Central Candidate Corridor in Louisiana would serve Fort Polk better than the Western or the Eastern Corridors.

If the Corridor 18 facility is eventually located along the corridor identified as the Representative Corridor, it could improve service to Fort Campbell by upgrading a part of the Kentucky Parkway system. Fort Polk Military Installation would not be directly served by this location. Fort Polk is already located on a STRAHNET route (US 171), while Fort Campbell is connected to I-24 by Alternate US 41. The locations of military installations are illustrated in Exhibit 9-7.

CORRIDOR PRESERVATION

One method of minimizing environmental, social and infrastructure costs is through the advance preservation of corridors. Even though there are obstacles to long range planning of corridor acquisition there are some opportunities available to government agencies for the purpose of preserving corridors for future use.



Intermodal Facilities

Exhibit 9-6

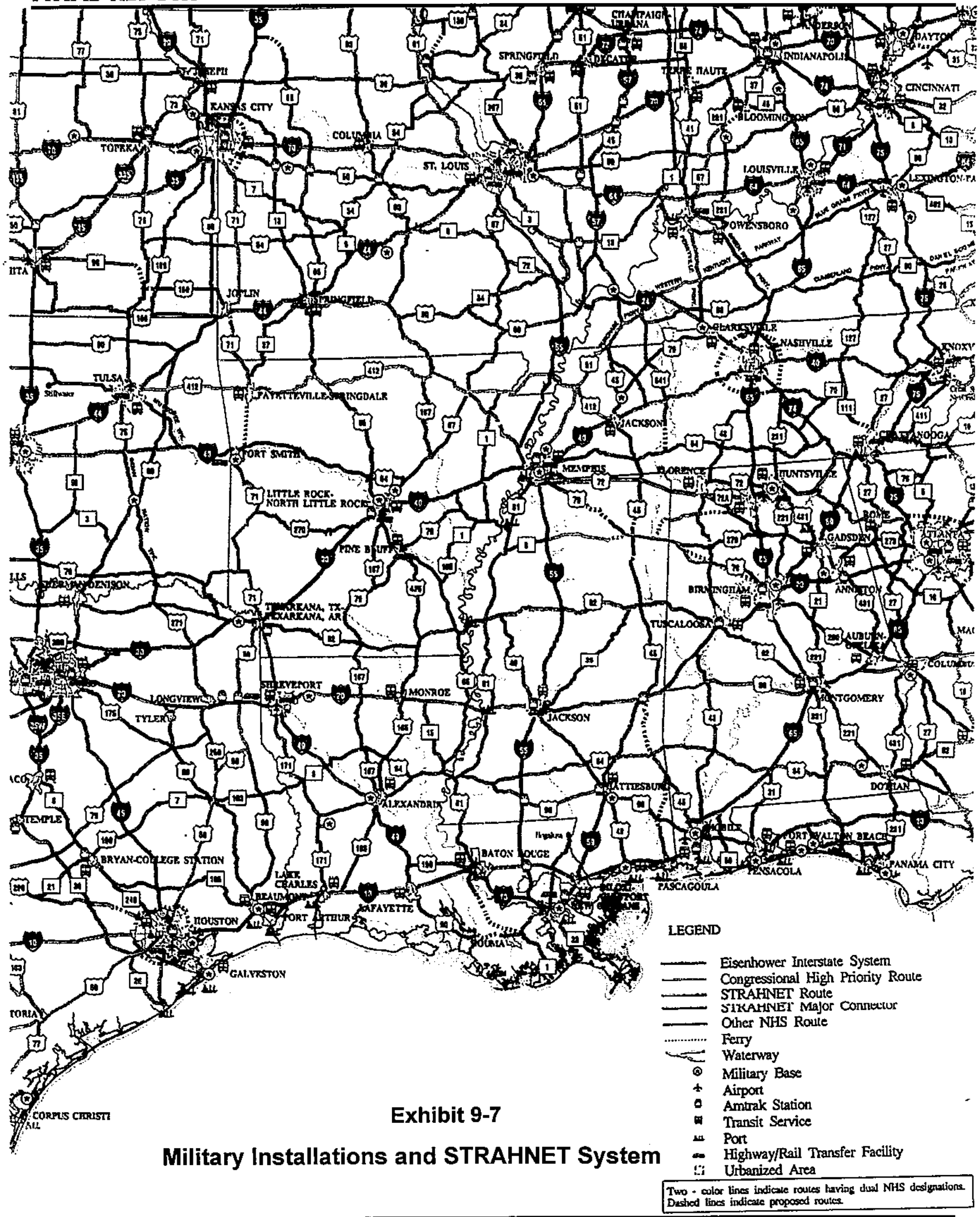


Exhibit 9-7

Military Installations and STRAHNET System

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 mandates that the state planning process consider "preservation of right-of-way for construction of future transportation projects...and identify those corridors for which action is most needed to present destruction or loss" (3, sec 1025 {a})

Purpose

The purpose of corridor preservation is:

- To prevent inconsistent development;
- To minimize or avoid environmental, social, and economic impacts;
- To reduce displacement;
- To prevent the foreclosure of desirable location options;
- To allow for the orderly assessment of impacts; and
- To permit orderly project development.

Methods

The two major methods of corridor preservation are reservation and actual acquisition

1. **Preservation or reservation** - any activities on the part of a government, not involving actual purchase, that are oriented to reserving rights-of-way what would be needed in the future until they can be purchased. Techniques usually involve some scheme to prevent development that would increase the acquisition expense or would create future disruption when roadway improvements are made.

2. **Actual acquisition** - which can include normal purchase either at the time of construction, or several years in advance of a project. Either can range from arms length negotiation and sale by a willing seller to adversarial proceedings where every element of the sale is contested.[1]

Tools that can be used to protect the location of a corridor include fee-simple acquisitions, voluntary agreements by owners not to develop, police-power control, development ordinances on the local level, purchase of development rights, options to purchase, and donations. Filing an official map of reservation (with enabling legislation) is the first step to establishing the location.

Advance acquisitions that qualify for federal funding must be "extraordinary" or "emergency" situations in order to be used. Official notice to the public of the selection of a preferred location and the holding of a public hearing are prerequisites to possible federal participation. Advance acquisition cannot influence project decision making particularly the consideration of alternatives. The state and federally funded advance acquisitions must comply to Title VI of the Civil Rights Act of 1970 and the Uniform Relocation Assistance and Rail Property Acquisition Policies Act of 1970.

The transfer or purchase of development rights purchasing a conservation easement particularly in a rural area, enables the owner to retain the fee interest and continue farming or conducting other nondevelopment uses on the property, and keeps the land on the tax rolls.

A state transportation agency may enter into a written agreement to purchase the right to exercise an option, provided that the owner does not develop the property during the life of the option. This is called an option to purchase.

Access Management is to provide or manage access to adjacent land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed.

ENDNOTES

1 Source: Abstract, *Preserving Rights-Of-Way for Transportation Projects*, George Reed, PE.

Chapter 10
OTHER FACILITY CONCEPTS

INTRODUCTION

In assessing the feasibility for highway investments within the Study Corridor, this Report has focused, thus far, on a conventional Interstate-type highway. During the study, a variety of highway options were reviewed, ranging from parkways for passenger vehicles only to super highways with full automation of vehicles and speeds up to 240 km/h (150 mph).

This review resulted in the selection of three highway options for further consideration:

- Option A - conventional Interstate-type highway;
- Option B - conventional design truckway; and
- Option C - high speed Interstate-type highway.

The feasibility of the first of these three options has been evaluated in detail as described in previous Chapters. An evaluation of the other two options is presented in this Chapter.

The evaluation of truckway/high speed Interstate-type options is based on a facility extending from Indianapolis to Houston. The analysis did not assume upgrades to truckway/high speed interstate standards on I-69 north of Indianapolis in Indiana and Michigan. If either of these options is implemented in Corridor 18, consideration should be given to a corresponding upgrade of I-69 between Indianapolis and the Canadian border.

CONVENTIONAL DESIGN TRUCKWAY OPTION

The second highway technology option selected for further consideration is a Conventional Design Truckway. This section presents projections of the impacts such a truckway would have on the movement of goods within the Corridor. The economic benefits of the Truckway Option are compared to its costs and assessments are made regarding economic and financial feasibility.

TRUCKWAY CHARACTERISTICS

The truckway alternative considered in this option consists of essentially an Interstate-type highway allowing the mixed operation of private automobiles, conventional trucks and high load capacity trucks.

The roadway design standards would be similar to those for Interstate-type highways but would also provide for truck climbing lanes and heavy weight pavement and bridge design. Maximum speed was assumed to be 105 km/h (65 mph). Staging areas at major road interchange points would be provided for the assembly/disassembly of longer combination vehicles (LCVs).

GVW Assumptions

Federal gross vehicle weight (GVW) and length limits were assumed to not apply to the Truckway. Two GVW assumptions were considered. The first allowed GVW to increase to about 58,600 kg (129,000 lbs). This was intended to represent a weight to power ratio consistent with existing trucks operating at 36,300 kg (80,000 lbs) and achievable with available (450 hp) tractors. It implies that some trucks would operate at less than capacity for the access portion of LCV movements.

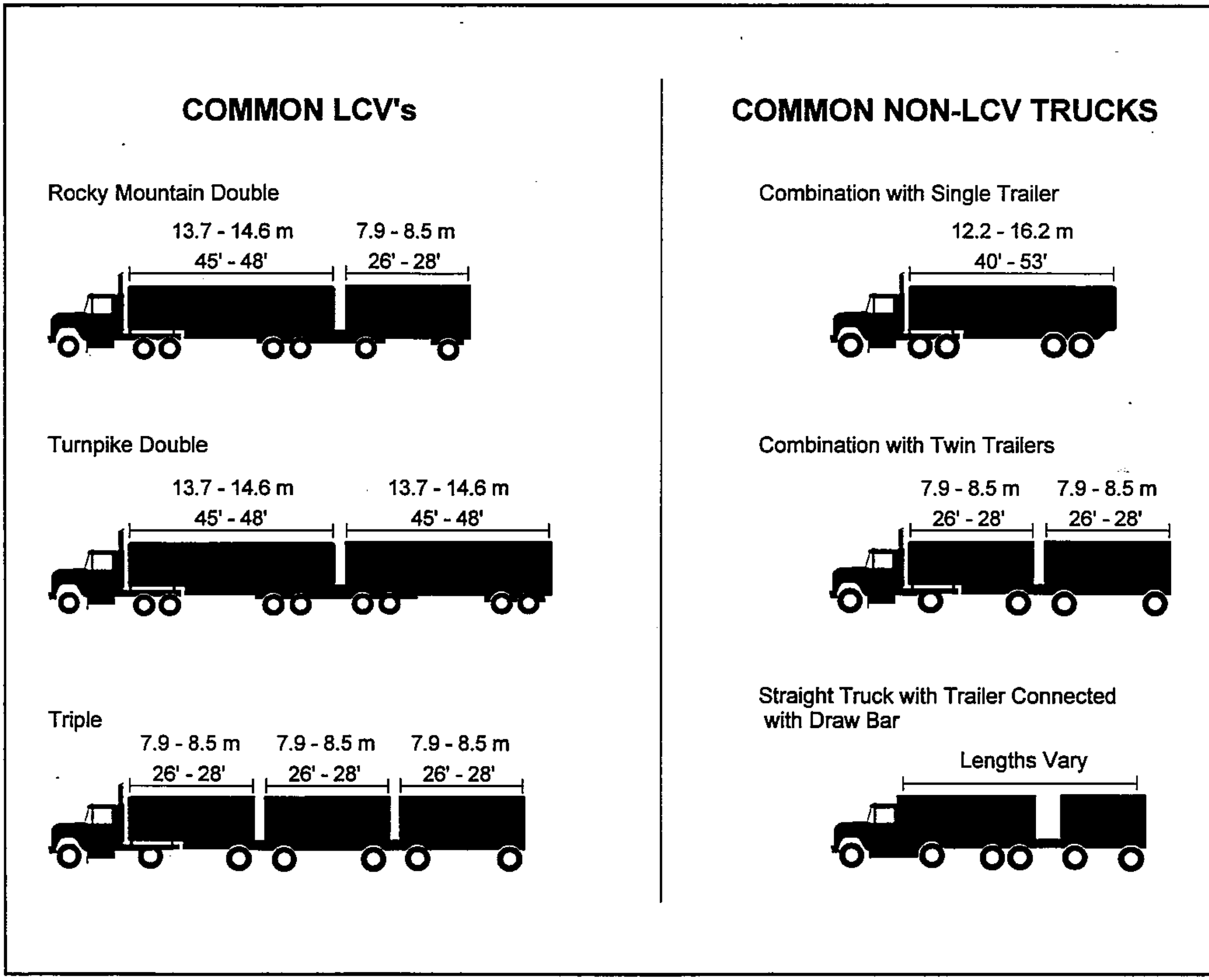
The second GVW alternative assumed that LCVs were allowed to transport twice the payload carried by 36,300 kg (80,000 lbs) limited trucks. This assumption represents the situation where the access portion of LCV movements can operate at the GVW limit and then be combined into LCV configurations with no redistribution of cargo. This assumption results in a maximum GVW of about 66,400 kg (146,000 lbs).

LCV Configurations

Several LCV configurations exist including double and triple trailer configurations of varying lengths. Exhibit 10-1 contains examples of conventional truck and LCV configurations that would be allowed to use the Truckway. For the purposes of this analysis, base case trucks were assumed to be either 5-axle, twin 8.5 m (28 ft) trailers or 5-axle, single 14.5 m (48 ft) trailers. LCV configurations were assumed to be 7-axle, triple 8.5 m (28 ft) trailers or 9-axle, double 14.5 m (48 ft) trailers.

TRUCKWAY CONSTRUCTION COSTS

The truckway allows for longer combination vehicles and truck loading of 66,400 kg (146,000 lbs). These vehicles would require thicker pavement to accommodate the additional loading, as well as bridges suitable for LCV traffic. At all interchanges additional lengths for weaving areas would be necessary, along with a longer turning radius provided for the ramps.



Source: American Trucking Associations and Transportation Research Board.

EXAMPLE LCV AND NON LCV TRUCK COMBINATIONS

Exhibit 10-1

At long, steep grades additional truck lanes would be necessary. Due to the mostly flat and rolling terrain in the study area, this is likely to have only a minor impact on construction costs. Only in cases where a maximum grade of 3 percent or greater is used would the climbing lane be necessary. The impact of this factor on the total cost would not be significant and could easily be accounted for within the contingency already added to the costs.

The truckway option cost estimate represents a 12 percent increase over the conventional Interstate-type highway option, as shown in Exhibit 10-2.

Exhibit 10-2
TRUCKWAY CONSTRUCTION COST SUMMARY
($ Millions)

State	Conventional Truckway	Percent Change from Conventional Highway
Indiana	$1,149	11.2%
Kentucky	633	12.0%
Tennessee	426	11.8%
Mississippi	857	12.0%
Arkansas	1,191	12.0%
Louisiana	1,101	12.0%
Texas	795	12.0%
TOTAL	**$6,154**	**12.0%**

OPERATIONS AND MAINTENANCE COSTS

The operations and maintenance costs for the truckway are the same as the costs for the conventional Interstate-type highway presented in Chapter 3 of this report. The design features mentioned above for the implementation of the truckway should allow for the additional loading from truck traffic, while automobile traffic will have much less of an impact on the thicker pavement. There is a safety concern with the larger trucks mixed with smaller cars. The effects of this national trend have yet to be determined. This should have little impact on the costs to maintain and operate the facility.

TRUCKWAY TRAVEL DEMAND

Travel demand by passenger vehicles was assumed to be identical to that estimated under Option A: Conventional Interstate-type Highway.

The goods movement response was estimated primarily as a function of the transportation cost differences between conventional trucking and the use of LCVs for the truckway portion of the trip. The process also considered:

- Whether or not the Truckway was a reasonable routing alternative.
- The proportions of access distance versus truckway distance over the total distance for transport.
- The mix of transport types (private versus public trucking company, high density versus low density freight, commodity type/vehicle type) occurring in the Corridor.
- Other characteristics of the trucking industry that tend to predispose particular transport types for or against the use of LCVs.

Induced Travel

For financial feasibility analyses, it was assumed that induced travel would increase forecast LCV vehicle km by five percent. Car and conventional truck vehicle km were assumed to increase by two percent (as in Option A: Conventional Interstate-type Highway).

Economic feasibility analyses did not include induced traffic. The inclusion of induced traffic is estimated to increase these benefits by from one to three percent.

Toll Free Projections

Exhibit 10-3 shows tonne-km of goods transport demand found to be a candidate for LCV/Truckway use. Also shown are tonne-km estimated to employ LCVs for all or a portion of their trip. If the Truckway and related LCV truck configurations were available it was estimated that from 12 to 21 percent of the freight transport potential market (depending on the GVW assumption) would use LCVs for a portion of their trip.

Exhibits 10-4 and 10-5 contain daily total truck vehicle-km with and without the Truckway alternative in place. The Truckway alternative is estimated to produce a daily reduction of 1.2 to 2.3 million truck-km in 1992 to 2.0 to 3.5 million in 2015, for the low and high LCV GVW options, respectively.

Exhibit 10-3 DAILY TONNE-KM USING LCVs (Millions)		
	1992	2015
Potential Tonne-Km	656.6	958.2
Estimated LCV Tonne-Km		
Low GVW Option	77.5	119.2
High GVW Option	135.4	207.1
LCV Shares (percent)		
Low GVW Option	11.8%	12.4%
High GVW Option	20.6%	21.6%
Potential Ton-Miles	456.0	665.4
Estimated LCV Ton-Miles		
Low GVW Option	53.8	82.8
High GVW Option	94.0	143.8

Exhibit 10-4 DAILY TOTAL TRUCK VEHICLE KM -- LOW GVW OPTION (Millions)		
	1992	2015
E+C Network Truck-Km	270.7	376.8
Truckway Alternative		
Conventional Truck-Km	267.7	371.8
LCV Truck-Km	1.8	3.0
Total Truck-Km	269.5	374.8
Difference (E+C - Truckway)	1.2	2.0
E+C Network Truck-Miles	169.2	235.5
Truckway Alternative		
Conventional Truck-Miles	167.3	232.4
LCV Truck-Miles	1.1	1.9
Total Truck-Miles	168.4	234.3
Difference (E+C - Truckway)	0.8	1.2

Exhibit 10-5
DAILY TOTAL TRUCK VEHICLE KM -- HIGH GVW OPTION
(Millions)

	1992	2015
E+C Network Truck-Km	270.7	376.8
Truckway Alternative		
Conventional Truck-Km	265.8	369.3
LCV Truck-Km	2.6	4.0
Total Truck-Km	268.4	373.3
Difference (E+C - Truckway)	2.3	3.5
E+C Network Truck-Miles	169.2	235.5
Truckway Alternative		
Conventional Truck-Miles	166.1	230.8
LCV Truck-Miles	1.6	2.5
Total Truck-Miles	167.7	233.3
Difference (E+C - Truckway)	1.5	2.2

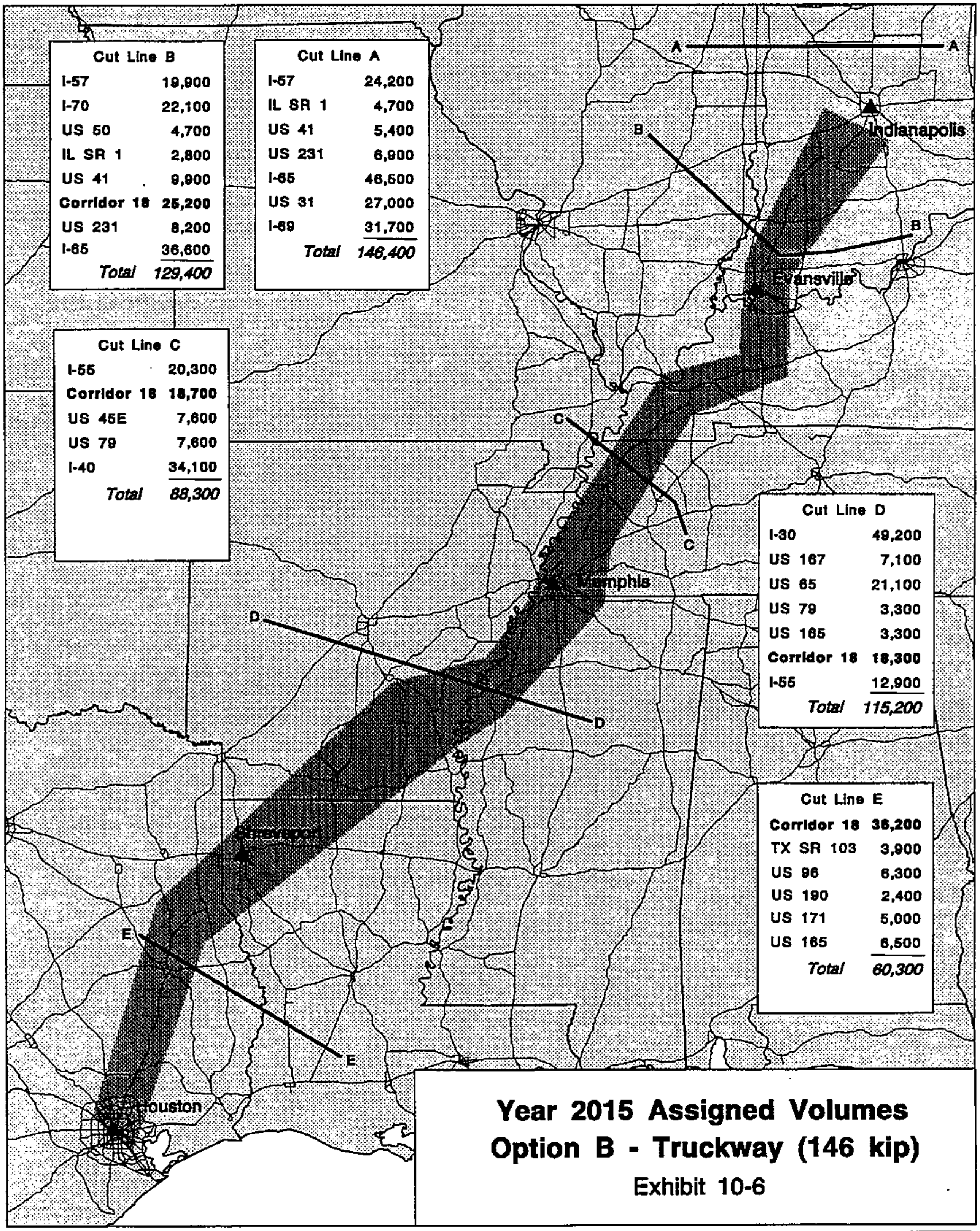
Exhibit 10-6 shows forecast traffic volumes at Corridor cut lines. Volumes shown are for year 2015, for the high GVW option.

Exhibit 10-7 shows daily truck vehicle km of travel on the truckway by conventional and LCV trucks for year 2015. LCV trucks are estimated to make up about 8 to 11 percent of the total travel on the highway.

With Toll Impacts

An analysis was conducted to estimate the percentage of LCV utilization that would remain if tolls were placed on LCV operation on the Truckway. An LCV truck toll of $0.1098 per vehicle-km ($0.1767 per vehicle-mile) was tested. It was found that this level of additional LCV cost would produce a reduction in LCV use of about 10 percent under the high GVW assumption and about 25 percent under the low GVW assumption (in terms of vehicle-km).

Exhibit 10-8 shows the impact of these toll assumptions on LCV usage when combined with the toll assumptions for Option A: Conventional Interstate-type Highway for other vehicle types ($0.0214/car-km and $0.0732/truck-km). Vehicle-km shown in this table also include induced travel.



Cut Line B	
I-57	19,900
I-70	22,100
US 50	4,700
IL SR 1	2,800
US 41	9,900
Corridor 18	25,200
US 231	8,200
I-65	36,600
Total	*129,400*

Cut Line A	
I-57	24,200
IL SR 1	4,700
US 41	5,400
US 231	6,900
I-65	46,500
US 31	27,000
I-69	31,700
Total	*146,400*

Cut Line C	
I-55	20,300
Corridor 18	18,700
US 45E	7,600
US 79	7,600
I-40	34,100
Total	*88,300*

Cut Line D	
I-30	49,200
US 167	7,100
US 65	21,100
US 79	3,300
US 165	3,300
Corridor 18	18,300
I-55	12,900
Total	*115,200*

Cut Line E	
Corridor 18	36,200
TX SR 103	3,900
US 96	6,300
US 190	2,400
US 171	5,000
US 165	6,500
Total	*60,300*

Year 2015 Assigned Volumes
Option B - Truckway (146 kip)
Exhibit 10-6

Exhibit 10-7
2015 DAILY TRUCKWAY VEHICLE-KM OF TRAVEL
(Millions)

	LOW GVW OPTION		HIGH GVW OPTION	
	Veh-Km	Percent	Veh-Km	Percent
Cars	27.0	74.1	27.0	74.8
Conventional trucks	6.4	17.5	5.1	14.2
LCV Trucks	3.0	8.4	4.0	11.0
TOTAL	**36.4**	**100.0**	**36.1**	**100.0**
	Veh-Miles	Percent	Veh-Miles	Percent
Cars	16.9	74.1	16.9	74.8
Conventional Trucks	4.0	17.5	3.2	14.2
LCV Trucks	1.9	8.4	2.5	11.0
TOTAL	**22.8**	**100.0**	**22.6**	**100.0**

Exhibit 10-8
PROJECTED DAILY TRAVEL WITH AND WITHOUT TOLLS, OPTION B

	VEHICLE-KM (thousands)			
	Cars	Conventional Trucks	LCV Truck	Total
TOLL FREE				
1992 - Low GVW Option	17,818	4,582	2,016	24,416
1992 - High GVW Option	17,818	3,696	2,752	24,266
2015 - Low GVW Option	27,555	6,562	3,117	37,234
2015 - High GVW Option	27,555	5,280	4,246	37,081
WITH TOLLS ON CORRIDOR 18				
1992 - Low GVW Option	11,582	3,115	1,512	16,209
1992 - High GVW Option	11,582	2,514	2,477	16,573
2015 - Low GVW Option	17,912	4,462	2,338	24,712
2015 - High GVW Option	17,912	3,590	3,822	25,324
	VEHICLE-MILES (thousands)			
	Cars	Conventional Trucks	LCV Truck	Total
TOLL FREE				
1992 - Low GVW Option	11,136	2,864	1,260	15,260
1992 - High GVW Option	11,136	2,310	1,720	15,166
2015 - Low GVW Option	17,222	4,101	1,948	23,271
2015 - High GVW Option	17,222	3,300	2,654	23,176
WITH TOLLS ON CORRIDOR 18				
1992 - Low GVW Option	7,239	1,947	945	10,131
1992 - High GVW Option	7,239	1,571	1,548	10,358
2015 - Low GVW Option	11,195	2,789	1,461	15,445
2015 - High GVW Option	11,195	2,244	2,389	15,828

ECONOMIC FEASIBILITY

The Truckway option will produce benefits similar to the Conventional Interstate-type Highway option for cars and for trucks not choosing to employ LCV configurations. In addition, those goods movements choosing to use LCVs will obtain an additional benefit related to the increased productivity that LCV transport offers for some movements.

Exhibits 10-9 and 10-10 (following page) summarize benefits for the Truckway alternative for the low and high GVW options (non-toll). When compared to the costs of the Truckway option, the economic feasibility indicators shown in Exhibit 10-11 are obtained.

Exhibit 10-11
ECONOMIC FEASIBILITY INDICATORS FOR TRUCKWAY OPTIONS

	Benefit/ Cost Ratio	Internal Rate of Return	Net Present Value
Low GVW Option	1.64	11.6%	$4.0 billion
High GVW Option	2.42	16.5%	$9.0 billion

Benefit/cost ratios for both GVW options are greater than 1.0 and are higher than the benefit/cost ratio estimated for Option A: Conventional Interstate-type Highway (1.39). The benefits achieved under the high GVW option are significantly higher than for the lower GVW option. The difference is produced by the higher loads and greater productivity assumed for both the access and mainline movements associated with use of higher capacity trucks.

FINANCIAL FEASIBILITY

Similar to the financial analyses reported in Chapter 8 for the Interstate-type highway, a pro forma analysis was conducted for the Truckway option. The focus of the results is the net (i.e., net of what could be paid for with tolls) public funding requirements.

Results of these analyses are presented in Exhibit 10-12 for the Low GVW assumption. Exhibit 10-13 presents similar information for the High GVW assumption. From this, it can be seem that, not unexpectedly, the High GVW alternative generates greater revenues and thus a lower public funding requirement than does the Low GVW alternative.

Exhibit 10-9
TRANSPORTATION EFFICIENCY BENEFITS
FOR THE TRUCKWAY OPTION - LOW GVW OPTION
($ Millions)

	1992	2015	30-Year Total[a]
AUTOS			
Operating Costs	23.1	55.7	501.6
Travel Time	82.7	243.1	2,112.7
TOTAL	105.8	298.8	2,614.3
CONVENTIONAL TRUCKS			
Operating Costs	54.5	124.1	1,130.3
Travel Time	42.6	78.2	747.1
TOTAL	97.1	202.3	1,877.4
LCV TRUCKS	195.2	292.0	2,942.1
ACCIDENTS	196.1	293.7	2,958.2
TOTAL	**549.2**	**1,086.8**	**10,392.0**

(a) Discounted at 7 percent.

Exhibit 10-10
TRANSPORTATION EFFICIENCY BENEFITS
FOR THE TRUCKWAY OPTION - HIGH GVW OPTION
($ Millions - Annual)

	1992	2015	30-Year Total[a]
AUTOS			
Operating Costs	23.1	55.7	501.6
Travel Time	82.7	243.1	2,112.7
TOTAL	105.8	298.8	2,614.3
CONVENTIONAL TRUCKS			
Operating Costs	46.0	109.4	987.8
Travel Time	36.0	69.0	652.5
TOTAL	82.0	178.4	1,640.3
LCV TRUCKS	517.0	787.3	7,893.4
ACCIDENTS	211.2	316.1	3,184.5
TOTAL	**916.0**	**1,580.6**	**15,332.5**

(a) Discounted at 7 percent.

Exhibit 10-12 FINANCIAL ANALYSIS LOW GVW TRUCKWAY ALTERNATIVE WITH TOLLS ($ in millions)				
Year	Project[1] Costs	Operations &[1] Maintenance	Toll[2] Revenue	Public Funding Surplus/ (Requirement)
1996	412.48			(412.48)
1997	416.72			(416.72)
1998	404.82			(404.82)
1999	333.84	17.00	40.34	(310.50)
2000	330.63	16.84	45.83	(301.64)
2001	327.45	16.68	43.60	(300.53)
2002	332.52	40.48	99.92	(273.08)
2003	329.32	40.09	95.06	(274.35)
2004	326.16	39.70	90.44	(275.42)
2005	961.07	68.34	161.64	(867.78)
2006	951.83	67.68	153.77	(865.74)
2007	942.68	67.03	146.30	(863.42)
2008		98.14	180.05	81.91
2009		97.20	171.30	74.10
2010		96.26	188.93	92.66
2011		95.34	179.74	84.40
2012		94.42	171.00	76.58
2013		93.51	162.69	69.17
2014		92.61	154.78	62.16
2015		91.72	170.71	78.98
TOTAL	6,069.51	1,133.05	2,256.08	(4,946.48)

(1) Discounted at 7 percent.
(2) Toll Rates increased at the rate of inflation (3 percent), with increases effective every 5 years. Revenue streams are discounted at 7 percent.

Exhibit 10-13
FINANCIAL ANALYSIS
HIGH GVW TRUCKWAY ALTERNATIVE
WITH TOLLS
($ in millions)

Year	Project[(1)] Costs	Operations &[(1)] Maintenance	Toll[(2)] Revenue	Public Funding Surplus/ (Requirement)
1996	412.48			(412.48)
1997	416.72			(416.72)
1998	404.82			(404.82)
1999	333.84	17.00	44.30	(306.54)
2000	330.63	16.84	50.33	(297.14)
2001	327.45	16.68	47.89	(296.23)
2002	332.52	40.48	109.78	(263.21)
2003	329.32	40.09	104.47	(264.95)
2004	326.16	39.70	99.41	(266.45)
2005	961.07	68.34	177.70	(851.71)
2006	951.83	67.68	169.10	(850.42)
2007	942.68	67.03	160.91	(848.81)
2008		98.14	198.08	99.94
2009		97.20	188.49	91.29
2010		96.26	207.93	111.66
2011		95.34	197.86	102.52
2012		94.42	188.28	93.86
2013		93.51	179.16	85.65
2014		92.61	170.49	77.87
2015		91.72	188.07	96.35
TOTAL	6,069.51	1,133.05	2,482.22	(4,720.33)

(1) Discounted at 7 percent.
(2) Toll Rates increased at the rate of inflation (3 percent), with increases effective every 5 years. Revenue streams are discounted at 7 percent.

HIGH SPEED INTERSTATE-TYPE OPTION

The third technology option selected for consideration was a High Speed Interstate-type Highway. This section presents projections of travel demand for such a facility and examines its potential economic and financial feasibility.

HIGH SPEED INTERSTATE-TYPE CHARACTERISTICS

The high speed Interstate-type facility envisaged by this option would incorporate limited Advanced Vehicle Control System (AVCS) functions and permit speeds up to 130 km/h (80 mph).

AVCS Functions

AVCS functions assumed with this option include:

- lane departure warnings;
- driver performance monitoring;
- obstacle detection;
- road environment sensing;
- lane change assist; and
- smart cruise control.

This limited set of functions is referred to as AVCS-1 in this study and represents the low end of a range of AVCS functions which may be implemented over time and which may eventually lead to fully automated Super-Highways with speeds up to 190/240 km/h (120/150 mph).

Many, if not all, of the AVCS functions listed above may be implemented in conjunction with a conventional Interstate-type facility (Option A). In the case of Option C, it is assumed that this level of AVCS, combined with an additional lane per direction, would permit an increase in vehicle speeds to 130 km/h (80 mph).

Concepts for Automated Highway Systems (AHS) and AVCS are still being developed and it is too early to identify the possible lane-usage rules which may apply to 4, 6 or 8-lane AHS roadways. They will depend a great deal on the extent to which different vehicle types (cars, trucks) may be permitted to share an automated lane and the extent to which AVCS-equipped vehicles and regular vehicles may share a lane.

For the purposes of this study it is assumed that a high speed Interstate-type facility would be constructed with a cross-section for three lanes in each direction in rural segments of Corridor 18.

CONSTRUCTION COSTS – HIGH SPEED INTERSTATE

The costs for the high speed interstate option are presented in Exhibit 10-14. These costs provide for a 6- lane cross section, with the availability to upgrade to eight lanes at some future point. Procedures for implementing an automated facility have not yet been clearly defined. The cost estimate shown reflects three contiguous lanes in each direction with one lane being designated as an automated lane. The design of this facility will be capable of conversion to the full 8-lane section in the future.

Exhibit 10-14
HIGH SPEED INTERSTATE COST SUMMARY
(Millions $)

State	Conventional	High Speed (6-lane Section)	Percent Change	High Speed (8-Lane Section)	Percent Change to 8-Lane Section
Indiana	1,026	1,594	55%	2,360	48%
Kentucky	565	1,440	155%	2,131	48%
Tennessee	380	937	147%	1,387	48%
Mississippi	765	870	14%	1,287	48%
Arkansas	1,064	1,168	10%	1,730	48%
Louisiana	983	1,230	25%	1,821	48%
Texas	710	1,499	111%	2,219	48%
Total	**$ 5,493**	**$ 8,738**	**59%**	**$ 12,935**	**48%**

The high speed interstate costs require additional pavement thickness and have much higher design standards both horizontally and vertically, requiring more earthwork and ROW. The 6-lane HSIH would increase the costs by 59% over the conventional Interstate-type highway.

Exhibit 10-14 also shows estimated costs for the full 8-lane cross section, which includes significant separation between the automated and conventional lanes.

Costs associated with annual operations and maintenance (O&M) of the facility are presented in Exhibit 10-15. The conventional highway (Option A) and truckway (Option B) have the same unit costs for Operations and Maintenance costs, while the high speed highway (Option C) has a higher cost due to the need for increased maintenance and communications costs.

Exhibit 10-15
OPERATIONS AND MAINTENANCE COSTS

Technology Option	($ M)
Conventional Highway/Truckway	$ 34.3
High Speed Interstate Highway*	$ 43.8

* 6-Lane Cross Section

TRAVEL DEMAND

To estimate travel demand on a high speed Interstate-type facility, the study's highway network model was modified to reflect a speed of 130 km/h (80 mph) on all rural segments of the representative corridor. Freeflow network speeds were unchanged at 88 km/h (55 mph) on urban segments of the representative corridor. Speeds were also unchanged for all other roads in the network, resulting in the representative corridor having a 24 km/h (15 mph) speed advantage in comparison to parallel competing rural interstates with a 105 km/h (65 mph) speed limit.

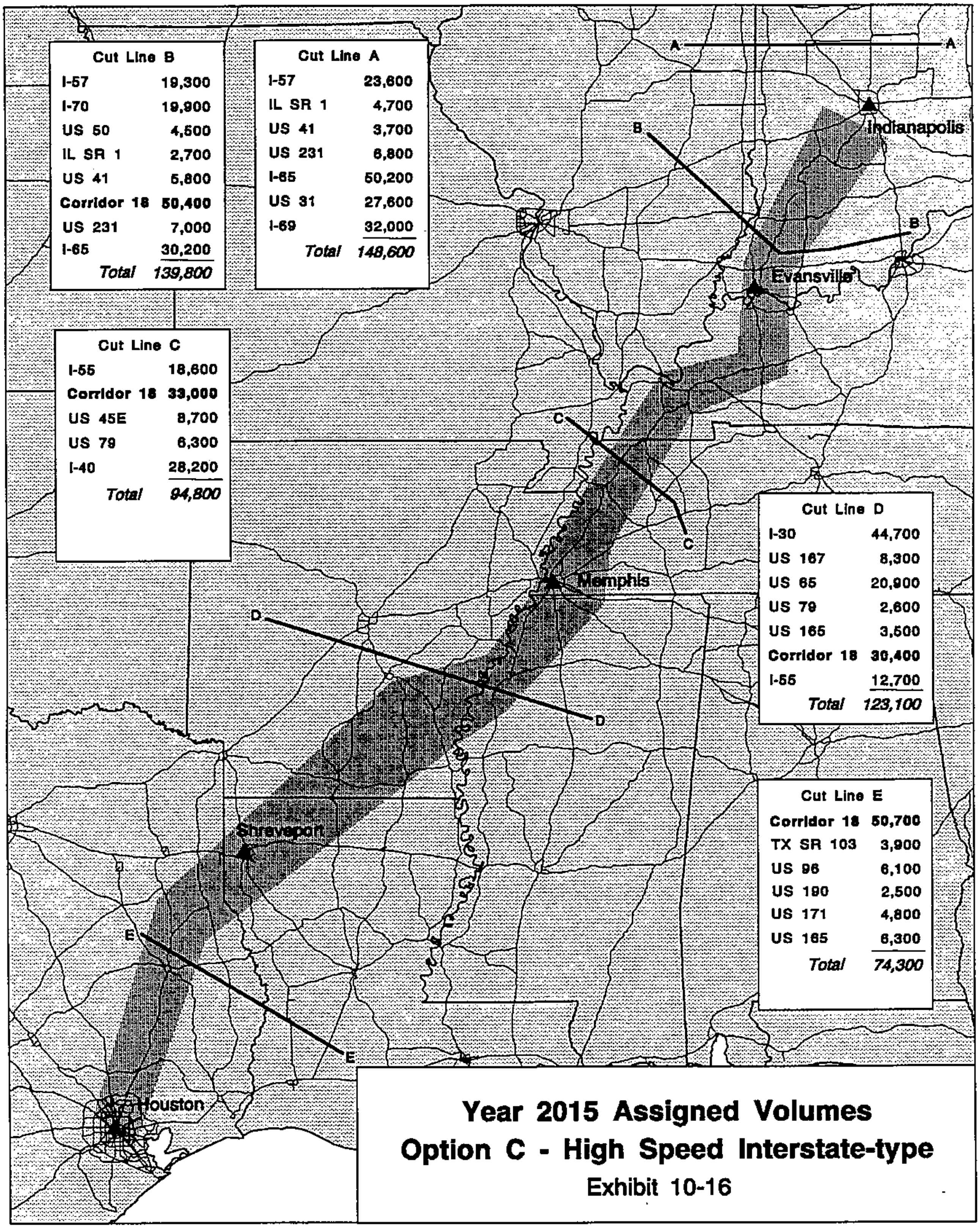
Induced Travel

Implementation of a high speed Interstate-type facility may induce somewhat more travel than a conventional Interstate-type project. For the purpose of feasibility assessments induced traffic is assumed to amount to five percent of non-induced traffic in the representative corridor.

Toll Free Projections

Traffic projections at study corridor cut lines are shown in Exhibit 10-16 for the High Speed Interstate-type option. These estimates assume no tolls are charged for use of Corridor 18.

Exhibit 10-17 compares assigned 2015 totals across these cut lines for the Existing + Committed Network and Options A and C.



Year 2015 Assigned Volumes
Option C - High Speed Interstate-type
Exhibit 10-16

Exhibit 10-17
COMPARISON OF CUT LINE TOTALS WITH OPTIONS A AND C

Cut Line	E+C Network	Option A Conventional Interstate-type	Option C High Speed Interstate-type
A	143,600	146,400	148,800
B	127,600	129,700	139,800
C	85,200	91,000	94,800
D	116,200	117,000	123,100
E	52,400	62,000	74,300

Travel Characteristics

By the year 2015 daily travel demand on the high speed Interstate-type facility in Corridor 18 is estimated at 60.67 million vehicle-km (37.70 million vehicle-miles). This represents an increase in travel demand of 61 percent in comparison to Option A, as shown in Exhibit 10-18.

Exhibit 10-18
2015 DAILY TRAVEL, OPTIONS A & C
(millions)

VEHICLE TYPE	OPTION A Conventional Interstate-type			OPTION C High Speed Interstate-type		
	VKmT	VMT	Percent	VKmT	VMT	Percent
Passenger Vehicles	27.72	17.22	74%	41.97	26.08	69%
Trucks	9.86	6.12	26%	18.70	11.62	31%
TOTAL	**37.57**	**23.35**	**100%**	**60.67**	**37.70**	**100%**

With Toll Projections

An analysis was performed to estimate the percentage of projected travel which would be retained if tolls were charged on the high speed Interstate-type facility. In view of the higher speeds permitted on the corridor in comparison to conventional Interstates it was assumed that toll rates may be 50 percent higher than used in the comparable analysis with Option A. Toll rates assumed on the high speed Interstate were:

- Cars - $0.0312 per km ($0.0517 per mile)
- Trucks - $0.1098 per km ($0.1767 per mile)

It is estimated that 70 percent of vehicle-km (vehicle-miles) on a toll free high speed Interstate-type facility in Corridor 18 would be retained if tolls were charged at the rates indicated above. Projected values of daily vehicle-km (vehicle-miles) of travel on Corridor 18 in these two cases are shown in Exhibit 10-19.

Exhibit 10-19
PROJECTED DAILY TRAVEL WITH AND WITHOUT TOLLS, OPTION C

HIGH SPEED INTERSTATE-TYPE FACILITY	DAILY TRAVEL (millions)			
	1992		2015	
	VKmT	VMT	VKmT	VMT
TOLL FREE				
Passenger Vehicles	27.09	16.83	41.97	26.08
Trucks	12.34	7.67	18.70	11.62
TOTAL	**39.43**	**24.50**	**60.67**	**37.70**
WITH TOLLS				
Passenger Vehicles	18.59	11.55	29.92	18.59
Trucks	8.18	5.08	12.39	7.70
TOTAL	**26.77**	**16.63**	**42.31**	**26.29**

ECONOMIC FEASIBILITY

One of the primary objectives of Intelligent Transportation Systems (ITS) is to improve transportation efficiency through increased automation. The high speed Interstate-type option evaluated in this study is designed to increase travel efficiency through increased travel speeds, reducing the amount of time motorists spend in transit, and through improved highway safety. The economic feasibility analysis examines whether or not this type of high-speed Interstate-type facility is warranted in Corridor 18.

To determine feasibility, the same methodology used for the traditional Interstate-type highway was applied to the high-speed Interstate-type option. The costs of planning, designing, building, and maintaining the high-speed Interstate-type option were compared to the efficiency benefits to determine economic feasibility.

Economic Costs

The cost side of the benefit/cost evaluation comprises the costs of constructing, operating, and maintaining the high speed interstate option. The construction cost for this option is estimated at $8.738 billion, and the annual maintenance cost is estimated at $20,858 per km ($33,568 per mile).

Economic Efficiency Benefits

The total transportation efficiency benefits attributable to a high speed Interstate-type facility in Corridor 18 are presented in Exhibit 10-20. Through increased automation which enables higher travel speeds, this option is estimated to significantly reduce travel time throughout the Corridor 18 study area. By the year 2015, it is estimated that a high speed Interstate-type facility would create over $660 million in annual travel time savings, nearly double the estimated value of travel time for the conventional Interstate-type option.

Exhibit 10-20
TRANSPORTATION EFFICIENCY BENEFITS FOR THE HIGH-SPEED INTERSTATE-TYPE OPTION
($ Millions)

	YEAR 1992	YEAR 2015	30-YEAR TOTAL[a]
Value of Travel Time Savings			
Autos	$181.7	$430.5	$3,890.0
Trucks	150.6	233.7	2,330.9
TOTAL	$332.3	$664.2	$6,220.9
Vehicle Operating Cost Savings			
Autos	$(19.5)	$(46.0)	$(416.0)
Trucks	(55.3)	(117.0)	(1,082.2)
TOTAL	$(74.8)	$(163.0)	$(1,498.2)
Accident Reduction Savings	$288.9	$434.7	$4,372.8
TOTAL	$546.4	$935.9	$9,095.5

(a) Discounted at 7 percent.

SOURCE: Wilbur Smith Associates

The high speed Interstate-type option is estimated to slightly increase overall vehicle kilometers of travel throughout the Corridor 18 study area. The primary reason for the increase in travel is due to the increased number of motorists traveling further distances to access the automated and higher speed facility. However, the increase in vehicular travel along with the less fuel efficient higher travel speeds create a disbenefit for total vehicle operating costs as depicted in Exhibit 10-18.

The high speed Interstate-type option evaluated in this study would incorporate limited Advanced Vehicle Control System (AVCS) facilities. The AVCS would decrease vehicular conflicts thereby reducing accident potentials on Corridor 18. Exhibit 10-18 displays the value of reduced accident potentials attributable to this option.

Transportation Efficiency Feasibility

Exhibit 10-21 presents the economic feasibility results of the high-speed Interstate-type option. These indicators are interpreted as follows:

- An economically feasible project is one which has a positive Net Present Value (NPV), and Internal Rate of Return equal to or exceeding the discount rate (7 percent), and Discounted Benefit/Cost Ratio (B/C) of 1.0 or higher.

- The higher the NPV, IRR and B/C, the more feasible the project.

Exhibit 10-21
ECONOMIC FEASIBILITY INDICATORS
FOR HIGH-SPEED INTERSTATE-TYPE HIGHWAY

Net Present Value [a]	Internal Rate of Return	Discounted Benefit/Cost [a]
$145 million	7.1 percent	1.02

(a) Discounted at 7 percent.
SOURCE: Wilbur Smith Associates

The economic feasibility results for the high speed Interstate-type option indicate that this type of highway is feasible in Corridor 18. This option has a B/C ratio of 1.02, indicating that for every $1 of cost, $1.02 in transportation benefits are received. The Net Present Value is positive, revealing that the project will net approximately $145 million in transportation benefits. The Internal Rate of Return of over 7 percent also indicates that this project is economically feasible.

FINANCIAL FEASIBILITY

A financial analysis based upon toll financing was conducted for the High-Speed Interstate-type Highway alternative. Results are presented in Exhibit 10-22.

Exhibit 10-22
FINANCIAL ANALYSIS
HIGH-SPEED INTERSTATE-TYPE HIGHWAY ALTERNATIVE WITH TOLLS
($ in millions)

Year	Project[(1)] Costs	Operations &[(1)] Maintenance	Toll[(2)] Revenue	Public Funding Surplus/ (Requirement)
1996	575.02			(575.02)
1997	548.82			(548.82)
1998	489.54			(489.54)
1999	596.08	21.72	101.86	(515.94)
2000	590.35	21.51	115.86	(496.00)
2001	584.67	21.30	110.37	(495.60)
2002	760.83	51.70	226.49	(586.03)
2003	753.51	51.20	215.76	(588.95)
2004	746.27	50.71	205.54	(591.43)
2005	992.73	87.28	372.74	(707.28)
2006	983.19	86.45	355.08	(714.55)
2007	973.73	85.61	338.26	(721.08)
2008		125.34	425.68	300.34
2009		124.14	405.52	281.38
2010		122.94	447.84	324.90
2011		121.76	426.63	304.87
2012		120.59	406.43	285.83
2013		119.43	387.18	267.75
2014		118.28	368.84	250.56
2015		117.15	407.34	290.19
TOTAL	8,594.72	1,447.11	5,317.43	(4,724.41)

(1) Discounted at 7 percent.
(2) Toll Rates increased at the rate of inflation (3 percent), with increases effective every 5 years. Revenue streams are discounted at 7 percent.

Chapter 11
FINDINGS & CONCLUSIONS

Work reported herein addresses the evaluations of Corridor 18 which connects Indianapolis, Evansville, Memphis, Shreveport -Bossier City, and Houston. These studies show that a highway facility in this corridor is feasible and would have overall positive benefits for corridor residents, businesses and other institutions as well as a positive impact on the Nation's economy.

OVERALL ASSESSMENT

On an overall basis, information presented in the preceding report sections regarding the feasibility of a highway facility in Corridor 18 may be summarized as in Exhibit 11-1.

These analyses show that a Corridor 18 facility would serve important international, national and regional traffic flows; would provide benefits to such traffic in excess of facility costs; would have a variety of beneficial economic development impacts within the corridor area (including increased jobs, wages, and value added); would save lives and reduce accident costs; and would improve access and deployment capabilities for important intermodal facilities and military installations.

The study also found that the major challenge will be finding funds with which to build and maintain the facility.

ENGINEERING FEASIBILITY

Study processes resulted in the identification of some 93 study segments which, in various combinations, could serve the entire length of the study corridor. All of the 93 segments are feasible in terms of their constructability. While some segments present bigger challenges than do others, none of them involve obstacles which are insurmountable.

Capital costs for a Conventional Interstate-type Highway would approximate $5.5 billion. This cost will be influenced by final location decisions and the extent to which existing facilities are used. However, there are trade-offs between the use of existing facilities and the length of Corridor 18 which results from their use.

Exhibit 11-1 **OVERALL FEASIBILITY ASSESSMENT** **Conventional Interstate-type Highway**	
CRITERIA	**FINDINGS**
Engineering Feasibility	■ No insurmountable obstacles are foreseen. ■ Capital Cost = $5.5 billion
Need	■ Would serve significant traffic volumes on most segments. ■ Would enhance freight transportation, including international, national and regional trade.
Economic Efficiency	■ Would provide $1.39 cents in travel benefits for every $1.00 in cost. ■ National productivity would be increased by the project's $2.2 billion Net Present Value.
Economic Development Impacts	■ Would help development in economically-depressed areas. ■ Would have positive benefits for the Corridor in terms of job creation, wages and value added. ■ Would support the Initiatives of the Lower Mississippi Delta Development Commission. ■ Would have a positive effect on the Rural Empowerment Zones and Enterprise Communities located in the area.
Financial Viability	■ All states in the Corridor have constrained budgets. ■ Special funding arrangements most likely would be required.
Environmental Impacts	■ Significant environmental challenges, especially wetlands. ■ Dependent upon final location decisions, no insurmountable obstacles are foreseen.
Safety Impacts	■ Safety will be enhanced by an upgraded highway facility. ■ Over 30 years, safety benefits would be: ➤ 1,300 lives saved ➤ 57,000 injuries avoided ➤ 80,000 property damage only accidents avoided
Intermodal Facilities and Military Installations	■ Improved access could be provided to several important intermodal facilities and military installations.

NEED

A Corridor 18 facility is forecast to carry significant travel volumes on many segments in the year 2015. The higher volume segments are forecast to have daily traffic volumes in the range of 37,000 total vehicles. Depending upon final location decisions, heaviest traffic volumes are forecast for the segments between Shreveport and Houston and between Indianapolis and Evansville.

By the year 2015 daily travel demand on Corridor 18 is estimated at 38 million vehicle-km (23 million vehicle-miles). A significant amount of this total traffic is forecast to be commercial vehicles. Trucks are projected to account for 26 percent of travel on the facility.

ECONOMIC EFFICIENCY

A public investment in Corridor 18 is "economically feasible" if the Nation's economy is better off with it than without it. For purposes of determining whether Corridor 18 is feasible from an economic efficiency perspective, transportation cost savings are viewed as benefits. That is, when the benefits to travelers and freight from time savings, greater safety and/or reduced vehicle operating costs exceed the cost of providing a Corridor 18 facility, it is deemed to be economically feasible.

Economic Efficiency - Conventional Interstate-type Highway

- 1.39 Benefit/Cost Ratio
- $2.2 billion Net Present Value
- 9.9 percent Internal Rate of Return

Study analyses indicate that the ratio of benefits to cost for the entire Corridor is 1.39. That is, for every dollar spent on it, Corridor 18 will produce $1.39 in user benefits.

These analyses show that the National economy will be better off by $2.207 billion if a Corridor 18 facility is built.

The project has an Internal Rate of Return of 9.9 percent, well in excess of the constant dollar discount rate of 7.0 percent recommended by the U.S. Office of Management and Budget (OMB) as a minimum value.

ECONOMIC DEVELOPMENT IMPACTS

Currently, much of the study area encompassed by Corridor 18 has below average per capita incomes. Indeed, certain areas rank as some of the most economically-depressed areas in the entire country.

A Corridor 18 facility would have significant positive effects on the economy of the study area. In aggregate, it is estimated that provision of such a facility would have the following results:

Economic Development Impacts – Conventional Interstate-type Highway

- Create 27,000 jobs (in 2025)
- Result in $11 billion in additional wages (1995-2025)
- Produce $19 billion in value added (1995-2025)

The Lower Mississippi Delta Development Commission studied and made recommendations regarding the economic needs, problems and opportunities of the Lower Mississippi Delta region. Currently, the transportation component of the Delta Initiatives Report is being updated. It is clear that a Corridor 18 facility would support the development initiatives that were promoted by this Commission.

The U.S. Department of Agriculture has underway a program which *"... confers upon rural distressed American communities the opportunity to take effective action to create jobs and opportunities."* One of the three designated Empowerment Zones is located in the study area of Corridor 18. Additionally, six of the Enterprise Communities designated to participate in this program are within the study area. Provision of a Corridor 18 facility should be a benefit to the achievement of the purposes of this program.

FINANCIAL VIABILITY

Financing a project with a capital cost of $5.5 billion constitutes a major challenge.

An important potential source of revenue for such purposes could be the application of tolls along the facility. Subject to further analyses, tolls could produce sufficient revenues to cover about one-third of the project costs. Although tolls could be the largest source of project-generated revenues, additional potential sources include joint use of right-of-way (e.g., fiber optic lines), telephone commissions (from telephone coinboxes) and advertising (e.g., billboards). There also are the possibilities of reducing the public share of project costs through right-of-way donations.

Study analyses suggest that the public funding requirement for Corridor 18 will be substantial. If these requirements are to be met by existing revenue sources, then Corridor 18 will have to compete with other funding needs of the corridor states, including preservation of existing infrastructure and other committed capital projects.

Special funding for Corridor 18 could be most instrumental in the implementation of the project. This could include both state and National initiatives.

ENVIRONMENTAL IMPACTS

The Corridor 18 study area includes some of the most extensive river systems and wetlands in the country. In addition, there are some threatened and endangered species within the corridor which potentially could be affected if a new facility is provided. Decisions regarding the final location of the facility must take these matters into consideration as well as the presence of National and state parks, forests and other wildlife and recreational areas and preserves. Also, there are some air quality non-attainment areas within the corridor which require special consideration.

Study analyses suggest that the 93 study segments provide ample opportunities to minimize the adverse impacts a Corridor 18 facility would entail. Indeed, within these segments, there is sufficient flexibility regarding final location that the vast majority of small environmentally sensitive areas can be avoided. Where this is not possible, there are opportunities for mitigation, the costs for which are included in the project costs reported herein.

SAFETY IMPACTS

A Corridor 18 facility will result in slightly more vehicle travel with its concomitant greater exposure to accidents. However, this additional travel, plus substantial volumes of traffic diverted from other facilities, will occur on an Interstate-type highway. Such highways have much better safety records than do facilities which do not have the special safety features of Interstate-type facilities. As a consequence, a Corridor 18 facility will result in a reduction in the number of accidents, injuries and fatalities that otherwise would occur.

INTERMODAL FACILITIES

Passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) has given increased emphasis to development of an efficient, seamless transportation system that utilizes the several transportation modes to do the things which they do best. One of the most important elements in creating a seamless transportation system is the provision of good access to major intermodal facilities.

Both large and small intermodal facilities are found throughout Corridor 18. Depending upon the location eventually selected for a Corridor 18 highway, many of these intermodal facilities will most likely enjoy a very significant improvement in their access to the regional, national and international transportation system. For instance, there are a number of railroad freight intermodal facilities which could benefit from a Corridor 18 facility, including those in Indianapolis, Evansville, Memphis and Houston. A Corridor 18 facility also could provide improved access to Amtrak's City of New Orleans passenger services. Certain waterports also could be served by a Corridor 18 highway, the largest of which are at Memphis and Houston (and other Texas ports served by Corridor 20 or other connecting facilities). Within Corridor 18 there are 11 airports with at least 50,000 passengers which could have improved intermodal connections if this facility is built. Improved highway access to the Memphis airport (and its Federal Express hub) also could have significant beneficial impacts upon air freight.

MILITARY INSTALLATIONS

The mobility of the armed services is critical to the Nation's defense. For example, a major emphasis of the Interstate Highway System was the value it had to the movement of defense personnel, equipment and supplies, as evidenced by its official designation as the Dwight D. Eisenhower System of Interstate and Defense Highways.

A Corridor 18 facility has the potential of serving a number of military locations, depending on the route location ultimately selected. This potential could include Crane Naval Surface Warfare Center in Indiana, Fort Campbell in Kentucky, Milan Arsenal and Memphis Defense Depot in Tennessee, and Fort Polk and Barksdale Air Force Base in Louisiana.

TRUCKWAY CONCEPT

The basic analyses reported in the preceding sections of this chapter address the Interstate-type highway concept.

Because of the high potential of Corridor 18 being a major NAFTA route, analyses also were conducted to determine the effects if a truckway concept was implemented. While the

Economic Efficiency - Truckway Concept

- 1.64 to 2.42 Benefit/Cost Ratio
- $4.0 to $9.0 billion Net Present Value
- 11.6 to 16.5 percent Internal Rate of Return

concept is primarily aimed at facilitating long-distance freight movements, it also would serve shorter trips of a regional or local nature.

Longer combination vehicle (LCVs) are viewed by freight carriers to be important enhancements to their productivity and efficiency. Although LCV operating costs are about 15 percent higher than conventional semi-trailer trucks, the ton-km cost savings can range from 20 to 50 percent.

The benefits to truck operators comes at the expense of higher capital and maintenance costs for highway infrastructure. Initial construction costs for a truckway concept in Corridor 18 are estimated to be:

- $6.2 billion
- Compared to $5.5 billion for a conventional Interstate-type highway, an increase of 12 percent.

Analysis of the relationship between benefits and costs reveal that, compared to the conventional Interstate-type highway, the benefits to trucks exceed the additional costs required to accommodate them.

HIGH SPEED INTERSTATE-TYPE HIGHWAY CONCEPT

Major advances are being made regarding Intelligent Transportation Systems (ITS). Many of these are focused upon improved highway safety. It is quite likely that the resulting safety improvements could be so significant that an increase in vehicle speed limits is justified.

Economic Efficiency - High Speed Interstate-type Highway Concept

- 1.02 Benefit/Cost Ratio
- $145 million Net Present Value
- 7.1 percent Internal Rate of Return

Currently, research regarding the Automated Highway System (AHS) is not sufficiently advanced to permit full determination of all aspects of the system. With regard to these feasibility analyses, one of the most important unreconciled issues is the number of lanes required for different levels of system automation. Therefore, the study has had to make certain assumptions which subsequently may prove to be in need of modification. For study purposes, it was assumed that to achieve a system which permits speed limits of 130 km/h (80 mph), a minimum of three lanes in each direction would be required.

Based upon this assumption, initial construction costs for a high speed Interstate-type highway concept in Corridor 18 are estimated to be:

- $8.74 billion.
- Compared to $5.5 billion for a conventional Interstate-type highway, an increase of 59 percent.

CONCLUSIONS

Much of this study has focused upon the development of information to guide decision makers regarding the feasibility of a highway facility extending between Indianapolis/Evansville/ Memphis/Shreveport-Bossier City/Houston. That is, the study has addressed the question: ***Does the project make sense and should it be built?***

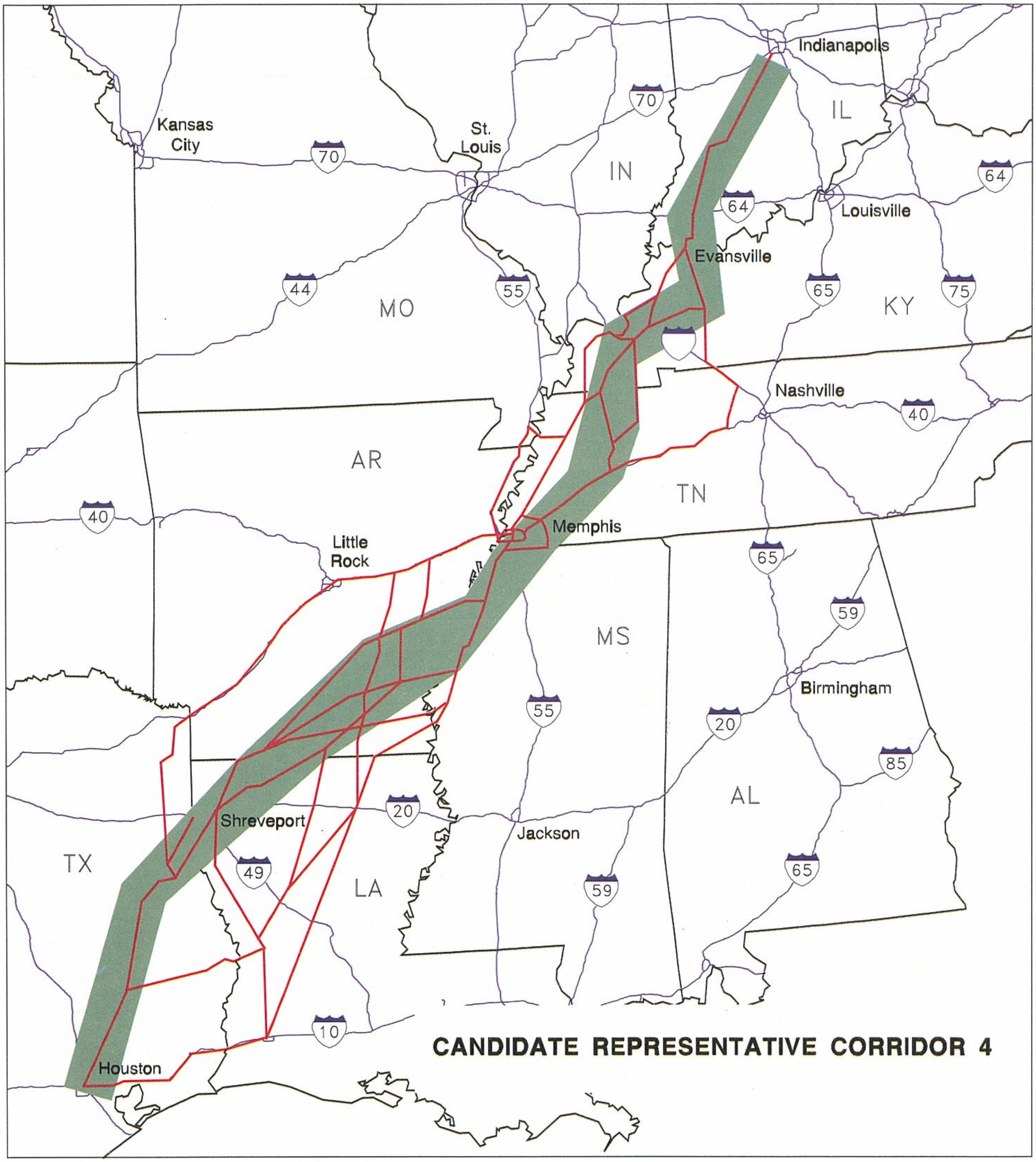
The analyses indicate that the project is feasible and that, on balance, the Nation and the corridor would be better off with it. This conclusion is based upon the following:

FEASIBILITY OF CORRIDOR 18

- There are no insurmountable engineering (constructability) obstacles.
- It would serve significant freight and person travel.
- It would provide travel benefits significantly in excess of costs.
- It would promote economic development in a region that is in need of an economic boost.
- Environmental impacts are not insurmountable.
- Safety would be improved.
- It would serve important intermodal facilities and military installations.

These findings indicate that Corridor 18 should be built. The remaining question is can it be built. The capital costs of this facility are such that it clearly exceeds the capability of funding from existing sources. Most states are severely challenged to maintain and preserve existing systems, plus take on a few construction projects each year. With only existing funding sources, a "macro project" of this magnitude would require diversion of funds from other critical needs, a course that is highly questionable and likely to be impractical.

Even though Corridor 18 is economically feasible, if additional funding cannot be found, it cannot be built. A major effort is needed to develop a special funding program for this major transportation corridor.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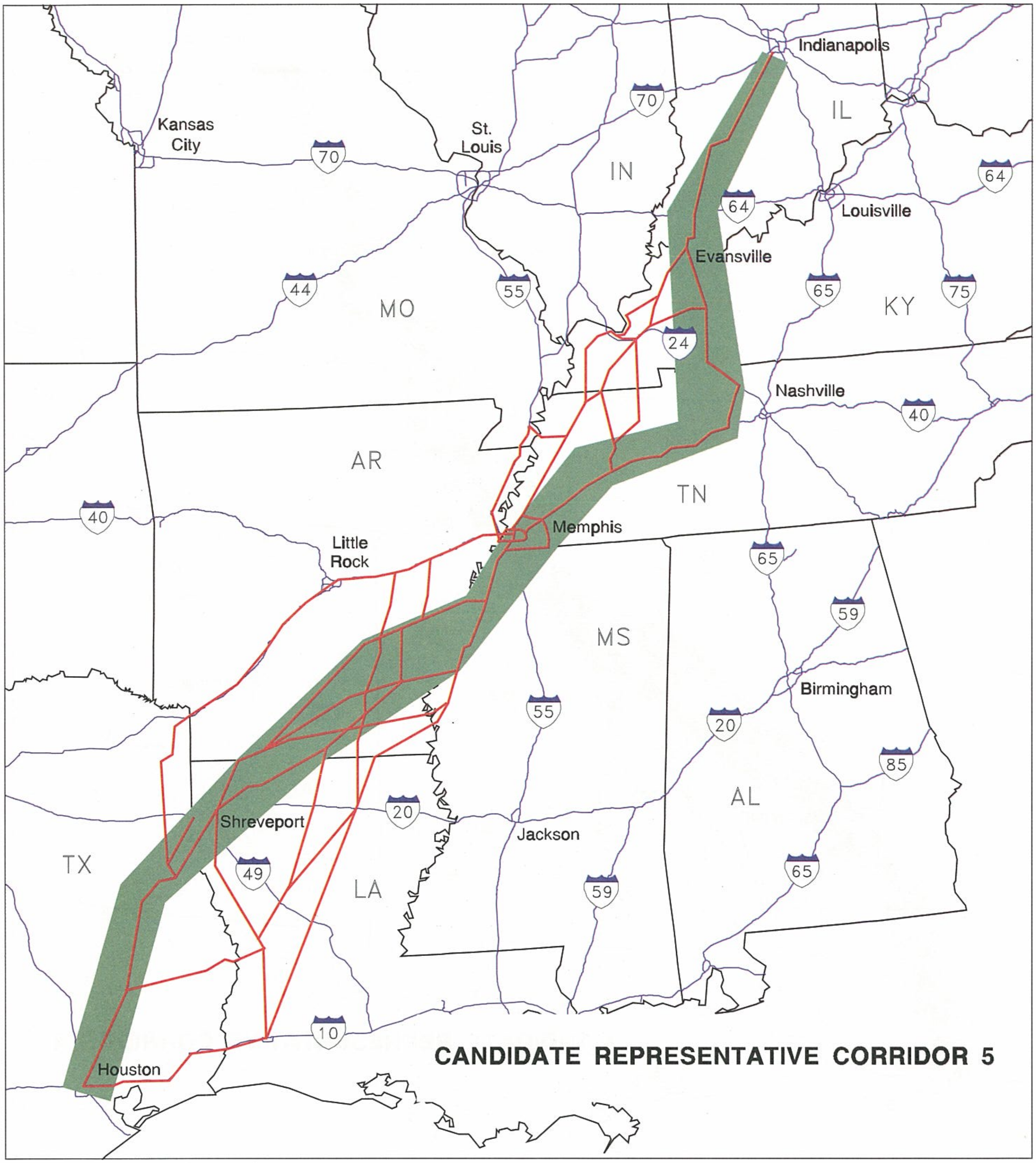
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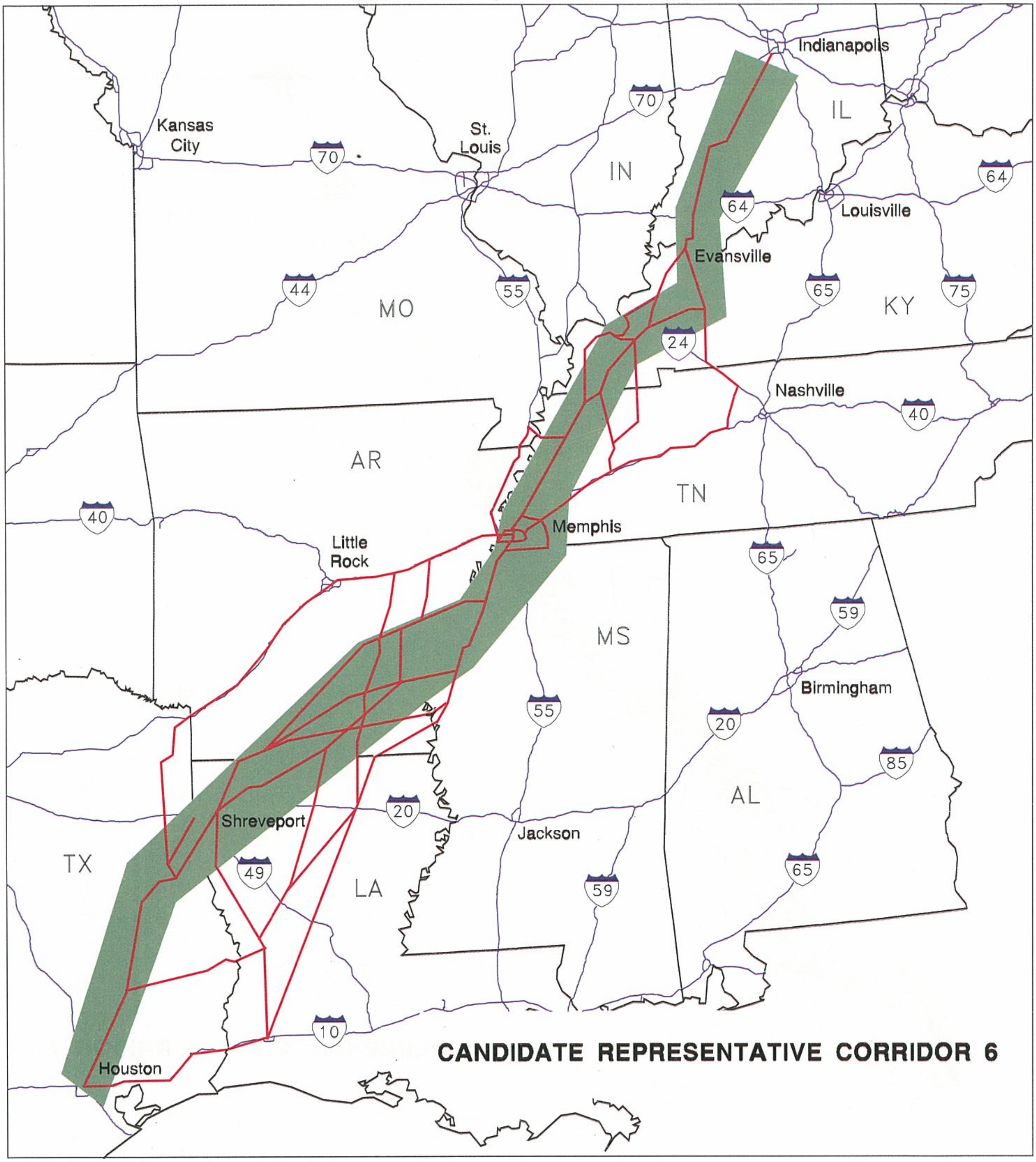

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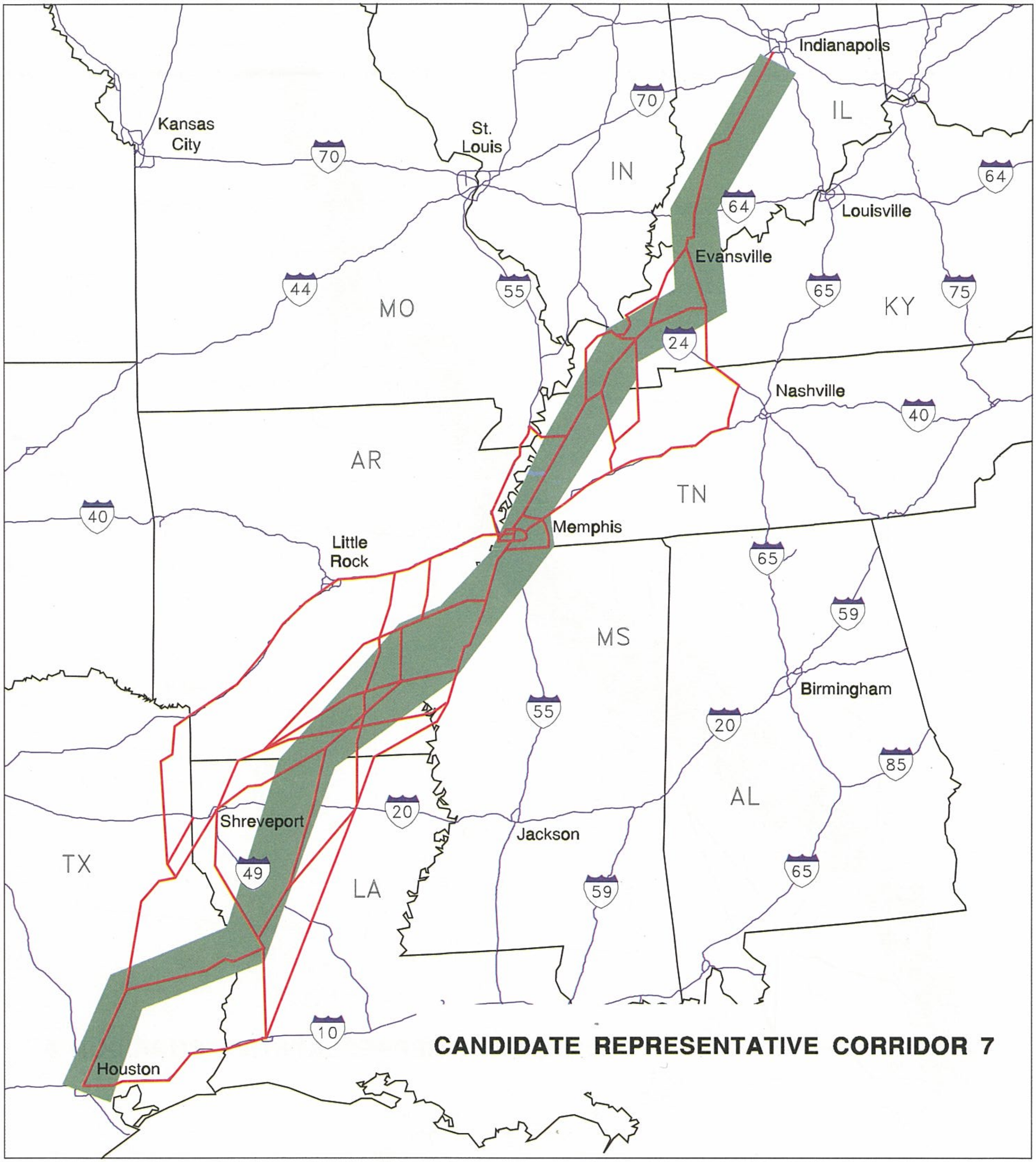
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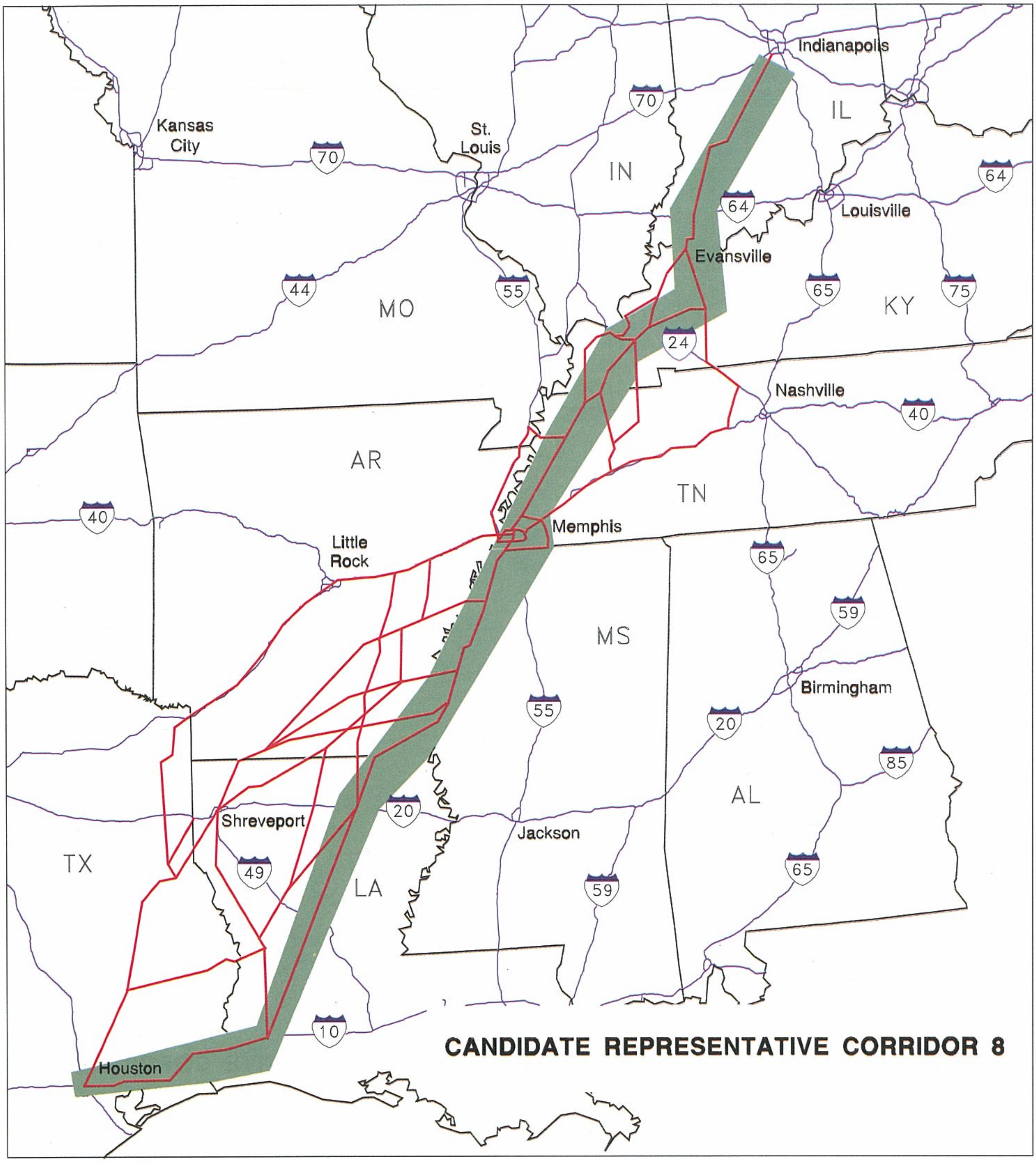
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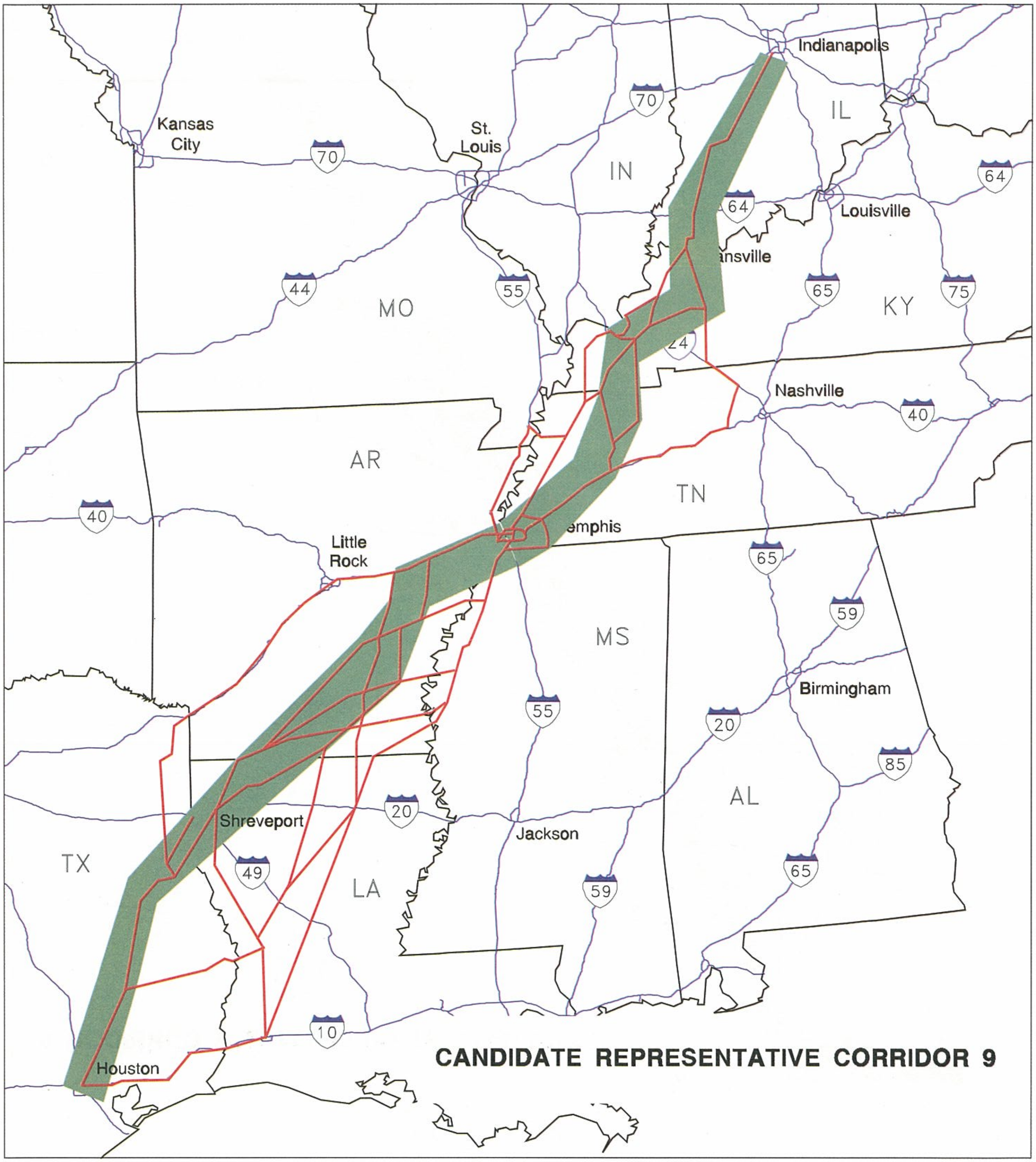
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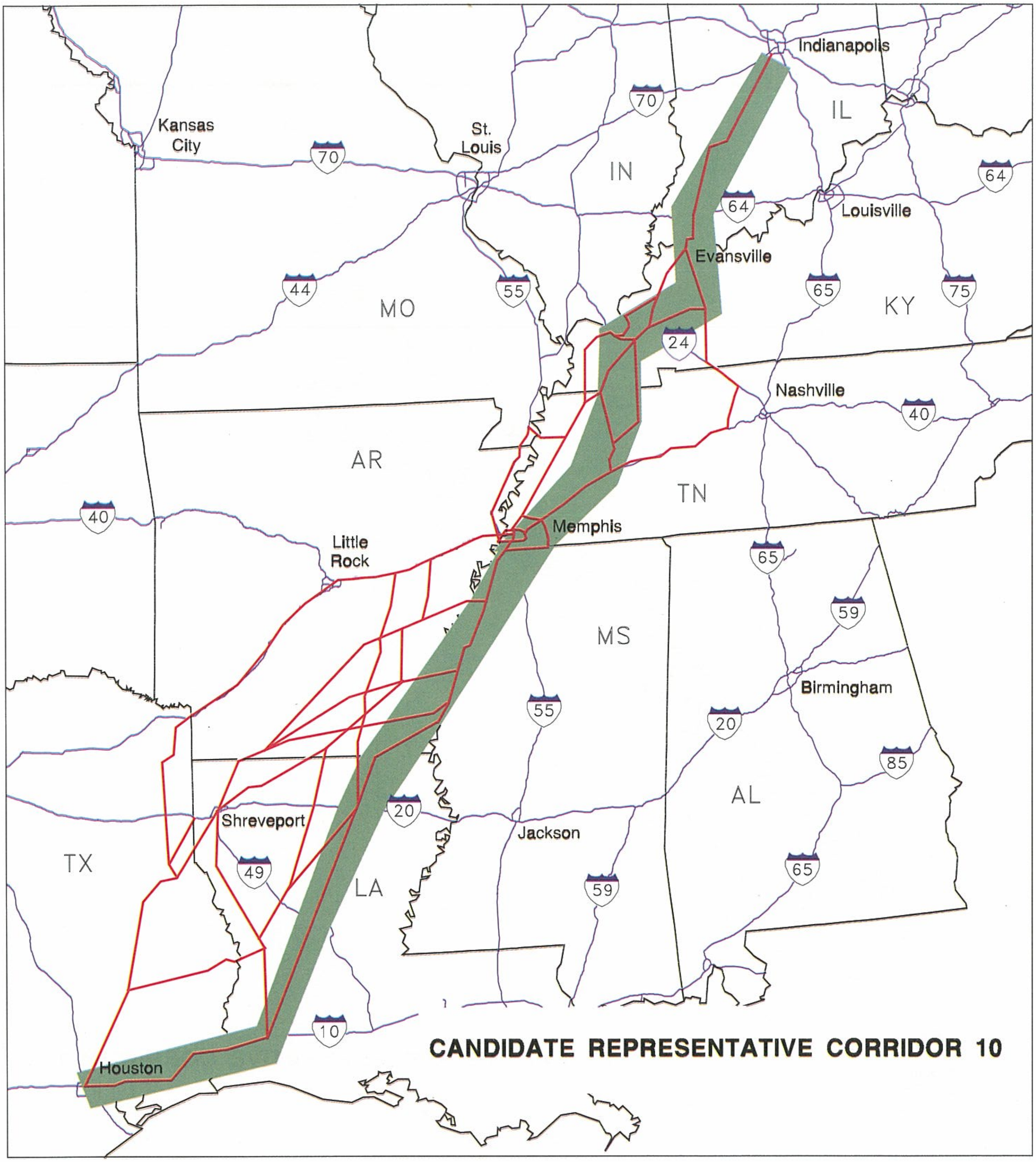

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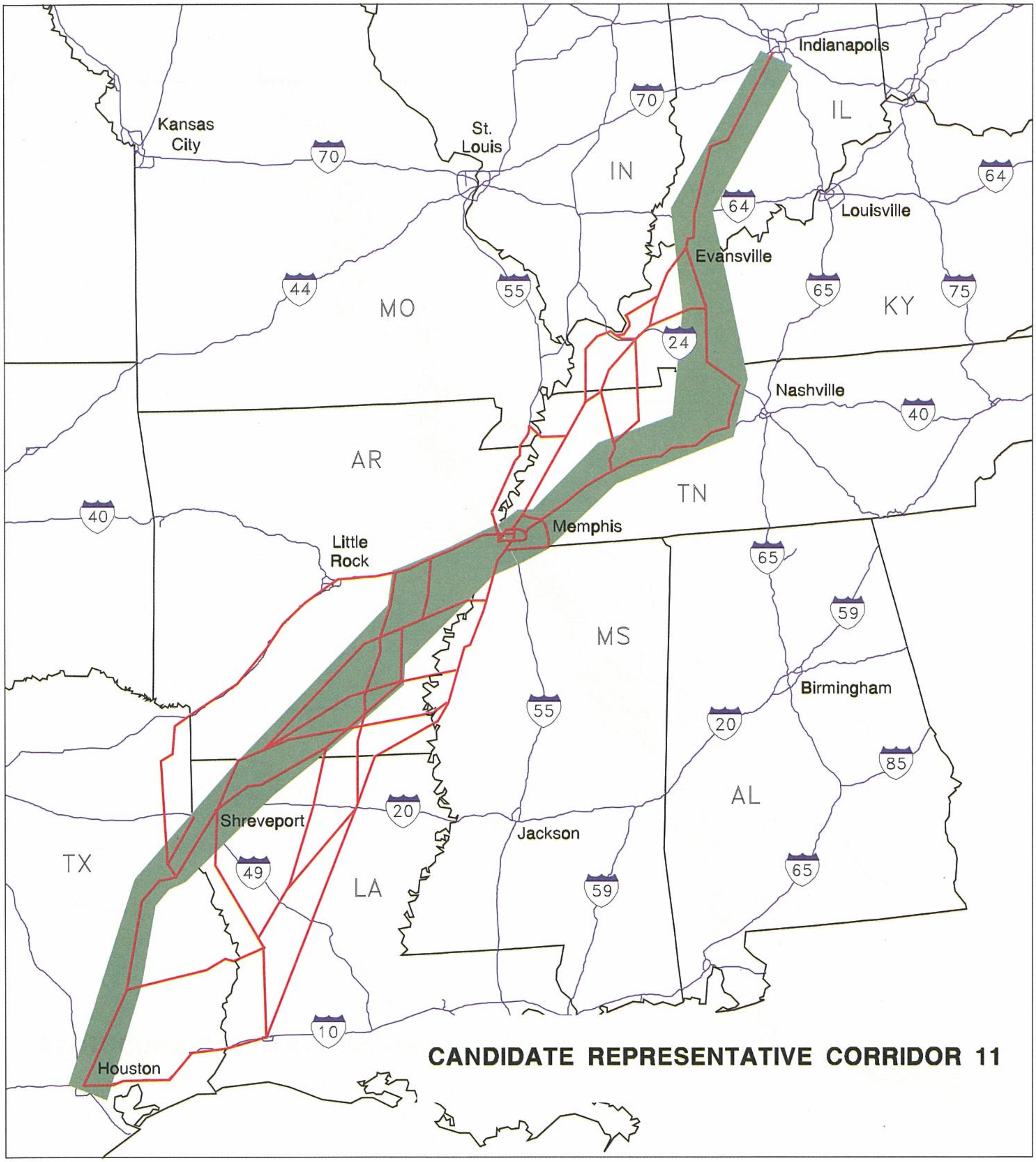
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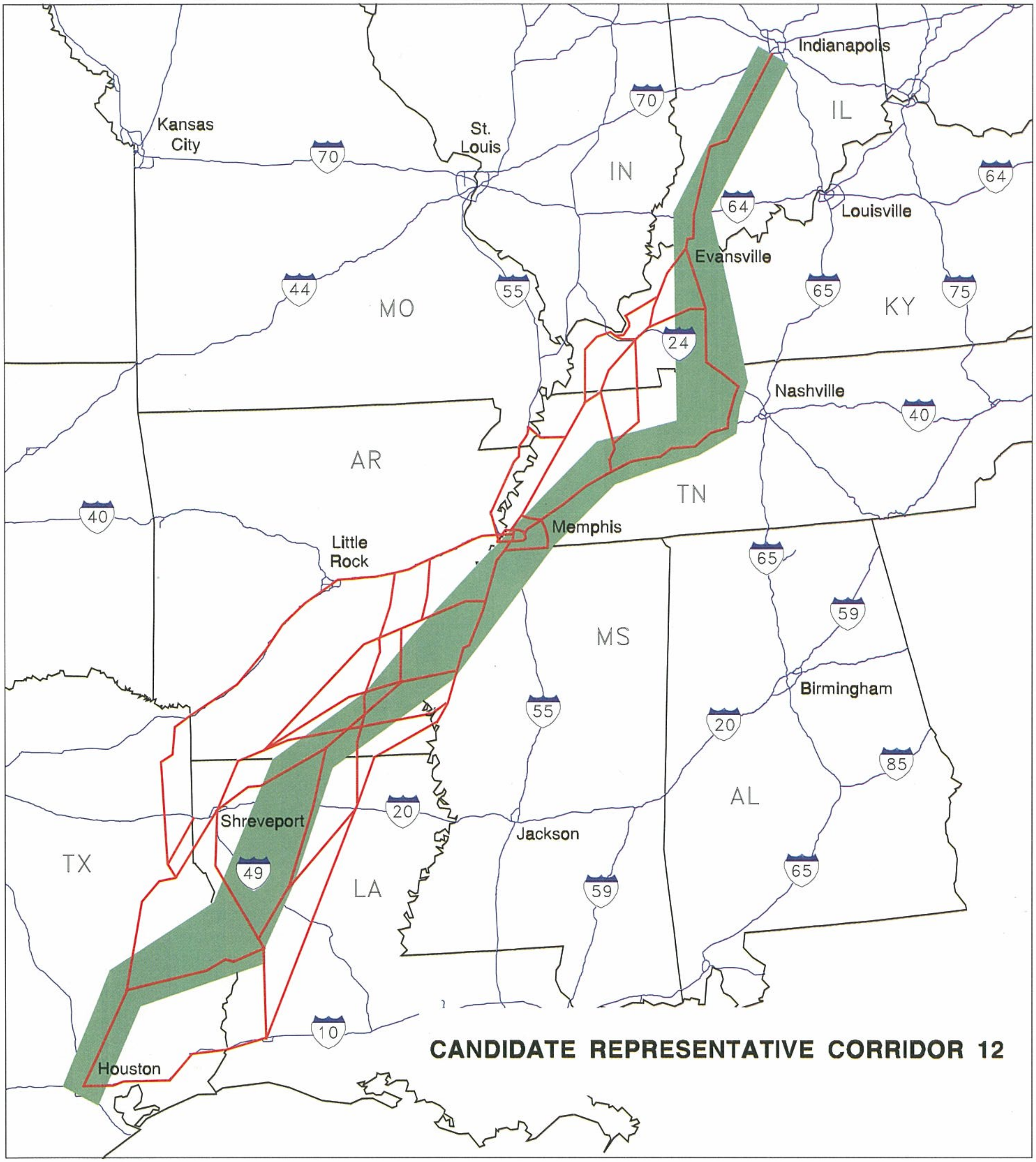

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