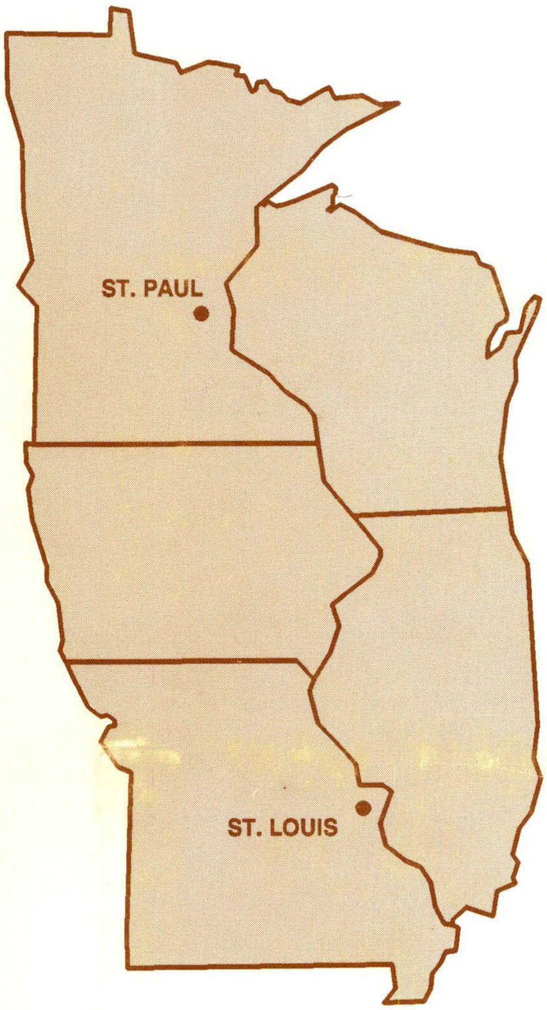
ST LOUIS TO ST PAUL CORRIDOR FEASIBILITY AND NECESSITY STUDY



CONSULTANT'S
REPORT
TO THE
STATES

by

WILBUR SMITH ASSOCIATES

March 1990

STUDY TEAM

St. Louis to St. Paul Corridor Feasibility and Necessity Study

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ST LOUIS TO ST PAUL CORRIDOR FEASIBILITY AND NECESSITY STUDY

CONSULTANT'S REPORT TO THE STATES

by

WILBUR SMITH ASSOCIATES

March 1990

WILBUR
SMITH
ASSOCIATES

ENGINEERS • ARCHITECTS • ECONOMISTS • PLANNERS

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March 13, 1990

TO: Mr. Thomas Welch - Iowa DOT
Mr. Dan Dees - Illinois DOT
Mr. George Gundersen - Wisconsin DOT
Mr. Don Hiatte - Missouri H&TD
Mr. Merritt Linzie - Minnesota DOT
Mr. Ed Finn - FHWA Ames
Mr. Ron Rogers - FHWA Kansas City
Mr. Dane Ismart - FHWA Washington, D.C.

SUBJECT: **ST. LOUIS - ST. PAUL CORRIDOR FEASIBILITY AND NECESSITY STUDY FINAL REPORT**

Gentlemen:

Wilbur Smith Associates is pleased to submit our final report which details the methodologies used in our assessment of the highway corridor between St. Louis and St. Paul and documents how the four most promising routes were selected. As requested, we have not made any recommendations for one specific route, but have provided the data whereby that decision can be made.

The study analyzes the need for a four-lane highway between St. Louis and St. Paul, and finds it to be needed; it analyzes the highway's feasibility, and finds it to be feasible; it analyzes alternative design standards and suggests that it be built to expressway standards; and, the study evaluates alternative routes and presents four "finalist" routes for your consideration.

We sincerely appreciate having been afforded the opportunity to assist the five states and the Federal Highway Administration, and trust that the corridor analyses will prove to be useful and of benefit to the corridor's residents.

Respectfully submitted,

WILBUR SMITH ASSOCIATES

Robert J. Zuelsdorf
Senior Vice President

RJZ:dsh

ST. LOUIS TO ST. PAUL CORRIDOR FEASIBILITY AND NECESSITY STUDY

Recognizing that the corridor area between St. Louis and St. Paul does not have the type of north-south highway that connects most of the nation's urban centers, the U.S. Congress included funds in the 1989 Appropriations Act for "a study to be conducted in cooperation with the States of Iowa, Missouri and Minnesota on the feasibility and necessity of constructing a four-lane highway from St. Louis, Missouri to St. Paul, Minnesota."

THREE STUDY REPORTS

To respond to this Congressional request, three interrelated reports have been, or will be, prepared.

1. **Consultant's Report to the States** - Includes an evaluation of the corridor, the alternative routes, and their feasibility. Does not contain conclusions or recommendations.

2. **States' Report to FHWA** - Based on the "Consultant's Report," a report to the federal government outlining the states' recommendations.

3. **FHWA Report to Congress** - The Federal Highway Administration's report to Congress, stating the study conclusions.

This brief material summarizes the Consultants' Report.

STUDY ISSUES

The Consultant's Study did its best to answer a series of questions which would be useful in the decision process. Three key issues were evaluated:

1. **Need and Feasibility** - Is a continuous four-lane highway between St. Louis and St. Paul needed? Is it feasible in terms of travel efficiency? economic development? engineering design? environmental implications? other implications?

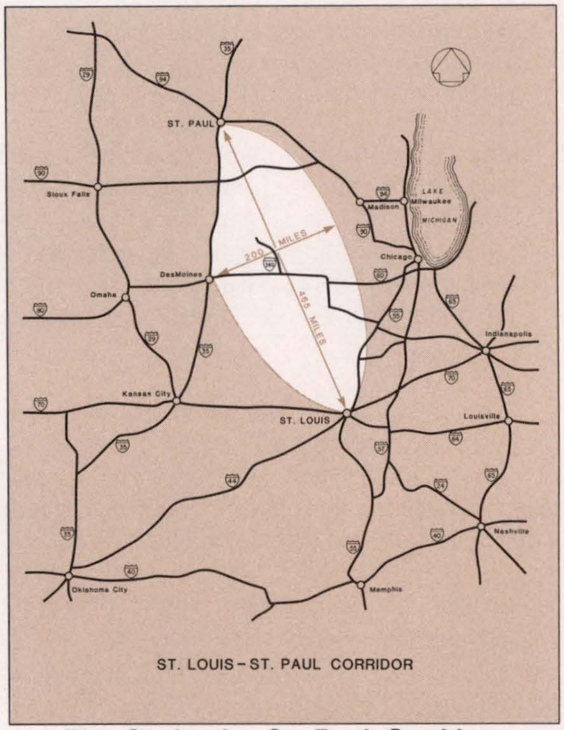
2. **Route Options** - What route options exist? Which are most feasible? Which routes cost the least? Which generate the greatest benefit? Which are needed the most?

3. **Design Standard** - Should a continuous four-lane highway be built all the way from St. Louis to St. Paul, or should portions be built? Should it be at "expressway" standards, or "freeway" standards?

THE CORRIDOR

This corridor of 8.4 million people has reasonably good east-west four-lane highways but poor north-south arteries. The states have been trying to improve the roads, have programmed some improvements, but do not have sufficient funds to resolve all the corridor's transportation issues.

The study area is framed by a series of interstate routes. The southern boundary is defined by I-70, which runs between St. Louis and Kansas City. The western edge is bounded by I-35, which connects Kansas City with Des Moines and the Twin Cities. The eastern boundary is a combination of interstate routes connecting St. Louis and St. Paul via Springfield, Bloomington, Rockford, and Madison.



The St. Louis - St. Paul Corridor

EVALUATION OF 36 ROUTES

The most cost-effective way to develop a four-lane highway between the two end points is to widen existing two-lane highways to four-lane, where possible. Every existing State highway in the corridor that could possibly serve as a potential route was considered. Initial investigations by the states and the Consultant identified 36 possible combinations of existing highways that might be used. Those route combinations are identified as "Routes Considered" on the opposite page.

ROUTE EVALUATION CRITERIA

Each route option was subjected to a series of evaluations which allowed the route options to be compared, each with the others. The evaluations used the following evaluation criteria:

- Travel Efficiency
  - Existing and future traffic volumes
  - Vehicle time, cost, accident savings
- Engineering Factors
  - Ease of construction
  - Capital cost
- Economic Development
  - Economic development prospects
  - Job creation
- Impacts and Implications
  - Environmental impacts
  - Other mode implications
  - Agriculture impacts

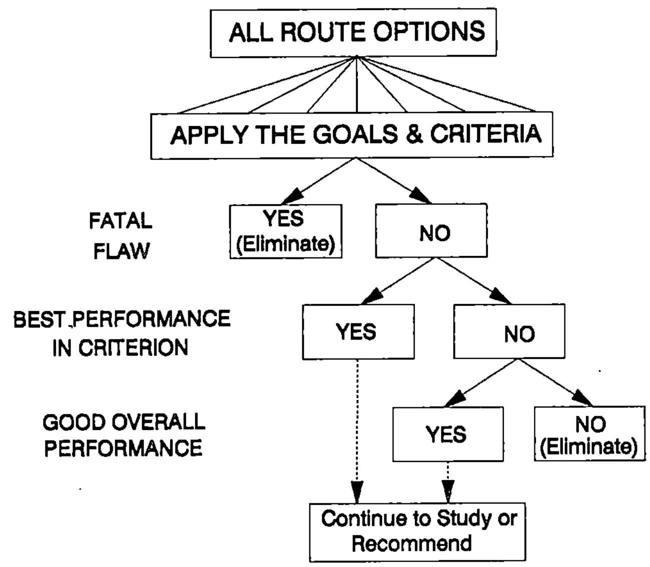
An important goal of the "Consultant's Report to the States" was to analyze possible routes between St. Louis and St. Paul, and to identify those routes that are most feasible. To accomplish this, a "Route Screening Process" was used which treated all route options as equals, and which evaluated each.

The route analyses considered all reasonable highway route options between St. Louis and St. Paul and, based on increasingly detailed evaluation, reduced the number of options to those few that were found to be most promising.

At each level of the analysis, route options that were eliminated, were eliminated for specific reasons, and with state and FHWA review and concurrence.

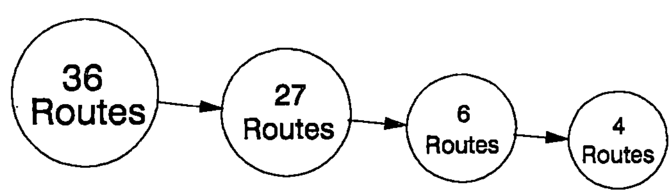
FORMAL EVALUATION PROCESS

To ensure equitable treatment of all routes, a set of "decision rules" was used. When a route was found to have a "fatal flaw," or when it was found to not meet the highway's objectives, or when it simply was not as good as another alternative, it was eliminated from further consideration. The following "decision tree" was used.

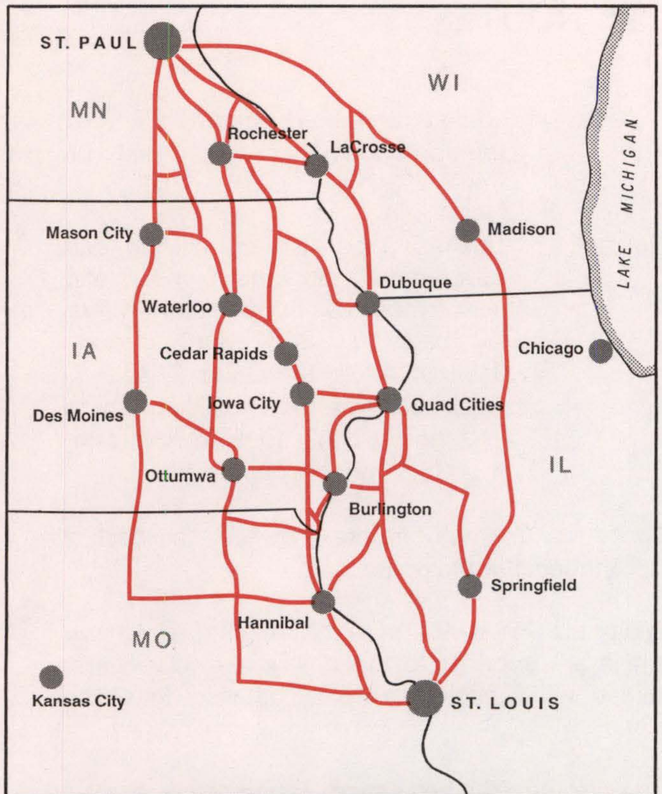


ROUTE SCREENING PROCESS

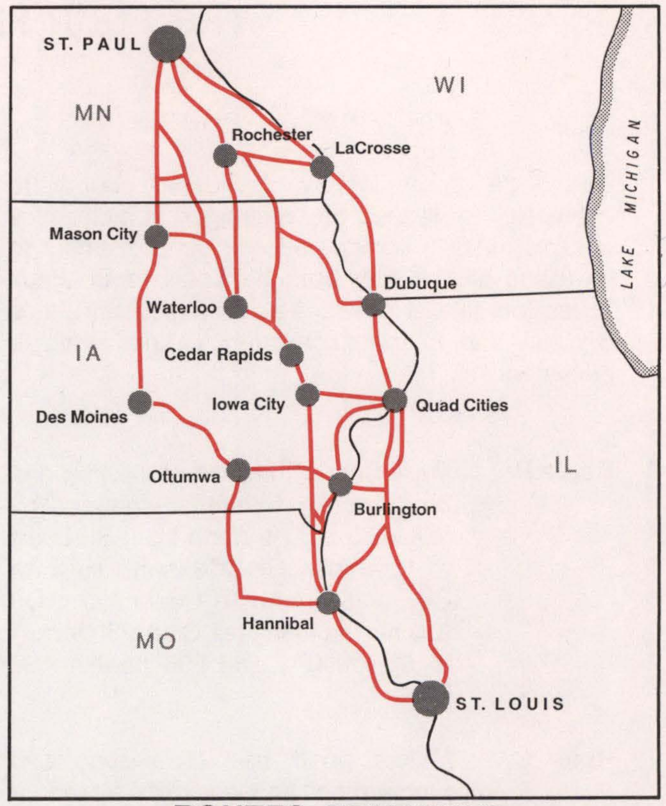
The route evaluation criteria were initially applied in a general sense. Based on that, nine routes were eliminated. Then the evaluations were done based on more detailed analysis, and 21 routes were eliminated. The final route screening was done using "incremental benefit/cost analysis," which reduced the number of route options to four.



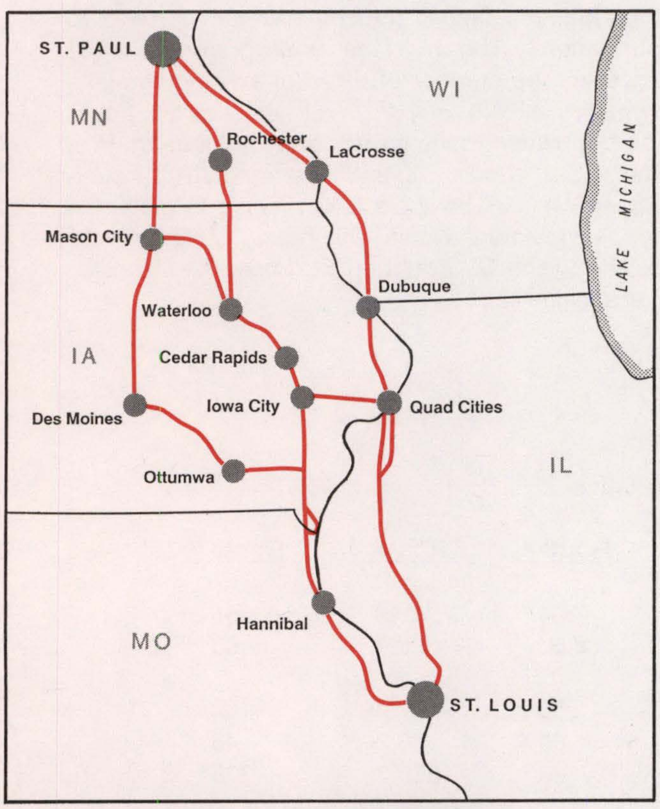
Number of Routes Analyzed



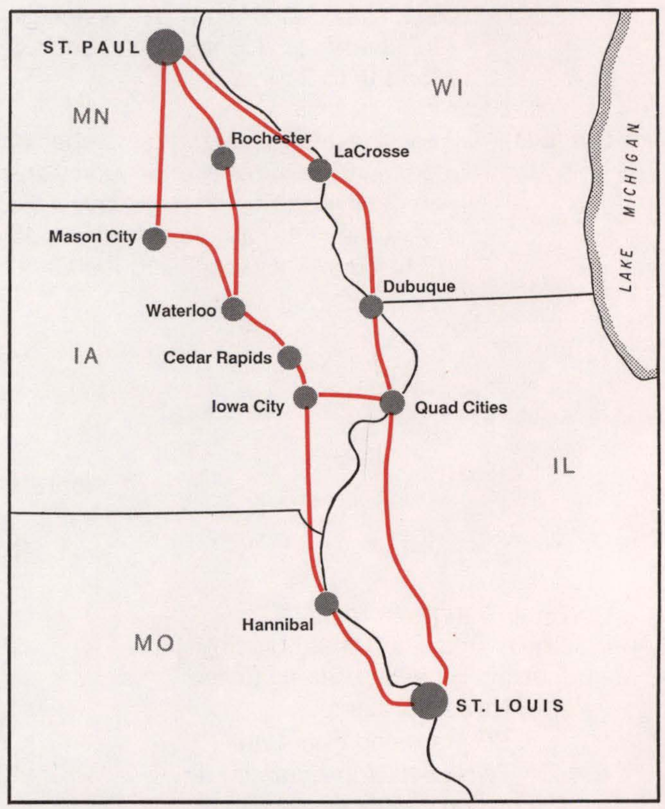
ROUTES CONSIDERED



ROUTES REMAINING AFTER PRELIMINARY SCREENING



ROUTES REMAINING AFTER SECONDARY SCREENING



FINALIST ROUTES

ROUTE SCREENING RESULTS

THE FOUR FINALIST ROUTES

FOUR "FINALIST" ROUTES

Of the 36 routes initially considered, four were ultimately identified as offering characteristics suitable for final consideration for improvement to four lane all the way from St. Louis to St. Paul. These four finalist routes are designated as Routes B, C, D and E and each offers certain strategic advantages:

Route B: Makes maximum use of existing and programmed four-lane highways by following US 61 north from St. Luois to Hannibal; US 218 north to Iowa City; I-380 north to Cedar Falls; US 218 north to Charles City; US 18 west to Mason City and I-35 north to St. Paul.

Route C: Makes good use of existing and programmed four-lane highways and is the most direct route. The route would follow US 61 north from St. Louis to Hannibal; US 218 north to Iowa City; I-380 north to Waterloo; US 63 north to Rochester and and US 52 north to St. Paul.

Route D: Would serve the greatest number of communities currently unserved by any four-lane north-south highways. To do so, the route would go north on US 67 through Jacksonville to the Quad Cities, and then north on US 61 through Dubuque and LaCrosse to St. Paul.

Route E: Makes good use of existing and programmed four-lane highways and serves most major population centers, by following US 67 north through Jacksonville to the Quad Cities; I-80 west to Iowa City; I-380 north to Waterloo; US 63 north to Rochester and US 52 north to St. Paul.

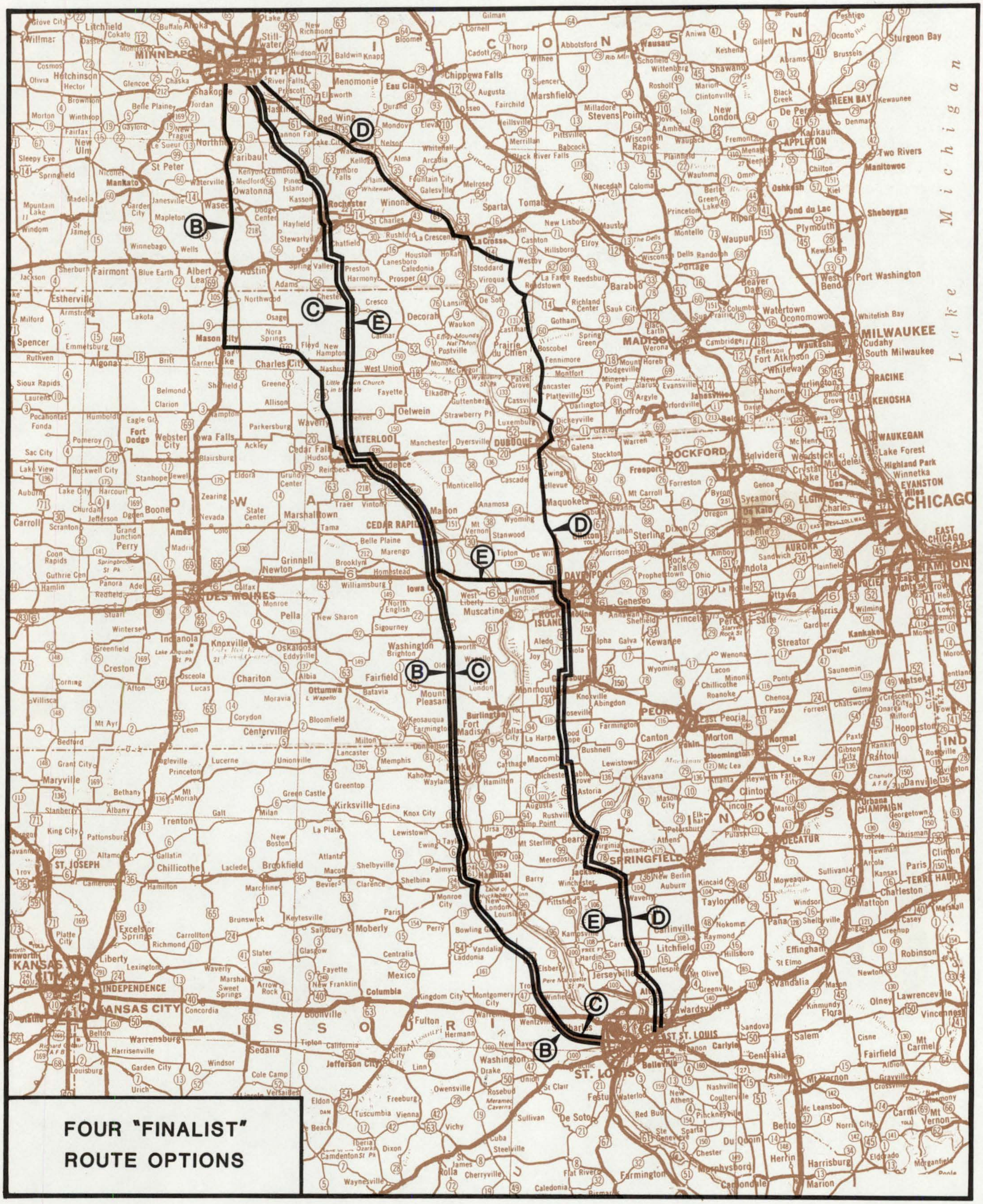
These four routes therefore represent the best of the "strategic" route options.

While the initial 36 routes were studied to see which are superior to the others, the four finalist routes were subjected to a detailed feasibility test.

The "Route Characteristics" table below depicts relevant data for each route. The route length is the distance between the circumferential freeways circling St. Louis and St. Paul. The trip time is the estimated time if the route were improved to four lanes. The two-lane unprogrammed miles represent the number of miles of existing two-lane highways all the way from St. Paul to St. Louis. The population in the impact area includes St. Paul and St. Louis plus intermediate county populations. The population served totals are people residing within 25 miles of the route, excluding the St. Paul and St. Louis "Metropolitan Statistical Areas."

Route Characteristics

	Route B	Route C	Route D	Route E
Route Length (miles)	532	504	549	556
End to End Trip Time (hrs:min)	9:09	8:59	9:57	9:53
Existing Highways Status (miles):				
Now Four-Lane	330	258	124	183
Programmed Four-Lane	65.6	60	66.7	48
Two-Lane Unprogrammed	136.4	186	358.3	325
Population (millions):				
In Impact Area	5.9	6.1	6.2	6.4
Served by Route	1.2	1.2	1.3	1.5



FOUR "FINALIST" ROUTE OPTIONS

FOUR LANE HIGHWAY FEASIBILITY EVALUATION

The initial concept evaluated in the study was the feasibility of widening one existing route to a four-lane highway, designed to "expressway standards." This standard implies a legal speed of 55 mph (except where already posted at 65 mph), and without traffic controls. Later in the analysis the concept of a "freeway standard", with a legal speed of 65 mph, was evaluated.

FIVE TESTS OF FEASIBILITY

To determine whether the four-lane highway was warranted and feasible, each route was subjected to five "tests of feasibility":

Engineering Feasibility - Can the route be built from the engineering perspective?

Environmental Feasibility - Can it be built without significant negative impact?

Need - Are the improvements needed based on existing and future travel demand?

Travel Efficiency Feasibility - Are the improvements economically feasible based on highway user benefits?

Economic Development Feasibility - Are the improvements feasible in terms of their economic impact on local economies?

ENGINEERING FEASIBILITY

Each route was field inspected, key construction and engineering issues were identified, and costs of highway construction were estimated. This led to the conclusion that each route could be physically improved to a four-lane cross section at reasonable cost. Final determination of engineering feasibility will require detailed alignment investigations which are beyond the scope of this planning study.

Key statistics concerning the engineering feasibility of each route are presented below. The key engineering points are that Routes B and C are estimated to be the least expensive to construct, due in part to the fact that so much of them are already multilane highways or programmed to be improved to four-lanes and because they pass through terrain that permits easy expansion of the existing highway.

All of the routes would involve the construction of a sizeable number of bypasses around towns and urban areas which would not only benefit the long-distance St. Louis to St. Paul traffic but would also be of benefit to shorter distance travel around the towns and urban areas.

Engineering Feasibility

	Route B	Route C	Route D	Route E
Road Construction Needed (miles)	136.4	186	358.3	325.0
Construction Cost ($ million)	$358.5	$457.6	$1,317.2	$1,092.3
Number of Bypasses Needed:				
Urban Areas	3	3	4	3
Towns	13	14	36	20
Ease of Construction (1 is easiest)	1	1	3	2

The preliminary engineering analyses and field investigations indicated, from an engineering feasibility perspective, that:

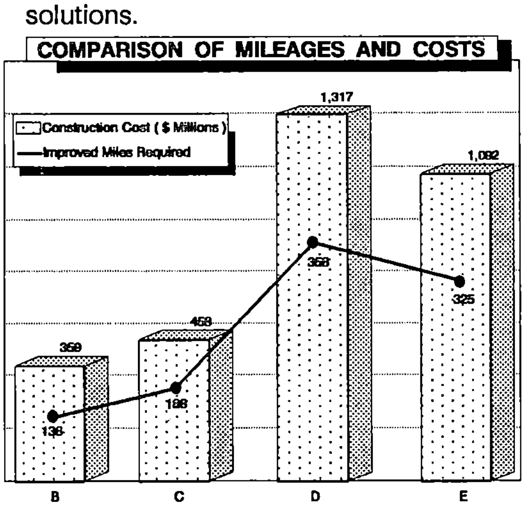
- Each of the routes could be improved to a four-lane cross-section, although each would have engineering challenges to avoid undue cost or undue environmental impact.

- Route B and C would be the easiest to improve to four lanes, since some right-of-way has already been reserved, and other right-and-way can be obtained. Both routes also make good use of existing and/or programmed four-lane highways.

- The portion of Route D and E which passed through Illinois on US 67 will present a number of engineering challenges, which may require some construction on new alignment.

- The portion of Route D which passes through Wisconsin and Minnesota negotiates some of the study area's most difficult terrain and, as a result, would be the most difficult to improve to four lanes.

- Several river crossings occur in sensitive areas, which will require detailed study in order to find acceptable crossing solutions.



- Preliminary cost estimates which were developed indicate that Route B is the least expensive of the expressway alternatives, because it would require the least centerline miles of highway improvements (136) and because it follows terrain which does which does not create real difficulties for expansion of existing two lane roads to a four-lane status.

- Route C is also relatively inexpensive to improve to a four-lane expressway. Again, its low cost is related to limited centerline miles of highway improvements (186) required, as well as the general ease of construction along the existing alignment.

- Route D, and to a lesser degree Route E, would be significantly more expensive to improve to a four-lane expressway because of the extensiveness of improvements required (358 and 325 centerline miles respectively) as well as the challenging terrain that the alignments must negotiate.

ENVIRONMENTAL FEASIBILITY

Highway improvement projects always have a potential to create environmental impacts. Preliminary reviews suggest that:

- There are a number of environmentally sensitive areas within the study area, and each route contains at least one such area which may pose engineering challenges to construction of a four-lane expressway in an acceptable manner. These include:

  - Mississippi River Basin adjacent to US 61 in Minnesota.
  - La Crosse Urban Area.
  - Wisconsin River Basin (US 61).
  - Shell Rock River near Nora Springs, IA (US 18).
  - Des Moines River Basin and Wetlands along Iowa Route 394.
  - Illinois River Basin near Beardstown, Illinois (US 67).

- The greatest potential for adverse environmental impacts appears to be along Route D through Wisconsin and Minnesota.

NEED

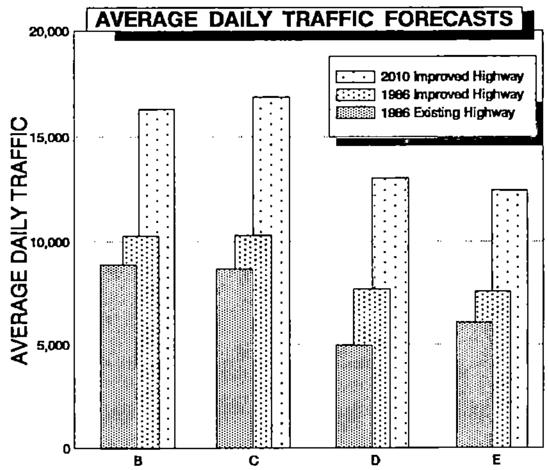
To determine potential benefits to users of each route alternative, it was necessary to develop a means of estimating the number of users of each route, with and without the improvements. Since some users would be diverted from unimproved routes to improved highways, the traffic forecasting procedures had to recognize the origin-destination pattern of travel in the region, instead of just forecasting simple growth rates on road links.

Therefore, a network based transportation model was used with the study region subdivided into 433 zones. A roadway network was developed that included the major roadways in the region. Travel demand procedures were then developed to estimate the number of trips between study zones.

The procedures included development of a base year trip table using corridor travel patterns identified through roadside surveys, observed traffic volumes, the most probable routings between zone pairs and the relative population residing in each zone. The base year trip table was then expanded to reflect year 2010 population forecasts and observed trends in corridor travel characteristics.

Based on traffic forecasts and capacity analyses, several conclusions can be drawn:

- All of the finalist routes have the potential to reduce regionwide vehicle hours of travel if improved to a continuous four-lane expressway, because higher average travel speeds would be provided.
- Routes B and D have the potential to significantly reduce vehicle miles of travel for regionwide travel, because some existing trips currently travel longer distances on alternative routes. With the improvements, the shorter routes are likely to become more attractive.
- Regional average daily traffic forecasts of betwen 12,400 and 16,900 as depicted below suggest that a four-lane route will be needed and appropriate.



Annual Travel Data

	Route B	Route C	Route D	Route E
Annual Vehicle Hours of Travel (VHT) Change from Base Condition				
1986 (millions)	-1.56	-1.37	-3.7	-1.77
2010 (millions)	-2.47	-2.18	-6.27	-2.79
Annual Vehicle Hours of Travel (VHT) Change from Base Condition				
1986 (millions)	-22.3	0	-59.5	+6.2
2010 (millions)	-35.4	+0.4	-110.2	+9.1

TRAVEL EFFICIENCY FEASIBILITY

A public investment such as a new highway is "economically feasible" if the economy is better off with the highway than without it. One way a highway improvement can help the economy is by reducing the cost of transportation (greater efficiency due to reduced vehicle operating costs, reduced travel times, reduced risk of accidents). If those travel efficiencies, over time, discounted and summed are greater than the cost of improving and operating the highway, then the highway is a prudent public investment and should be built.

Improvements in travel efficiency are valid economic benefits at the local level, the state level and the national level. Therefore, the travel efficiency feasibility test should be viewed as a key criterion, and perhaps the only economic criterion, at the national level.

According to this travel efficiency economic feasibility measure, any highway improvement with a "benefit/cost ratio" of 1.0 or more, or a positive "net present value," or a "rate of return" over ten percent or more, is economically feasible and should be built.

In making this calculation, the benefits are the travel efficiency gains by year over a 30-year time period. The costs are the construction cost of the "unprogrammed" road miles, plus any increases in highway maintenance cost. Both costs and benefits are discounted at the FHWA-specified ten percent rate.

The table at the bottom of the page identifies the relative economic feasibility of each route in terms of this travel efficiency criterion. That table indicates:

- Route D will create the greatest travel efficiency savings (94 percent more than Route B). However, Route D is also the most expensive (267 percent more than Route B).
- When the discounted benefits are compared with the costs, only Route B is found to be economically feasible (B/C of 1.3).
- The other routes become economically feasible only when "economic development" benefits are added to the travel efficiency benefits (see the next page).
- The study does find, however, that major portions of Routes C, D and E are also feasible.
- Therefore, at least some investments in all of the finalist routes are warranted and will be needed.

On this basis, if the most cost-effective route is to be chosen based solely on efficiency (economic benefits to the national economy), Route B would be selected. However, efficiency is only one of the criteria that might be considered, especially at the local level.

Travel Efficiency Feasibility

	Route B	Route C	Route D	Route E
Year 2010 Travel Benefits ($ million)	$59.6	$47.9	$115.8	$39.1
Construction Cost ($ million)	$358.5	$457.6	$1,317.2	$1,092.3
FEASIBILITY INDICATORS				
Benefit/Cost Ratio[a]	1.3	.8	.7	.3
Net Present Value ($ million)[a]	$74	$-72	$-361	$-634
Internal Rate of Return (%)	12.6%	7.8%	6.2%	.1%

[a]Discounted at 10%

ECONOMIC DEVELOPMENT FEASIBILITY

Government is often asked to make highway investments for "economic development" purposes. The rationale, and it is correct from the corridor perspective, is that the area will be better off due to greater transport efficiency, the possible attraction of new businesses, and the overall improved ability of the region to compete for economic activity. Without question, a well planned north-south highway will be a significant asset to the region, and will be of help to the economic future of communities and land uses located in proximity to the highway. Ample evidence exists to support the contention that the corridor's economy will benefit from the highway.

This study examined the economic development issue, and found that the communities along the selected route will benefit economically from the route. The communities will benefit in three ways.

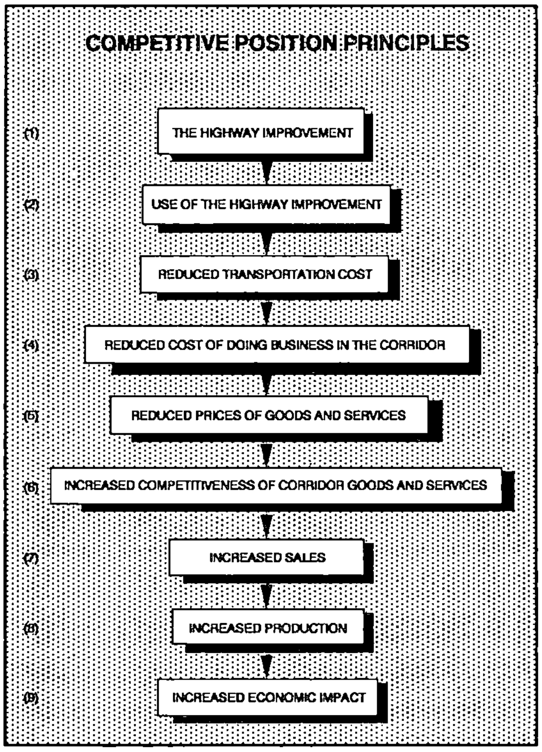
1. Travel Efficiency

The people that will make the most extensive use of the improved highway are those who reside in the area. They will benefit from the travel efficiencies via reduced vehicle operating costs, reduced travel times, and reduced accident rates.

2. Improved Competitive Position

The communities in the St. Louis - St. Paul corridor region are working to diversify their economic bases by attracting new employers. A major new highway through the region will provide improved and lower cost transportation which in turn could help to improve the communities' competitive position.

Any businesses that are therefore attracted or retained will yield economic development benefits. The following chart depicts this process.



3. Traveler Expenditures

The study also finds that traffic will be diverted to the improved highway. Such traffic increases will increase revenues to those businesses located along or near the routes, including visitor and tourism attractions, such as roadside businesses and gas stations, restaurants, motels, and others. These economic benefits were calculated for each route.

Total Year 2010 Annual Local Economic Benefits

Benefit Types	Route B	Route C	Route D	Route E
1. Travel Efficiency ($ millions)	$59.6	$47.9	$115.8	$39.1
2. Competitive Position ($ millions)	8.1	5.8	11.9	7.6
3. Travel Expenditures ($ millions)	64.0	77.5	143.4	71.1
4. Total Economic Development ($ millions)	$131.7	$131.2	$271.1	$117.8

This study finds that the local economic development implications associated with the highway improvement are potentially significant. However, these economic development statistics should be used with caution.

From the point of view of businesses, communities and counties located along a candidate route, highway improvements of the magnitude envisaged in this study are, almost by definition, economically feasible. It is feasible from the local corridor perspective because the highway will not only create travel efficiency, but will also cause economic development along the route (improved competitive position and increased traveler expenditures).

However, from the National point of view, most of those economic development impacts are transfers from one location to another. Consequently, the National funding decision should be based more on the travel efficiencies impact and less on the more localized economic development impact. The type of economic impact to be used, by national versus local decision makers, is depicted in the following table.

Economic Impacts by Impact Area

Impact Type	Impact Area	
	National	Corridor
Transport Efficiency	X	X
Competition Position		X
Travel Expenditures		X

Local Economic Development Feasibility

	Route B	Route C	Route D	Route E
Net Present Value ($ Million)[a]				
Travel Efficiency (by itself)	$ 74.4	$-72.1	$-361.1	$-633.6
Competition Position (by itself)	$-235.0	-329.3	-970.6	-819.6
Travel Expenditures (by itself)	$ 104.2	99.1	-184.5	-433.8
Travel Eff. + Comp. Position	$ 124.3	$-37.6	$-287.1	$-586.1
Travel Eff. + Comp. Pos. + Travel Exp.	$513.6	425.3	572.9	-153.2
Benefit/Cost Ratio[a]				
Travel Efficiency (by itself)	1.3	.8	.7	.3
Competitive Positive (by itself)	.2	.1	.1	.1
Travel Expenditures (by itself)	1.4	1.3	.8	.5
Traval Eff. + Comp. Position	1.4	.9	.7	.3
Travel Eff. + Comp. Pos. + Travel Exp.	2.8	2.2	1.6	.8
Internal Rate of Return (%)				
Travel Efficiency (by itself)	12.6%	7.8%	6.2%	.04%
Competitive Positive (by itself)	-2.6%	-5.5%	-6.9%	-8.1%
Travel Expenditures (by itself)	13.6%	12.7%	8.1%	4.0%
Travel Eff. + Comp. Position	14.2%	8.9%	7.0%	1.1%
Travel Eff. + Comp. Pos. + Travel Exp.	25.5%	20.4%	15.2%	8.1%

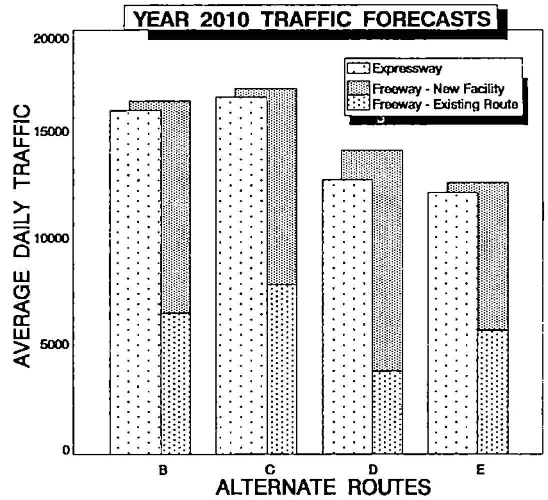
[a]Discounted at 10%

FREEWAY FEASIBILITY

Preceding analyses focused on the feasibility of a four-lane expressway (sufficient for vehicular travel at 55 mph). Another option, which was explored during later stages of the study involved construction of a St. Louis to St. Paul highway at "Freeway" standards. This "Freeway" option implies a 65 mph rural speed limit, and a 55 mph urban speed limit.

Because of design standards, the freeway option does not generally involve widening of existing highways from two to four lanes; rather, it generally involves the construction of four new lanes of highway, built on a combination of existing and new right-of-way. Thus, the "freeway" option would sometimes involve two highways in a given corridor -- the existing route, plus the new freeway. This transportation option was then evaluated in the same manner as the expressway options were. A summary of key freeway findings includes:

- **Extensiveness of Improvements** - all of the routes would require significantly more miles of improvements than under expressway standards.
- **Capital Costs** - All routes would be significantly more expensive, although the relationship between the four finalist routes cost would be similar in that Routes B and C would be significantly less expensive than D and E.
- **Traffic Forecasts** - Total traffic forecasts for freeway alternatives are only slightly higher than expressways, in large part due to the significant travel improvements occasioned by expressways.



- **Travel Efficiency** - Because there are only slight increases in traffic, but major increases in cost, none of the freeways would be feasible based on travel efficiencies alone.
- **Economic Development Benefits** - The freeway option would increase economic development by 18 to 44 percent more than comparable expressway routes. The largest benefit would be associated with Route D.
- When all three types of economic benefit are included, Routes B, C, and D are economically feasible.

From an overall comparison, freeway options along Routes B and D are equally attractive, Route C is not quite so good, and Route E is a distant fourth.

KEY FREEWAY FINDINGS

	Route B	Route C	Route D	Route E
Total Improvement Mileages	340	447	514	412
1989 Construction Cost ($ millions)	674.9	874.0	2,060.4	1,411.2
Year 2010 Corridor ADT	16,680	17,260	14,370	12,870
Travel Efficiency (B/C Ratio)[a]	0.81	0.61	0.84	0.44
Travel Efficiency (NPV $ millions)[a]	-108.1	-284.8	-278.0	-649.7
Year 2010 Eco. Dev. Benefits ($ millions)	87.9	98.3	223.1	99.2
Total Economic Benefit/Cost Ratio[a]	1.77	1.44	1.65	0.77
Total Economic Impact (NPV $ millions)[a]	433.5	319.3	1,079.6	-264.1

[a]Discounted at 10%

STUDY FINDINGS

While the Consultant's Study was never intended to select or recommend a definitive course of action or to select a specific route, the Consultant's work did yield a number of findings that will help to define a specific approach to the corridor's problems.

FOUR-LANE FEASIBILITY

The analyses suggest that the concept of completing a four-lane highway between St. Louis and St. Paul is, overall, feasible. More specifically:

1. Traffic forecasts suggest that such a route will be needed.
2. It appears that an environmentally acceptable route can be found, although more detailed environmental study will be needed.
3. The routes are feasible in the engineering sense, although several engineering challenges exist in order to avoid undue cost or environmental impacts.
4. From the local economic development impact perspective, all of the route options are economically feasible.
5. However, the national funding decision should be based on those impacts that improve the nation's economy (travel efficiency feasibility) rather than the more regionalized economic development benefits which are localized in nature (transfers from one region to another).
6. The "expressway" design standard (55 mph) is more feasible than is the "freeway" design standard (65 mph).
7. Construction of urban area and town bypasses are feasible and a top priority.

ROUTE B, C AND D ADVANTAGES

No single route is superior to the other routes in all respects. Rather, each route has certain advantages. For example:

ROUTE B has the advantages that it would be the least expensive to build ($359 million), it would make maximum use of existing and programmed four-lane highways (only 136 miles of new construction needed), it is currently the most heavily traveled (ADT), it is the most feasible route in terms of travel efficiency (1.3 benefit/cost) and economic development (2.8 benefit/cost), it would be easy to construct with few if any environmental implications, and it is a very cost effective approach to linking the two metropolitan areas.

ROUTE C has the advantages that it is the shortest, most direct route between St. Louis and St. Paul (504 miles), entails the fastest inter-city travel time (8 hours 59 minutes), is forecast to be the heaviest traveled route if built to four lanes (16,890 ADT), it would be easy to construct with few if any environmental implications, it is also a very cost-effective approach to linking the two metropolitan areas, and it is a close second in terms of construction cost ($458 million), new route miles to be constructed (186 miles) and economic feasibility (benefit/cost).

ROUTE D has the advantages that it would provide four-lane services to the greatest number of people, would provide four-lane services to the greatest population size currently without four-lane north-south highways, would improve the route which is in greatest need of upgrading based on volume/capacity calculations, would provide better access to the Mississippi River environs, would create the greatest savings in travel efficiency ($115.8 million annually), would create the greatest localized economic development benefit ($155.3 million annually), and would be the most effective in diverting traffic to the improved four-lane highway.

REPORT CONTENTS

REPORT CONTENTS
(continued)

MAPS AND ILLUSTRATIONS

Chapter 1

INTRODUCTION AND OVERVIEW

If a traveler desires to make a highway trip between St. Louis, MO and St. Paul, MN, he or she has a decision to make. The trip could be made via a very indirect four-lane Interstate highway, or via a more direct, generally two-lane highway.

1. **Interstate Route** - To use the Interstate Route, the traveler would have to travel by way of Kansas City or drive almost to Chicago. These are difficult choices, since they add between 175 and 200 miles to the trip distance.

2. **More Direct Route** - Alternatively, the traveler could make the trip using any of an assortment of more direct highways. These, however, are largely two lane roads that pass directly through cities and towns at urban speed limits with numerous signalized intersections, and the trip is tedious.

The above decision is necessitated by the fact that there is no reasonably direct, four-lane highway between these two large metropolitan areas.

The Corridor Area

The St. Louis to St. Paul corridor, identified on Figure 1-1, is one of three major metropolitan area pairs in the U.S. located within a day's journey, without a direct connection via Interstate or at least a continuous 4-lane highway. The corridor area includes approximately 8.4 million people, includes a large urban area at each end, and is generally bounded by I-35 and U.S. 65 to the west, and I-90/94/55 to the east.

Congressional Mandate

Recognizing that the corridor area does not have the type of north-south highway that connects most of the nation's urban centers, the US Congress included funds in the 1989 Appropriations Act for "a study to be conducted in cooperation with the States of Iowa, Missouri and Minnesota on the feasibility and necessity of constructing a four-lane highway from St. Louis, Missouri to St. Paul, Minnesota." Three reports have been developed in response to this request.

1. **Consultant's Report to the States** - To assist in the development of a response to the Congress, the states retained a Consultant to analyze the corridor, to gauge the relative need for a four-lane highway, and to evaluate the alternative routes for such a highway. These analyses are summarized in this "Consultant's Report." The Consultant's Report contains analyses and comparisons. It does not, however, reach conclusions or make recommendations.

2. **States' Report to FHWA** - Based on the "Consultant's Report," a report to the federal government outlining the states' recommendations.

3. **FHWA Report to Congress** - Based on the "States Report," the Federal Highway Administration's report to Congress, stating the study conclusions.

Study Rationale

The need for a study of this type is apparent, when one understands the perspectives of those involved in making highway corridor investment decisions. Clearly the corridor's residents and business community feel that they need upgraded north-south highway facilities; also clearly, there are insufficient funds currently available to build all desired highway projects in each state and the corridor, and rational and prudent allocation of funds is therefore necessary.

The Corridor Perspective - Residents of the St. Paul to St. Louis Corridor, and others, have long wanted an improved north-south four-lane highway in the area. The corridor residents envision great benefits from such a highway -- increased intercity mobility, vehicular safety, increased tourism, improved goods transport, more efficient transport, better access to communities along the route, and economic development. Many advocates of the corridor believe that the economic development benefits will exceed the costs associated with the road projects, and that a four-lane freeway (or at least an expressway) must therefore be warranted and economically feasible. It is also felt that such a roadway would tie the region together in the north-south direction. During the course of the study, approximately 400 letters were received from local jurisdictions, businesses and residents which expressed these sentiments and which supported the highway project.

The State and Federal Perspectives - The federal and state governments need to make certain that limited highway monies be programmed for the most warranted, most beneficial highways, highway corridors, and projects. Analyses to date have tended to support the construction of four-lane segments in places, supported by rehabilitation of some two-lane sections, addition of turning lanes, passing lanes, and other improvements. The costs of these improvements are, of course, much less than are the costs of the four-lane alternative.

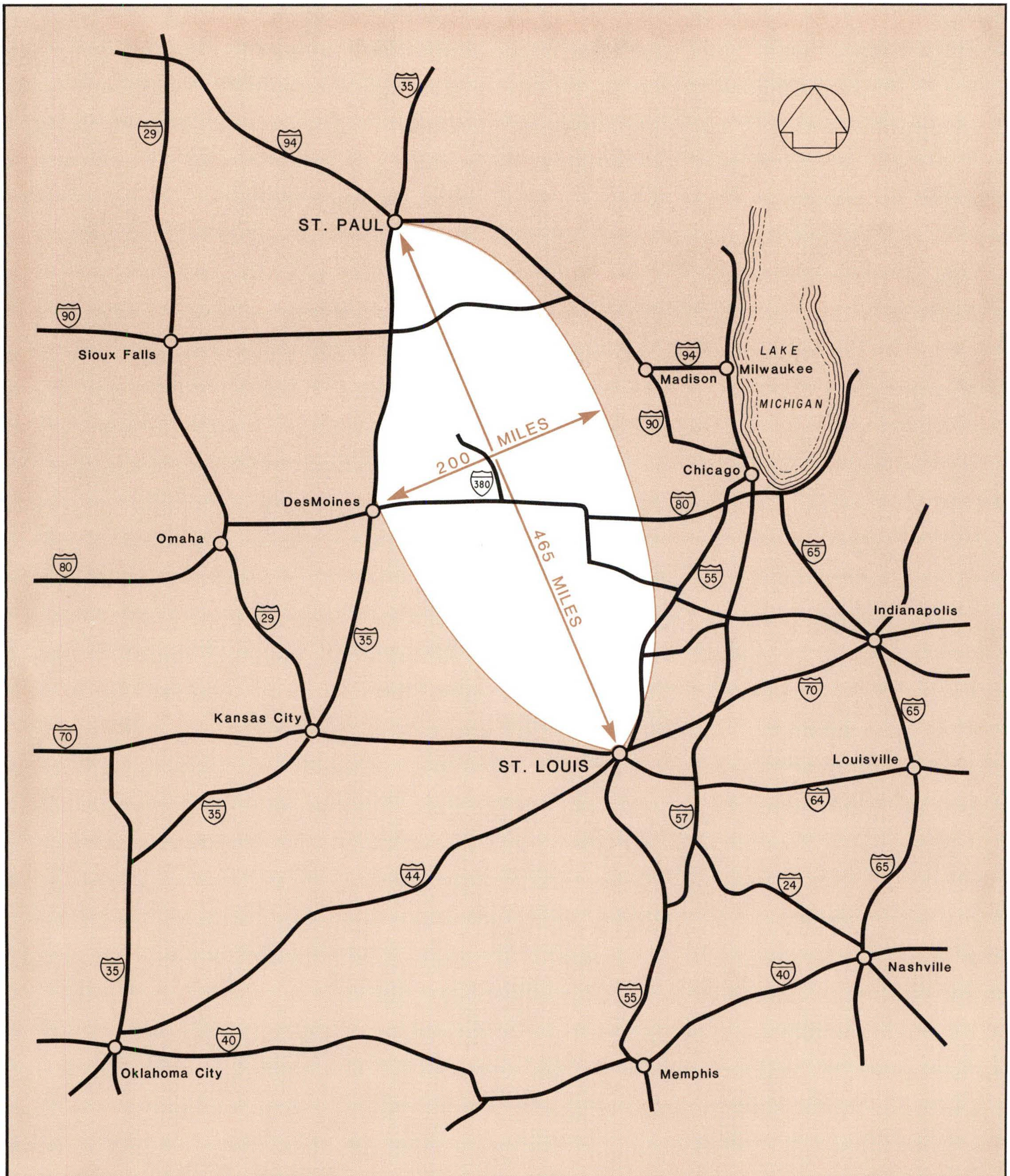
Study Purposes

The "Consultant's Report" was conducted to provide sufficient analyses, information and insights to enable a series of decisions to be made. Final recommendations were not made by the Consultant in the study; rather the decisions will be made later, based on the study's analyses and comparisons. The Consultant's study results include analyses to determine:

1. Whether a major north-south highway investment is warranted, and on what basis;

2. Which corridor(s) and alignment(s) locations are best, and why; and,

3. The appropriate investment level, location and alternative design and operations standards.



ST. LOUIS – ST. PAUL CORRIDOR

FIGURE 1-1

Calendar No. 779

100th Congress } SENATE { REPORT
2nd Session } { 100-411

DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATION BILL, 1989

JULY 6, 1988 – Ordered to be printed

Mr. LAUTENBERG, from the Committee on Appropriations, submitted the following

REPORT

[To accompany H.R. 4794]

62

AVENUE OF THE SAINTS

The Committee has provided funds for a study to be conducted in cooperation with the States of Iowa, Missouri, and Minnesota on the feasibility and necessity of constructing a four-lane highway from St. Louis, MO. to St. Paul, MN. The report shall include recommendations concerning the feasibility of and the best route for such a highway. The results of the study shall be transmitted to the House and Senate Committees no later than April 30, 1990.

CONGRESSIONAL MANDATE

Figure 1-2

The analyses examined whether it makes economic sense to invest large sums of money in improving existing roadways, or a combination of existing roadways and new alignments. The study focuses on alignment options, road standards, traffic demands, conceptual design, costs, benefits, impacts and implications. It considers impacts pertaining to development, the economy, the environment, and the area's general well being.

Study Issues

The study team attempted to answer questions which would be useful in the decision process. Three key issues were evaluated:

1. **Need and Feasibility** - Is a continuous four-lane highway between St. Louis and St. Paul needed? Is it feasible in terms of travel efficiency? economic development? engineering design? environmental implications? other implications?

2. **Route Options** - What route options exist? Which are most feasible? Which routes cost the least? Which generate the greatest benefit? Which are needed the most?

3. **Design Standard** - Should a continuous four-lane highway be built all the way from St. Louis to St. Paul, or should portions be built? Should it be at "expressway" standards, or "freeway" standards?

Study Conduct

The study was divided into two phases: 1) Evaluation and Screening of Route Options, and 2) Feasibility of "Finalist" Route Options.

Evaluation and Screening of Route Options - There are many different highways and highway combinations that can be used to travel between St. Louis and St. Paul. Initially 36 such route option combinations were proposed. To handle this complex set of combinations, a three step "screening process" was used. The concept was to evaluate all options equally. When some were found to be inferior, they were eliminated. Those remaining were then subjected to a more detailed level of analysis which led to the elimination of other routes.

By following this process, the 36 routes were ultimately reduced to four routes, which were identified as the "finalist" route options.

Feasibility of "Finalist" Routes - Eventually four routes were identified as the finalist route options. These four were then subjected to a detailed feasibility assessment. Each was compared and contrasted in terms of five "feasibility tests."

- **Engineering Feasibility** - Can the route be built from the engineering perspective?
- **Environmental Feasibility** - Can it be built without significant negative impact?
- **Need** - Are the improvements needed based on travel demand?
- **Travel Efficiency Feasibility** - Are the improvements economically feasible based on highway user benefits?
- **Economic Development Feasibility** - Are the improvements feasible in terms of their economic impact on local economies?

Study Working Papers

To ensure that the Consultant's work focused on key issues and to make certain that the work was technically correct, the Consultant prepared interim "Working Papers" which were submitted to the participating states and to the Federal Highway Administration. These agencies met at key points during the study, the working papers were reviewed, and guidance was provided. Five "Working Papers" were developed:

Date	Working Papers	Title
June 1, 1989	"A"	Route Options, Data Needs and Route Decision Procedures
July 31, 1989	"B"	Screening Level #1: Preliminary Evaluation of Route Options
September 1, 1989	"B Supplement"	Rationale for the Elimination of Some Route Options
October 20, 1989	"C"	Final Screening of Route Options and Other Documentation
January 12, 1990	"D"	Feasibility of the Four Finalist Route Options

Limited numbers of each Working Paper were printed, and all data and analyses contained in the Working Papers were treated as preliminary, for review purposes only.

The remainder of this "Consultant's Report" summarizes and finalizes the items contained in those Working Papers. Like the Working Papers, the "Consultant's Report to the States" includes analyses, data and comparisons; final conclusions and final recommendations are not contained in the report. Those are only included in the final report submitted to the U.S. Congress.

Chapter 2

THE ST. LOUIS TO ST. PAUL CORRIDOR

Existing highways in the corridor that could be used as a route between St. Louis and St. Paul are depicted on Figure 2-1. These alternative routes range from existing four-lane Interstates such as I-35 on the west and I-55/39/90/94 on the east, to a combination of two and four-lane highways located throughout the study area.

Chapter 2 describes this corridor area including the highways, the corridor area's demographics and economic base, and other relevant background information.

Existing Road Characteristics

The study area is framed by a series of Interstate routes. The southern boundary is defined by I-70, which runs between St. Louis and Kansas City. The western edge is bounded by I-35 from Kansas City through Des Moines to the Twin Cities. The eastern side is served by a combination of Interstate routes.

Two Interstate highways run east-west through the study area. The northern-most of these is I-90, which runs slightly north of, but parallel to the Minnesota/Iowa state line. The second interstate is I-80, which bisects the study area as it travels from the Quad Cities to Des Moines.

Other multilane facilities within the corridor include all but a three-mile segment of U.S. 52 between St. Paul and Rochester, Minnesota, as well as three segments of four-lane facilities along U.S. 61 between St. Paul and LaCrosse, Wisconsin. In Iowa, there is an eighty mile four-lane segment consisting of I-380 and U.S. 218, which connects Waterloo and Iowa City. In Missouri, U.S. 61 includes two segments of four-lane roadway; one stretching from St. Louis to north of Troy and a second running from New London to south of LaGrange. Illinois also has a 25 mile stretch of four-lane facility (IL 336) which runs from near Hannibal, Missouri to north of Quincy, Illinois, as well as the I-74 route between Monmouth and the Quad Cities. There are several other small segments of four-lane roadways (principally urban bypasses) scattered throughout the study area. All other study routes and route sections are two-lane facilities.

Bridges - Bridges are often classified as deficient or not deficient from a transportation planning standpoint. If they are classified as deficient, it is usually because they are either functionally obsolete or structurally deficient. However, not all states within the study area use these classifications. Additionally, not all states within the study area identified all structures along the route which are deficient. In some instances, only those deficient bridges programmed for replacement could be identified. All deficient bridges which could be identified on study routes are identified on Figure 2-2. Those bridges which are funded for near term replacement (prior to 1995) are also identified

The key finding of this graphic is that most Mississippi River crossings which might be used by the various route options are either not deficient, or are already programmed for replacement. Additionally, most Mississippi River bridges which are included within the various options are existing multilane structures or are programmed for widening to four lanes by 1995. Major structures which would require improvement if they were to be utilized as a four-lane highway between St. Louis and St. Paul include the U.S. 61 bridges across the Mississippi at La Crosse, the U.S. 61 bridge over the Wisconsin River, the Iowa Route 394 bridge over the Des Moines River, and the U.S. 67 bridge over the Illinois River.

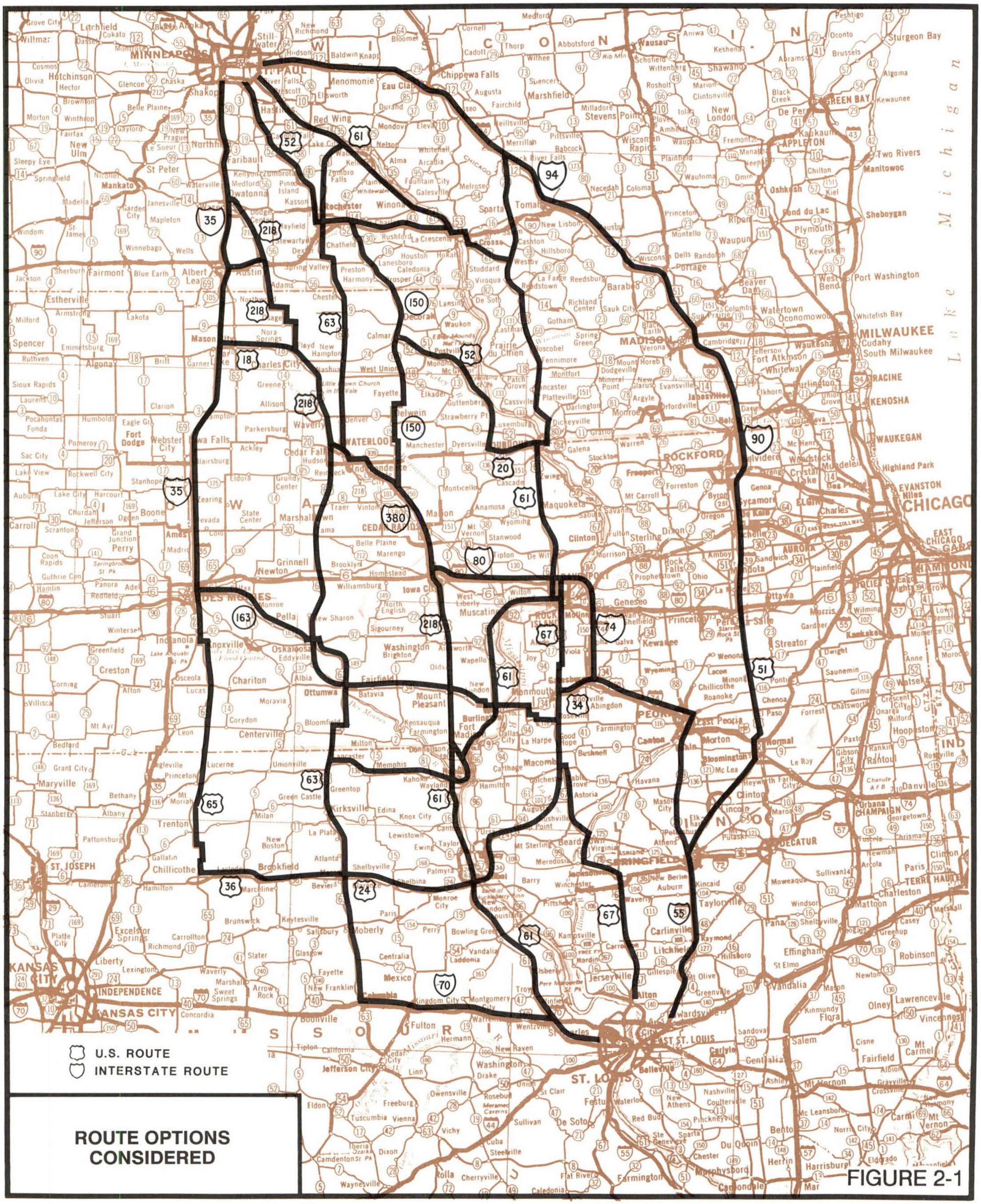
Existing Highway Constraints

Existing highway constraints are defined within the context of this study as topographic, land development or route alignment features which could impede the goal of providing a four-lane limited access facility with free flow conditions for traffic between St. Louis and St. Paul, or would increase the cost of providing such facilities. Based on field reviews of existing highways, a number of constraints were identified and have been summarized on Figure 2-3 and in the following subparagraphs.

U.S. 61 Between Red Wing and Wabasha, Minnesota - In addition to several constricted urban sections, most notably Lake City, the existing facility has been constructed within a fairly narrow strip of land bounded by the Mississippi River and some high bluffs. There is also a railroad track adjacent to the route.

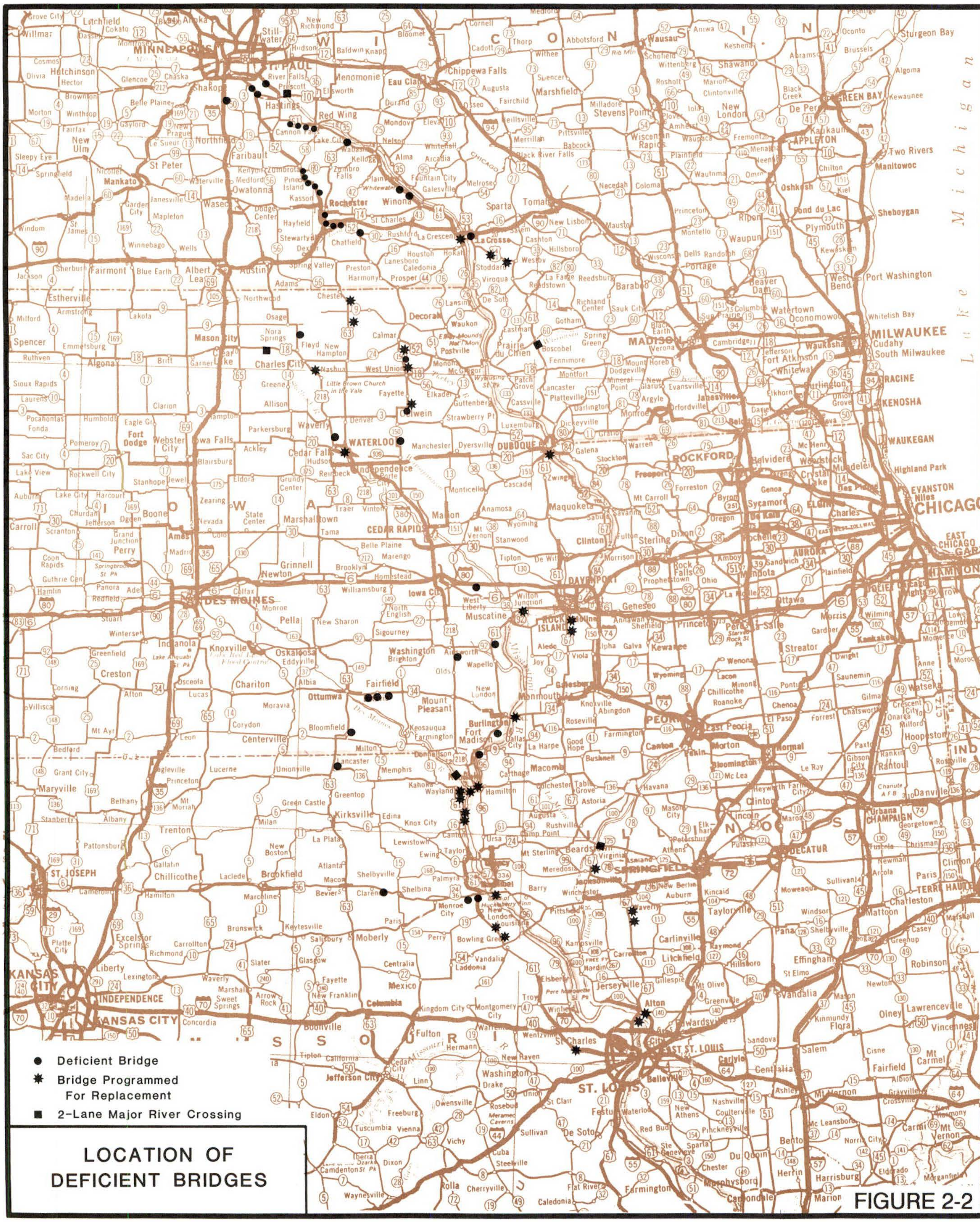
U.S. 61 in La Crosse, Wisconsin - There are two, two-lane bridges which connect La Crescent, Minnesota to La Crosse, Wisconsin via an island in the middle of the Mississippi River. Both bridges are structurally deficient. In addition, the urban section through La Crosse (U.S. 14/61) is a one-way pair, providing two travel lanes in each direction. Due to the large number of signalized intersections, numerous driveways, and pedestrian activity, the speed limit is posted at 30 mph. A series of high bluffs to the east would make construction of a bypass difficult, and the Mississippi River forms a barrier to the west.

U.S. 61 Bridge Across the Wisconsin River - Just north of Boscobel, Wisconsin, the existing two-lane U.S. 61 highway alignment traverses a narrow corridor between a shear ridge line and the Wisconsin River Basin for several



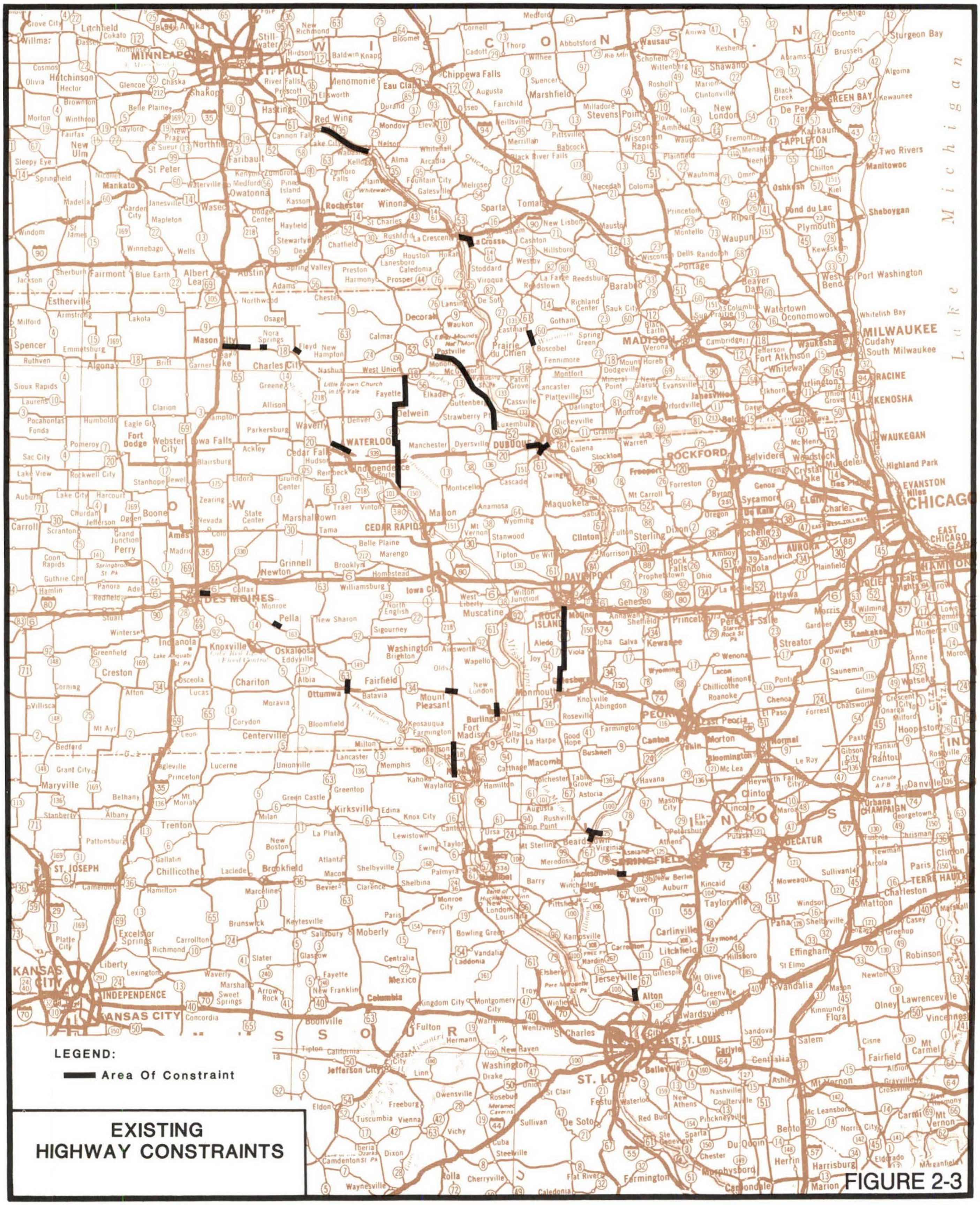
ROUTE OPTIONS CONSIDERED

FIGURE 2-1



LOCATION OF DEFICIENT BRIDGES

FIGURE 2-2



EXISTING HIGHWAY CONSTRAINTS

FIGURE 2-3

miles before making a right angle turn over a two-lane bridge. Because of the topography of the area, it would be difficult to widen the highway within the existing alignment.

<u>U.S. 18 Through Mason City, Iowa</u> - Four miles east of the city limits, U.S. 18 becomes a four-lane, undivided urban facility with no access control and a speed limit of 35 mph. There are three at-grade railroad crossings in the Central Business District, with a significant amount of train traffic. Between the railroad lines, the four-lane facility becomes a two-lane, one-way pair. Throughout the urban area, traffic is controlled by closely spaced traffic signals.

<u>U.S. 63 and U.S. 218 Through Waterloo, Iowa</u> - I-380 ends on the south side of Waterloo. From there the route becomes a limited access, six-lane, divided arterial on the southern edge of Waterloo. There are a number of traffic signals at major cross streets. U.S. 63 branches off just beyond the Central Business District as a three-lane, one-way pair. The speed limit on U.S. 63 is 35 mph. It becomes a four-lane, divided facility with traffic signals in the northern suburbs. The U.S. 218 segment is under construction as a six-lane, divided arterial through Waterloo. Its speed limit is 45 mph. In Cedar Falls, it becomes a four-lane arterial with very little access control, many traffic signals, several right angle turns, and a speed limit of 35 mph. North of Iowa Route 57, US 218 becomes a two-lane, 45 mph, facility.

<u>Iowa Route 150 - Calmar to I-380</u> - This 75 mile section includes significant numbers of substandard horizontal curves, a very constricted right-of-way related to passage through nine towns, and the presence of six deficient bridges or structures. Field reviews suggest that, from an engineering standpoint, it would not be cost effective or possible to create a four-lane alignment within the existing cross section. It is suggested that the best means of creating a four lane facility within this corridor would be through construction on new alignment.

<u>US Route 52 - Postville to Dyersville, Iowa</u> - This 50 mile segment of two-lane highway contains a very large number of horizontal and vertical curves, as well as bisecting the towns of Postville, Luana, Monona, Froelich, Garnavillo, Guttenberg, Millville, Luxemburg, New Vienna and Dyersville, The right-of-way is very limited, making widening on the existing alignment somewhat impractical.

<u>Dubuque, Iowa</u> - Several route options pass through Dubuque on US 20 and/or US 61. Both arterials are urban facilities, with significant numbers of traffic signals and commercial driveways which create vehicular conflicts along the route. Additionally, the speed limits are in the 30 to 40 mph range. A southwestern bypass of the city between US 20 and US 61 would be very difficult because of very sharp changes in terrain, and unstable shale subsoils.

<u>US 67 Rock Island to Monmouth, Illinois</u> - This 40 mile section of two-lane road is built on a very narrow right-of-way through a rolling terrain, with many residential structures built close to the roadway.

Iowa 394/Missouri Route B - This existing two-lane route includes an old functionally obsolete, two-lane bridge across the Des Moines River. Additionally, while the horizontal alignment is fairly straight, it negotiates some rough vertical terrain.

Other Constraints - Several constraints caused by urbanized areas were noted during the course of the field reviews. These constraints included limited right-of-way, traffic signals, right angle turns, and low speed limits coupled with significant vehicular conflicts from side streets and driveways. Chief among the urbanized areas noted were: Alton, Jacksonville, and Beardstown in Illinois; Burlington (US 61), Fort Madison, Mount Pleasant, Ottumwa, Pella and Des Moines in Iowa.

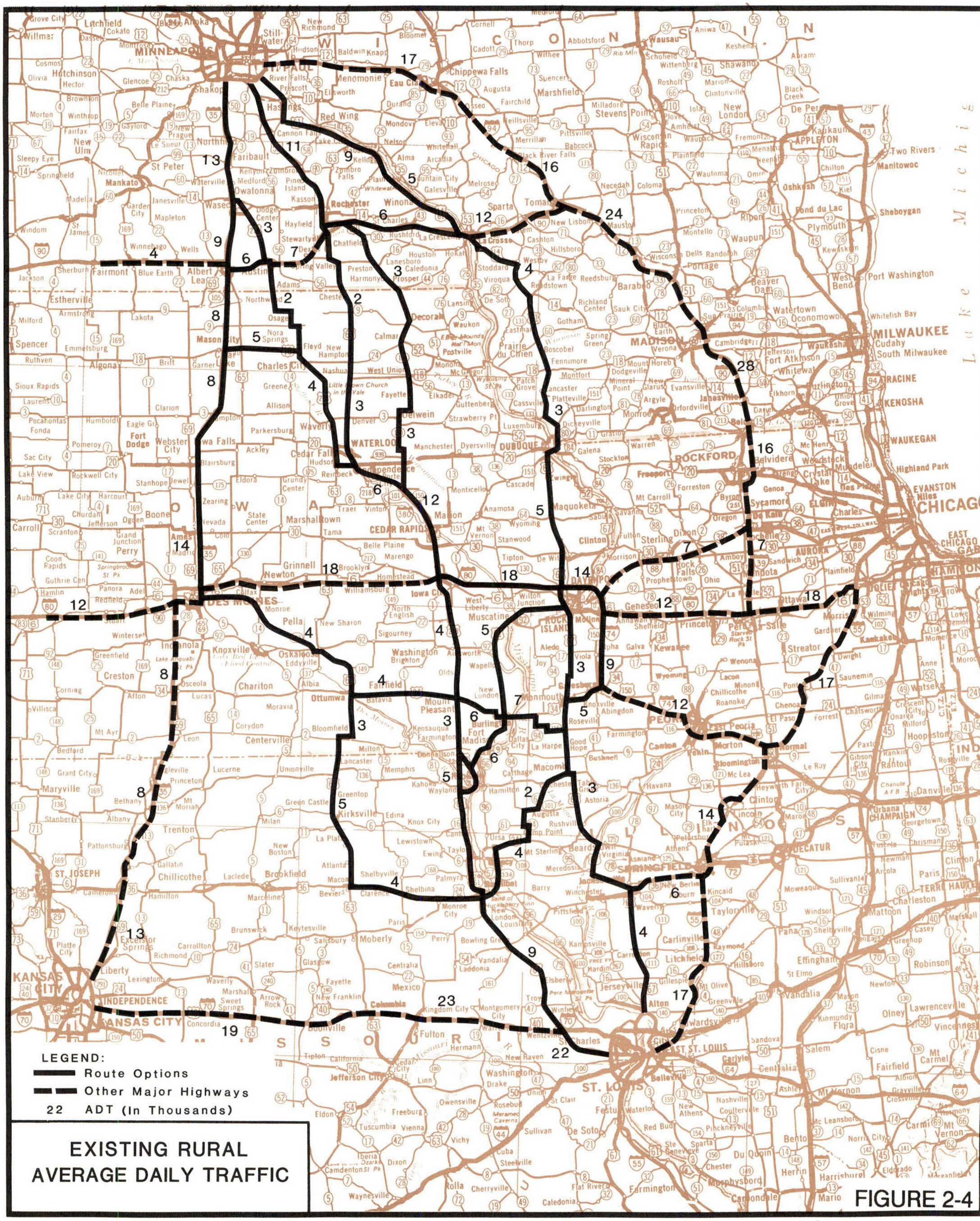
Highway constraints by themselves do not create "fatal flaws," since most constraints can be overcome through relocation of homes and businesses, or through application of more elaborate construction procedures such as aerial structures, retaining walls etc. These mitigating efforts are, however, reflected in the estimated construction costs.

Existing Highway Traffic

Recent (1986 - 1988) traffic counts of study area routes are summarized on Figure 2-4. Representative volumes are displayed for both route option segments and other major highways. Not surprisingly, the highest volumes are on the Interstate routes. Interstate traffic volumes range from a low of 4,000 west of Albert Lea to a high of 28,000 on I-90 in southern Wisconsin. The magnitude of traffic volumes is directly related to proximity with and size of urbanized areas. This pattern is most clearly noted along I-35 between Kansas City and Minneapolis. The highest volumes on this segment of the Interstate are found closest to the major urban areas.

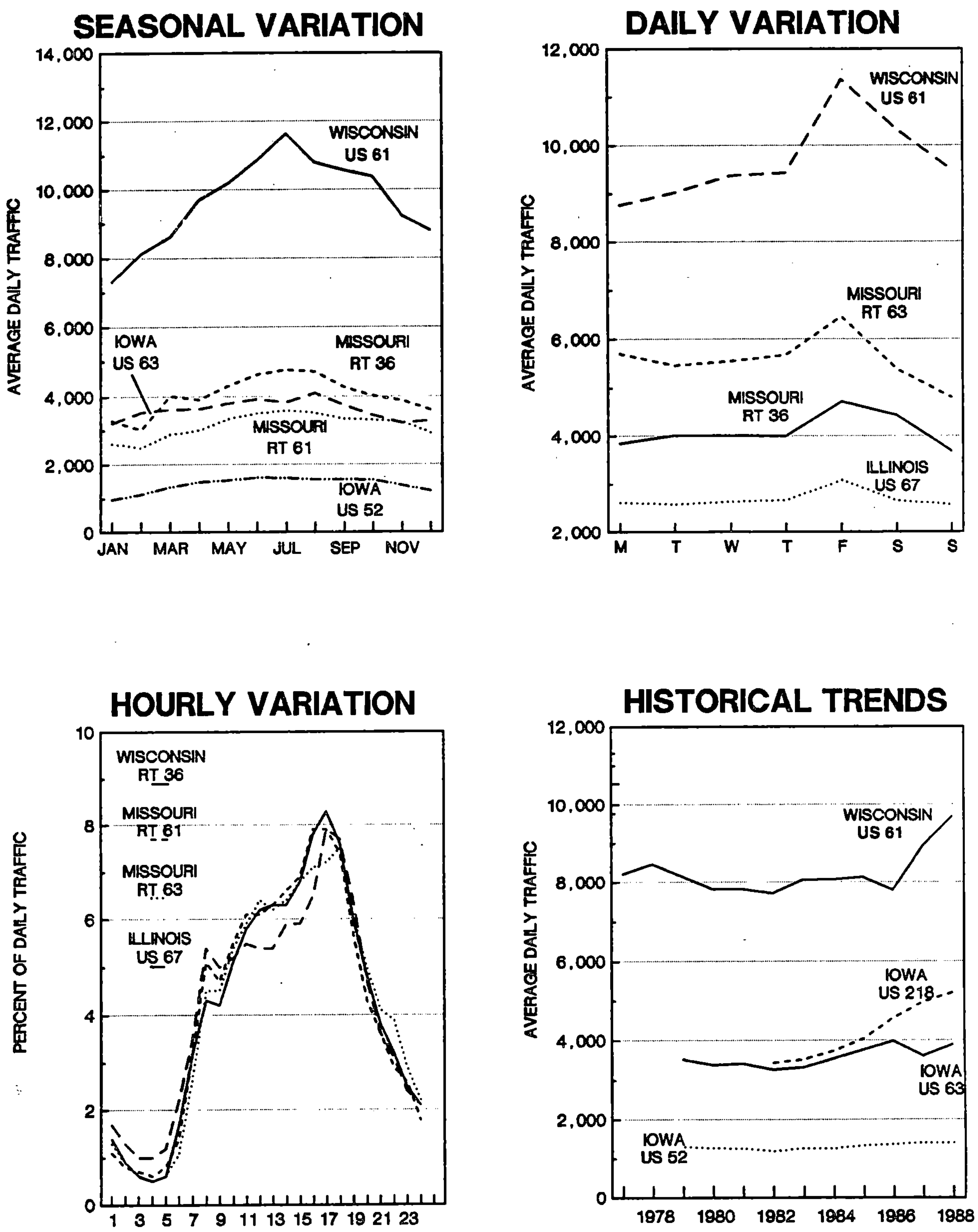
Within the study area, the largely rural nature of the region explains the generally low traffic volumes observed. Most daily traffic volumes summarized in Figure 2-4 for study area routes are less than 10,000 average daily traffic (ADT), with many less than 5,000. The biggest exception is the section of I-380 between Iowa City and Waterloo, which carries traffic volumes in the 10 to 15,000 ADT range. The next most popular route is US 61 through Missouri, southern Iowa, and Minnesota, where traffic volumes of five to 9,000 ADT were recorded.

Variations and Trends - During the course of a normal year, traffic on a segment of roadway will vary by season, day of week, and hour of the day. In addition, traffic volumes tend to increase over time. All of these patterns are summarized for a representative sample of study area routes in Figure 2-5 and in the following subparagraphs.



EXISTING RURAL AVERAGE DAILY TRAFFIC

FIGURE 2-4



TRAFFIC TRENDS AND VARIATIONS

Figure 2-5

Seasonal Variations - Traffic increases substantially on area roads during the summer months, most notably in July and August. Traffic volumes recorded during those months are ten to twenty percent above the annual average. At the opposite end of the spectrum, traffic volumes are ten to twenty percent below the annual averages during the winter months.

Daily Variations - Regardless of the amount of traffic on a specific facility, volumes tend to increase on Fridays throughout the corridor. There is very little other daily variation throughout the remainder of the week.

Hourly Variations - Examining traffic volumes over the course of an average day shows that there is really only one peak. Approximately eight percent of the daily traffic occurs during each of the two hours between four and six p.m. There is no real morning peak hour in these rural areas. Traffic builds up all day long until the afternoon peak, after which it declines as the evening progresses.

Historical Trends - On the three rural Iowa count stations selected for the historical trend analysis, the average annual growth rate ranged from a low of one percent on US 52 to a high of 8.5 percent on US 218. A count station on US 61 in Wisconsin averaged 2.1 percent annual growth over a comparable period.

Travel Survey Results

In an effort to define trip making patterns and travel characteristics within the study corridor, origin/destination surveys were conducted along various north/south roads between St. Louis and St. Paul. Rather than stopping traffic and conducting a roadside interview, field crews recorded license plates of a representative sample of passenger cars during the course of a day at 14 sites in June 1989. These plates were matched with addresses by each state's department of motor vehicles. Each individual (excluding private businesses) identified in this manner was mailed a survey. The survey requested information about origin, destination and purpose of the trip taken the day the license plate was recorded and the number of persons traveling in the vehicle. To minimize local trips, the survey locations were in rural areas, well away from the urban areas.

The surveys were coded, edited and entered into computerized data files. Figure 2-6 is a copy of the survey form used in the license plate survey. Of the 15,980 license plates recorded, 13,960 were matched, 11,934 surveys were mailed out and 3,281 of the surveys were completed and returned for a 23.5 percent overall response rate, as shown on Table 2-1.

Table 2-1
LICENSE PLATES RECORDED, MATCHED AND RETURNED
ST. LOUIS TO ST. PAUL CORRIDOR STUDY

	Plates Recorded	Address Matches	Surveys Returned	Percent Returned
Illinois	768	641	124	19.3
Iowa	8,776	7,926	2,198	27.7
Minnesota	3,090	2,588	421	16.3
Missouri	2,165	1,865	369	19.8
Wisconsin	1,181	940	169	18.0
Total	15,980	13,960	3,281	23.5

SOURCE: Wilbur Smith Associates

As a reasonableness check, and to identify corridor trip making characteristics, the survey data was analyzed by cumulative percent of trips made by distance, number of trips by trip purpose, trip frequency and vehicle occupancy by trip purpose, average trip length by trip purpose, and travel desires. Findings include the following.

- Trip Length - Table 2-2 presents the cumulative percent of trips by distance. These statistics suggest that the majority of vehicles made one way trips of 100 miles or less. Traffic at nine out of the twelve stations had at the least 58 percent of the vehicles traveling 100 miles or less. At most stations, less than 10 percent of the motorists reported making one-way trips of more than 200 miles.

Table 2-2
CUMULATIVE PERCENT OF TRIPS BY DISTANCE
St. Louis to St. Paul Corridor Study

Distance (miles) (less than or equal to)	SURVEY STATIONS 1	2	3	4	5	6	7	8	9	10	11	12
20	8.8	27.1	3.2	19.9	40.8	10.0	37.2	8.9	44.1	11.0	10.7	21.9
50	34.3	54.1	43.4	62.2	58.8	20.6	73.0	24.8	50.2	18.8	14.6	34.5
100	58.4	75.1	74.6	81.8	79.5	43.5	79.7	32.9	79.3	64.7	58.7	53.5
150	72.6	89.7	86.4	90.0	88.7	58.3	87.5	42.8	89.7	82.4	76.3	72.1
200	78.3	93.8	90.0	94.3	92.4	70.3	90.5	58.5	92.5	91.1	87.4	81.6
300	86.8	97.0	97.7	97.3	97.6	89.8	97.4	86.5	98.4	96.8	96.5	90.4
400	93.8	98.6	99.0	99.7	99.3	95.5	98.1	93.5	100.0	98.7	99.5	96.4
500 or Above	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Key:

1 = US 218 Olds, IA
2 = US 61 Wapello, IA
3 = I-380 Cedar Rapids
4 = US 61 Dewitt, IA
5 = IA 150 Calmar, IA
6 = US 63 New Hampton, IA
7 = US 218 Waverly, IA
8 = I-35 Mason City, IA
9 = US 61 Near Bosobel, WI
10 = US 61 Lake City, MN
11 = US 52 Zumbrota, MN
12 = US 61 Troy, MO

Figure 2-6

Dear Traveler:

The States of Minnesota, Wisconsin, Iowa, Illinois and Missouri are conducting a survey to learn more about the travel patterns of those who use the region's transportation system. This survey is an alternative to stopping traffic along busy highways. Your vehicle license plate number was recorded traveling:

North on United States Highway 61
North of Burlington, Iowa
In the PM on Monday, June 5, 1989
License Plate:
Station/Direction/Hour: 02/1/08

We are asking that the person driving the vehicle on this trip take a few minutes to complete this questionnaire. This is completely voluntary, and the information will only be used in combination with other questionnaires received. You cannot be identified by returning this form, unless you want to be. Please return the survey by mail as soon as possible. No postage is necessary. If you include your return address and the card is postmarked prior to midnight July 14, 1989, you will be entered into a drawing for a $100 cash prize. *

There is the possibility that your license plate was recorded in error. If that is the case, please disregard this questionnaire.

Thank you for your time!!

1. Where do you live?____

   If you wish to be eligible for the drawing, write name and street address above, otherwise just fill in general description below.

____________	__________	_________
Nearest City or Town	State	Zip Code

2. Where did you start from on this trip?

____________	__________	_________
Nearest City or Town	State	Zip Code

3. Where were you going? (Please answer for one way only, the farthest point from where you started)

____________	__________	_________
Nearest City or Town	State	Zip Code

4. What was the major purpose for this trip? (check only one of the following)

_____	Work (commuting)	_____	Agriculture
_____	Work (business)	_____	Education
_____	Vacation	_____	Other
_____	Other recreational		

5. How many people including yourself were traveling in your vehicle? __________

6. Approximately how many times have you made this trip in the past 12 months?________

* Void where prohibited by law. WSA employees, subconsultants, and their immediate families are not eligible to receive this prize

PLEASE FOLD SO ADDRESS ON REVERSE SHOWS, TAPE SHUT AND MAIL

- **Trip Purpose** - Figure 2-7 identifies trip purpose in the corridor and indicates that the largest single type of trips (35.6 percent) are made for business and commuting to work, (21.4 percent and 14.2 percent respectively); an additional 34 percent of the trips are made for other reasons than those specifically listed in the survey. Vacation travel comprised 8.9 percent of the traffic stream, while other types of recreational travel accounted for 13.9 percent. Combined agricultural and educational travel accounted for less than eight percent.

- **Trip Length by Trip Purpose** - The average trip length is 97 miles. Figure 2-8 shows that only vacation and other recreational trip purposes have average trip lengths considerably in excess of the overall average. Commuting to work and agricultural trip purposes have very low average trip lengths, while business, education and other trip purposes are equal to or slightly less than the corridor wide average. Overall, the surveys indicate that trip lengths are relatively short.

- **Trip Frequency by Trip Purpose** - Commuting to work has the highest average annual trip frequency for all states, while vacation has the lowest frequency. The average trip frequency by trip purpose by state is illustrated in Figure 2-9.

Survey results indicate that the number of occupants per vehicle is closely related to the trip purpose. On the average, there are fewer occupants per vehicle commuting to work and more occupants per vehicle for vacation purposes. The average vehicle occupancy for commuting to work ranges from slightly more than 1.0 persons in Illinois to 1.5 persons in Wisconsin. (Only in Wisconsin was there a vehicle occupancy rate lower than commuting to work, that of education at 1.4). Figure 2-10 illustrates the average vehicle occupancy rate by purpose for the five states.

In summary, the survey results were found to be comparable to studies performed in other rural parts of the country. Specific findings included the following:

1. The majority of passenger vehicles travel 100 miles or less.
2. The largest groups of trips are for commuting to work and business.
3. Commuting to work has highest average trip frequency in all states.
4. Vehicle occupancy rates and patterns were very similar to nationwide experiences.

These results suggest that most trips made in the corridor are for relatively short distances. The survey data was factored up to represent areawide travel based on existing traffic counts, so that daily trip interchanges between various sub-areas of the corridor could be quantified. The majority of these movements are to intermediate cities (as opposed to between St. Louis and St. Paul). The most significant finding is that the existing volume from St. Louis to St. Paul is only 219 private automobile vehicles trips per day. Some of the major passenger vehicle trip interchanges which could be served by highway improvements under consideration in this study included:

City Pairs	**Trip Frequency**
Quad Cites and Central U.S. 67 areas	(2,867 trips)
Ottumwa and Des Moines areas	(1,668 trips)
Waterloo and Mason City areas	(3,165 trips)
Waterloo and Minneapolis/St. Paul areas	(1,816 trips)
LaCrosse and Minneapolis/St. Paul areas	(1,120 trips)
LaCrosse and Dubuque areas	(1,459 trips).

This reflects the same findings as the other four, namely that most of the corridor trips are of a relatively short distance.

Programmed Highway Improvements

Regardless of the St. Louis to St. Paul corridor decisions, a variety of highway improvements are needed on the various routes, and the state highway agencies are making such highway improvements as funding becomes available. Many highway improvements on corridor routes are already programmed, including the following:

Widening of Minnesota Route 3 - In order to close the three mile, two-lane segment of US 52 between I-494 and Rochester, MNDOT plans to build Route 3 as a multilane highway.

Widening of US 218 - To relieve congestion between Cedar Falls and Waverly, Iowa, this two-lane facility will be widened to four lanes, and a two lane bypass will be built around Waverly and Charles City. The Interstate Substitution project within Cedar Falls and Waterloo will also be completed. Longer range plans have been established (but no funds programmed) for the widening of a portion of US 18 east of Mason City. South of I-80, this highway is also programmed for widening to four lanes between Iowa Route 22 and Mount Pleasant.

Widening/Improvement of US 61 - There are a number of projects programmed for construction during the next five years along stretches of this route through Wisconsin, Iowa and Missouri. These include:

Wisconsin - Widening US 61 to four lanes from Dickeyville south to the existing four-lane section east of Dubuque.

Iowa - Construction of an eastern bypass through Dubuque as well as four-laning a portion of the route south from Dubuque to Zwingle and between Maquoketa and De Witt; a portion of the route west of Rock Island, a segment between Burlington and Fort Madison, and finally a segment of US 61 at Keokuk leading to the bridge across the Des Moines River. This deficient bridge is also being replaced with a dual structure (joint effort with Missouri).

Figure 2-7
PERCENT OF TRIPS BY PURPOSE
ST. LOUIS TO ST. PAUL CORRIDOR STUDY

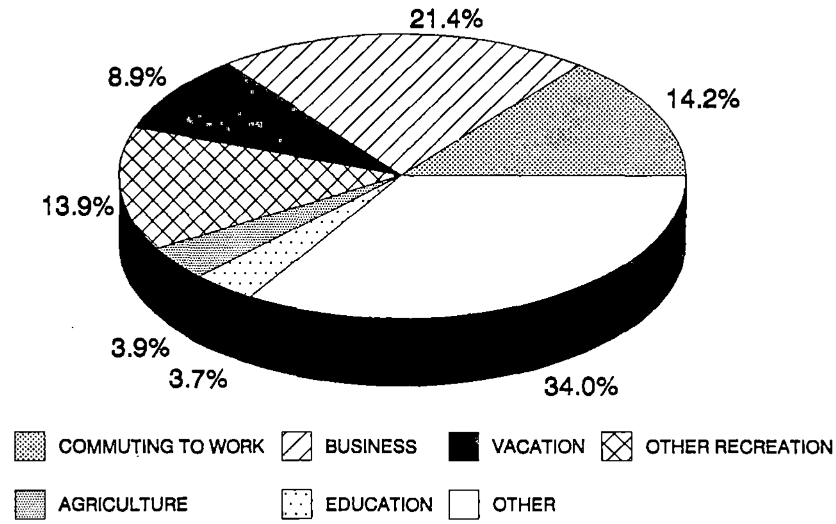


Figure 2-8
AVERAGE TRIP LENGTH BY PURPOSE
ST. LOUIS TO ST. PAUL CORRIDOR STUDY

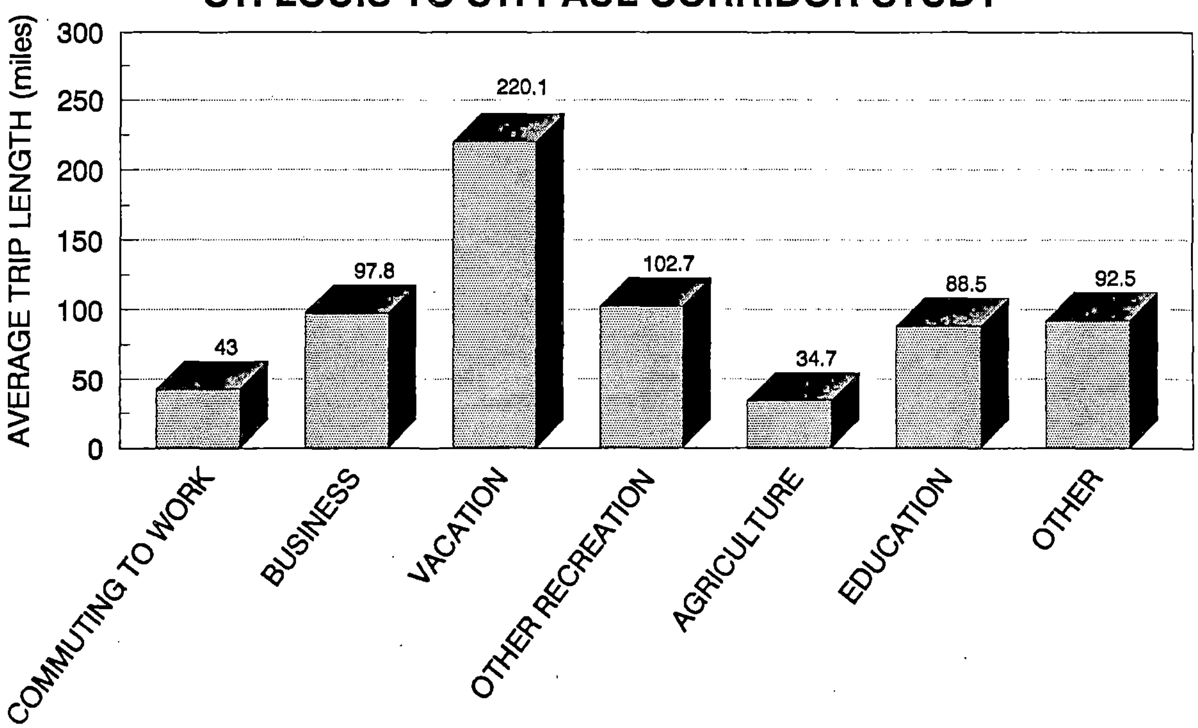


Figure 2-9
ANNUAL AVERAGE TRIPS PER VEHICLE BY PURPOSE
ST. LOUIS TO ST. PAUL CORRIDOR STUDY

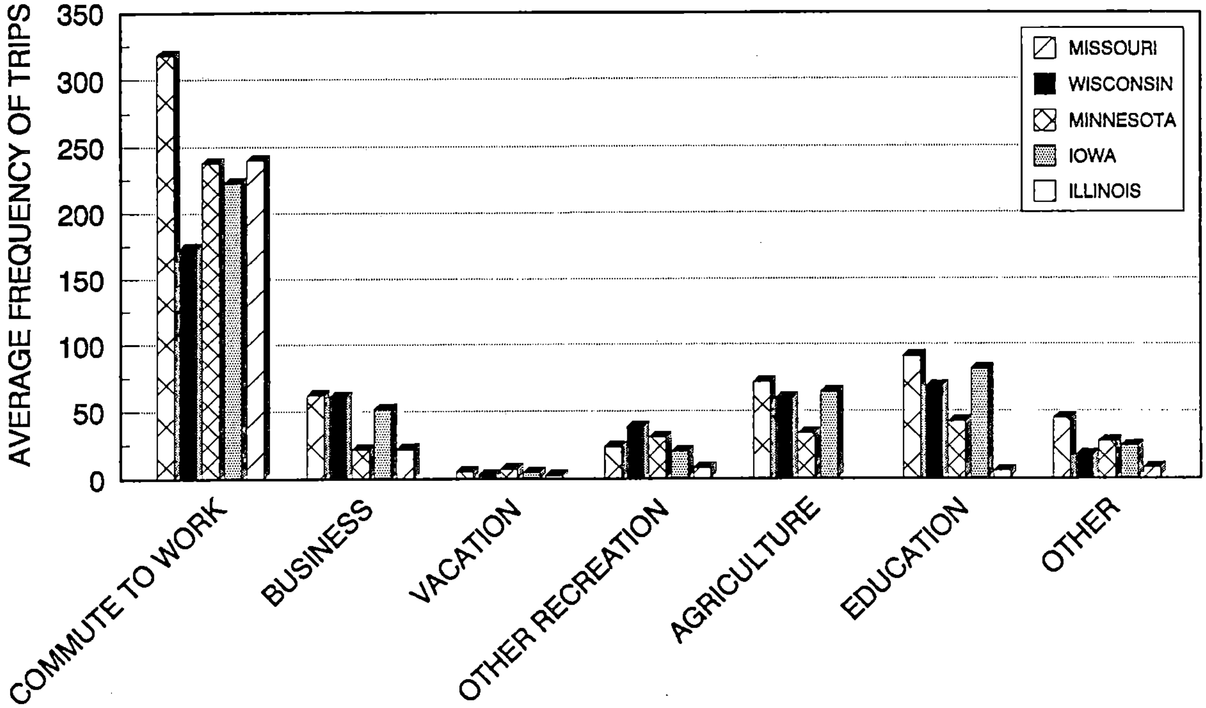
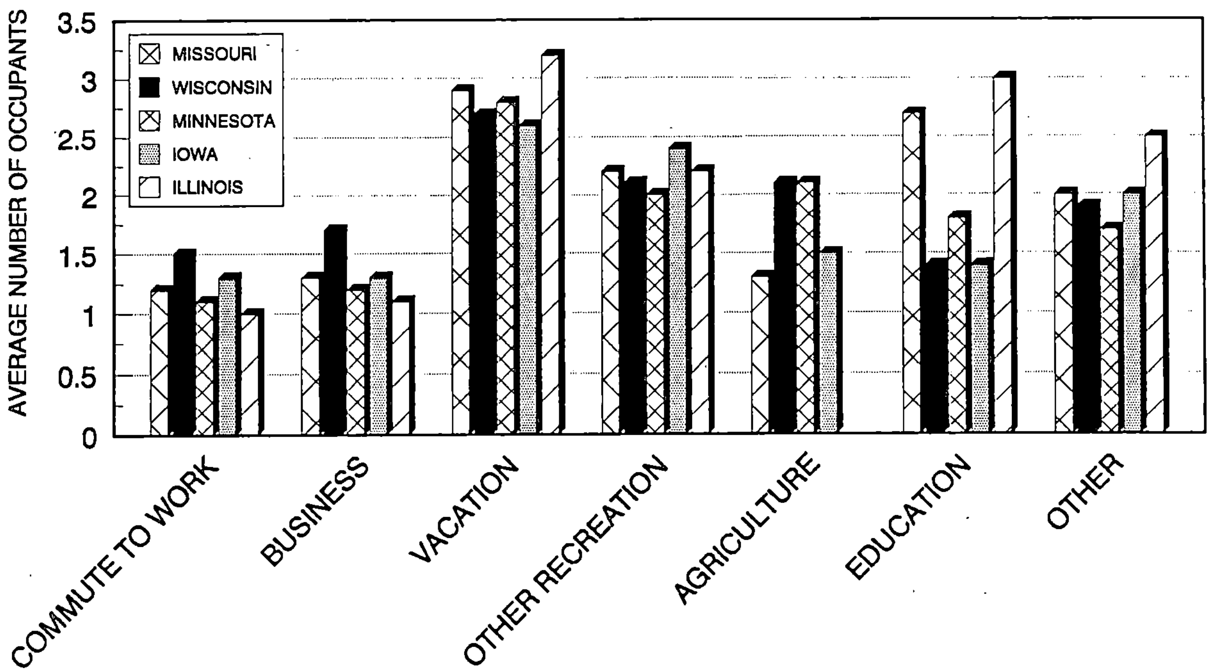


Figure 2-10
VEHICLE OCCUPANCY BY TRIP PURPOSE
ST. LOUIS TO ST. PAUL CORRIDOR STUDY



Missouri - In addition to its portion of cost for the US 61 bridge, Missouri H & TD will upgrade a portion of US 61 to the south of the bridge as well as widening approximately 17 miles to a four lane section between New London and Bowling Green.

Des Moines Area Improvements to IA 163 - Iowa DOT has funded the widening of a portion of IA 163 east of Des Moines. Additionally, an urban bypass will be constructed to connect IA 163 to I-80 so that through traffic can avoid traffic congestion in Des Moines. Monies have also been programmed for bypasses around Pella and Oskaloosa.

US 67 Near Monmouth, Illinois - Iowa DOT has funded a portion of the cost of widening US 67 to a four-lane cross-section between Monmouth and the existing four lane section north of Macomb.

US 34 Bridge Across the Mississippi Near Burlington - Illinois and Iowa are both participating in the replacement of this deficient bridge with a four lane structure.

US 36 Bridge Across the Mississippi at Hannibal - Missouri and Illinois are participating in the replacement of this bridge with a four lane structure.

Alton to St. Louis - The Illinois DOT has funded the construction of a more direct two lane road through part of Alton, as well as the replacement of the Clark Bridge across the Mississippi with a new four lane structure. Additionally, there are long range plans (but limited funds) to tie US 67 to I-255 in east St. Louis via an outer bypass.

Highway Design Standards

Any of a number of alternative highway design standards could ultimately be adopted for the St. Louis to St. Paul project. The design standards affect highway speed, safety, and cost criteria. During initial stages where there were many route options, only two standards were investigated (options 2 and 3). During final analyses, where there were only a limited number of routes under study, alternative design standards were explored.

Design Standard Options - The improved St. Louis to St. Paul highway could ultimately be improved to any of several design standards. The four design standards initially considered were:

1. **Corridor Designation** - The lowest standard would be to simply designate a specific route as "The Avenue of the Saints" but not invest in the route improvements over and above each state's projects already programmed for improvement. In other words, existing two lane segments would remain two lane facilities until such time as traffic volumes and/or funding levels justify widening to four lanes by individual states.

2. **4-Lane Partial Access Controlled Expressway Route Where Practical** - The next higher option would be to build a continuous 4-lane highway, divided with limited access where practical. Typical rural speed limits would be set at 55 mph. This standard would feature a 4-lane divided cross section with limited access throughout all rural areas, and would include bypasses

of all small towns and larger cities where practical. However, bypasses would not be built around several of the larger cities where the construction costs might be prohibitive or the impacts too severe; in those instances, 4-lane at-grade arterial streets with traffic signals would have to be accepted.

3. **4-Lane Partial Access Controlled Expressway** - This option would be to build a continuous 4-lane highway with limited access over its entire length, St. Louis to St. Paul. This option is the same as Option #2 except that it includes bypasses around all towns and cities.

4. **Freeway Standard** - The highest standard would be to build a 4-lane divided highway at freeway standards all the way from St. Louis to St. Paul. This standard would entail construction of a controlled access facility with rural speed limits of 65 mph.

Preliminary analyses focused on the two expressway alternatives (Options #2 and #3). Later, during the feasibility stage, the "Corridor Designation" (Option #1) and freeway (Option #4) alternatives were also considered, as well as possible combinations of standards along routes.

The Expressway Options - In principle, the expressway option is conceived as a "no-stop roadway", except in Option #2, which would have traffic signals and lower speed limits in some major urban areas (see Table 2-3). The expressway would have grade separations required at railroad crossings, federal and important state marked routes, as well as at public crossroads where traffic signals would be warranted within five to ten years of initial construction. Private access directly to the facility would be discouraged wherever possible. In order to facilitate the safe movement of traffic at a speed limit of 55 mph, as well as to accommodate significant volumes of heavy trucks, initial concepts of the facility through rural areas included a four lane divided highway.

Table 2-3
CITIES WHERE BYPASSES WOULD NOT BE BUILT IN DESIGN OPTION #2
St. Louis to St. Paul Corridor Study

Ottumwa	Jacksonville
Hannibal	Alton
Mt. Pleasant	Red Wing
Mason City	LaCrosse
Waterloo	Dubuque

Note: In Design Standard Option #2 urban bypasses would not be built around the above cities. In Design Standard Option #3 urban bypasses would be built around these cities.

Typical Cross-Section - A typical cross-section of what the potential four lane expressway linking St. Louis and St. Paul could look like is depicted in Figure 2-11. It is proposed to include two 24-foot wide travel ways separated by a 64-foot median. The median would include six foot paved or granular shoulders, while the outside shoulders would be 10 feet wide. The minimum 250 foot right-of-way would include room for open drainage and utility easements. All of these design features are in compliance with the AASHTO Design Standards as set forth in *A Policy on Geometric Design of Highways and Streets, 1984*. Among other things, the shoulders would provide usable area for emergencies, minimize rutting and drop-off adjacent to the travel lane, promote adequate roadway drainage and provide lateral support for the roadway base and surface course.

Corridor's Demographic and Economic Base

The corridor's economic base was examined as background information relative to the evaluation of the potential economic impact that the envisaged highway might have on the corridor and regional economies. A corridor "Impact Area" was defined, and is presented on Figure 2-12. That area includes every county within an area defined by the routes that were not eliminated in the preliminary screening, plus the counties contained in the St. Louis and Minneapolis - St. Paul "Metropolitan Statistical Areas (MSA)," plus some counties beyond the routes that would likely benefit from one or more of the routes. The number of counties included in the "corridor impact area," by state, are as follows:

Number of Counties in Corridor Impact Area

Iowa	54
Illinois	27
Minnesota	22
Missouri	18
Wisconsin	12

Traffic from counties outside of this "Corridor Impact Area" will also use the route, especially traffic from north of St. Paul and south of St. Louis, and such traffic is included in the traffic and travel efficiency analyses. The impact area, however, was designed to comprise a defined area within which the economic analyses could be applied.

Corridor Characteristics - Population, economic, agriculture and manufacturing statistics and trends were documented individually for each county in the "Corridor Impact Area." Table 2-4 lists socio-economic and agricultural trends for the defined corridor area. As shown, the corridor area is experiencing some growth.

Corridor Sub-Regional Characteristics - The defined corridor area, however, is dominated in some respects by the Metropolitan Areas on each end. Table 2-5 indicates that, of the corridor area's total population of 8.4 million, 56.1 percent is at the endpoints (St. Louis and Minneapolis/St. Paul MSA's). Excluding the two endpoints, the intermediate area's characteristics are:

Table 2-4
CORRIDOR CHARACTERISTICS
St. Louis to St. Paul Corridor Study
(in thousands)

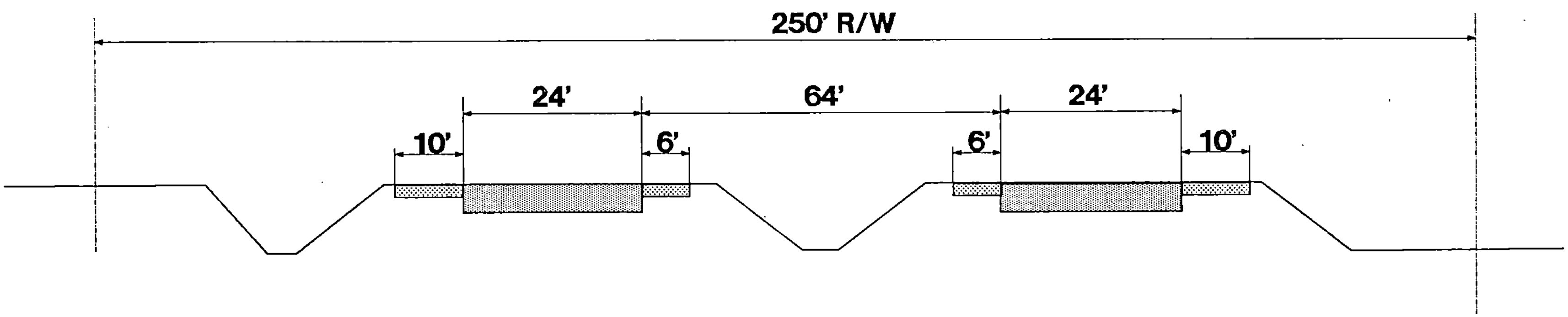
	1980	1986	PERCENT CHANGE 1980-86
Demographics			
Population	8,271.8	8,433.6	1.9%
Employment	3,785.9	4,073.6	7.1%
Per Capita Income ($000)	$8.6	$12.8	32.8%

	1982	1987	PERCENT CHANGE 1982-87
Agriculture:			
Number of Farms	151.11	139.12	-7.9%
Market Value-Agriculture Products (Current $)	10,294.3	9,501.0	-7.7%
Livestock Quantities			
Cattle/Calves	3,721.7	3,325.3	-10.7%
Hogs/Pigs	22,400.8	21,647.8	-3.4%
Poultry	9,364.7	10,085.6	7.1%
Crops Quantities			
Barley (Bu)	266.4	320.2	16.8%
Corn for Grain (Bu)	1,500,564.8	1,286,515.7	-14.3%
Wheat (Bu)	34,115.5	23,077.8	-32.4%
Oats (Bu)	51,177.6	41,232.3	-19.4%
Soybeans (Bu)	258,975.3	281,502.4	8.0%
Sorghum (Bu)	3,534.4	3,360.7	-4.9%
Hay (Tons)	10,484.6	10,402.3	-0.8%

SOURCES:

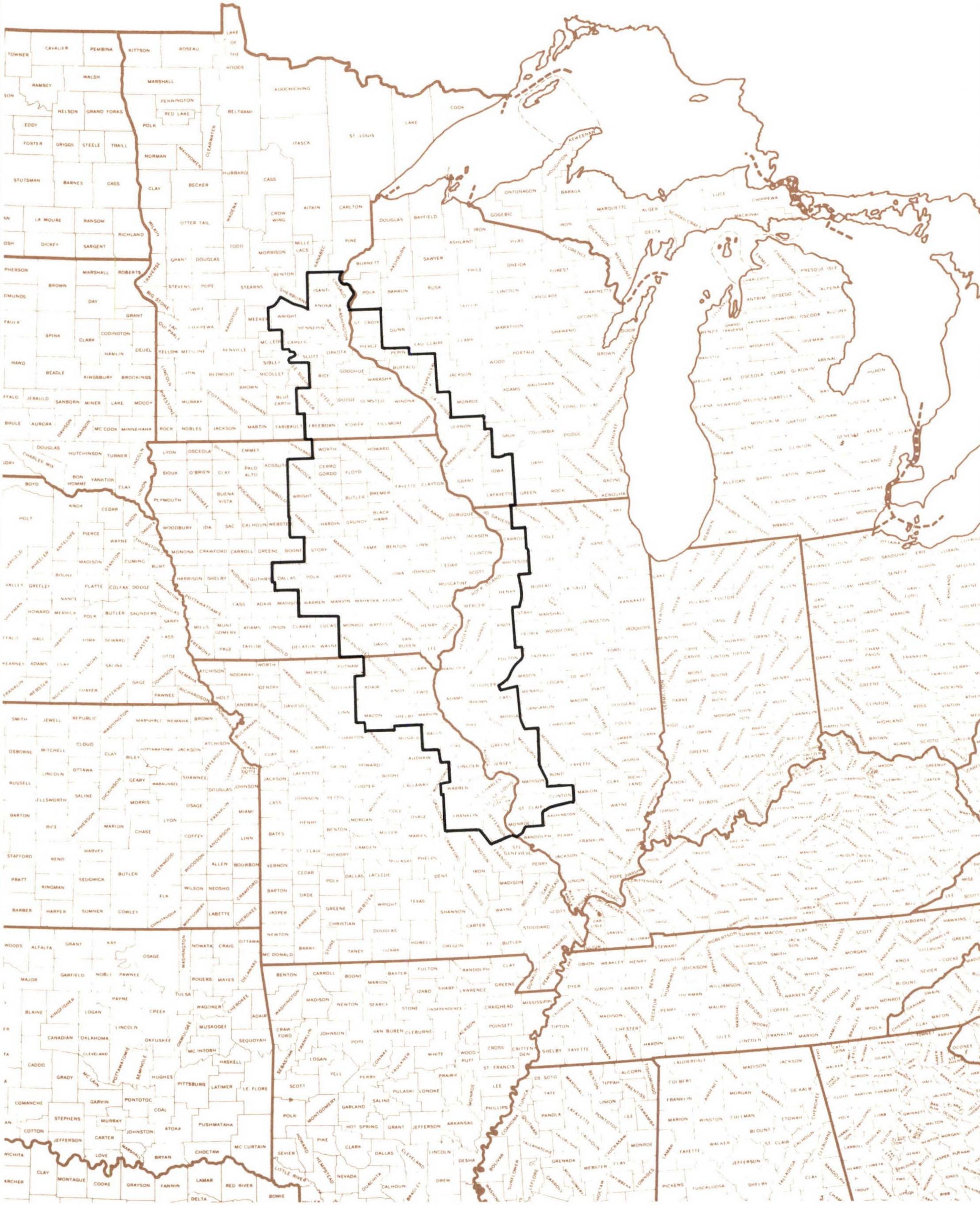
- Local Area Personal Income, volumes 2 & 3, Bureau of Economic Analysis, July 1988- data years 1985 and 1986, IL,MN,MO,WI.
- Statistical Abstract for Missouri 1987, data year 1980.
- PER CAPITA PERSONAL INCOME - IOWA (1980-1987) From Iowa Dept. of Employment Services, May 1989 Originally from U.S. Dept. of Commerce, Regional Economic Information System, Bureau of Economic Analysis
- Local Area Personal Income, Bureau of Economic Analysis - data year 1980, IL,MN,MO,WI.
- Supplement to Employment and Unemployment in States and Local Areas, 1981-1988, data for IL,MN,MO,WI. Labor Force, Employment, and Unemployment Estimates for States, Labor Market Areas, Counties, and Selected Cities. Bureau of Labor Statistics
- Iowa Department of Employment Services Revisions of 1977-1988 labor force, employment, and unemployment data, based on new Bureau of Economic Analysis regression model. (Supplied on disc - April 1989)
- City and County Data Book, 1983 - Data year 1980.
- City and County Databook 1988, Bureau of the Census- 1980 data IL,MN,MO,WI.
- STATISTICAL PROFILE OF IOWA (ANNUAL REPORT). (Mainframe data base included 1940, 1950, 1960, 1970, 1980 population data by county)
- 1986 Population by County: "1988 City and County Data Book," U.S. Bureau of the Census (originally reported in "1980 Census of Population, Characteristics of the Population, Number of Inhabitants") March 16, 1989.- data for Iowa
- 1987 Census of Agriculture, Bureau of the Census.

TYPICAL CROSS SECTION
FOUR LANE EXPRESSWAY



Expressway Rural Portions
St. Louis to St. Paul Corridor Study

Figure 2-11



CORRIDOR IMPACT AREA

FIGURE 2-12

Table 2-5
REGIONAL ECONOMIC BASE CHARACTERISTICS
1980-1986
St. Louis to St. Paul Corridor Study
(in thousands)

	1980	1986	Percent Change 1980-86
St. Louis MSA			
Population	2,377.0	2,438.0	2.5%
Employment	1,003.7	1,102.5	9.0%
Per Capita Income	$10.5	$15.9	34.0%
Minneapolis/St. Paul MSA			
Population	2,113.5	2,295.0	7.9%
Employment	1,085.0	1,261.8	14.0%
Per Capita Income	$11.5	$17.2	33.1%
Intermediate Corridor			
Population	3,781.3	3,700.6	-2.1%
Employment	1,697.2	1,709.3	.7%
Per Capita Income	$5.4	$7.4	27.0%
Total Corridor			
Population	8,271.8	8,433.6	1.9%
Employment	3,785.9	4,073.6	7.1%
Per Capita Income	$8.6	$12.8	32.8%

SOURCES:

- Survey of Current Business, Bureau of Economic Analysis, April 1979, data year 1986, MSA.
- U.S. Department of Commerce, data year 1980, MSA.
- City and County Data Book 1988, Bureau of the Census- 1980 data
- Local Area Personal Income 1981-1986, Bureau of Economic Analysis- 1985 and 1986 data.
- Statistical Profile of Iowa (Annual Report), Mainframe data base included 1940,1950,1960,1970,1980 population data by county.
- Supplement to Employment and Unemployment in States and Local Areas, 1981-1988, data for IL,MN,MO,WI. Labor Force, Employment, and Unemployment Estimates for States, Labor Market Areas, Counties, and Selected Cities. Bureau of Labor Statistics
- Iowa Department of Employment Services Revisions of 1977-1988 labor force, employment, and unemployment data, based on new Bureau of Economic Analysis regression model. (Supplied on disc - April 1989) Contacts: Ann Wagner, Bob Van Every
- City and County Data Book, 1983 - Data year 1980.
- 1988 Statistical Abstract, Bureau of the Census.

Intermediate Area Characteristics (a)	Total	Percent of Total Area
Population	3,700,600	43.9
Employment	1,709,300	42.0
Per Capita Income	$7,400	

(a) Excluding Minneapolis - St. Paul and St. Louis MSA's.

Population in Corridor Area - The corridor area's population trends and forecasts are presented in Tables 2-6 and 2-7. The forecasts were prepared by each state. The population data indicates, for example:

- Population growth in the St. Louis and St. Paul MSA's has been significant, and considerable future increases are anticipated.
- The population along the corridor has been more stable, and limited increases are forecast for the future.
- The corridor's intermediate locations (excluding the two end-points) are not experiencing as much growth as is the U.S. or any of the states. This is somewhat typical of rural areas nationally.

Corridor Activity Centers - The corridor region has a mix of local economies. For purposes of evaluation, the local economies are divided into four categories:

1. **Main Metro Areas** - The St. Louis and St. Paul Metropolitan Statistical Areas which dominate in terms of population and employment.
2. **Intermediate Major Cities** - The cities of Des Moines, Waterloo, Cedar Rapids, Iowa City, Davenport, Rochester, LaCrosse, Moline, etc. that have significant economic activity.
3. **Corridor Cities** - The corridor's cities and towns of 5,000 or more people which serve as economic activity centers. These tend to serve as agricultural support centers, and many of them have attracted various forms of manufacturing and other activities -- some of which are agriculture-oriented.
4. **Rural Areas** - The small towns and rural areas, including the corridor area's 139,120 farms. Because so much of the corridor is developed (agriculture use of the land), the rural areas (excluding the places of 5,000 or more residents) are, in a sense, dominant.

Table 2-6
REGIONAL POPULATION FORECASTS
St. Louis to St. Paul Corridor Study
(thousands)

	Resident Population (000)					
	Trend			Forecasts		
	1970	1980	1986	1990	2000	2010
Corridor Population						
Minnesota/St. Paul MSA	1,965.0	2,113.5	2,295.0	2,334.9	2,472.6	2,561.6
St. Louis MSA	2,429.0	2,377.0	2,438.0	2,413.7	2,519.9	2,567.5
Intermediate Corridor	3,598.4	3,781.3	3,700.6	3,781.8	3,790.3	3,842.1
Total Corridor	7,992.4	8,271.8	8,433.6	8,530.4	8,782.8	8,971.2
Five States Totals	26,839.6	28,313.8	28,469.5	28,971.6	29,792.9	30,418.0

20 Year Percent Change

	Trends 1970-1990	Forecasts 1990-2010
Corridor Population		
Minnesota/St. Paul MSA	15.8%	8.8%
St. Louis MSA	-0.6%	6.0%
Intermediate Corridor	4.8%	1.6%
Total Corridor	6.3%	4.9%
Five States Totals	7.4%	4.8%

SOURCES:

- City and County Data Book 1988, Bureau of the Census- 1980 data IL,MN,MO,WI.
- Local Area Personal Income 1981-86 volumes 2 & 3 Bureau of Economic Analysis- 1985 and 1986 data IL,MN,MO,WI.
- Minnesota Population Projections 1980-2010, Minnesota Dept. of Energy, Planning, and Development, May 1983- data years 1990-2010.
- Projections of the Population of Missouri Counties by Age and Sex: 1985 to 2010, Missouri Office of Administration, May 1988- data years 1990-2010.
- STATISTICAL PROFILE OF IOWA (ANNUAL REPORT)
  (Mainframe data base included 1940, 1950, 1960, 1970, 1980 population data by county)
- 1986 Population by County: "1988 City and County Data Book," U.S. Bureau of the Census (originally reported in "1980 Census of Population, Characteristics of the Population, Number of Inhabitants") March 16, 1989.- data for Iowa
- Census of Population, Bureau of the Census, 1970.
- Wisconsin Population Projections, 1980-2020, 5th Edition, June 1988, State Department of Administration.
- Population Projections for Iowa Counties: 1990-2010, Iowa Census, Iowa State University, 1987.
- Illinois Population Trends:1980-2025, Bureau of the Budget.

Table 2-7
POPULATION TRENDS AND FORECASTS
St. Louis to St. Paul Corridor Study
(Thousands)

	Trend (000)			Forecasts (000)			Percent Change	
	1970	1980	1986	1990	2000	2010	1970-80	1980-86
Corridor Population								
Minnesota/St. Paul MSA	1,965.0	2,113.5	2,295.0	2,334.9	2,472.6	2,561.6	7.0%	7.9%
St. Louis MSA	2,429.0	2,377.0	2,438.0	2,413.7	2,519.9	2,567.5	-2.1%	2.5%
Rest of Corridor	3,598.4	3,781.3	3,700.6	3,781.8	3,790.3	3,842.1	4.8%	-2.1%
Total Corridor	7,992.4	8,271.8	8,433.6	8,530.4	8,782.8	8,971.2	3.4%	1.9%
Five States Population	26,839.6	28,313.8	28,469.5	28,971.6	29,792.9	30,418.0	5.2%	-.5%
U.S. Population	203,302.0	226,546.0	241,078.0	250,410.0	268,266.0	282,575.0	10.3%	6.0%
Population by State								
Iowa Corridor	1,964.2	2,054.4	2,023.9	2,023.8	2,067.4	2,098.7	4.4%	-1.5%
Rest of Iowa	861.2	859.4	827.9	829.7	832.3	831.0	-0.2%	-3.7%
Illinois Corridor	1,363.9	1,373.5	1,339.5	1,338.9	1,304.5	1,292.6	.7%	-2.5%
Rest of Illinois	9,750.1	10,178.5	10,213.4	10,372.8	10,592.6	10,794.1	4.2%	.3%
Minnesota Corridor	2,347.5	2,516.8	2,676.6	2,734.1	2,884.8	2,981.6	6.7%	6.0%
Rest of Minnesota	1,458.5	1,559.2	1,537.4	1,636.8	1,715.6	1,774.3	6.5%	-1.4%
Missouri Corridor	1,988.7	1,965.0	2,022.3	2,046.7	2,114.4	2,167.0	-1.2%	2.8%
Rest of Missouri	2,687.8	3,101.0	3,043.9	3,112.0	3,234.1	3,322.3	13.3%	-1.8%
Wisconsin Corridor	328.1	362.1	371.3	386.9	411.7	431.3	9.4%	2.5%
Rest of Wisconsin	4,089.6	4,343.9	4,413.3	4,489.9	4,635.5	4,725.1	5.9%	1.6%
Total Corridor	7,992.4	8,271.8	8,433.6	8,530.4	8,782.8	8,971.2	3.4%	1.9%
Total States	26,839.6	28,313.8	28,469.5	28,971.6	29,792.9	30,418.0	5.2%	.5%
Iowa	2,825.4	2,913.8	2,851.8	2,853.5	2,899.7	2,929.7	3.0%	-2.1%
Illinois	11,114.0	11,552.0	11,552.9	11,711.7	11,897.1	12,086.7	3.8%	.0%
Minnesota	3,806.0	4,076.0	4,214.0	4,370.9	4,600.4	4,755.9	6.6%	3.3%
Missouri	4,676.5	5,066.0	5,066.2	5,158.7	5,348.5	5,489.3	7.7%	.0%
Wisconsin	4,417.7	4,706.0	4,784.6	4,876.8	5,047.2	5,156.4	6.1%	1.6%

SOURCES:

- City and County Data Book 1988, Bureau of the Census- 1980 data IL,MN,MO,WI.
- Local Area Personal Income 1981-86 volumes 2 & 3 Bureau of Economic Analysis- 1985 and 1986 data IL,MN,MO,WI.
- Minnesota Population Projections 1980-2010, Minnesota Dept. of Energy, Planning, and Development, May 1983- data years 1990-2010.
- Projections of the Population of Missouri Counties by Age and Sex: 1985 to 2010, Missouri Office of Administration May 1988- data years 1990-2010.
- STATISTICAL PROFILE OF IOWA (ANNUAL REPORT) (Mainframe data base included 1940, 1950, 1960, 1970, 1980 population data by county)
- 1986 Population by County: "1988 City and County Data Book," U.S. Bureau of the Census (originally reported in "1980 Census of Population, Characteristics of the Population, Number of Inhabitants") March 16, 1989.- data for Iowa
- Census of Population, Bureau of the Census, 1970.
- Wisconsin Population Projections, 1980-2020, 5th Edition, June 1988, State Department of Administration.
- Population Projections for Iowa Counties: 1990-2010, Iowa Census, Iowa State University, 1987.
- Illinois Population Trends:1980-2025, Bureau of the Budget.

The locations of the incorporated places of 5,000 or more population are listed on Table 2-8. These places are also illustrated on Figure 2-13. The map of these places indicates that all of the alternative route options serve a number of such economic activity centers.

Cargo Transportation

Trucks comprise a significant share of corridor traffic, and would be among the beneficiaries of an improved St. Louis-St. Paul highway corridor. Truck travel will benefit from increased travel speeds, travel reliability and improved safety. Shippers and consignees could possibly benefit from reduced freight rates. The corridor region could benefit if such trucking improvements are translated into improved economic development prospects (ease and cost of truck travel is one criterion in most site selection decisions).

Truck Cargo Origins and Destinations - The commodities carried by each mode in the corridor, and their origins/ destinations, have been established and are summarized herein. Figure 2-14 presents the commodity flow origin and destination zones used in the cargo analysis (the cargo statistics by Business Economic Areas were provided by Reebie Associates). The corridor's estimated highway cargo tonnage origin/ destination matrix is presented on Table 2-9. The tonnage is indicative of all tons (except unprocessed agriculture commodities) involving the defined zones; however, not all of this tonnage would use the improved highway route. The heaviest volume origin/destination zone pairs are those listed on Table 2-10.

For most of these trips, the trucks would either use the routes for a part of their journey, or not at all. In terms of using the entire route all the way, end-to-end, the following truck tonnage currently moves, which indicates that about 500 trucks take the end to and trip daily:

Origin Zone/Area	Destination Zone/Area	Annual Tons
Southbound:		
1 North of St. Paul	10 St. Louis	202,249
1 North of St. Paul	11 South of St. Louis	225,710
2 St. Paul	10 St. Louis	269,309
2 St. Paul	11 South of St. Louis	211,508
Total		908,776
Northbound:		
10 St. Louis	1 North of St. Paul	107,249
10 St. Louis	2 St. Paul	417,808
11 South of St. Louis	1 North of St. Paul	152,767
11 South of St. Louis	2 St. Paul	658,285
		1,336,109
Total Northbound and Southbound		2,244,885

Table 2-8

POPULATION AND ECONOMIC ACTIVITY CENTERS

Places Over 5,000 Resident Population

St. Louis to St. Paul Corridor Study

PLACE	POPULATION
Corridor End Points:	
MO St. Louis MSA	2,438,000
MN Minneapolis/St. Paul MSA	2,295,000
Intermediate Corridor Places:	
IA Des Moines MSA	380,000
IA Davenport MSA	371,000
IA Cedar Rapids MSA	169,000
IA Waterloo MSA	152,000
MN Rochester	62,782
IA Dubuque	59,700
IA Iowa City	50,490
WI La Crosse	47,650
IA Ames	44,460
IL Quincy	39,600
IL Galesburg	31,830
IA Mason City	30,200
IA Clinton	30,080
IA Burlington	28,000
IA Marshalltown	26,070
IA Ottumwa	25,290
MN Winona	24,675
IL Warren	24,610
IA Muscatine	23,580
MN Austin	21,780
MN Owatonna	18,766
IL Jacksonville	19,790
MO Hannibal	18,670
IL Macomb	18,130

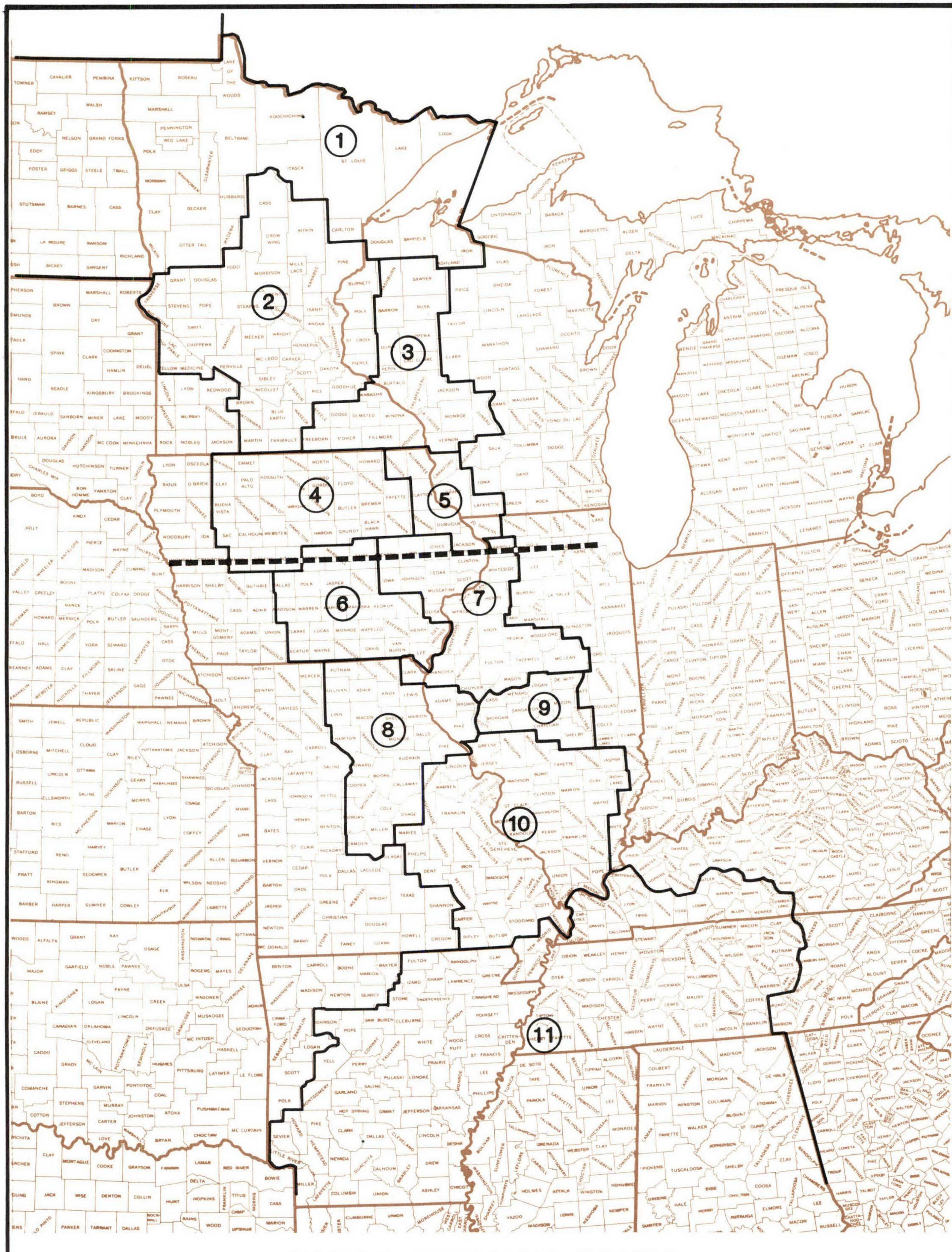
PLACE	POPULATION
MN Albert Lea	18,046
MO Kirksville	16,010
IL Sterling	15,570
IA Newton	14,800
IL Kewanee	13,150
IA Keokuk	13,010
IL Canton	12,450
IA Fort Madison	12,360
IA Oskaloosa	10,800
IL Rock Falls	10,640
IL Monmouth	10,010
IL Washington	9,820
IA Fairfield	9,570
WI Platteville	9,450
IA Charles City	8,560
MN Waseca	8,453
IA Pella	8,300
IA Decorah	8,000
IA Knoxville	7,920
IA Mount Pleasant	7,200
IA Oelwein	6,840
IA Maquoketa	6,350
IA Nevada	6,270
IA Centerville	5,920
MO Macon	5,920
WI Prairie du Chien	5,890
IA Iowa Falls	5,870
IL Beardstown	5,640

SOURCE:

a. 1988 City and County Data Book, Bureau of the Census.
b. 1988 Statistical Abstract, Bureau of the Census.

POPULATION AND ECONOMIC CENTERS

FIGURE 2-13



CARGO ANALYSIS ZONES

FIGURE 2-14

Table 2-9

TRUCK TONNAGE ORIGINS/DESTINATIONS

St. Louis to St. Paul Corridor Study

1987

ORIGIN ZONE	ANNUAL TONS BY DESTINATION ZONE 1	2	3	4	5	6	7	8	9	10	11
1. North of St. Paul	--	2,558,201	442,575	114,010	57,973	236,926	401,020	23,931	47,480	202,249	225,710
2. St. Paul, Minneapolis	2,414,447	--	2,502,812	397,832	174,540	496,382	582,937	39,668	63,040	269,309	211,508
3. LaCrosse, Rochester	174,269	1,404,707	--	76,147	67,263	98,592	161,008	20,119	41,709	112,004	71,819
4. Waterloo, Ft. Dodge	194,052	1,295,374	243,360	--	152,003	1,472,109	1,016,074	39,674	35,030	150,033	65,874
5. Dubuque	66,703	226,241	64,657	98,574	--	180,793	917,310	15,429	19,278	103,868	55,054
6. Des Moines	137,175	538,820	95,782	962,151	83,043	--	559,105	74,399	31,822	478,220	103,788
7. Peoria, Davenport, C.R.	176,802	722,630	150,788	1,050,975	563,852	744,664	--	274,047	1,187,360	1,406,558	340,781
8. Quincy, Columbia	15,385	72,672	17,865	38,985	29,654	51,778	388,719	--	117,639	987,253	593,907
9. Springfield	25,949	127,638	31,582	16,712	7,257	30,119	768,932	82,146	--	760,425	168,108
10. St. Louis	107,249	417,808	90,096	227,225	85,887	343,004	1,187,087	1,255,871	1,174,351	--	2,092,109
11. South of St. Louis	152,767	658,285	156,269	182,641	73,551	295,031	927,015	489,674	215,524	2,800,470	--

Note: U.S. tonnage only. Includes for hire and private trucking.
Generally excludes commodites (grains) and raw minerals.
Excludes "intra-zonal" movements.

SOURCE: Transearch Freight Commodity Flow Data

Table 2-10
CARGO PRINCIPAL ORIGIN/DESTINATION PAIRS
1987

ORIGIN		DESTINATION		ANNUAL TONS	COULD USE CORRIDOR ROUTES
11.	South of St. Louis	10.	St. Louis	2,800,470	No
1.	North of St. Paul	2.	St. Paul	2,558,201	No
2.	St. Paul	3.	LaCrosse, Rochester	2,502,812	Yes
2.	St. Paul	1.	North of St. Paul	2,414,447	No
10.	St. Louis	11.	South of St. Louis	2,092,109	No
4.	Waterloo	6.	Des Moines	1,472,109	No
7.	Peoria, Davenport, C.R.	10.	St. Louis	1,406,558	Yes
3.	LaCrosse, Rochester	2.	St. Paul	1,404,707	Yes
4.	Waterloo, Ft. Dodge	2.	St. Paul	1,295,374	Yes
10.	St. Louis	8.	Quincy, Columbia	1,255,871	Yes
7.	Peoria, Davenport, C.R.	9.	Springfield	1,187,360	Yes
10.	St. Louis	7.	Peoria, Davenport, C.R.	1,187,087	Yes
10.	St. Louis	9.	Springfield	1,174,351	No
7.	Peoria, Davenport, C.R.	4.	Waterloo	1,050,975	Yes
4.	Waterloo	7.	Peoria, Davenport, C.R.	1,016,074	Yes

Truck Cargo Tons Crossing Screenline - To gauge the overall inter-zonal truck tonnage in the corridor, an east-west screenline was established between zones 1-5 and 6-11. The line is just north of Ames and just north of Cedar Rapids (south of Waterloo). Table 2-11 lists the truck tonnage crossing that screenline in 1987. The 14.4 million tons would imply that 2,630 laden cargo carrying trucks crosses the screenline daily (at 15 tons per truck). These crossings occur on a variety of highway routes, and not all of them could use the envisaged St. Louis - St. Paul highway corridor.

Rail Cargo Origin/Destinations - Rail tonnage moving through the corridor to and from the same zones as used for trucking is shown on Table 2-12. The volumes vary considerably from zone to zone.

Table 2-11
ESTIMATED ANNUAL TRUCK TONS CROSSING CORRIDOR SCREEN LINE[(a)]
St. Louis to St. Paul Corridor
1987

DESTINATION ZONE		ANNUAL TONS
From Zones 6, 7, 8, 9, 10, 11 to:		Northbound
1	North of St. Paul	615,327
2	Minneapolis/St. Paul	2,537,853
3	LaCrosse, Eau Claire, Rochester	542,382
4	Waterloo, Fort Dodge	2,478,689
5	Dubuque	843,244
	Total Northbound Tons	7,017,495
From Zones 1, 2, 3, 4, 5 to:		Southbound
6	Des Moines	2,484,802
7	Peoria, Davenport, Cedar Rapids	3,078,349
8	Quincy, Columbia	138,821
9	Springfield	206,537
10	St. Louis	837,463
11	South of St. Louis	629,965
	Total Southbound Tons	7,375,937
	Total Tons - Both Directions	14,393,432

(a) East-West screenline drawn just north of Cedar Rapids

Note: U.S. tons only. Includes for hire and private trucking. Generally excludes commodities (grains) and raw minerals. Excludes "intra-zonal" movements.

SOURCE: Transearch Freight Commodity Flow Data

Table 2-12
RAIL TONNAGE ORIGINS/DESTINATIONS
St. Louis to St. Paul Corridor Study
1987

ORIGIN ZONE	ANNUAL TONS BY DESTINATION ZONE 1	2	3	4	5	6	7	8	9	10	11
1. North of St. Paul	--	4,215,947	264,836	40,665	8,763	72,283	63,431	4,165	32,071	2,325,847	596,784
2. St. Paul, Minneapolis	1,186,517	--	599,247	152,908	83,770	233,578	570,356	15,862	9,038	259,056	386,385
3. LaCrosse, Rochester	19,313	128,068	--	78,248	72	2,250	170,286	777	236	20,134	31,352
4. Waterloo, Ft. Dodge	14,175	564,911	44,280	--	840,911	944,796	5,687,477	304	159,514	244,486	223,345
5. Dubuque	0	6,139	6,287	55,425	--	2,821	32,659	26	0	149	32,835
6. Des Moines	381	35,308	5,926	1,692	32,241	--	916,185	19,497	98,220	254,941	105,060
7. Peoria, Davenport, C.R.	22,748	603,896	21,314	145,878	28,618	223,940	--	4,231	762,951	303,735	498,953
8. Quincy, Columbia	15,905	60,064	993	1,714	0	101,968	25,481	--	158,288	286,711	29,805
9. Springfield	0	3,540	0	0	0	0	217,766	4,303	--	1,642,130	782,688
10. St. Louis	7,899	164,011	40,302	109,944	73	105,508	1,449,615	148,455	229,661	--	7,393,541
11. South of St. Louis	37,696	433,034	44,620	14,709	19,948	103,455	403,901	64,195	341,635	2,307,862	--

Note: U.S. tonnage only, rail freight only.
Excludes "intra-zonal" movements.

SOURCE: Transearch Freight Commodity Flow Data

Corridor Overview Findings

The background material in this report chapter described a corridor area that has better east-west highways than north-sourh highways. The material suggests:

1. North-south highways in the corridor are predominantly two-lane, with some four-lane sections.

2. The north-south traveler is confronted with a variety of route options, most of which are not acceptable for long distance intercity travel.

3. There are some constraints to four-lane highway construction, with the most severe constraints existing in the route options in Wisconsin and Minnesota near the Mississippi River.

4. Existing highway traffic volumes are low relative to four-lane or Interstate Highway standards. Part of this is due to the dispersal of traffic over so many two-lane routes.

5. The travel survey results suggest that the average trip length is about 100 miles (long by urban standards, short by Interstate Highway standards).

6. The state highway agencies are already making improvements to various highway segments throughout the corridor. None of these, however, would lead to a four-lane highway all the way from St. Louis to St. Paul.

7. An important issue is the need/ability to bypass some or all of the towns and urban areas along the routes.

8. There is population and economic growth throughout the corridor area. Travel demand will therefore continue to increase well into the future, indicating continuing need for highway improvements on all routes, not just a single selected St. Louis to St. Paul route.

9. Trucks constitute a sizable share of the area's traffic and truck traffic is increasing at a faster rate than is automobile traffic. Such truck densities on two-lane highways are an important issue.

Chapter 3

ROUTE SCREENING EVALUATIONS

An important goal of this "Consultant's Report to the States" was to analyze possible routes between St. Louis and St. Paul, and to identify those routes that are most feasible. To accomplish this, a "Route Screening Process" was used which treated all route options as equals, and which evaluated each.

The route analyses considered all reasonable highway route options between St. Louis and St. Paul and, based on increasingly detailed evaluation, reduced the number of options to those few that were found to be most promising. Figure 3-1 depicts the flow of that screening process, in the form of four sequential maps.

- Routes Considered -- All routes and route combinations initially included in the study (36 routes and route combinations).
- Preliminary Screening Results -- The route options that survived the "preliminary analyses" (27 routes and route combinations).
- Secondary Screening Results -- The route options that survived the "secondary analyses" (6 routes and route combinations).
- Selection of "Finalist" Routes -- The route options which were identified as the best candidate routes (4 routes).

Route Screening Methodology

Initial analyses found 36 route options which were to be considered as possible corridors for an improved highway connecting St. Louis and St. Paul. The goal of this Feasibility and Necessity Study was to evaluate all of the route options, eliminate those which were inferior to the others, and to evaluate the feasibility of the finalist several best route options. To reduce the various route combinations down to the several best routes, a "formalized process" was used.

<u>**Formalized Route Screening Process**</u> - To avoid the biases of subjective or somewhat arbitrary comparisons of the various route options, this study applied a formalized, consistent "Route Screening Process." By applying such a procedure, each route option was treated equally to the others, and no option was eliminated from consideration until sufficient evidence existed to make such a decision.

The "screening process" involved four sequential "analysis levels," each intended to produce specific products, as identified on Table 3-1. The level of analysis detail increased with each new level.

Table 3-1
FOUR STEP SCREENING PROCESS
St. Louis to St. Paul Corridor Study

ANALYSIS LEVEL	ROUTES INCLUDED	EVALUATION	PRODUCT
Preliminary	All 36	Some routes are eliminated without evaluation	Identify routes that merit evaluation
Screening #1	Remaining 27	Eliminate additional routes based on limited evaluation	Identify routes that merit more detailed evaluation
Screening #2	Remaining 6 Routes	Eliminate additional routes based on detailed evaluation	Identify finalist routes, to be tested for feasibility
Feasibility #3	Four "Finalist" Routes	Examine finalist routes feasibility	Feasibility and necessity comparisons

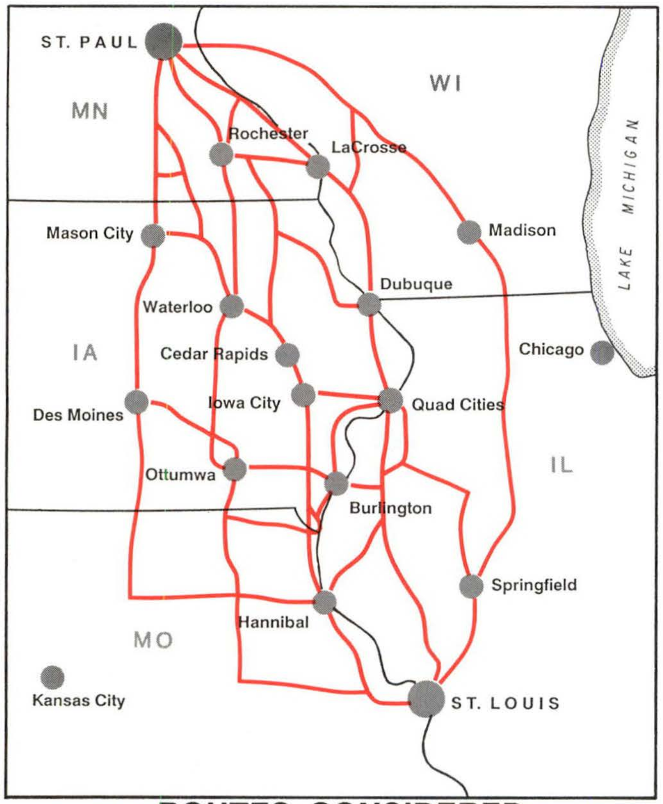
SOURCE: Wilbur Smith Associates

Goals Achievement - If a major highway investment is to be made in the corridor, it will be because such an investment is feasible, warranted and sensible. To gauge whether such an investment is worthwhile, four highway goals were established:

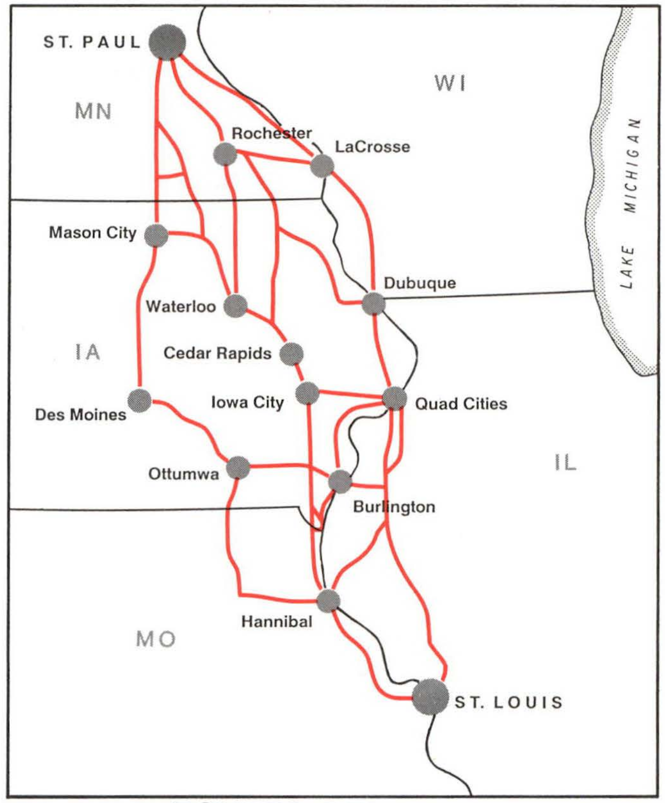
1. Travel Efficiency - Measured in terms of traffic volumes served, vehicle operating costs saved and travel time saved. This goal implies that the best road options are those which could improve efficiency the most for the greatest number of vehicles.

2. Economic Development - Measured in terms of final demand, economic activity and jobs. This goal implies that the best road options are those which improve local and regional economies in terms of "economic impact."

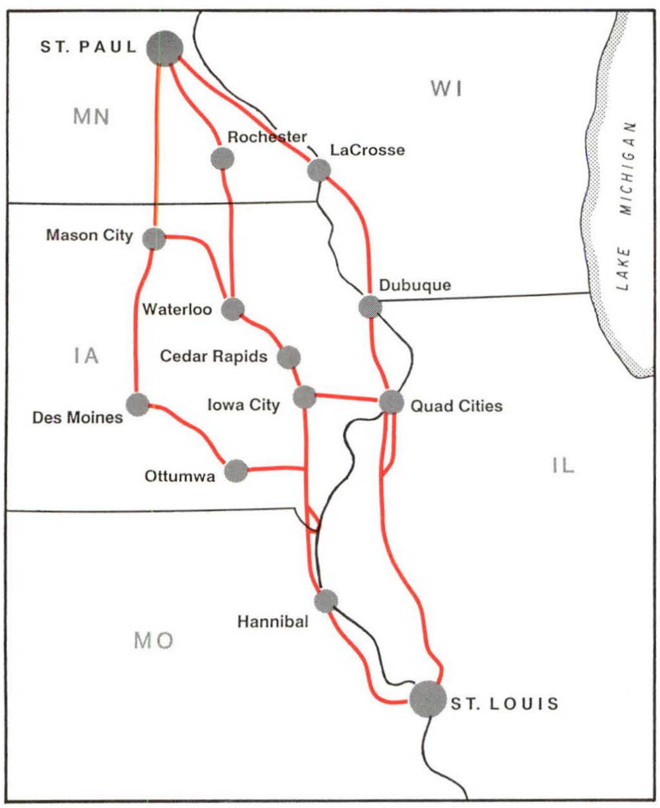
3. Capital Cost - Measured in terms of as yet uncommitted public sector dollar expenditures. This goal implies that the best road options will be those which are the least expensive, or at least realistic, in terms of use of the public's tax dollars.



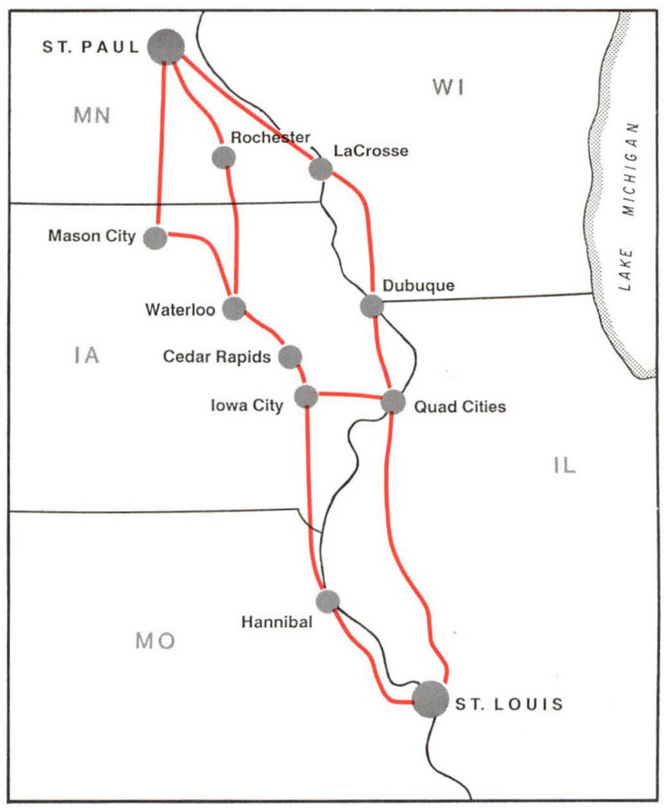
ROUTES CONSIDERED



ROUTES REMAINING AFTER PRELIMINARY SCREENING



ROUTES REMAINING AFTER SECONDARY SCREENING



FINALIST ROUTES

FIGURE 3-1

4. **Impacts** - Measured in terms of impacts on such areas as the environment, farms, and other modes. This goal implies that the better routes will either have positive impacts, or will not have major negative impacts.

Within each of these four major goals were a number of sub-issues and objectives. Furthermore, no single route was found that was best in terms of all goals.

To evaluate each route option's capacity to attain the four goals, a "Goals Achievement Matrix," as depicted on Figure 3-2, was utilized. The highway corridor's four princpal goals are shown, as are the analysis levels.

Within each cell in the matrix is a summary of the evaluation factors considered, as well as an indication of each analysis level's level of evaluation detail. Each study goal was included in each analysis level, in the form of an increasingly detailed evaluation as the work proceeded from one analysis level to another. For example, under Goal #1: Travel Efficiency, Screening Level #1 included only network travel times between St. Paul and St. Louis, plus indicators of accessibility to intermediate communities, plus need as measured by existing traffic volumes. The Travel Efficiency analyses were much more detailed in Screening Level #2, including traffic assignments to the improved route options, traffic forecasts and detailed highway user cost assessments. The Travel Efficiency analyses in Feasibility Level #3 were the most detailed, involving thorough economic benefit/cost analysis.

<u>**Route Elimination Decision Processes**</u> - The various route options were evaluated in accordance with their ability to attain the four goals. The process of evaluation was conducted using a set of "decision rules" and "decision trees." To objectively assess the route options, five decision rules were used, which in combination, determined which routes would continue to be studied in later levels, as listed on Table 3-2.

Table 3-2

DECISION RULES

A. FATAL FLAW	▪ If a route is found to have a major flaw, it is rejected.
B. MINIMUM THRESHOLDS ATTAINED	▪ Route must achieve at least certain thresholds, or it is rejected.
C. BEST SINGLE CRITERION PERFORMANCE	▪ Best route for each goal automatically included.
D. SEVERAL BEST OVERALL PERFORMANCE	▪ Good routes for all goals are automatically included.
E. SIGNIFICANCE OF DIFFERENCES	▪ Greater emphasis given to significant differences.

Each route was then subjected to the study's various analyses, and a route was retained or rejected based on its ability to attain the goals via attainment of the Table 3-2 decision rules. Figure 3-3 describes the overall decision tree process, in simplified format. It indicates that a route option was eliminated only with cause.

"Preliminary" Route Screening

All route options were subjected to the "preliminary screening process," intended to identify any routes or route segments that clearly and obviously did not merit more detailed analysis. The intent was to eliminate these, so that study resources could be focused on the other, more realistic route options. The route segments depicted on Figure 3-4 as dashed lines were eliminated during the preliminary level, for the following reasons.

U.S. 63 Rochester to Lake City, MN - This 35-mile segment would allow the corridor to approach St. Paul via U.S. 63 and U.S. 61. However, the segment has three fatal flaws which indicated that it should be eliminated from further consideration:

- It would pass directly through the City of Rochester, or would require a bypass around Rochester, either of which would be expensive.
- U.S. 52 between Rochester and St. Paul is already a four-lane highway, while U.S. 63 north of Rochester is only a 2-lane highway, as is most of U.S. 61.
- U.S. 63 from Rochester to U.S. 61 to St. Paul requires motorists to travel 87 miles, while U.S. 52 is only 65 miles. Therefore, the intercity traffic would likely not use it.

Wis. Route 27: Westby to Black River Falls, Wis. - This 51 mile segment would allow the route to make some use of I-94, from Black River Falls to St. Paul. However, the route, or the alternative of U.S. 53 from LaCrosse to Osseo, Wis., has two fatal flaws:

- It would be very expensive to upgrade either State Route 27 or U.S. 53.
- It would create a much more circuitous route than the more direct U.S. 61 between LaCrosse and St. Paul, part of which is already 4-lane.

In addition, during public hearings for Wisconsin's "Corridor 2020" Highway System, no one voiced support for such a route.

U.S. 63 Oskaloosa to Cedar Falls, Iowa - This segment would provide a direct north-south route on U.S. 63, perhaps south to Oskaloosa or even as far south as Macon, Missouri, and to the north connecting with either U.S. 63 or U.S. 218. However, this route suffered from several fatal flaws.

- The route parallels I-35 only 48 miles to the west, resulting in a redundancy of north-south 4-lane highways if this portion of U.S. 63 were also improved.

GOALS ACHIEVEMENT MATRIX

HIGHWAY GOALS AND CRITERIA	1	2	3	4
ANALYSIS LEVEL	**TRAVEL EFFICIENCY**	**ECONOMIC DEVELOPMENT**	**CAPITAL COST**	**IMPACTS ANALYSIS**
Screening 1	Travel Time; Accessibility Necessity	Existing Opportunities	Cost Expectations	Issues, Distribution
Screening 2	Travel Forecast and User Costs	Economic Development Benefits	Cost Estimates	Environmental Scenic Routes Farm Lands Other Modes
Feasibility 3	Road User Benefit/Cost	Economic Development Benefit/Cost	Costs Compared with Benefits	Comparisons, and Alleviation

PRODUCTS: Relative Comparisons	Travel Forecasts User Costs Quantified B/C	Impact by Sector - Jobs - $ Impact Value	Costs - Const. - Maint. Cost Savings	Relative Impact Comparisons

FIGURE 3-2

DECISION TREE SEQUENCE
(Repeat in each of The Screening Levels)

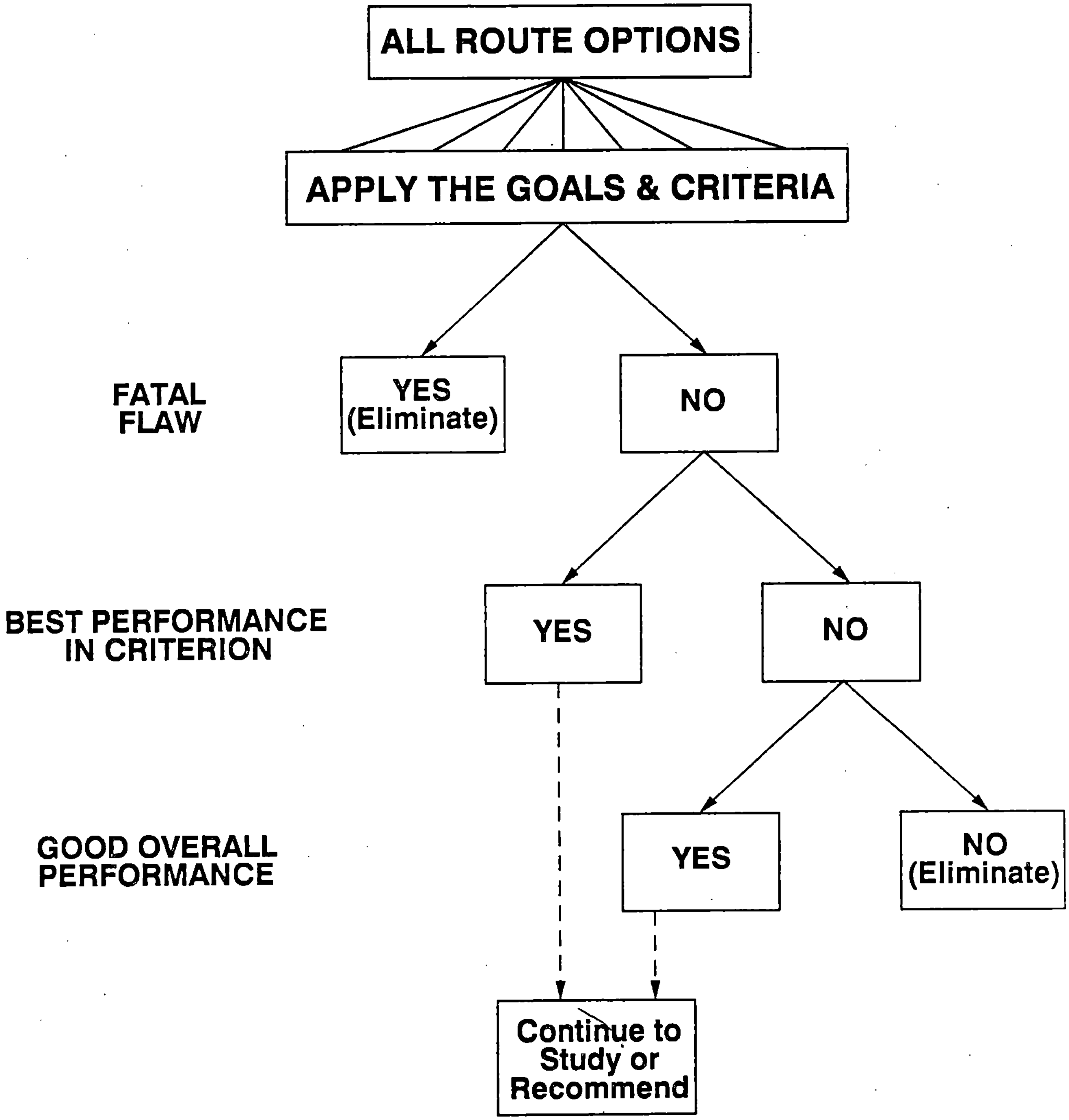


FIGURE 3-3

ELIMINATED ROUTES
PRELIMINARY SCREENING

FIGURE 3-4

- Waterloo is already served from the south by I-380, again indicating a redundancy if this section of U.S. 63 were to also be improved.

In addition, this route section is not significant enough to be included on the Iowa Long Range State Commercial Network.

U.S. 63 Ottumwa to Oskaloosa, Iowa - This 29-mile section is one of two possible routes between these two cities, the other being Iowa Route 23/137. The U.S. 63 option suffers because:

- The Route 23/137 combination is 4 miles shorter in travel distance.
- The U.S. 63 version would require a more expensive bypass around Oskaloosa.
- There is greater potential for traffic generation on the Route 23/137 option, particularly truck traffic originating at Eddyville.

In addition, Iowa DOT has determined that it will seek to upgrade the Route 23/137 option as part of the Des Moines to Burlington highway corridor improvement.

U.S. 136 Lancaster to Wayland, MO - If U.S. 63 or any portion of I-35 south of Mason City were to be selected, some combination of route segments would be needed to carry the traffic west to those routes. U.S. 136 in Missouri was one possibility, as were U.S. 36 in Missouri and U.S. 34 in Iowa. U.S. 136 had less merit than its parallel options, because:

- There is less traffic generation and economic activity along U.S. 136 than along the other options.
- U.S. 36 has a higher state priority than does U.S. 136.
- There is considerably more local interest along U.S. 36 than along U.S. 136.
- It would be less expensive to upgrade U.S. 36 than U.S. 136, since U.S. 136 would have to be completely rebuilt if it were to be widened to 4 lanes.

I-70/U.S. 63/U.S. 36/U.S. 63 via Columbia to Chillicothe, MO. - This western -most route option to the south-west of the corridor would enable use of major sections of existing interstate routes (I-70 west from St. Louis and I-35 north from Des Moines). The route, however, suffers from several fatal flaws.

- The Chillicothe to Des Moines portion parallels I-35 only 20 miles to the west, meaning that this portion would be redundant.
- The entire route is so circuitous (almost to Kansas City) that St. Louis - St. Paul traffic would not use it.

I-55/State 29 or State 121 to Peoria - This route option would create a 4-lane highway to Davenport through construction of only a short section between Lincoln and Peoria, Illinois. This option, however, was eliminated because:

- The State 121 section is already under construction as a 4-lane highway. As a result, if this were the selected St. Louis - St. Paul route, the section should be viewed as already built. This corridor study searched for a superior option to that which already exists.

- The route is somewhat circuitous, requiring travel northeast out of St. Louis before turning northwest out of Peoria.

I-55/U.S. 51 to Peru, Illinois/I-39/I-90/I-94 - This eastern-most route option would permit extensive use of existing or programmed Interstate highways (I-55, I-39, I-90, I-94) and would therefore be one of the lowest construction cost options. New construction would be needed only between Normal and Peru, Illinois. While this new construction may be warranted, it was eliminated from further consideration in this St. Louis - St. Paul study because:

- The Normal to Peru section is already under construction and therefore, from the perspective of this study, is a completed route and the study was intended to look for new routes.

- The route would take St. Louis - St. Paul traffic in such a circuitous route that little traffic would use it. Instead the traffic would likely use one of the more direct routes, despite the higher travel speeds on the Interstate.

U.S. 20 Cedar Falls, Iowa to I-35 - Another route option would be to widen U.S. 20 west from Waterloo/Cedar Falls to U.S. 65, and to build a new diagonal alignment highway to I-35. This option suffers, however, because:

- It would require new construction west from US-65, which would take Iowa farmland.

- For U.S. 20 to be widened to 4-lanes, at the desired standard would require complete reconstruction of U.S. 20. This was viewed as being significantly more expensive than several other route options.

Secondary Route Screening

The Preliminary Screening eliminated some route options. The remaining routes all fell into one of five distinct "strategic" route options. For analysis purposes, the remaining routes were identified as Route Options "A," "B," "C," "D" and "E"; their sub-options were differentiated through numerical suffixes.

The remaining routes were evaluated in somewhat greater detail during the secondary screening level. A total of 27 distinct route sub-options were included in these considerations, and these sub-options and their characteristics are listed on Table 3-3. To evaluate the sub-options, the secondary Screening Level used a variety of analyses, including the following.

Travel Efficiency - Based on travel times and distances between the beltway around St. Louis and the beltway around St. Paul, travel times were calculated based on distance and travel speeds. On Interstates as well as in urban areas, traffic was assumed to move at the posted speed limits. On rural primary highways

Table 3-3
End to End
CHARACTERISTICS OF EACH ROUTE OPTION
St. Louis to St. Paul Corridor Feasibility and Necessity Study
Expressway Standards

OPTION	EXAMPLE CITIES SERVED	LENGTH (a) (Miles)	TRAVEL TIME (Minutes) (b) Existing	Improved	EXISTING TRAFFIC (c) (VMT)	POPULATION SERVED (d) (Residents)	UNIMPROVED CENTERLINE (e) (Miles)	CAPITAL COST ($ Million) Four Lane[f]	Free Flow Four Lane[g]
OPTION A	Des Moines, Ottumwa								
* A-1	Macon, Hannibal	586	641	601	7,168.1	1,165.4	242	404.6	427.8
A-2	Mt. Pleasant, Hannibal	565	626	579	7,052.3	1,276.0	181	339.7	388.2
* A-3	Mt. Pleasant, Jacksonville, Alton	603	695	620	4,938.6	1,267.3	329	809.5	1001.9
OPTION B	Waterloo, Cedar Rapids, Mt. Pleasant								
B1-4	Mason City, Hannibal	532	611	549	6,691.4	1,164.3	137	307	358.5
* B2-4	Austin, Hannibal	536	619	559	6,481.6	1,080.7	168	364.2	396.2
* B3-4	Austin, Hannibal	526	624	555	6,330.6	1,134.7	207	406.6	438.6
* B1-5	Mason City, Jacksonville, Alton	570	681	590	4,386.6	1,178.0	288	776.8	980.2
* B2-5	Austin, Jacksonville, Alton	574	688	599	4,147.7	1,104.5	319	834.0	1010.0
* B3-5	Austin, Jacksonville, Alton	564	695	597	3,988.9	1,158.5	350	876.4	1052.4
OPTION C	Rochester, Cedar Rapids								
C1-3	New Hampton, Hannibal	504	584	539	5,531.2	1,189.6	186	372.8	457.6
* C2-3	Oelwein, Hannibal	508	593	547	5,295.5	1,198.9	216	472.8	502.8
OPTION D	Dubuque, Quad Cities								
* D1-3	Rochester, Burlington, Hannibal	615	741	666	5,985.1	1,265.3	314	579.5	659.5
* D2-3	LaCrosse, Burlington, Hannibal	624	770	679	6,012.0	1,351.1	335	774.2	885.2
* D1-6-4	Rochester, Macomb, Hannibal	594	709	643	5,724.2	1,345.2	277	697.0	827.0
* D2-6-4	LaCrosse, Macomb, Hannibal	603	739	656	5,748.2	1,426.2	298	891.7	971.7
* D1-6-5	Rochester, R.I., Alton	540	677	584	2,904.9	1,319.9	337	980.0	1254.0
D2-6-5	LaCrosse, R.I., Alton	549	705	597	2,904.6	1,326.2	358	1174.7	1317.2
* D1-7-4	Rochester, I-74, Macomb, Hannibal	614	707	659	6,192.5	1,390.9	239	532.0	612.0
* D1-7-5	Rochester, I-74, Macomb, Alton	560	677	601	3,358.6	1,235.1	299	815.0	1089.0
* D2-7-4	LaCrosse, Macomb, Hannibal	623	738	673	6,218.7	1,471.9	260	726.7	971.7
D2-7-5	LaCrosse, I-74, Macomb, Alton	569	706	613	3,360.6	1,351.0	320	1009.7	1254.7
* D8-6-5	Rochester, La Crosse, Alton	577	709	618	3,556.9	1,433.2	313	1056.2	1291.2
* D8-7-5	Rochester, La Crosse, Alton	597	708	634	4,021.4	1,464.3	275	901.2	1126.2
OPTION E	Rochester, Quad Cities								
E1-3	New Hampton, Davenport, Alton	556	672	593	4,071.7	1,507.7	325	807.7	1092.3
* E2-3	Oelwein, Davenport, Alton	560	681	601	3,848.0	1,551.7	351	907.7	1081.7
* E1-4	New Hampton, Burlington, Alton	542	655	580	3,393.3	1,159.7	365	852.5	1073.5
* E2-4	Oelwein, Burlington, Alton	546	664	588	3,186.7	1,175.7	391	927.6	1106.6

(a) Total highway length between St. Louis and St. Paul (beltline to beltline)
(b) St. Louis to St. Paul travel time on existing roads versus 4-lane improved
(c) Daily vehicle miles of travel (Thousands) on route based on all available existing traffic counts
(d) Resident population (Thousands) within 25 miles of each route, excludes St. Louis and Minneapolis - St. Paul MSA's
(e) Improved miles required for continuous 4-lane status (upgrade centerline miles)
(f) Estimated cost of 4-lane end to end improvements (excluding funded improvements) excluding major bypasses
(g) Estimated cost of 4-lane end to end improvements (excluding funded improvements) including all major bypasses

* Eliminated from further consideration based on secondary screening analyses.

SOURCE: Working Paper B Supplement, p. 3 with modifications based on later analysis and updates.

such as U.S. 61, U.S. 63 or U.S. 67, travel speeds were assumed to be 55 mph along four-lane segments and 50 mph along two-lane segments. This speed differential was validated in studies conducted by the Iowa Department of Transportation, and generally reflects the influence of slower traffic on two-lane highways.

Accessibility - Travel efficiency was also measured by quantifying total populations located within a 50-mile band (25 miles on each side) of each route. Additionally, the increase in mobility provided to these populations was also measured. Using the arbitrary standard of one hour's travel time, the number of people located within a reasonable journey of one another was calculated with and without each sub-option's highway improvements. The net increase in population located within one hour's travel time of other population centers was then calculated throughout the study area on the assumption that such improvements in mobility increase employment, marketing and social opportunities.

Need - Travel efficiency was also measured based on the relative need for each sub-option. At this preliminary point in the study, need was represented by existing daily vehicle-miles of travel (VMT). VMT were calculated from traffic counts supplied by the various states.

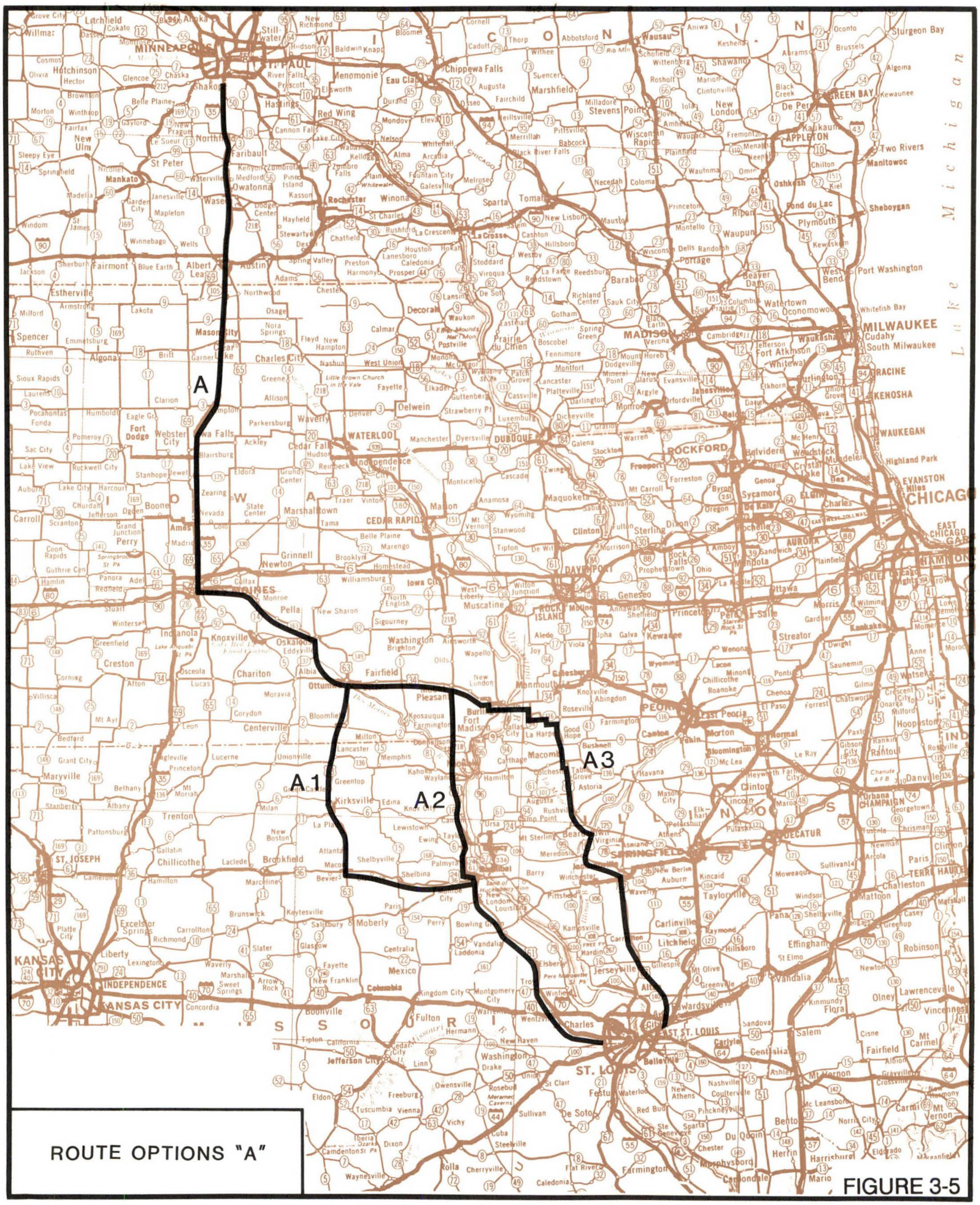
Capital Costs - Capital costs were developed for each route sub-option, and were periodically revised as alignments changed and additional data became available. In some instances, detailed cost estimates had already been developed for some segments. Where detailed cost estimates had not previously been prepared, the consultants worked closely with the respective state highway agencies to develop cost estimates based on average unit costs experienced on similar projects.

These capital costs were then reduced by the amounts of money already programmed by each state highway agency for such improvements. In some instances, a state already planned to widen a highway segment to four lanes and had already included the project within its five-year plan (e.g., had already committed the funds for the improvement). In each case, those monies already programmed for improvements were subtracted from the total capital cost estimates. Thus, the capital cost estimates exclude those capital costs which have already been funded by individual states. All costs were expressed in 1989 dollars.

These criteria were applied to all sub-options, and the sub-options were compared with each other (within each strategic option). On this basis, 21 of the sub-options were recommended for elimination.

Strategic Option A: St. Louis - Des Moines - St. Paul

The intent of Route Option "A" (Figure 3-5) was to make as much use of existing I-35 as possible. Presumably by using a portion of I-35, the corridor's capital improvement costs could be minimized. Option A passes through predominately rural, agricultural areas. Sub-options A-1 and A-2 would make use of major 4-lane segments of U.S. 61 in Missouri and would serve the tourist attractions at Hannibal. All three Option A sub-options would serve the population centers and firms at Ottumwa and Oskaloosa. Options A-2 and A-3 would serve Mount Pleasant. Option A-3 would provide access directly east/north from St. Louis, via a new Alton bypass.



ROUTE OPTIONS "A"

FIGURE 3-5

The issue considered in these investigations was, which of the three Option A sub-options is best? A comparison of route attributes suggests that sub-Option A-2 is superior to A-1 or A-3, and therefore A-1 and A-3 were eliminated from further consideration. Table 3-4 compares these sub-options utilizing data developed in this screening level. The two sub-options that were eliminated, were eliminated for the following reasons.

Sub-Option A-1 - This sub-option follows the route: St. Louis - Hannibal - Macon - Ottumwa - Des Moines - St. Paul. A-1 and A-2 have a great many similarities including:

- They are effectively the same route north of Ottumwa and south of Hannibal
- The St. Louis to St. Paul travel time savings would be effectively the same
- The existing traffic volumes are nearly the same (A-1 has a 2% advantage)
- They both could require that several major bypasses be built around cities
- They both have several communities for which a 4-lane highway might be useful in terms of economic development efforts
- They both serve the tourism destination point of Hannibal
- Neither seem to have environmental "fatal flaws" or other adverse impacts

These similarities cause the A-1 versus A-2 decision to be based on the differences, and the differences favor the A-2 sub-option:

- Sub-Option A-2 is estimated to cost between $40 and $65 million less than A-1 (depending on whether the bypasses are built). Lower cost on the A-2 alignment can be attributed to A-2's shorter length, as well as greater utilization of existing and already programmed four lane highways. This means that the same road function can be obtained via A-2, at a lower cost than can A-1.
- Sub-Option A-2 will serve approximately 110,000 more people than would Option A-1.

Sub-Option A-3 - This sub-option follows the route: St. Louis - Alton - Macomb - Burlington - Mt. Pleasant - Ottumwa - Des Moines - St. Paul. The route has some similarities with A-2, including:

- The total population served is equivalent (A-2 has a 0.7% advantage over A-3)
- They both could require that several major bypasses be built around cities
- They both have several communities for which a 4-lane highway might be useful in terms of economic development efforts
- They share the same existing roads west and north of Ottumwa

Table 3-4
ROUTE OPTION "A" CHARACTERISTICS
St. Louis to St. Paul Corridor Study

	SUB-OPTIONS		
	A-1	A-2	A-3
Length (miles) [a]	586	565	603
Travel Time (minutes) [a]			
- Existing	641	626	695
- Improved [b]	601	579	620
- Time Saved	40	47	75
Existing Traffic (VMT) [c]	7,168.1	7,052.3	4,938.6
Population (000)			
- Served [d]	1,165.4	1,276.0	1,267.3
- With Improved Mobility [e]	469.9	561.1	979.7
Upgraded Centerline Miles [f]	242	181	329
Capital Cost ($ million)			
- 4-lane [g]	$404.6	$339.7	$809.5
- 4-lane Free Flow [h]	$427.9	$388.2	$1,100.9
Major Urban Bypasses	Ottumwa Hannibal	Ottumwa Hannibal Mt. Pleasant	Ottumwa --- Mt. Pleasant Jacksonville Alton
Economic Development Opportunities	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service

(a) Total highway between St. Louis and St. Paul (beltline to beltline)
(b) Continuous 4-lane freeflow, with all bypasses built
(c) ADT by section times section length, existing (in thousands)
(d) Resident population (in thousands) within 25 miles of highway
(e) Accessibility index: population with improved access to cities (in thousands)
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates

- Neither seems to have environmental "fatal flaws" or other adverse impacts

While these are legitimate similarities, the differences between the A-2 and A-3 sub-options are much more significant -- and the advantages favor Sub- Option A-2 over A-3:

- Sub-Option A-2 is 38 miles shorter than is A-3, St. Louis to St. Paul

- The St. Louis to St. Paul travel time will be less (41 minutes less) on A-2 than via A-3 when the improvements are made

- Sub-Option A-2 has considerably more traffic (VMT) than does A-3 (43% more)

- Sub-Option A-2 will be much less costly (Sub-Option A-2 is estimated to cost between $339.7 and $388.2 million versus $809.5 to $1,100.9 million for Sub-Option A-3). This difference in cost is due to A-2's shorter distance and A-3's routing that could require an expensive bypass (Alton) as well as utilizing a route (US-67) which would require more expensive construction.

- Most traffic destined for St. Louis, once it reaches Mt. Pleasant, will follow Route 218/61 rather than to turn east to Route 67, even if US 67 were improved.

The major arguments favoring A-3 over A-2 are that A-3 has the potential to improve the mobility (accessibility index) for more people (75% more) than will Sub-Option A-2 and the absolute amount of time saved in A-3 is greater for those who use it. The A-2 cost advantages and travel time advantages, however, are sufficient to outweigh the A-3 mobility advantages.

These analyses indicate that Sub-Option A-2 is the best of the Strategic Option A alternatives, and A-2 is therefore the only "A" sub-option evaluated in greater detail during latter phases of the study.

<u>Strategic Option B: St. Louis - Cedar Rapids - I-35 - St. Paul</u>

The intent of Route Option "B" (Figure 3-6) is to make use of existing I-380 between Iowa City and Waterloo, while still making some use of I-35 at or north of Mason City. B-1 would serve the population center and firms at Mason City, while B-2 or B-3 would be a more direct St. Louis to St. Paul route. From Mount Pleasant south, one option is to use B-4, which could pass through Mt. Pleasant, serve Hannibal and make use of U.S. 61 in Missouri, much of which is already a 4-lane section; or to use B-5 which would serve Burlington, Jacksonville and Alton.

The issues concerning Route B are: a) which of the three Option B north-end sub-options is best, and b) which of the two Option B south-end sub-options is best? The secondary screening level analyses found that sub-option B-1 is superior to B-2 or B-3, and that B-4 is superior to B-5. Options B-2, B-3 and B-5 were therefore eliminated from further consideration. Table 3-5 compares these sub-options utilizing data developed in this screening level. Three of the Route B sub-options were eliminated for the following reasons.

Table 3-5

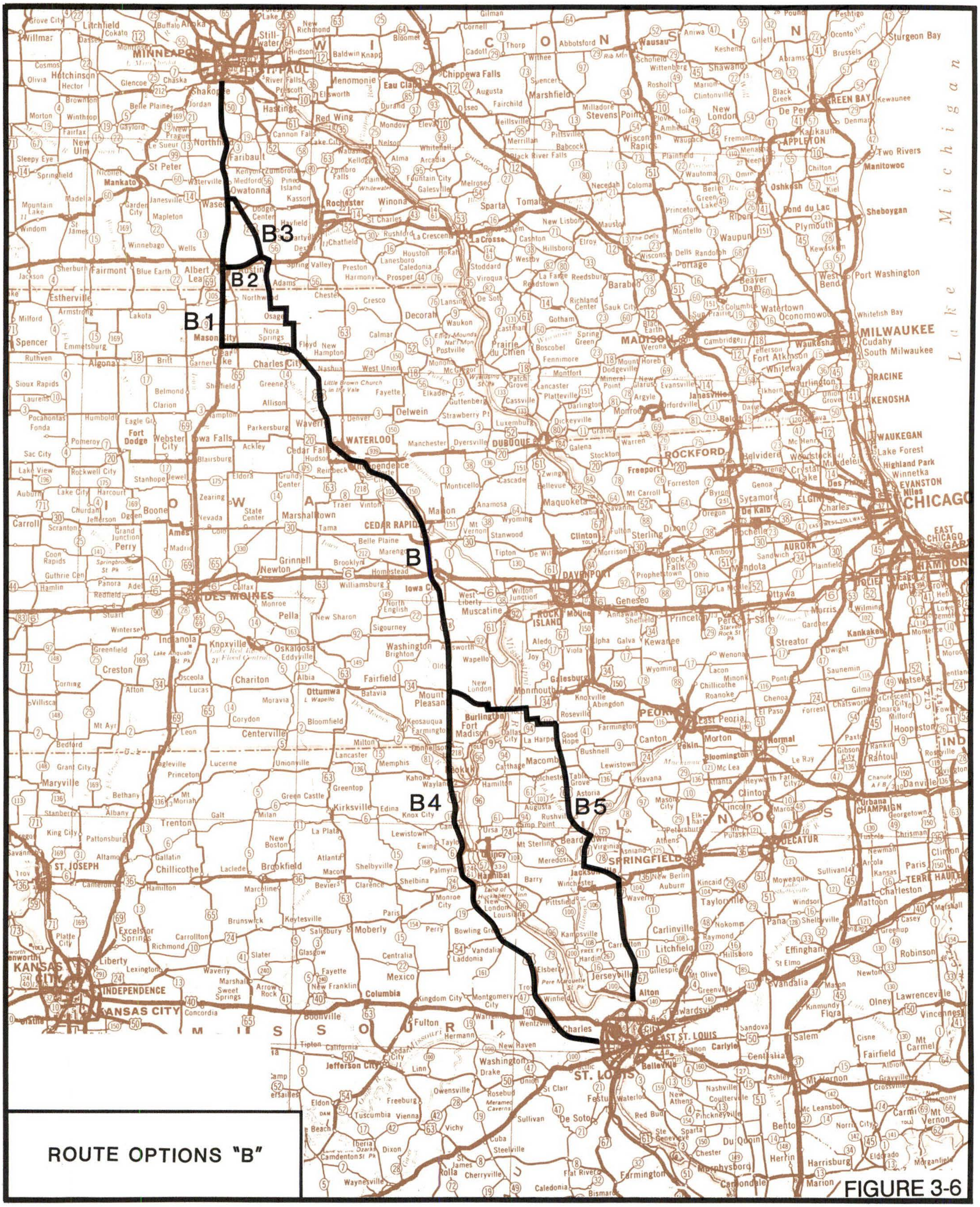
ROUTE OPTION "B" CHARACTERISTICS

St. Louis to St. Paul Corridor Study

	SUB-OPTIONS					
	B1-4	**B2-4**	**B3-4**	**B1-5**	**B2-5**	**B3-5**
Length (miles) [a]	532	536	526	570	574	564
Travel Time (minutes) [a]						
- Existing	611	619	624	681	688	695
- Improved [b]	549	559	555	590	599	597
- Time Saved	62	60	69	81	89	98
Existing Traffic (VMT) [c]	6,691.4	6,481.6	6,330.6	4,386.6	4,147.7	3,988.9
Population (000)						
- Served [d]	1,164.3	1,080.7	1,134.7	1,178.0	1,104.5	1,158.5
- With Improved Mobility [e]	517.4	485.4	531.8	943.2	911.2	957.6
Upgraded Centerline Miles [f]	137	168	207	288	319	350
Capital Cost ($ million)						
- 4-lane [g]	307.0	364.2	406.6	776.8	834.0	876.4
- 4-lane Free Flow [h]	358.5	396.2	438.6	980.2	1,010.0	1,052.4
Major Bypasses	Mason City Waterloo Mt. Pleasant Hannibal —	— Waterloo Mt. Pleasant Hannibal —	— Waterloo Mt. Pleasant Hannibal —	Mason City Waterloo Mt. Pleasant — Alton	— Waterloo Mt. Pleasant — Alton	— Waterloo Mt. Pleasant — Alton
Economic Development Opportunities	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service	New Industry Road Service	New Industry Road Service

(a) Total highway between St. Louis and St. Paul (beltline to beltline)
(b) Continuous 4-lane freeflow, with all bypasses built
(c) ADT (Thousands) by section times section length, existing (in thousands)
(d) Resident population (Thousands) within 25 miles of highway
(e) Accessibility index: population (Thousands) with improved access to cities
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates



ROUTE OPTIONS "B"

FIGURE 3-6

__Sub-Option B-2__ - This sub-option would use US Route 218 from Charles City north to Austin, and then follow existing I-90 west to I-34, thereby bypassing Mason City to the north. B-2 is similar to B-1 in several ways:

- B-1 and B-2 are identical south from Charles City to St. Louis;
- The lengths are nearly the same (B-2 is four miles longer than B-1);
- The St. Louis to St. Paul travel times (minutes) are nearly the same once the improvements are made (B-1 has a 10 minute advantage);
- Neither seem to have environmental "fatal flaws" or major adverse impacts; and
- The existing traffic served is nearly the same (B-1 has a 210,000 VMT advantage over B-2, due to more extensive use of I-35).

The above characteristics, which are not significantly different, slightly favor Sub-Option B-1 over B-2. Sub-Option B-1 is also favored by all of the more significant differences, as follows:

- Sub-Option B-1 serves a larger population (83,000 more people) than does B-2, including serving or at least skirting Mason City;
- Sub-Option B-1 has the potential to provide increased mobility to more people than does B-2;
- Sub-Option B-1 does not create a new 4-lane highway segment immediately parallel to existing I-35;
- Sub-Option B-1 requires less centerline miles of highway improvement (31 miles less) than does B-2; and as a direct result,
- Sub-Option B-1 is estimated to cost between $38 and $57 million less than B-2, depending on whether a Mason City bypass is included in B-1.

These statistics indicate that Sub-Option B-1 is superior to Sub-Option B-2, even if a new bypass is built around Mason City.

__Sub-Option B-3__ - This Sub-option would utilize US Route 218 between Owatonna, Minnesota and Charles City, Iowa, thereby bypassing Mason City. B-3 is very similar to B-2, and is also somewhat similar to B-1 in several ways:

- B-1 and B-3 are identical between Charles City and St. Louis;
- B-1 and B-3 are comparable in length (B-1 is 6 miles longer than B-3);
- The St. Louis to St. Paul travel times are effectively the same, once the respective improvements are made (due to 65 mph on I-35);

- The population served is nearly equal (B-1 has 29,600 more people located within 25 miles of the route than does B-3);
- The potential to improve mobility for corridor residents is nearly equal (B-3 has a 14,400 person advantage over B-1); and
- Neither seems to have environmental "fatal flaws" or other major adverse impacts.

The above characteristics are not significantly different, but other characteristics have substantial differences, and these differences favor the B-1 Sub-Option rather than B-3:

- The B-1 alignment serves 6% (361,000) more existing VMT than B-3;
- B-1 would require 70 fewer centerline miles of highway improvement;
- Sub-Option B-1 does not create a new 4-lane highway segment immediately parallel to existing I-35; and
- The B-1 Sub-Option would cost $80 to $100 million less than the B-3 Sub-Option (cost variation related to whether a Mason City bypass is included in B-1 or not).

<u>Sub-Option B-5</u> - This southern sub-option of Option B veers from the US-218 corridor at Mt. Pleasant, and travels along US 34 and IL 116 to US 67 south of Monmouth. The sub-option then uses US 67 to reach St. Louis. Besides sharing the same alignment for about two thirds of the distance between St. Louis and St. Paul (St. Paul to Mt. Pleasant), the B-4 and B-5 sub-options serve equal numbers of resident population. There are, however, substantial differences, and most of these differences favor the B-4 sub-option:

- B-4 is 38 miles shorter in distance than is the more circuitous B-5;
- B-4 is 40 minutes quicker for travel between St. Louis and St. Paul assuming construction of all improvements on both suboptions. (In the existing conditions, B-4 is 71 minutes faster than B-5).
- The B-4 alignment serves 56 percent more traffic (based on VMT) than does the B-5 alignment;
- B-4 requires 151 fewer centerline miles of improvement than does B-5;
- B-4 will cost between $470 and $614 million less than B-5. The variation in cost is related to the inclusion of optional bypasses of major urban areas as well as the fact that the B-5 sub-option uses US-67, which will be more expensive to improve due to alignment and subsoil conditions, and higher labor costs in Illinois.
- B-5 has the potential to improve mobility for 426,000 more people than B-4.

The principal arguments in favor of B-5 instead of B-4 are that B-5 has the potential to improve mobility (accessibility index) for more people than will B-4, and the absolute amount of travel time saved by improving B-5 is greater for those who would use it. The B-4 sub-option has cost, existing utilization (VMT) and overall travel time advantages which outweigh the B-5 mobility potentials.

These comparative analyses indicate that the combination of the B-1 and B-4 Sub-Options is the best of the Strategic Option B alternatives, and therefore B-1-4 continued to be studied during later stages of the study.

Strategic Option C: St. Louis - Cedar Rapids - St. Paul

Route Option C (Figure 3-7) is similar to Option B south of Waterloo, but does not use I-35. Rather, it would proceed more directly to St. Paul via either U.S. 63 (Option C-1) or via S.R. 150/U.S. 52 (Option C-2). The intent is to provide another 4-lane entry to St. Paul, without duplicating either I-35 or I-94. At the north end, the route would make use of existing 4-lane U.S. 52 between St. Paul and Rochester. South of Rochester it could use U.S. 63 which is a high standard 2-lane road on good alignment, or U.S. 52/S.R. 150 which is of a lower standard. Option C, like Option B, would use existing I-380 south to Iowa City and would then proceed south on U.S. 218/61 to St. Louis, serving Mount Pleasant and Hannibal and passing near Quincy, Illinois. Table 3-6 presents the Route C characteristics.

Based on this screening level, the C-1/C-3 route combination was found to be superior to its alternative and, as a result, the C-2 sub-option was eliminated from further consideration.

Sub-Option C-2 - This sub-option veers off of I-380 north of Cedar Rapids, Iowa and utilizes the general alignment of the existing Iowa Route 150 to Calmar and then north to Rochester. There are a number of similarities between C-1 and C-2, including:

- Sub-options C-1 and C-2 are identical, except for a 125 mile section between Rochester and Cedar Rapids; and
- Neither has environmental "fatal flaws" or other major adverse impacts; and

Other than that, there are important differences between I-380 and Rochester, and the differences favor C-1 over C-2:

- C-1 would eliminate a "stub-end" Interstate highway in Waterloo, by providing system continuity for all of existing I-380;
- C-1 is 4 miles shorter than C-2;
- C-1 has a St. Louis to St. Paul travel time which is currently 9 minutes quicker than C-2, and if roadway improvements were made, C-1 would still be 8 minutes faster than C-2;
- C-1 is a corridor which serves 236,000 more existing VMT than C-2;

Table 3-6
ROUTE OPTION "C" CHARACTERISTICS
St. Louis to St. Paul Corridor Study

	SUB OPTIONS	
	C1-3	**C2-3**
Length (miles) [(a)]	504	508
Travel Time (minutes) [(a)]		
- Existing	584	593
- Improved [(b)]	539	547
- Time Saved	45	46
Existing Traffic (VMT) [(c)]	5,531.2	5,295.5
Population (000)		
- Served [(d)]	1,189.6	1,198.9
- With Improved Mobility [(e)]	283.8	430.4
Upgraded Centerline Miles [(f)]	186	216
Capital Cost ($ million)		
- 4-lane [(g)]	372.8	472.8
- 4-lane Free Flow [(h)]	469.7	502.8
Major Urban Bypasses	Waterloo Mt. Pleasant Hannibal	--- Mt. Pleasant Hannibal
Economic Development Opportunities	New Industry Road Service Tourism	New Industry Road Service Tourism

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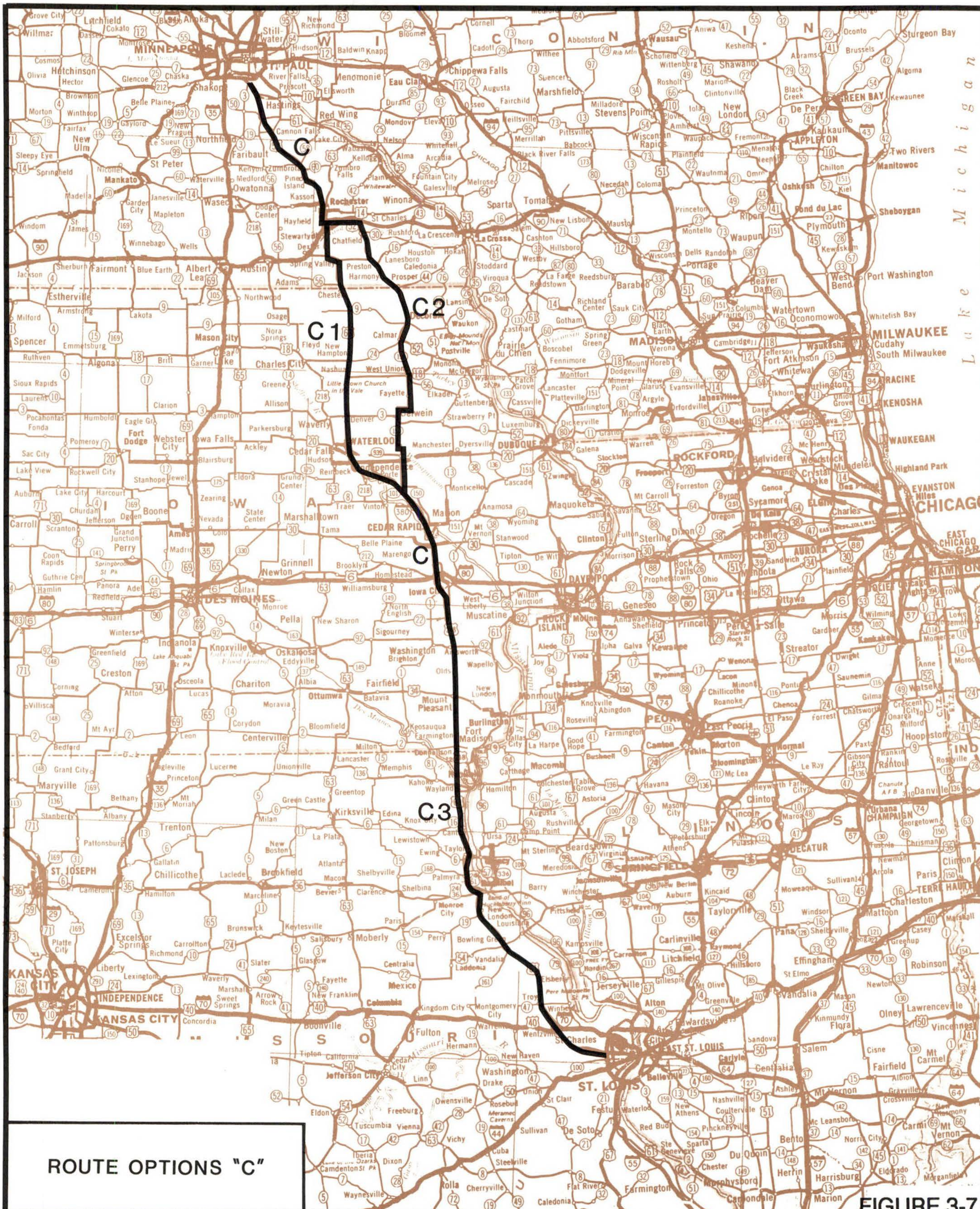
(a) Total highway between St. Louis and St. Paul (beltline to beltline)
(b) Continuous 4-lane freeflow, with all bypasses built
(c) ADT (Thousands) by section times section length, existing (in thousands)
(d) Resident population (in thousands) within 25 miles of highway
(e) Accessibility index: population (in thousands) with improved access to cities
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates



ROUTE OPTIONS "C"

FIGURE 3-7

- The C-2 sub-option would improve mobility for 150,000 more people than would C-1 (Waterloo is included in both C-1 and C-2);
- C-1 can be upgraded on the existing US 63 alignment, while C-2 would involve a new alignment over major sections;
- C-1 requires 30 fewer miles of roadway improvement than C-2; and as a result;
- C-1 is estimated to cost between $30 and $60 million less than C-2, depending on whether a Waterloo bypass is included in C-1. This cost savings would be due to C-1's shorter length and more extensive use of existing alignment.
- C-2 would avoid the bypass issues associated with C-1 at Waterloo.

Strategic Option D: St. Louis - Quad Cities - St. Paul

Route Option D (Figure 3-8) is the easternmost of the routes, but one which also provides a fairly direct route between St. Louis and St. Paul. It is the only route which could include five states (Minnesota, Wisconsin, Iowa, Illinois and Missouri). Overall, this route uses roads that are not of the high standard of Options A, B, or C, and passes through more difficult, hilly terrain due to its proximity to the Mississippi River.

The route would connect the Quad Cities and Dubuque with St. Paul and St. Louis, and could also serve either Rochester or LaCrosse. Option D-1 would offer tourist potential but also would be costly due to certain terrain features. Similarly, Option D-2, passing partially through Wisconsin, would be costly but offers similar tourism and local support potential. To the south, the route could use U.S. 67 south to Alton, Illinois (Sub-option D-5). This route is a narrow two lane facility without shoulders. Therefore existing traffic would benefit if the route were improved. Alternatively, either Suboptions D-3 or D-4 could be used which would allow traffic to travel west to U.S. 61 which, for the most part, is already 4-lanes in Missouri. Suboption D-3 would traverse the southeastern portion of Iowa, serving the communities of Muscatine, Burlington, Fort Madison, and Keokuk. Suboption D-4 is the only significant segment of new alignment under consideration in this study. It would branch off of U.S. 67 south of Macomb, Illinois and traverse largely agricultural lands to a juncture with Illinois Route 336 north of Quincy, connecting to US 61 at Hannibal, Missouri.

Strategic Option D, unlike Options A, B, or C, does not minimize cost by providing the most direct St. Louis to St. Paul route, or by utilizing existing four-lane facilities like I-35 or I-380. Strategic Option D attempts to maximize the St. Louis to St. Paul Highway's exposure to communities presently unserved by a four-lane facility and to support Mississippi River-oriented economic development. As a general rule then, the various alternatives of this option are longer in both length and travel time, while serving lesser amounts of existing traffic than do the other alternatives. Similarly, the various alternatives within Strategic Option D have larger populations located within 25 miles of the alignments, improve mobility for more of this population, require more miles of highway improvement, and are estimated to cost significantly more than other Options.

Strategic Option D, which encompasses the eastern-most alignments considered in this screening level, consists of three northern suboptions (D-1, D-2, and D-8 depicted on Figure 3-8), three southern suboptions (D-3, D-4 and D-5) and two central suboptions (D-6 and D-7). The issues posed in this screening are: a) which of the Option D north-end sub-options is best; b) which of the central sub-options is best; and c) which of the south-end sub-options is best? Screening level data is summaried on Table 3-7. Based on this data, the D-2-6-5 and D-2-7-5 Sub-Options were recommended for further consideration, and the other Option D sub-options were eliminated from further study.

Sub-Option D-1 - This sub-option utilizes U.S. 52 between St. Paul and Dubuque. D-1 and D-2 have a great many similarities, including:

- Both D-1 and D-2 have major urban bypass issues;
- They are nearly the same length (D-1 is nine miles shorter than D-2);
- The alignments are identical south of Dubuque;
- The St. Louis to St. Paul travel times would be nearly equal once the highway improvements are made (D-1 would be thirteen minutes shorter);
- The corridor traffic volumes are equal (D-2 is less than one percent higher);
- The population served is nearly equal (D-2 serves an additional 85,800 people);
- They both could benefit to existing tourist destinations, proposed tourist developments (riverboat gambling), and other uses of the Mississippi River; and
- D-1 and D-2 have environmental opposition to its widening.

Neither sub-option can be determined to be superior based on the similarities; but there are differences, and in consideration of the mission of Strategic Option D, those differences favor sub-option D-2:

- D-2 could increase mobility for 26 percent (273,000) more people than D-1
- D-1 requires 21 fewer miles of highway improvements than D-2; and
- D-1 is $166 to 195 million less expensive than D-2, partly related to requiring fewer miles of highway improvements, fewer major bridge improvements and somewhat less expensive bypasses.

Table 3-7

ROUTE OPTION "D" CHARACTERISTICS

St. Louis to St. Paul Corridor Study

	SUB-OPTIONS					
	D-1-3	D-2-3	D-1-6-4	D-2-6-4	D-1-6-5	D-2-6-5
Length (miles) [(a)]	615	624	594	603	540	549
Travel Time (minutes) [(a)]						
- Existing	741	770	709	739	677	705
- Improved [(b)]	666	679	643	656	584	597
- Time Saved	76	92	64	81	94	109
Existing Traffic (VMT) [(c)]	5,985.1	6,012.0	5,724.2	5,748.2	2,904.9	2,904.6
Population (000)						
- Served [(d)]	1,265.3	1,351.1	1,345.2	1,426.2	1,319.9	1,326.2
- With Improved Mobility [(e)]	601.6	874.9	710.5	983.8	1,054.4	1,327.7
Upgraded Centerline Miles [(f)]	314	335	277	298	337	358
Capital Cost ($ million)						
- 4-lane [(g)]	579.5	774.2	697.0	891.7	980.0	1,174.7
- 4-lane Free Flow [(h)]	659.5	885.2	827.0	971.7	1,254.0	1,317.2
Major Urban Bypasses	—	Red Wing	—	Red Wing	—	Red Wing
	—	LaCrosse	—	LaCrosse	—	LaCrosse
	Dubuque	Dubuque	Dubuque	Dubuque	Dubuque	Dubuque
	—	—	—	—	Jacksonville	Jacksonville
	Hannibal	Hannibal	Hannibal	Hannibal	—	—
	—	—	—	—	Alton	Alton
Economic Development Opportunities	New Industry	New Industry	New Industry	New Industry	New Industry	New Industry
	Road Service	Road Service	Road Service	Road Service	Road Service	Road Service
	Tourism	Tourism	Tourism	Tourism	Tourism	Tourism
Significant Impacts	Environment	Environment	Environment	Environment	Environment	Environment
	Sensitivity	Sensitivity	Sensitivity	Sensitivity	Sensitivity	Sensitivity

(a) Total highway between St. Louis and St. Paul (beltline to beltline)
(b) Continuous 4-lane freeflow, with all bypasses built
(c) ADT (Thousands) by section times section length, existing (in thousands)
(d) Resident population (Thousands) within 25 miles of highway
(e) Accessibility index: population (Thousands) with improved access to cities
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates

Table 3-7

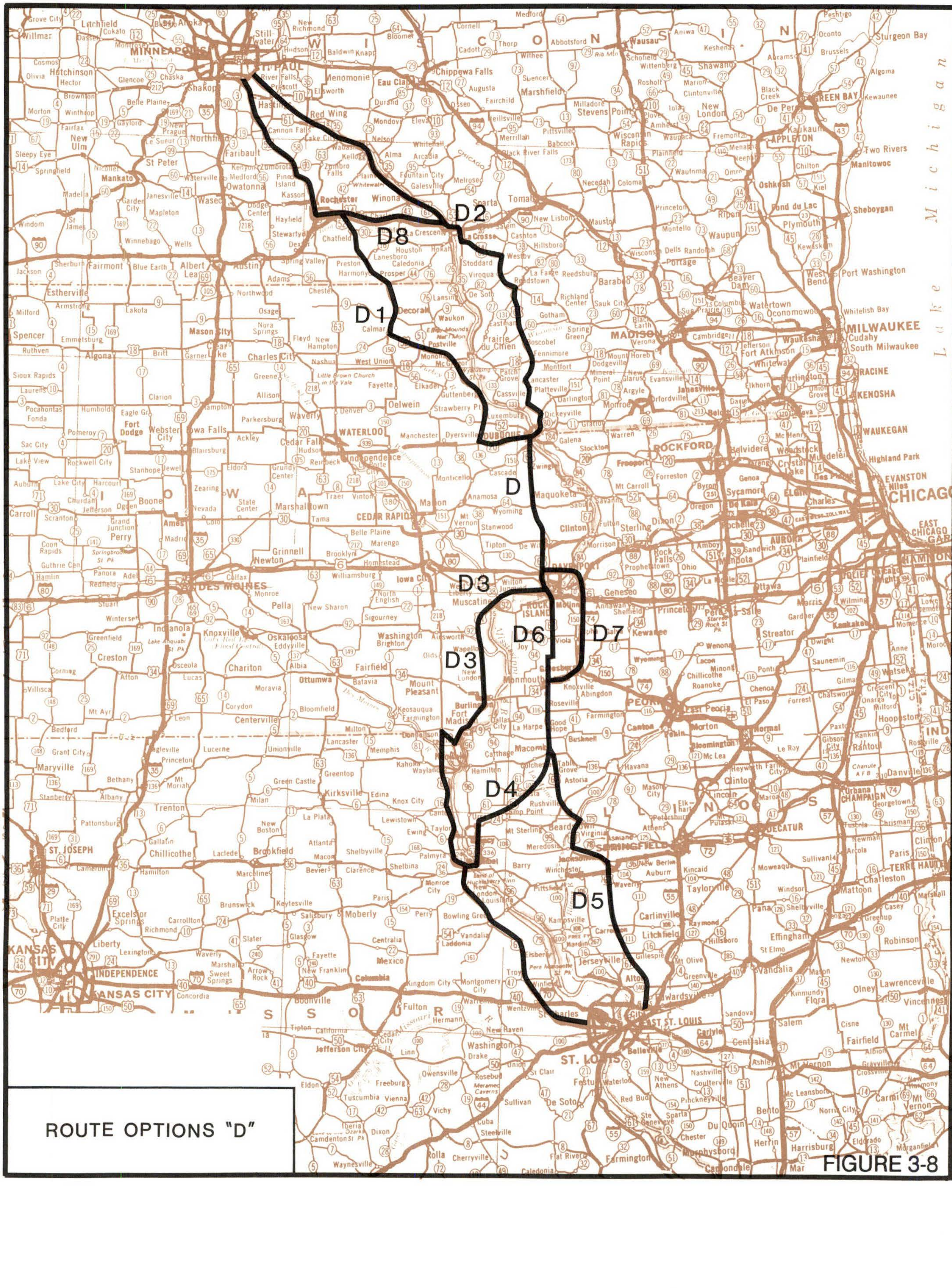
ROUTE OPTION "D" CHARACTERISTICS

St. Louis to St. Paul Corridor Study

	SUB-OPTIONS					
	D-1-7-4	D-1-7-5	D-2-7-4	D-2-7-5	D-8-6-5	D-8-7-5
Length (miles) [a]	614	578	623	587	577	597
Travel Time (minutes)[a]						
- Existing	707	699	738	728	709	708
- Improved[b]	659	620	673	632	618	634
- Time Saved	47	79	63	93	91	73
Existing Traffic (VMT)[c]	6,192.5	3,466.6	6,218.7	3,466.9	3,556.9	4,021.4
Population (000)						
- Served[d]	1,390.9	1,235.1	1,471.9	1,351.0	1,433.2	1,464.3
- With Improved Mobility[e]	514.7	858.6	788.0	1,131.9	1,049.5	853.7
Upgraded Centerline Miles[f]	239	314	260	335	313	275
Capital Cost ($ million)						
- 4-lane[g]	532.0	815.0	726.7	1,009.7	1,056.2	901.2
- 4-lane Free Flow[h]	612.0	1,089.0	971.7	1,254.7	1,291.2	1,126.2
Major Urban Bypasses	—	—	Red Wing	Red Wing	—	—
	—	—	LaCrosse	LaCrosse	LaCrosse	LaCrosse
	Dubuque	Dubuque	Dubuque	Dubuque	Dubuque	Dubuque
	—	Jacksonville	—	Jacksonville	Jacksonville	Jacksonville
	Hannibal	—	Hannibal	—	—	—
	—	Alton	—	Alton	Alton	Alton
Economic Development Opportunities	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service Tourism	New Industry Road Service Tourism
Significant Impacts	Environment Sensitivity	Environment Sensitivity	Environment Sensitivity	Environment Sensitivity	Environment Sensitivity	Environment Sensitivity

(a) Total highway between St. Louis and St. Paul (beltline to beltline)
(b) Continuous 4-lane freeflow, with all bypasses built
(c) ADT (Thousands) by section times section length, existing (in thousands)
(d) Resident population (Thousands) within 25 miles of highway
(e) Accessibility index: population (Thousands) with improved access to cities
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates



ROUTE OPTIONS "D"

FIGURE 3-8

Comparing the two suboptions on the basis of the potential to increase mobility per unit cost is one means to clarify the differences between D-1 and D-2. For every million dollars invested in D-1, 840 people will have the potential for increased mobility. The same one million dollar investment in D-2 will produce potential increase in mobility for 935 people. Thus, despite a higher cost, D-2 has the potential for an 11.3 percent higher mobility to cost ratio than D-1. D-1 was therefore eliminated from further study.

Sub-Option D-8 - This Sub-Option follows the route: St. Paul, Rochester, LaCrosse, Dubuque and St. Louis. D-8 has several things in common with D-2:

- The alignments are identical between LaCrosse and St. Louis; and
- The travel times between St. Louis and St. Paul are comparable under upgraded 4-lane conditions (D-2 is 2 minutes faster than D-8);
- They both have urban bypass issues at LaCrosse, Dubuque and Alton;
- They both have environmental opposition to widening.

Neither suboption can be favored over the other based on similarities; but there are differences, and in consideration of the mission of Strategic Option D, they favor Sub-Option D-2 over D-8:

- D-2 is 10 miles shorter between St. Louis and St. Paul than is D-8;
- D-8 has significantly more travel (VMT) than D-2, but this is apparently oriented to east-west movements on I-90, and therefore would not benefit from the north-south corridor;
- D-8 serves some 107,000 more people in its alignment than does D-2. This, however, is principally at Rochester which already has good 4-lane roads and therefore good mobility characteristics;
- D-2 has the potential to improve the mobility for some 278,000 more residents along the route than does D-8;
- D-8 requires some 60 fewer miles of highway improvement than does D-2; and as a direct result;
- D-2 would be approximately $118.5 million dollars more expensive to upgrade to a four lane status than would D-8.

Comparing the two suboptions on the basis of the potential to increase mobility per unit cost is one means to clarify the differences between D-2 and D-8. For every million dollars invested in D-2, 935 people will have the potential for increased mobility. The same one million dollar investment in D-8 will only produce a potential increase in mobility for 810 people. Thus, despite a higher cost, D-2 has the potential for a 15 percent higher mobility to cost ratio than D-8. Therefore, D-2 was favored and D-8 was eliminated.

Sub-Option D-3 - This sub-option follows the route: St. Louis - Hannibal - Keokuk - Muscatine - Quad Cities - Dubuque - St. Paul. While D-3 and D-5 have identical alignments between St. Paul and the Quad Cities, their route characteristics south of the Quad Cities are very different:

- D-5 is 75 miles shorter than D-3, largely because D-3 curves to the west and east over the course of its alignment. As such, D-3 would be a circuitous route between St. Louis and St. Paul (it is the longest of any of the 27 routes considered in this screening level).
- The St. Louis to St. Paul travel time will be shorter (82 minutes less) on D-5 than D-3, assuming that the envisaged highway improvements are made to both facilities (the D-3 travel times between St. Louis and St. Paul are the longest of any of the 27 suboptions evaluated);
- D-3 carries twice as much existing traffic (VMT) as D-5, but this is not necessarily north-south regional traffic;
- D-3 and D-5 serve about the same population base (D-3 serves two percent (24,900) more people than does D-5);
- D-5 could potentially to improve mobility for 52 percent (452,800) more people than D-3;
- D-3 will require 23 more miles of highway improvement than will D-5;
- D-3 will be between $400 and $535 million less expensive than D-5. This difference in cost is due to several factors, principally that D-5 utilizes the US-67 route which is more expensive because of the need for a bypass of Alton, alignment and subsoil issues, and higher labor costs in Illinois.

Because D-3 is so circuitous (the longest of all the suboptions), and because D-5 has substantially greater potential for improving mobility of its corridor population, D-3 was eliminated from further consideration, despite its lower capital cost.

Sub-Option D-4 - This sub-option follows the route: St. Louis - Hannibal - Quincy - Macomb - Quad Cities - Dubuque - St. Paul. It is the only sub-option which requires highway construction in a new corridor (from north of Quincy to Macomb, Ill.) for more than just a short bypass. While D-4 and D-5 have identical alignments between St. Paul and Macomb, their route characteristics south of Macomb are very different. The route characteristic comparisons include:

- D-5 is 54 miles shorter than D-4, because D-4 begins with a northwest alignment out of St. Louis, but then shifts to the northeast at Hannibal. At the same time, D-5 has a relatively northern alignment out of St. Louis. As such, more St. Louis to St. Paul traffic is likely to use the D-5 alignment;
- The St. Louis to St. Paul travel time will be less (59 minutes less) on D-5 than D-4 if the envisaged highway improvements are made;

- D-4 carries almost twice as much existing traffic (VMT) as D-5;
- D-4 serves a corridor with 7.5 percent (100,000) more people population than does D-5;
- D-5 could potential to improve mobility for a third more people (343,900) than does D-4;
- Despite longer overall distance, D-4 will require 75 fewer miles of highway improvement than will D-5;
- D-4 will be between $283 and $448 million less expensive than D-5. The difference in cost is related to D-5's greater use of US-67 through Illinois and D-4's greater utilization of existing and programmed four lane highway.

Because D-5 is shorter, more attractive for long distance endpoint to endpoint travel, and has substantially greater potential for improving the mobility of its corridor population, Sub-Option D-4 was eliminated from further consideration.

Sub-Option D-7 - This route consists of the existing US-34/I-74/I-80 circumferential freeway corridor around the Quad Cities. Except for the relatively small variation in alignment near the Quad Cities (D-6 follows the existing US-67 route directly to the Quad Cities), D-7 and D-6 have identical alignments between St. Louis and St. Paul and, therefore, serve essentially the same population. The two sub-options have a variety of differences, which are listed below:

- D-6 is 20 miles shorter than D-7, providing a more direct routing between St. Louis and St. Paul;
- The portion of D-7 which varies from D-6 is already a four lane facility, most of which is built to Interstate standards. The majority of the D-6 alignment between the two end points of the D-7 alignment variation is a narrow two lane highway with significant horizontal and vertical curvature;
- The St. Louis to St. Paul travel time would be shorter (16 minutes less) on D-6 than D-7, assuming US 67 is widened to a four lane cross-section;
- D-7 currently carries 13 percent more traffic (VMT) than does D-6, at least partly due to the higher design standards of D-7;
- D-6 could improve mobility for 23 percent more (195,800) people than D-7;
- Because D-7 is already a four lane facility around the Quad Cities, it would require 38 fewer miles of highway improvement than D-6;
- D-7 would be $165 million less expensive than D-6. This difference in cost is due to the fact that D-7 would not require any highway improvements, while all of D-6 would need to be widened to a four lane cross-section.

Because D-6 is shorter, and has a substantially greater potential for improving the mobility of its corridor population, D-6 was recommended for further study. In addition, since D-7 is considerably cheaper, and because D-6 would create a four lane highway immediately adjacent to an existing interstate route (I-74), D-7 was also recommended for continued study.

The foregoing comparative analyses suggests that the D-2-6-5 and D-2-7-5 sub-options are the best of the Strategic Option D alternatives.

Strategic Option E: St. Louis-Iowa City-St. Paul

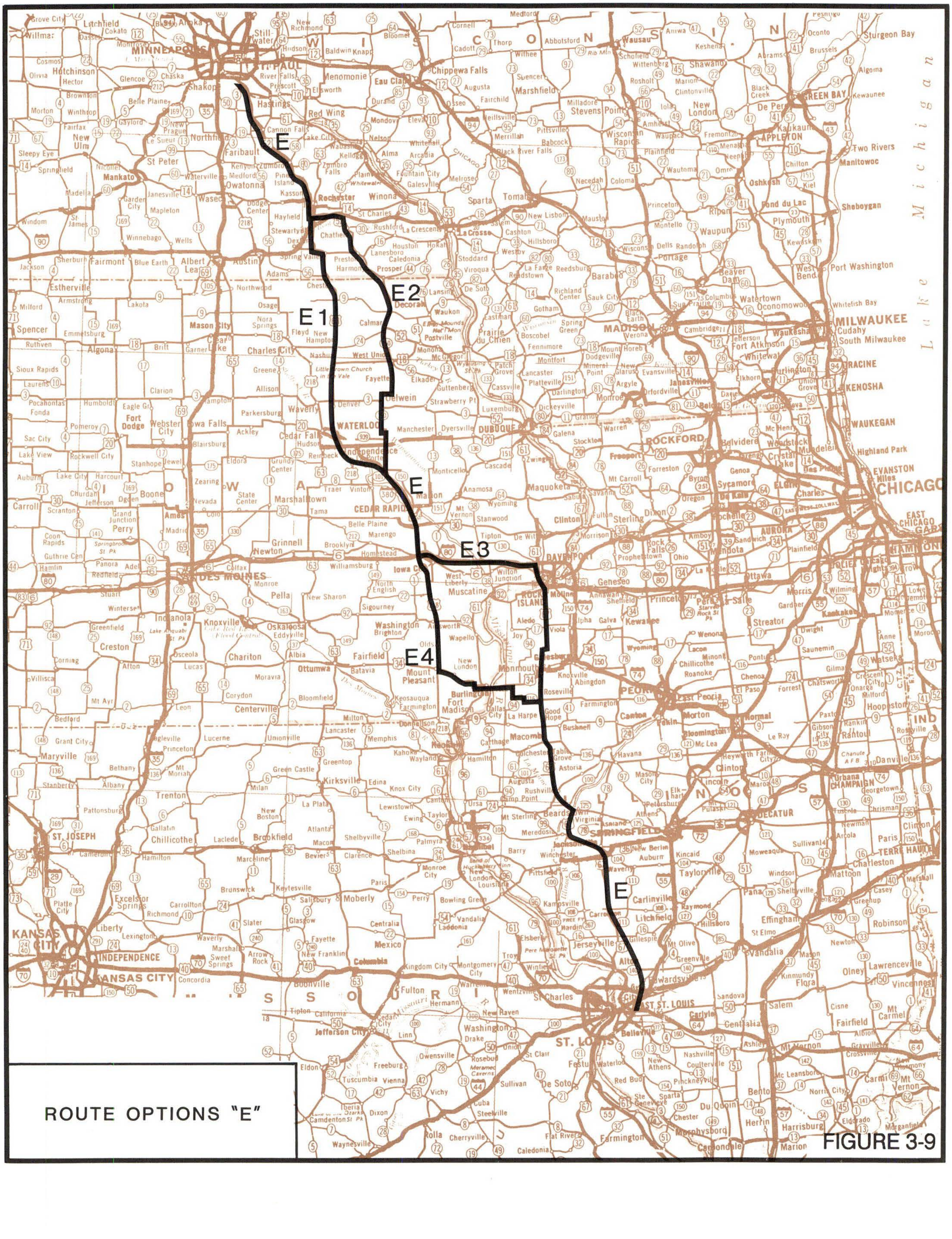
Route Option E (Figure 3-9) is an attempt to marry the socio-economic development potentials of the southern portion of Option D (D5) with the direct routing of the northern portion of Option C. In this fashion, the environmentally sensitive portions of the northern portion of the Option D could be bypassed. The option would veer west to join Option C at Monmouth (via US 34) or at the Quad Cities (via I-80).

Strategic Option E would connect St. Louis and St. Paul via I-380. As depicted on Figure 3-9, there are both northern and southern sub-options. Like Option C, U.S. 63 or Iowa Route 150 could be utilized north of I-380. However, south of I-380, the two sub-options would serve Illinois. E-3 would utilize I-80 to connect to U.S. 67 at the Quad Cities, while E-4 would utilize U.S. 34 to join U.S. 67 south of Monmouth, Illinois.

Since the northern two sub-options are exactly the same as sub-options C-1 and C-2, and because C-1 was determined superior to C-2, it follows that E-1 would be superior to E-2. Based on data available during the secondary screening level, E-3 was determined to be superior to E-4, resulting in E-4's elimination based on the following comparisons.

- E-4 is 14 miles shorter and would be 13 minutes faster than E-3 after all highway improvements were constructed
- E-3 has 678,400 more VMT than E-4
- E-3 serves 348,000 more people than E-4
- E-3 could improve mobility for 205,000 more people than E-4
- E-3 would require 40 fewer miles of highway improvements than E-4
- E-3 is estimated to cost between $20 and $25 million less than E-4

For these reasons, E 1-3 was determined to be the best strategic Option E Alternative.



ROUTE OPTIONS "E"

FIGURE 3-9

Table 3-8
ROUTE OPTION "E" CHARACTERISTICS
St. Louis to St. Paul Corridor Study

	SUB-OPTIONS			
	E1-3	E2-3	E1-4	E2-4
Length (miles) (a)	556	560	542	546
Travel Time (minutes)(a)				
- Existing	672	681	655	664
- Improved(b)	593	601	580	588
- Time Saved	79	80	75	76
Existing Traffic (VMT)(c)	4,071.7	3,848.0	3,393.3	3,186.7
Population (000)				
- Served(d)	1,507.7	1,551.7	1,159.7	1,175.7
- With Improved Mobility(e)	914.5	1,061.1	709.6	856.2
Upgraded Centerline Miles(f)	325	351	365	391
Capital Cost ($ million)				
- 4-lane(g)	832.6	907.7	852.5	927.6
- 4-lane Free Flow(h)	1,048.5	1,081.7	1,073.5	1,106.6
Major Urban Bypasses	Waterloo	—	Waterloo	—
	—	—	Mt. Pleasant	Mt. Pleasant
	—	—	—	—
	Jacksonville	Jacksonville	Jacksonville	Jacksonville
	Alton	Alton	Alton	Alton
Economic Development Opportunities	New Industry	New Industry	New Industry	New Industry
	Road Service	Road Service	Road Service	Road Service
	New Visitors	New Visitors	River Visitors	River Visitors

(a) Total highway between St. Louis and St. Paul (beltline to beltline)
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(c) ADT (Thousands) by section times section length, existing (in thousands)
(d) Resident population (in thousands) within 25 miles of highway
(e) Accessibility index: population (in thousands) with improved access to cities
(f) Miles of new road to be built
(g) 4-lane highway St. Louis to St. Paul, but without "Major Urban Bypasses"
(h) 4-lane highway St. Louis to St. Paul, with "Major Urban Bypasses"

SOURCE: Wilbur Smith Associates

The Travel Demand Model

Of the 36 initial alternative routes, 6 survived the secondary screening level. Those six were subjected to more detailed traffic and economic analysis, including the application of the study's travel demand model.

In order to determine the potential benefits to users of the candidate route improvement alternatives, it was necessary to develop a means of estimating the number of users of each route, with and without the improvement projects. Because, in some cases, users will be diverted from an existing, unimproved facility to the improved roadway the traffic forecasting procedures had to recognize the origin-destination pattern of travel in the region, and not just attempt to forecast simple growth rates of existing traffic on individual road links.

The traffic forecasting procedures employed a network based model in which the study region was subdivided into a series of traffic analysis zones. The demand estimating procedures were then designed to estimate the number of trips between each pair of analysis zones. A roadway network was coded that included the major roadways in the region. The network was composed of a series of nodes (intersections where three or more road links connect and where a choice of route decision can be made) and links (the road connections between intersections). Data concerning distance, travel time, facility type and observed traffic volume were provided for each link.

The traffic analysis zones (the origin and destination location of trips) were connected at appropriate access points to the road network. It was then possible to determine the most probable route used to travel between any two analysis zones. The aggregate of all zone to zone movements using a given road link provided an estimate of the total traffic using the link.

The traffic estimating procedures defined a base year (1986) trip table based on corridor travel relationships obtained from the roadside surveys, the observed average annual daily traffic on each link in the coded road network, the most probable routings between zone pairs and the relative population residing in each zone. The base year trip table was then revised to reflect changes in population between 1986 and 2010 and observed trends in per capita vehicle miles traveled. These adjustments produced a year 2010 trip table which was assigned to the base (unimproved) and alternative improved highway networks.

The demand forecasting process was divided into a series of seven discrete tasks.

1. Define Analysis Zone Scheme
2. Code Road Network
3. Compile Base and Future Year Population Data
4. Develop Base Year (1986) Trip Table
5. Develop Future Year (2010) Trip Table
6. Prepare Base and Future Year Traffic Assignments
7. Adjust Traffic Assignments for Truck Traffic

<u>Define Analysis Zone Scheme</u> - Two major factors were considered in defining the analysis zone scheme. First, the scheme had to be compatible with likely sources of base and future year population forecast which would be used as the primary indication of how travel demands would change over time. Second, a level of detail had to be provided in the zone scheme that would allow most, if not all, rural road traffic to be assigned to the network as an interzonal rather than an intrazonal movement (which would not appear in the network assignment).

The first factor, compatibility with population forecast data, suggested a zone scheme consisting of one zone for each county in the corridor. At their greatest level of detail, population forecasts were available at the county level.

A review of this candidate zone scheme found that additional detail would be desirable. As base year population data was available for urbanized areas it was decided to expand the zone scheme to include cities over 5,000 population as individual zones (this allowed approximately 95 percent of the total urban area population in the region to be assigned to individual zones).

In total, the analysis corridor was split into 433 analysis zones including 155 city zones and 278 county zones.

<u>Code Road Network</u> - Figure 3-10 depicts the transportation model's road network. The network includes all Interstate and other U.S. numbered routes, plus major state numbered routes which provide access to the individual analysis zones. Each link in the network was assigned to one of four roadway type classifications, with the following average speeds and average vehicle mix:

	MPH	Percent Trucks
1. Interstate	65	25
2. Multilane-Partial Access Control	55	20
3. Multilane-Divided	55	20
4. Two Lane	50	16

The speeds on links within or very close to urban areas were adjusted to account for the lower speed limit on urban interstates and the effects of congestion, traffic control devices and lower speed limits on other roads. These adjustments were made using data obtained from a field reconnaissance of major roads in the corridor.

Distances between major road junctions were extracted from state highway maps and used to provide a distance for every link in the system. The final base network included 2,592 links, 1,058 nodes and 17,898 road miles.

The latest available traffic count data were extracted from state traffic flow maps and used to associate an AADT volume with each link in the network. Because demand forecasting procedures would require both passenger car volumes and truck volumes, and since comprehensive classified count data were not available from all states, average truck percentages were developed for each facility type.

Compile Base and Future Year Population Data - Base year (1986) population estimates were compiled from three sources. County population totals for the states of Illinois, Minnesota, Missouri and Wisconsin were extracted from reports of Local Area Personal Income prepared by the U.S. Department of Commerce, Bureau of Economic Analysis. County population for the State of Iowa was obtained from the 1986 Local Population Estimate by the U.S. Bureau of the Census. City population for 1986 was extracted from the 1988 County and City Data Book also prepared by the U.S. Bureau of the Census. The population of counties containing cities that were assigned an individual traffic analysis zone was reduced by the city(s) population. County population forecasts were provided by the states.

No comprehensive source of city population forecasts was found to be available. Therefore, year 2010 city zone population was estimated using the following steps:

1. If a city was located in a county where population growth was forecast, the growth in population was assumed to occur within the city zone.

2. If a city was located in a county where a population decline was forecast, the decline was assumed to occur in the county zone with the city zone population held constant at the 1986 value.

3. The resulting city and county zone population forecasts were reviewed for reasonableness. Where illogical (in particular, very large increases in city population) results were found, the past trend of the city population growth was examined and used to manually adjust the city zone population forecast.

Develop Base Year (1986) Trip Table - To be useful, a transportation model must be able to develop a reasonably accurate representation of the existing origin-destination travel patterns in the corridor. To gain an indication of such travel patterns, a license plate/mailback survey was designed and conducted to observe automobile travel characteristics at critical locations along the corridor. Results from the survey were used to guide the development of a synthetic trip table of corridor automobile travel. The base year trip table was developed as follows.

For origin-destination movements passing through at least two survey station locations, the survey results were used as the initial estimate of trips for the O-D pair. For O-D movements passing through only one station and for which trips were observed in the survey, the survey results were also used as the initial estimate. For O-D movements passing through one or no stations, and for which no trips were observed, the results of a direct demand model calibrated from the combined survey data from all stations was used. The direct demand used for this purpose had the following form:

$$TRIPS_{i-j} = POP_i^{a} \times POP_j^{b} \times TIME_{i-j}^{c}$$

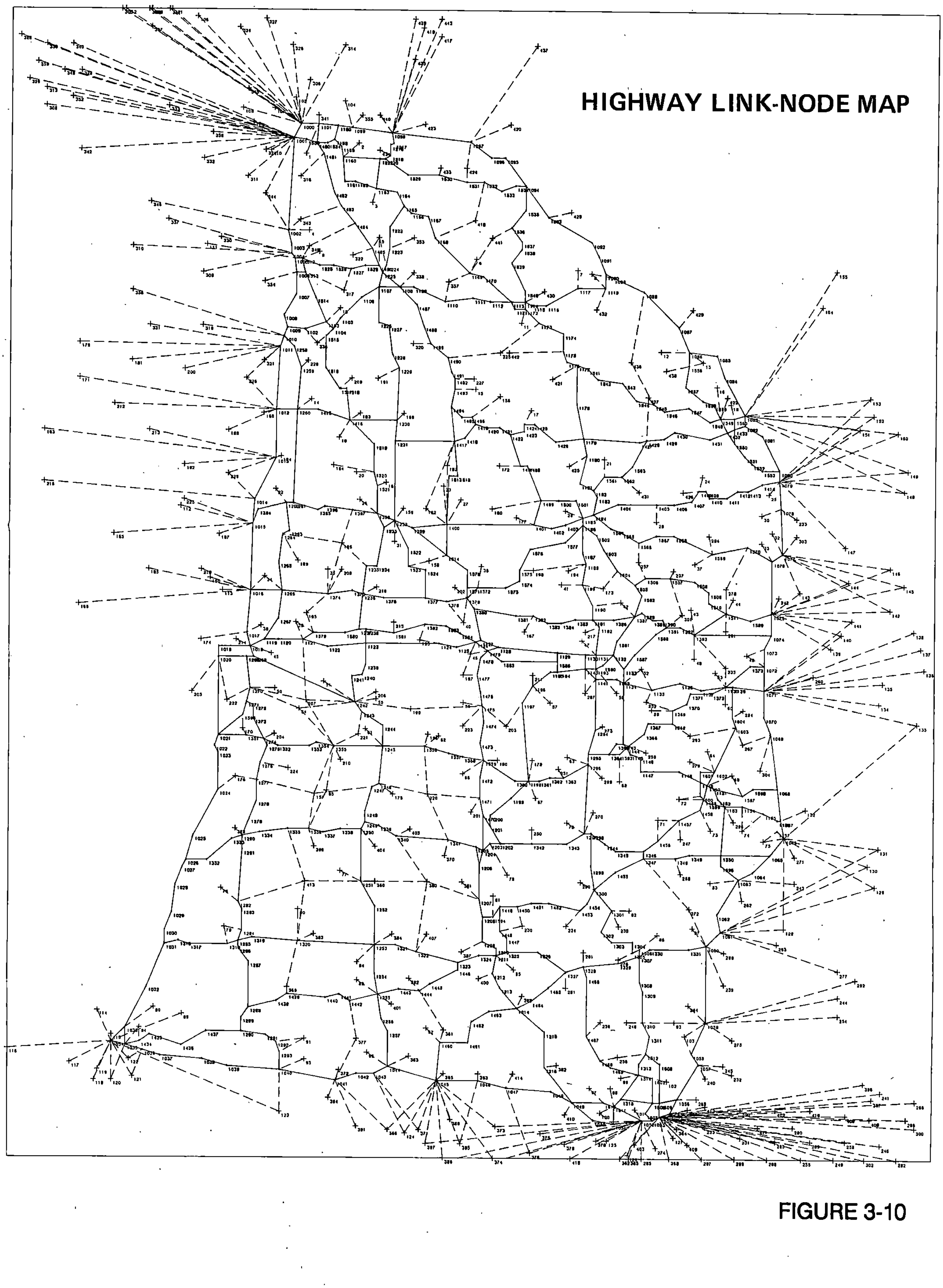


FIGURE 3-10

Where:

$TRIPS_{i-j}$	= Estimated trips between zones i and j;
POP_i	= Population (in thousands) of zone i;
POP_j	= Population (in thousands) of zone j;
$TIME_{i-j}$	= Travel time (in minutes) between zones i and j, and;
a, b, c	= Constants determined through calibration.

A computer program, developed for this purpose and successfully applied on a number of previous projects, was used to perform this task. The program compares the assigned value to the observed count for all links used by a given O-D movement and calculates a composite adjustment factor for that O-D pair. These factors are then applied to the initial trip table and a revised trip table for input to another iteration of the program is produced.

Several evaluation criteria were used to evaluate the synthetic trip table to see if an acceptable calibraion has been attained:

- A comparison of the overall trip length distribution of the synthetic trip table with that observed in the combined data from all survey locations.
- A comparison of the average trip length of trips estimated to pass through the individual survey station locations with the average trip length observed from that location's survey.
- A comparison of estimated traffic volume with observed traffic count for each survey station.
- A comparison of estimated traffic volume with observed traffic count for all other links in the system.

The calibration process was repeated until acceptable calibration results were attained. Figure 3-11 contains the observed versus estimated comparison of overall trip length distribution in the corridor. Trip length is shown in fifty mile intervals. The synthetic trip table slightly overstates travel in the 100-150 mile category, with all other categories very close to observed percentages. Overall average trip length was observed at 104 miles in the expanded survey data. The synthetic trip table calculated an average trip length of 102 miles.

Table 3-9 presents the comparison of average trip length and traffic volume at each of the 14 survey stations. While differences exist between the observed and estimated trip lengths at a few locations, it should be noted that the observed data is in fact survey data, with an implied potential for survey error. In general the comparison was quite good, with stations observed to have relatively shorter or longer trip lengths correctly identified by the model.

Table 3-9
1986 SYNTHETIC TRIP TABLE
STATION LINK COMPARISON
ST. Louis to St. Paul Corridor Study

STATION	ROUTE	STATE	AVG TRIP LENGTH-MILES OBS	EST 1	EST 3	PASSENGER CAR ADT OBS1	OBS3	EST 1
1	US218	IOWA	135	158	158	3.2	3.0-3.6	3.2
2	US61	IOWA	59	101	96	3.0	3.0-5.6	3.0
3	I380	IOWA	116	170	170	4.6	4.6-7.5	6.3
4	US61	IOWA	69	109	101	3.2	2.9-3.5	3.2
5	IA190	IOWA	128	139	138	2.9	1.3-2.9	3.0
6	US63	IOWA	212	211	189	1.9	1.9-3.6	2.6
7	US218	IOWA	81	77	89	2.1	2.1-3.1	2.6
8	I35	IOWA	218	288	237	6.1	6.0-7.7	6.7
9	US61	WISCONSIN	109	136	132	2.1	2.1-7.3	4.0
10	US61	MINNESOTA	90	125	105	4.7	4.7-5.0	4.8
11	US52	MINNESOTA	109	116	117	6.6	6.6-10.1	8.2
12	US61	MISSOURI	154	155	115	7.0	5.4-10.7	6.2
19	US67	ILLINOIS	112	87	62	4.0	2.3-7.7	4.0
20	I74	ILLINOIS	229	218	202	7.0	7.0-9.5	7.4

Notes:

EST 1 = For single station link

EST 3 = For 3 adjacent links

OBS1 = For single station link

OBS3 = For 3 adjacent links

SOURCE: Travel Model, Wilbur Smith Associates

The traffic volume comparison was also within acceptable limits for the individual station link comparisons. The volume comparisons are shown in two ways: first, to the station link itself, and then to the range of volume observed on the station link and the adjacent links to the north and south. The choice of where zone centroids are connected to the network can effect individual estimated link volumes. Therefore, the three link range probably provides the best basis for comparison.

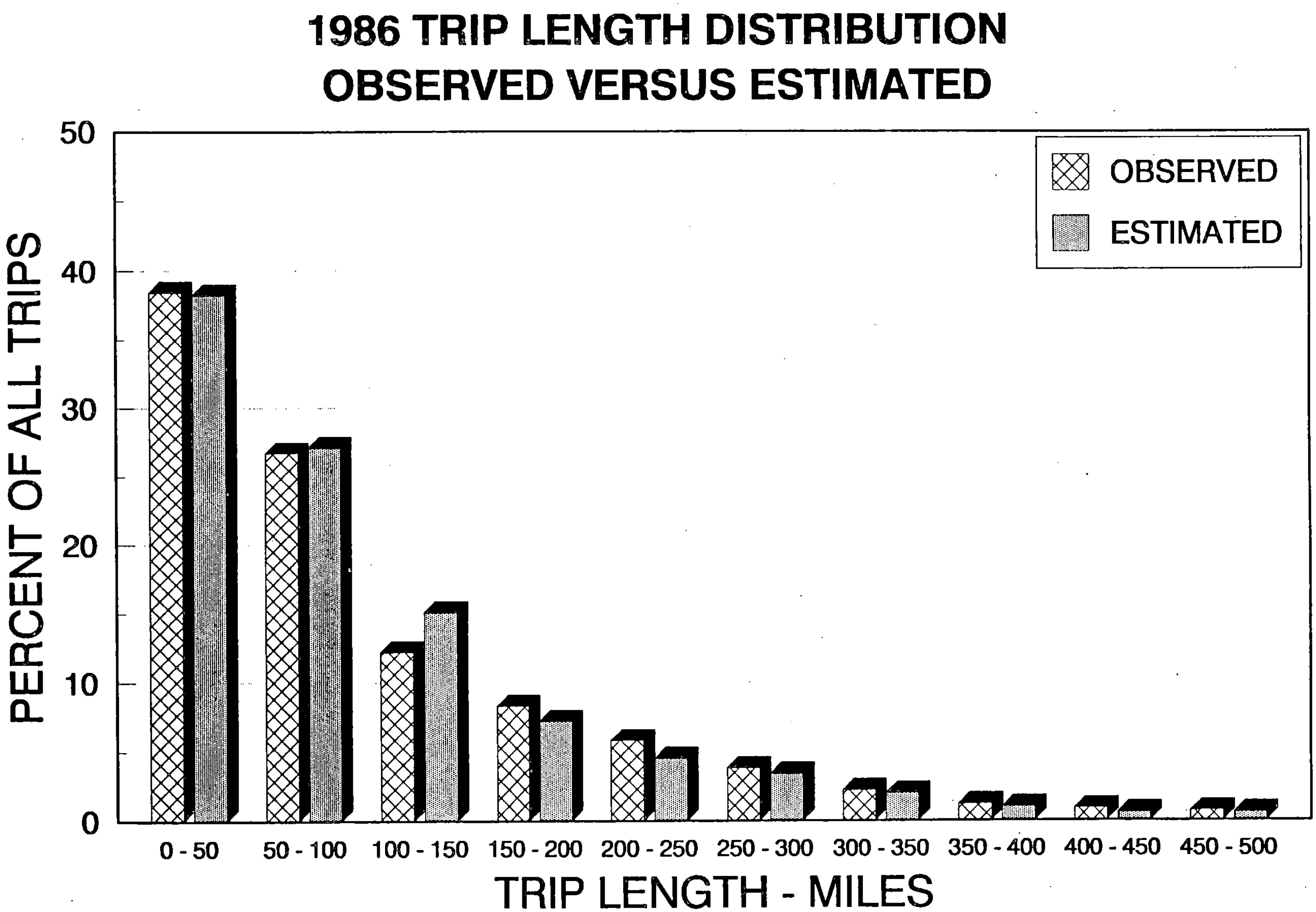

1986 TRIP LENGTH DISTRIBUTION
OBSERVED VERSUS ESTIMATED
PERCENT OF ALL TRIPS
0
10
20
30
40
50
OBSERVED
ESTIMATED
0 - 50
50 - 100
100 - 150
150 - 200
200 - 250
250 - 300
300 - 350
350 - 400
400 - 450
450 - 500
TRIP LENGTH - MILES

FIGURE 3-11

For all links in the network, 70 percent of the estimated traffic volumes were within 25 percent of the observed traffic counts. In absolute terms, 82 percent of all estimated link volumes were within 500 vehicles of the observed volume.

All things taken into consideration, the synthesized base year trip table is reasonable estimation of actual travel demands in the corridor in terms of both level of detail and accuracy.

Develop Future Year (2010) Trip Table - The procedure used to increase 1986 travel demand to 2010 conditions was designed to account for two primary factors related to automobile travel increases:

* Population increases - As the resident population increases, there are increasing numbers of people with travel needs.

* Increased rate of tripmaking - Observed increase in per capita vehicle miles of travel (for both passenger and commercial vehicles).

Population increases were accounted for by summing origin and destination zone population for 1986 and 2010 for each O-D pair in the corridor. A growth ratio was calculated from the summed population, and then applied to the number of trips for the zone pair in the base year trip table.

The underlying reasons for increased per capita rates of travel are complex. Among factors contributing to this increase are:

- Increased affluence and leisure time of the general public
- An increasing proportion of the population working
- A trend toward smaller family sizes, more households for the same population
- An increase in the efficiency of vehicles used for transportation (and therefore decreased travel costs)

To include the above factors in the forecasts, recent past trends of per capita VMT growth were examined to determine an annual rate of per capita VMT growth that could be extrapolated into the future. Extrapolation of past trends, especially over long periods, can sometimes produce illogical results. However, in this case it was concluded that this approach provided an acceptable compromise between the need to include the effects of this phenomenon in the travel forecasts and the need to cost-effectively allocate project resources.

To review per capita VMT trends, state population figures were obtained from the U.S. Bureau of the Census. VMT data were extracted from Highway Statistic Summaries published annually by the Federal Highway Administration. The review was limited to rural VMT trends as it was felt that including urban VMT would confuse the analysis and would not be representative of travel in the corridor. The review initially examined the period from 1970 to 1987. However, final calculations focused on the 1980 to 1987 period which eliminated the effects of the drastic fuel price changes and oil shortages that occurred in the 1970's.

The first step in the process was to determine the private vehicle/commercial vehicle rural VMT proportions. Table 3-10 contains national private and commercial rural VMT from 1980 to 1987 (VMT by vehicle type is reported only on a national basis). As expected, the proportion of rural VMT attributable private vehicles declined from about 67 percent in 1980 to 64 percent in 1987.

Table 3-10
NATIONAL RURAL VEHICLE MILES OF TRAVEL
PASSENGER VERSUS COMMERCIAL
St. Louis to St. Paul Corridor Study
1980-1987

	VMT (MILLIONS)			PERCENT
YEAR	Auto	Truck	Total	AUTO
1980	450,659	221,371	672,030	67.1
1981	461,101	224,833	685,934	67.2
1982	464,447	226,779	689,226	67.1
1983	464,772	233,745	698,517	66.5
1984	467,411	250,721	718,132	65.1
1985	474,043	256,198	730,201	64.9
1986	484,873	265,202	750,075	64.6
1987	501,223	279,859	781,082	64.2

Source: Highway Statistics, Federal Highway Administration.

The next step was to apply the national passenger vehicle percent of total VMT to each of the states in the corridor. Table 3-11 contains the resulting passenger vehicle VMT for each state and for the region as a whole.

Table 3-11
RURAL PASSENGER VEHICLE MILES OF TRAVEL
STATES IN CORRIDOR
St. Louis to St. Paul Corridor Study
1980-1987

	VMT (MILLIONS)					
YEAR	**Ill.**	**Ia.**	**Mn.**	**Mo.**	**Wis.**	**Total**
1980	14,701	8,300	9,864	11,430	11,201	55,496
1981	15,042	8,354	9,968	11,658	12,312	57,334
1982	14,596	8,373	10,218	11,696	12,006	56,889
1983	14,305	8,404	10,768	11,775	12,366	57,618
1984	14,453	8,579	10,557	12,201	12,207	57,817
1985	14,985	8,668	10,859	12,621	12,832	59,965
1986	15,058	8,392	10,393	12,991	12,883	59,717
1987	15,253	8,481	10,608	13,426	13,619	61,387

Source: Highway Statistics, Federal Highway Administration and Consultant Calculations.

Per capita passenger vehicle VMT was calculated by dividing the state population figures given in Table 3-12 into the passenger vehicle VMT calculated above. The resulting per capita rates by state and for the region are contained in Table 3-13. Inspection of the per capita rates by state found that the rates are reasonably consistent between states with the exception of Illinois. The Illinois rate was about half the rate for the other states. Because of this difference, the Illinois data was subtracted from the regional totals and regional average rates calculated from the remaining four states' data. These average rates are also shown in Table 3-13.

An average annual compound growth rate of 1.44 percent per year was calculated from the regional data. When extrapolated over the 1986-2010 forecast period (24 years) this annual rate produced a 41 percent increase in automobile travel. The initial 2010 trip table, which reflected only population growth was, therefore, factored up by 41 percent to account for the per capita rate of travel increase component.

Table 3-12
STATE POPULATION TRENDS
St. Louis to St. Paul Corridor Study
1980-1987

YEAR	POPULATION (THOUSANDS) Il.	Ia.	Mn.	Mo.	Wi.	Total
1980	11,427	2,914	4,076	4,917	4,706	28,040
1981	11,474	2,918	4,112	4,938	4,635	28,077
1982	11,478	2,908	4,113	4,942	4,746	28,187
1983	11,491	2,905	4,145	4,963	4,747	28,251
1984	11,522	2,904	4,163	5,004	4,762	28,355
1985	11,538	2,880	4,190	5,034	4,775	28,417
1986	11,551	2,850	4,213	5,064	4,783	28,461
1987	11,582	2,834	4,246	5,103	4,807	28,572

Source: U.S. Bureau of the Census

Table 3-13
PERCAPITA RURAL PASSENGER VEHICLE VMT
St. Louis to St. Paul Corridor Study
1980-1987

YEAR	PERCAPITA VMT (Miles) Il.	Ia.	Mn.	Mo.	Wi.	Total	TOTAL MINUS ILLINOIS
1980	1,287	2,848	2,420	2,325	2,380	1,979	2,456
1981	1,311	2,863	2,424	2,361	2,656	2,042	2,547
1982	1,272	2,879	2,484	2,367	2,530	2,018	2,531
1983	1,245	2,893	2,598	2,373	2,605	2,040	2,584
1984	1,254	2,954	2,536	2,438	2,526	2,040	2,576
1985	1,299	3,010	2,592	2,507	2,687	2,110	2,665
1986	1,304	2,945	2,467	2,565	2,693	2,098	2,641
1987	1,317	2,993	2,498	2,631	2,833	2,148	2,774

Source: Consultant Calculations

<u>**Prepare Base and Future Year Traffic Assignments**</u> - The 1986 and 2010 trip tables were assigned to the base and alternative improvement road networks. The assignment process produced passenger vehicle volumes for each link on the road network for each alternative. Route choice for the assignments was based on minimizing travel time. Improved road segments were assumed to have an average speed of 55 miles per hour for expressway options.

<u>**Adjust Traffic Assignments for Truck Traffic**</u> - Average percent trucks statistics by facility type were developed for base year conditions (1986). For base year assignments, these percentages were used to expand the passenger vehicle volumes to estimated total traffic. For 2010, however, it was necessary to revise these percentages to account for the observed higher rate of commercial vehicle rural VMT growth.

The national commercial vehicle VMT data were again examined to determine the compound annual growth rate for 1980 to 1987. This rate was calculated to be 3.4 percent per year (or a 123 percent increase over the 1986-2010 forecast period). The forecast private vehicle growth rate over the same period is about 50 percent (considering both population and per capita VMT increases).

Applying these increases to the base year percent distribution of private and commercial vehicles produces about a 30 percent increase in the percentage of commercial vehicles. This produced the average percent of trucks in 2010 shown below.

FACILITY TYPE	PERCENT TRUCK 1986	PERCENT TRUCK 2010
Interstate	25	33
Multilane-Partial Access Control	20	26
Multilane-Divided	20	26
Two Lane	16	21

Traffic Forecasts

The traffic model was used to estimate traffic volumes on each of the route options for the years 1986 and 2010 with and without the expressway improvements. All programmed road improvements are included in the "base case;" consequently, differences in estimated volumes between the base case and the expressway are due exclusively to the highway improvements evaluated in this study.

Figures 3-12 through 3-17 present the traffic volumes for each route alternative for 1986 and 2010 including the commercial vehicle adjustment, for the "no build" (unimproved) and "build" (improved) options. Private daily vehicle trips in the corridor totaled 453,595 in 1986 and is expected to increase to 681,236 in 2010.

Table 3-14 summarizes the vehicle miles operated on each alternative alignment under base and improved conditions. The "net increase" column of this table is an indication of how much traffic is diverted to the alternative alignment from other roalways.

Alternative B-1-4 diverts about 40 percent more traffic from other roads than does A-2. Alternative C-1-3 also diverts about 40 percent more traffic than C-1-5. The two D alternatives attract about the same amount of traffic from other links.

Based on the above comparisons of the alterntives' ability to reduce total regional VMT and VHT, and to attract/divert traffic from other roadways the following is concluded:

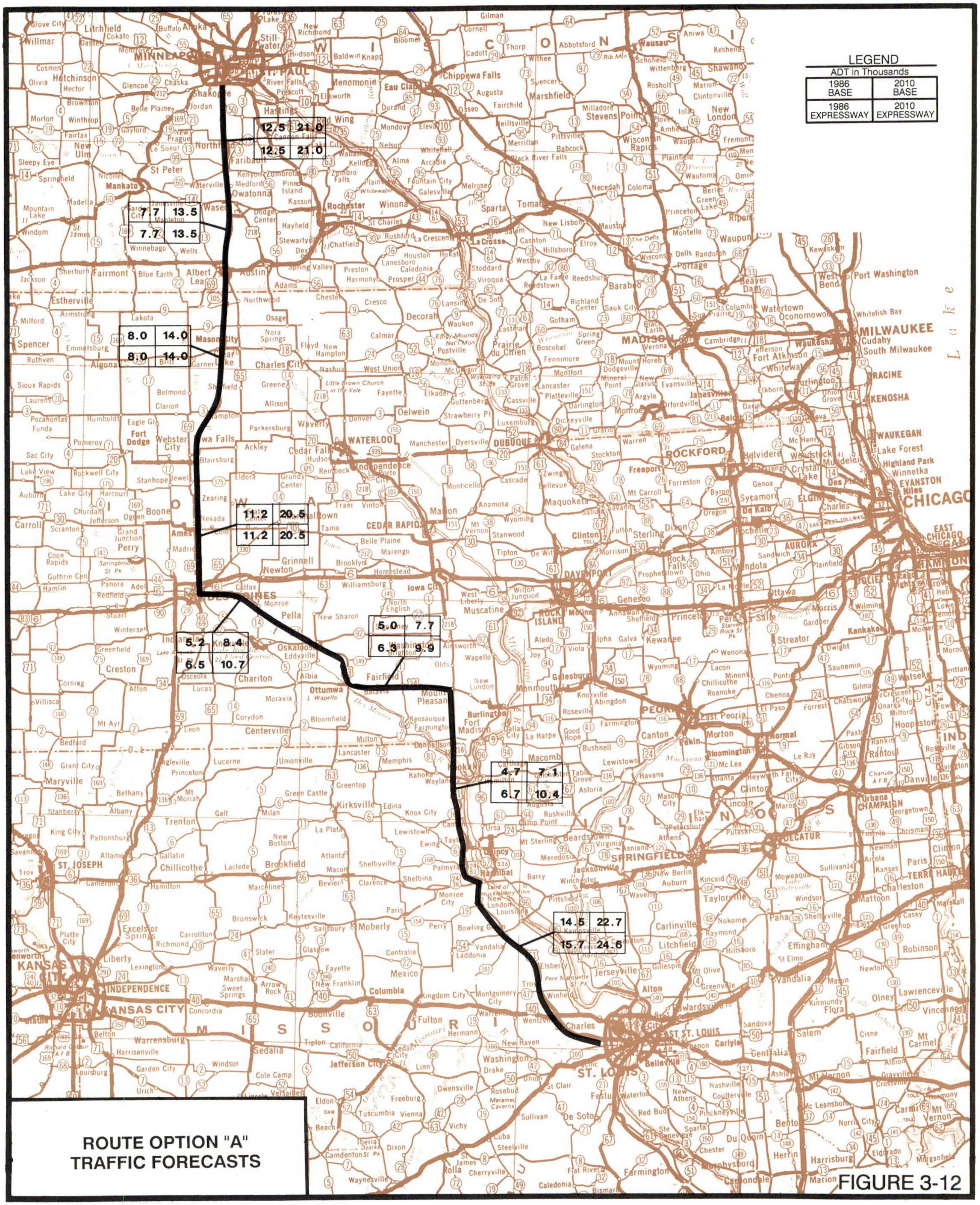
- Alternative B-1-4 reduces regional VMT and VHT and diverts more traffic from other routes than does Alternative A-2 for a smaller investment.
- Alternative C-1-5 produces a greater overall reduction in VHT than does C-1-3. However, only a small VMT reduction is obtained, and C-1-3 has a higher potential for attracting traffic from other roads.
- Alternative D-2-6-5 produces significant VMT and VHT benefits when compared to D-2-7-5. Both alternatives have about the same potential for diverting traffic from other roads.

Selection of Finalist Routes

In the third level screening, three sets of route sub-section options were compared on an "incremental" basis. That is, the routes were not evaluated all the way from St. Louis to St. Paul; rather, only the differences between competing sub-options were evaluated. The capital cost differences were compared with the user cost savings differences using conventional benefit/cost analysis.

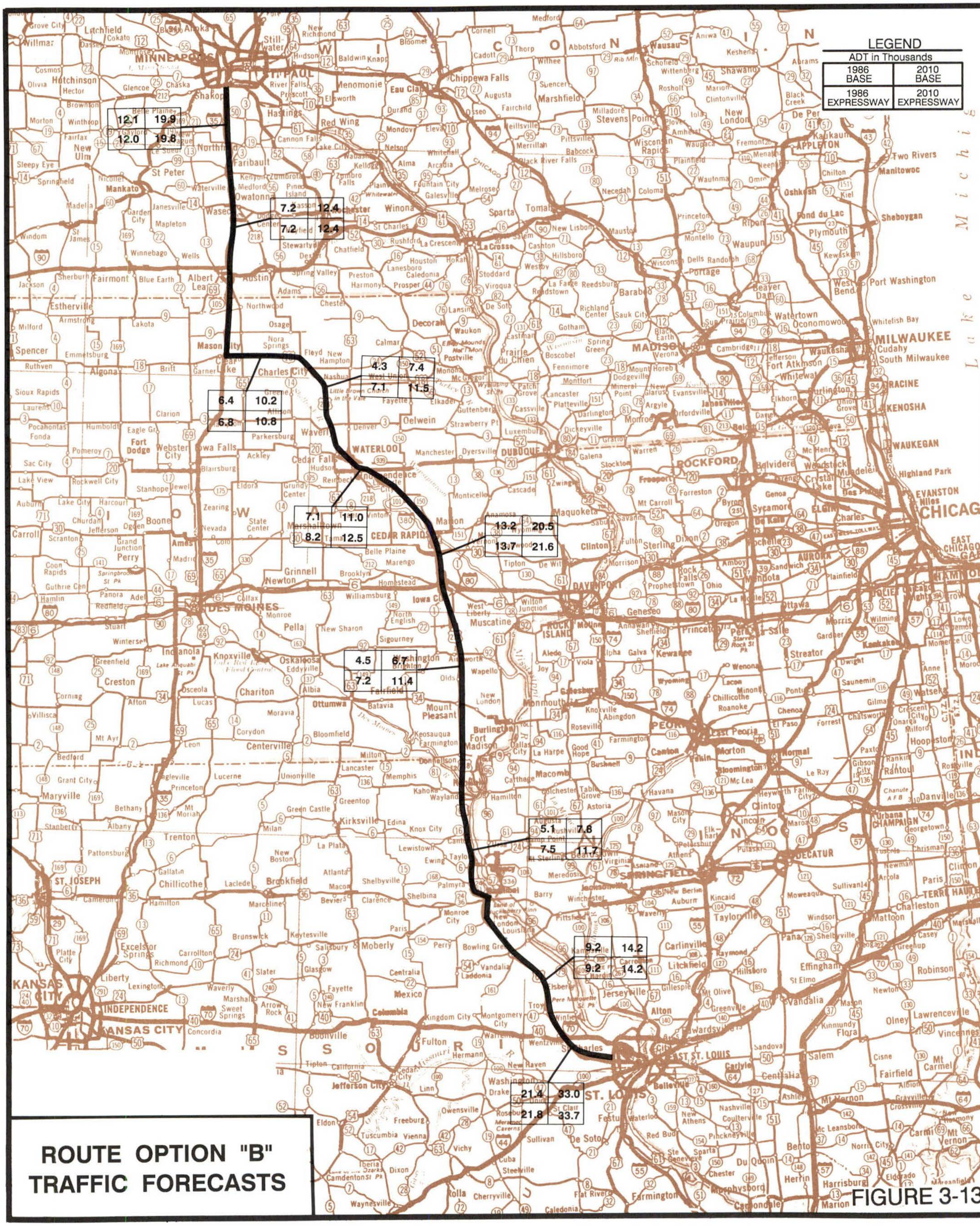
Three sets of route segments were evaluated, and the goal was to select the superior route between each of the segment's endpoints. The route segment endpoints and route options that were evaluated using this incremental approach were:

Segment Endpoints	Route Segment Options
(1) Mason City to Mt. Pleasant	(a) A-2 via Des Moines, or (b) B1-4 via Waterloo and Iowa City
(2) Iowa City to St. Louis	(a) C1-3 via Mt. Pleasant and Hannibal, or (b) E1-3 via Davenport and Alton
(3) Davenport to Monmouth	(a) D2-6-5 via Rock Island and U.S. 67, or (b) D2-7-5 via Interstate 74



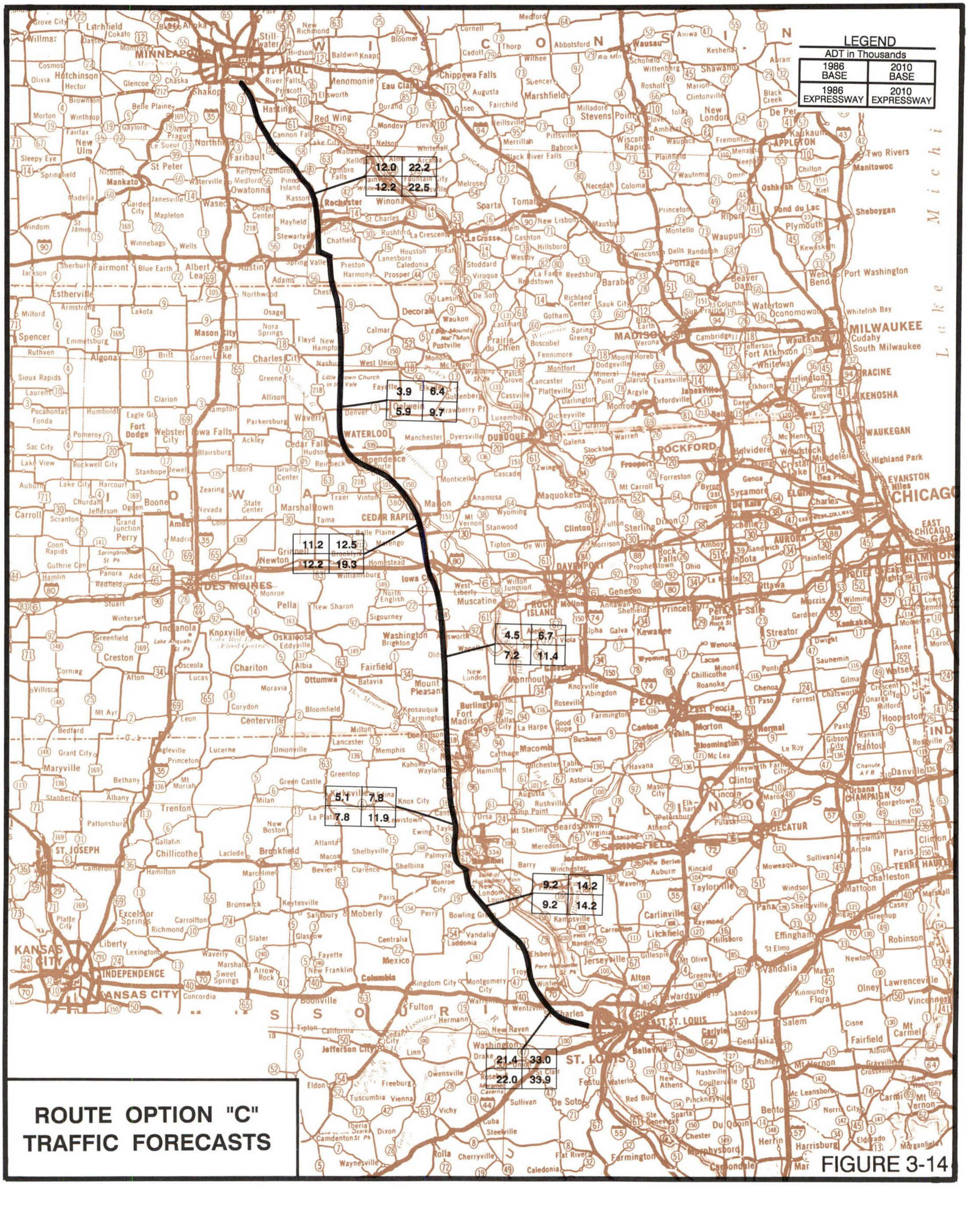
ROUTE OPTION "A"
TRAFFIC FORECASTS

FIGURE 3-12



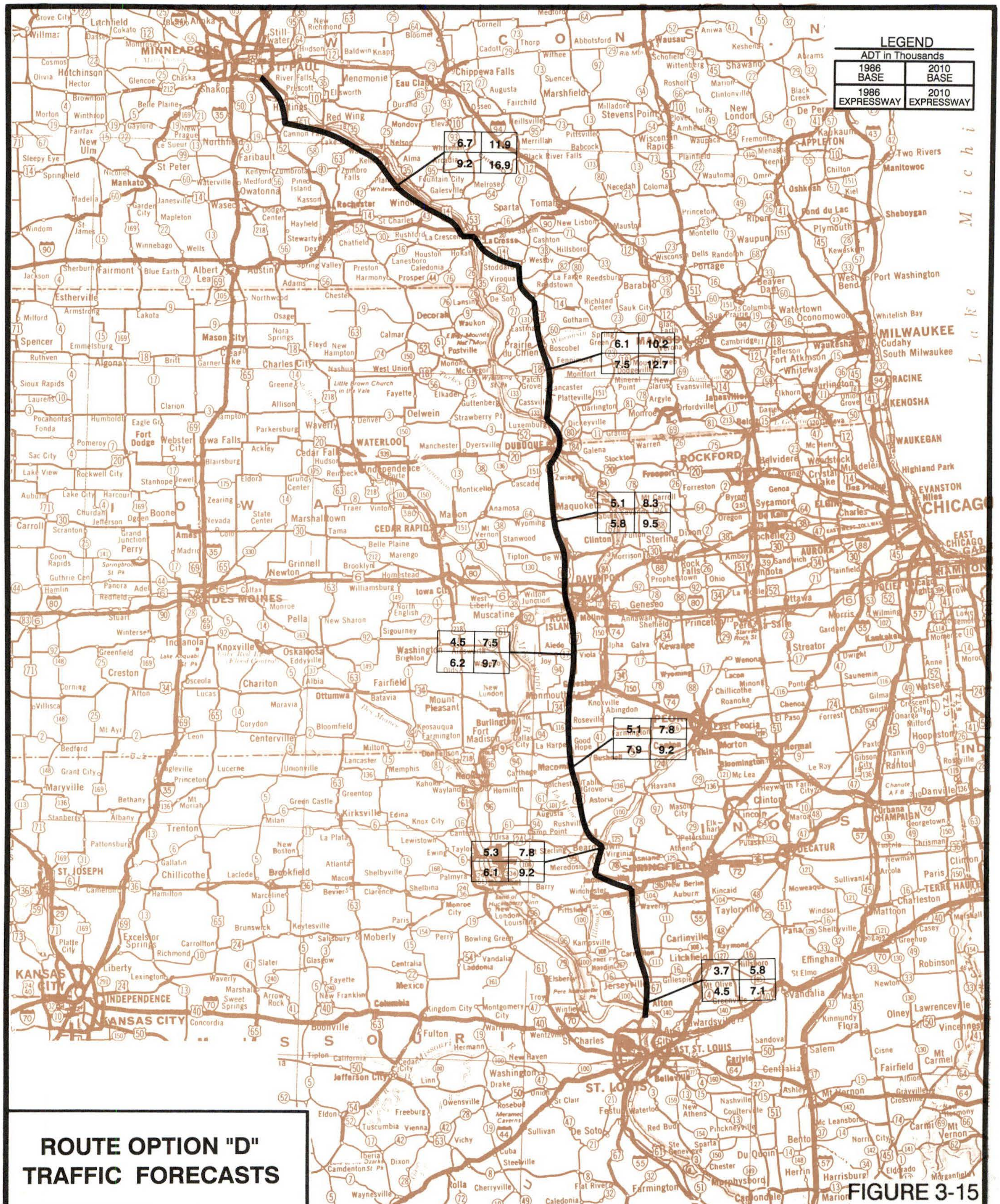
ROUTE OPTION "B" TRAFFIC FORECASTS

FIGURE 3-13



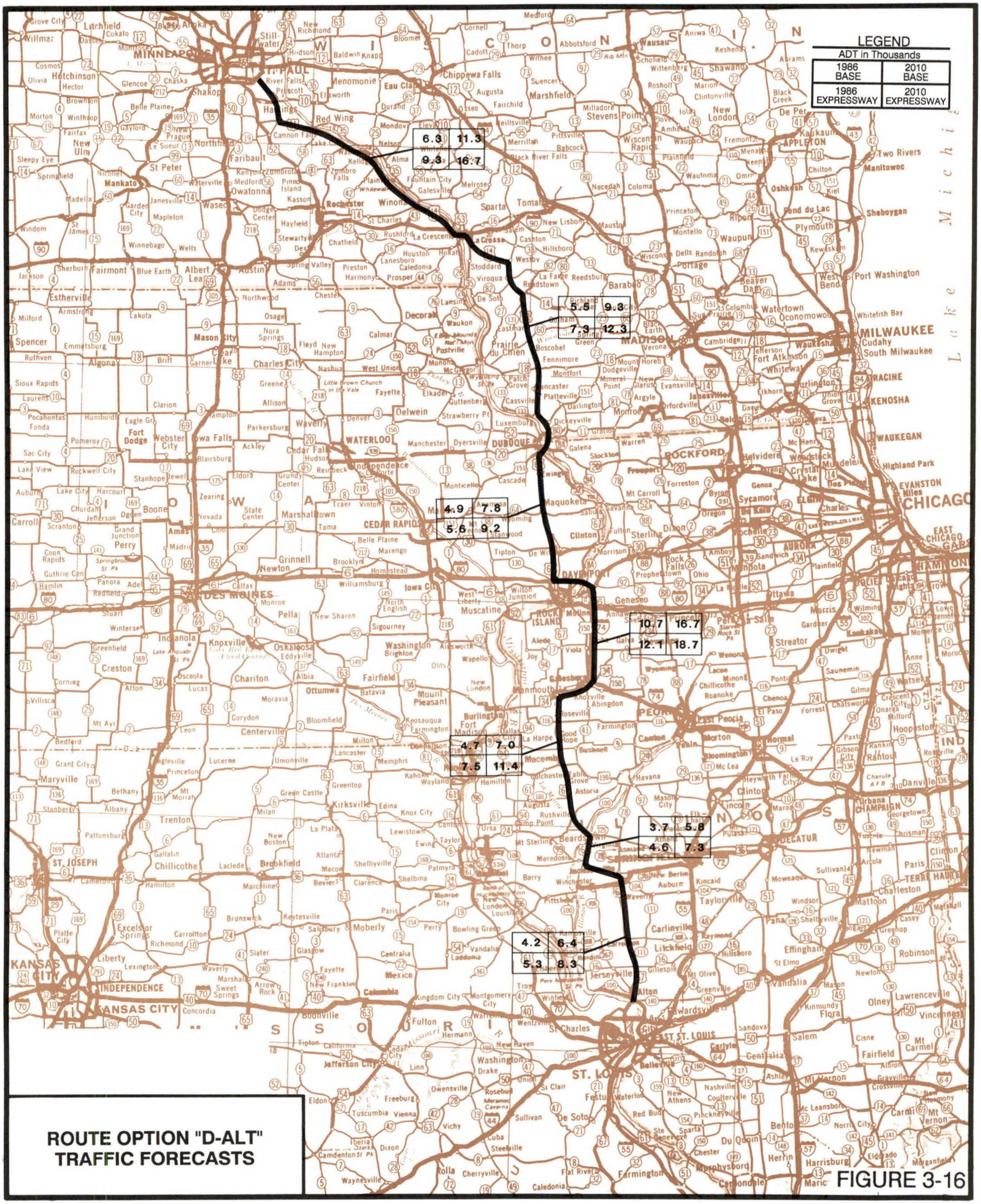
ROUTE OPTION "C"
TRAFFIC FORECASTS

FIGURE 3-14



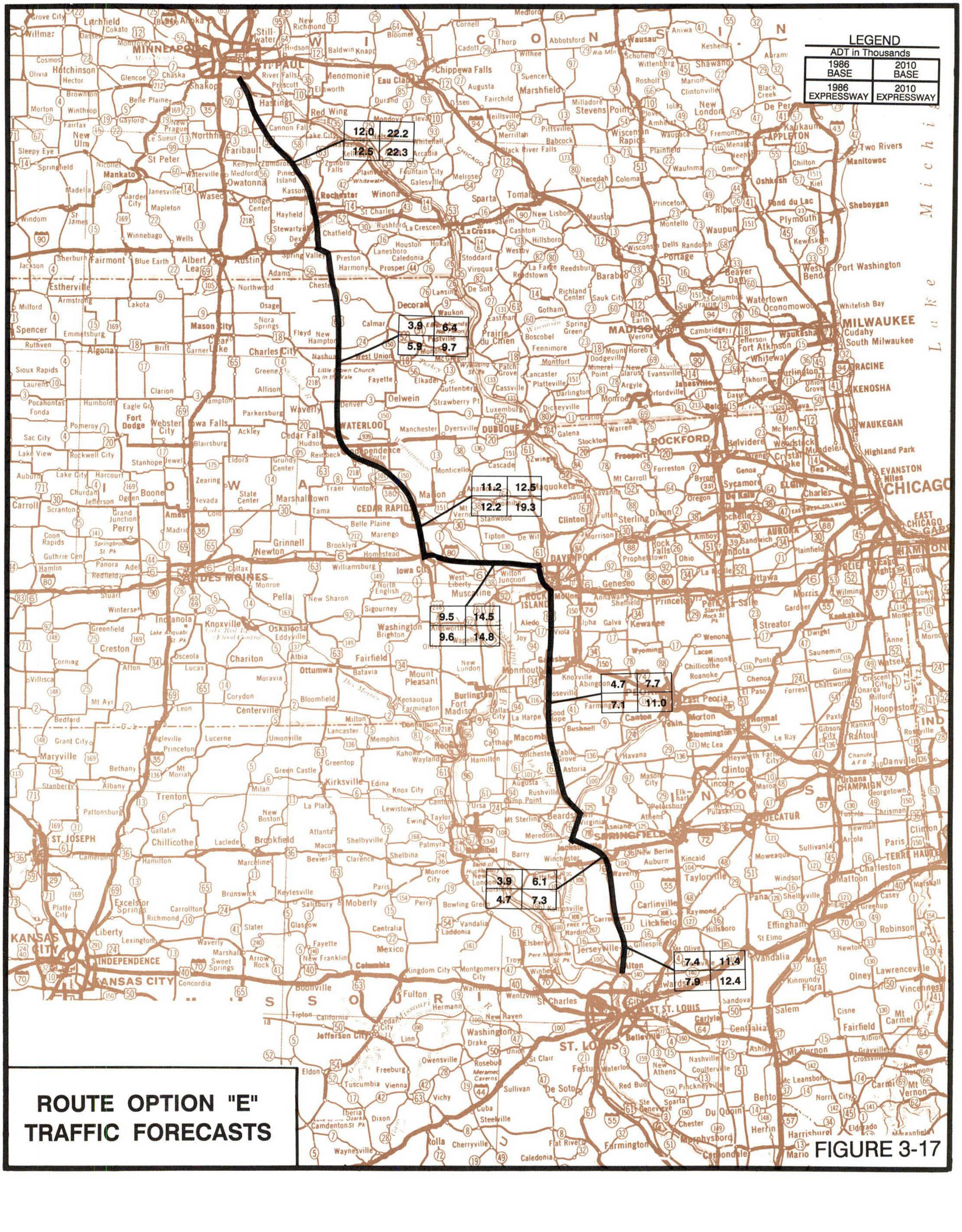
ROUTE OPTION "D"
TRAFFIC FORECASTS

FIGURE 3-15



ROUTE OPTION "D-ALT"
TRAFFIC FORECASTS

FIGURE 3-16



ROUTE OPTION "E" TRAFFIC FORECASTS

FIGURE 3-17

Table 3-14
DAILY VEHICLE MILES OF TRAVEL ON ALTERNATIVE ALIGNMENTS
St. Louis to St. Paul Corridor Study

ALT./YEAR	UNIMPROVED			IMPROVED			NET INCREASE		
	AUTO	TRUCK	TOTAL	AUTO	TRUCK	TOTAL	AUTO	TRUCK	TOTAL
A-2									
1986	3,869,821	1,108,910	4,978,731	4,219,666	1,257,131	5,476,797	349,845	148,221	498,066
2010	5,705,677	2,385,982	8,091,659	6,227,270	2,695,768	8,923,038	521,593	309,786	831,379
B-1-4									
1986	3,618,399	1,032,351	4,650,750	4,142,555	1,219,216	5,361,771	524,156	186,865	711,021
2010	5,280,933	2,193,835	7,474,768	6,068,666	2,586,954	8,655,620	787,733	393,119	1,180,852
C-1-3									
1986	3,388,068	905,081	4,293,149	4,097,740	1,143,686	5,241,426	709,672	238,605	948,277
2010	5,072,578	1,936,844	7,009,422	6,186,569	2,461,333	8,647,902	1,113,991	524,489	1,638,480
E1-3									
1986	2,915,663	769,232	3,684,895	3,429,288	961,184	4,390,472	513,625	191,952	705,577
2010	4,428,365	1,672,871	6,101,236	5,202,809	2,082,809	7,285,618	774,444	409,938	1,184,382
D-2-6-5									
1986	2,339,090	513,499	2,852,589	3,136,574	812,605	3,949,179	797,484	299,106	1,096,590
2010	3,589,161	1,113,046	4,702,207	4,815,063	1,764,496	6,579,559	1,225,902	651,450	1,877,352
D-2-7-5									
1986	2,685,091	658,839	3,343,930	3,434,217	934,858	4,369,075	749,126	276,019	1,025,145
2010	4,058,418	1,415,307	5,473,725	5,207,886	2,014,770	7,222,656	1,149,468	599,463	1,748,931

SOURCE: Traffic Model, Wilbur Smith Associates

Incremental Method - Using traffic forecasts, it was possible to quantitatively compare these route segment sub- options. For each comparison, the segment option with the lowest capital cost was defined as the "base case" and the higher cost option is the "test option." For each comparison, the following questions were asked, and answered:

- **Mason City to Mt. Pleasant** -- Route B1-4 (the lower cost "base case") between these endpoints will cost $192.1 million, and Route A-2 will cost $213.9 million. The incremental cost of A-2 is therefore $21.8 million. The issue is, what incremental benefits of A-2 over and above B1-4 will occur, and are these incremental benefits sufficient to justify the $21.8 million incremental cost?

- **Iowa City to St. Louis** -- Route C1-3 (the lower cost "base case") between these two endpoints will cost $237.1 million, and Route E1-3 (the "test option") will cost $816.0 million. The incremental cost of C1-5 is therefore $578.9 million. The issue is, what incremental benefits of E1-3 over and above C1-3 will occur, and are these incremental benefits sufficient to justify the $578.9 million incremental cost?

- **Davenport to Monmouth** -- Route D2-7-5 (the lower cost "base case") between these two endpoints will not entail any capital expenditure because it is existing I-74, while Route D2-6-5 (the "test option") will cost $165.0 million. The incremental cost of D2-6-5 is therefore $165.0 million. The issue is what incremental benefits of D2-6-5 over and above D2-7-5 will occur, and are these incremental benefits sufficient to justify the $165.0 million incremental cost?

To make the incremental benefit/cost calculations, the incremental capital cost was compared with the incremental user benefits (travel time, vehicle operating costs, accidents) in traditional benefit/cost terms. Three indicators were prepared for each comparison:

* **Net Present Value** - If the "test option" is superior to the "base option," the Net Present Value (NPV) will be positive at the discount rate of 10 percent.

* **Discounted Benefit/Cost Ratio** - If the "test option" is superior to the "base option," the Benefit/Cost Ratio (B/C) will be greater than 1.0, at the discount rate of 10 percent.

* **Internal Rate of Return** - If the "test option" is superior to the "base option," the Internal Rate of Return (IRR) will be greater than 10 percent (the assumed discount rate).

These statistics were used to demonstrate that one option was superior to its alternative, and that its alternative should therefore be eliminated from consideration. These statistics, since they are "incremental" in nature, do not demonstrate that any route is or is not feasible. They only indicate which route option is superior to its alternative, and therefore which route options should be considered "finalist" routes, which should be studied in detail in terms of feasibility.

User Benefits Types - Road user benefits comprise travel time savings, vehicle operating cost savings, and accident savings. All were developed using the transportation network model and all are expressed in monetary terms.

- Travel Time Savings - All of the route options, if improved, will save car and truck travel time. The incremental analysis compared total network travel time for each route option, and isolated the differences. These differences were assigned a dollar value for economic analysis purposes.

- Vehicle Operating Cost Savings - Car and truck per mile vehicle operating costs are derived from a recent report entitled "Costs of Owning and Operating Motor Vehicles in Iowa," by the Iowa Department of Transportation. Only each vehicle's variable costs are included (repair, tires, fuel) and all costs are expressed at 1989 price levels. The network model was used to develop network-wide annual vehicle miles. The car variable operating cost is 13.57 cents per mile (excluding time values) and the truck variable operating cost is 69.42 cents per mile (excluding the driver's wage).

- Accident Savings - The number of accidents, by severity type, were estimated using accident rates for each highway and highway type obtained from each state. The monetary costs of accidents are from the FHWA Technical Advisory entitled "Motor Vehicle Accident Costs" dated June 30, 1988, and updated to 1989 price levels.

Incremental Benefit/Cost Findings - The indicators of which route is superior to which other route are the result of the comparison of incremental construction costs with the incremental user cost savings that result from the construction cost expenditure. All road improvements are assumed to be open to traffic on January 1, 1993, so user benefits begin to accrue on that date. A 30 year timespan is assumed for benefit calculation purposes, and the stream of costs and benefits is discounted at 10 percent per year.

Table 3-15 summarizes these incremental comparisons. The statistics indicate quite clearly that, from a user benefit/cost standpoint:

* Route B1-4 is clearly superior to Route A-2
* Route C1-3 is clearly superior to Route E1-3
* Route D2-6-5 is clearly superior to Route D2-7-5

Routes B1-4, C1-3 and D2-6-5 were therefore recommended as finalist route options to be carried forward into the feasibility phase of the analysis. In addition, the E1-3 route was included as a finalist route because it is a route to the Quad Cities (a major population center) and then makes food use of existing Interstate Highways.

Table 3-15
INCREMENTAL BENEFIT/COST COMPARISONS
St. Louis to St. Paul Corridor Study

ROUTE SEGMENT COMPARISON	NPV	B/C	IRR
A2 Compared with B1-4[a]	$-110.0	-5.4	-201.27%
E1-3 Compared with C1-3[b]	-265.8	.4	2.60%
D2-6-5 Compared with D2-7-5[c]	30.08	1.2	12.28%

(a) Route B1-4 (the base) is clearly superior to A2 (the test) in every respect. Route B1-4 is less expensive to construct, and its user benefits are greater than those for Route A2. Therefore, all comparisons are negative -- A2 costs more, and yields less. Route A2 should be eliminated from consideration.

(b) Route C1-3 (the base) is superior to Route E1-3 (the test). While Route C1-3 is less expensive to construct, Route E1-3 generates greater user benefits than does Route C1-3. However, the Route E1-3 user benefits are insufficient to cover its cost increment, e.g., it only has a B/C of .4, and a low IRR. Route E1-3 should be eliminated from consideration.

(c) Route D2-7-5 (the base) is inferior to Route D2-6-5 (the test). Route D2-6-5 costs more than Route D2-7-5 to construct (D2-7-5 costs nothing), but the user benefits associated with Route D2-6-5 are substantial, and are sufficient to select Route D2-6-5. Route D2-7-5 should be eliminated from consideration.

SOURCE: Wilbur Smith Associates

Route Screening Findings

A major element of the Consultant's work was devoted to the various routes that might be suitable for a St. Louis to St. Paul four-lane highway. Those route analyses indicate the following:

1. Currently 36 routes and route combinations could be used in traveling between St. Louis and St. Paul. The actual route choice, however, is limited to four or five routes, although any of the 36 routes could be improved to provide the service.

2. Analyses suggested that there are five overall "strategic" routes, and each strategic route has a number of sub-route options. There are significant differences between these five strategic routes; as a result, the study attempted to define the best routing within each strategic route.

3. More detailed analyses suggested that only four of the strategic routes should be considered in the "feasibility" phase of the work (see Chapters 6 through 9). These four finalist routes are depicted on Figure 4-1, and are:

   Route B - U.S. 61 north to Hannibal; U.S. 218 north to Iowa City; I-380 north to Cedar Falls; U.S. 218 north to Charles City; U.S. 18 west to Mason City and I-35 north to St. Paul.

   Route C - U.S. 61 north to Hannibal; U.S. 218 north to Iowa City; I-380 north to Waterloo; U.S. 63 north to Rochester and U.S. 52 north to St. Paul.

   Route D - U.S. 67 north through Jacksonville to the Quad Cities, and U.S. 61 north through Dubuque and La Crosse to St. Paul.

   Route E - U.S. 67 north through Jacksonville to the Quad Cities; I-80 west to Iowa City; I-380 north to Waterloo; U.S. 63 north to Rochester and U.S. 52 north to St. Paul.

Chapter 4

EXPRESSWAY NEED AND IMPACTS

Initially this study examined highway alignments that would provide motorists with an expressway featuring free-flow (e.g., no traffic controls) movement over continuous four-lane highways between St. Louis and St. Paul. Initial tests of "feasibility" concerning the expressway design standard for the four finalist route options depicted on Figure 4-1 focused on several issues:

- Can the highway improvements physically be built?
- At what cost?
- Might significant environmental impacts be associated with the highway improvements?
- To what extent will the highway be used?
- Might there be other impacts or implications associated with the expressway?

Engineering Feasibility

One "test of feasibility" which any route must pass is the ability to physically widen the route from two to four lanes or, alternatively, to build some four-lane segments on new alignment. "Ability to physically construct" implies that conditions are such that the widening project is possible, at reasonable cost, within a reasonable time span and without unreasonable adverse implications.

Final determination of such engineering feasibility will require detailed alignment investigations which are beyond the scope of this planning study. To gauge engineering feasibility in a preliminary sense, the routes were discussed with relevant state engineering personnel and others, the routes were driven several times, and several analyses were conducted.

These preliminary assessments suggest that it is possible to widen the routes, although some routes and route segments would be more easily widened than others. The analyses suggest that no route should be discarded based on the engineering test of feasibility, although some routes do have segments that will require special attention, with several of those segments described as follows.

St. Louis to Iowa City via U.S. 61/218 (Alternatives B&C) - Throughout much of Missouri, U.S. 61 is a four-lane, limited access freeway. Most of the existing two-lane segments already have the right-of-way reserved for expansion to four lanes and much of the grading for these expansions has already been completed. Where overpasses have been constructed across two-lane segments of U.S. 61, the bridges typically include two spans; one for the existing two lanes and one for the future addition of two lanes. A little less than half of the existing two-lane mileage of the route through Missouri has already been programmed for expansion to four lanes by 1994. Additionally, there are seven deficient bridges (most are only functionally obsolete, but several have been posted for lower weight limits). All seven bridges are already programmed for replacement by the state. One existing deficiency in the provision of "free flow" travel along this route occurs on an existing four-lane segment of U.S. 61 as it passes through Hannibal, Missouri. Several traffic signals control the movement of vehicles at major intersections in the downtown, and the speed limit is posted at 35 mph. In order to provide 55 mph free-flow conditions, a bypass would have to be built, mostly likely on the west side of Hannibal.

In the vicinity of Wayland, Missouri, this alternative would leave the US 61 alignment (which swings to the east following a more circuitous route towards Keokuk, Iowa). Instead, the route would use or parallel Missouri Route B and Iowa Route 394 until it rejoins US 218 south of Donnellson, Iowa. Such a routing would require construction of a new four-lane bridge across the Des Moines River as well as some substantial cut and fill activity on the Iowa side due to rough terrain conditions.

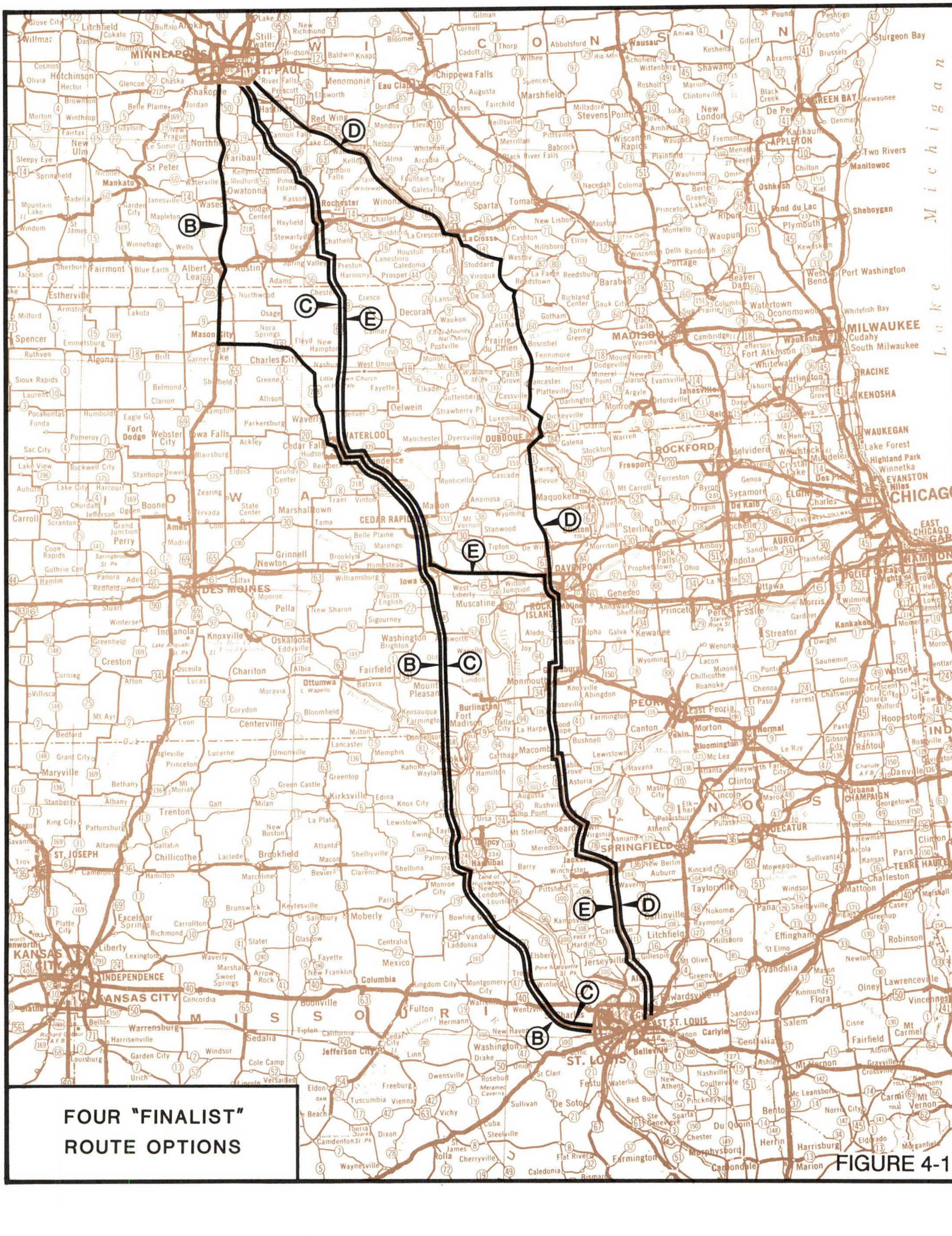
Continuing north on U.S. 218, there is a relatively straight and flat two-lane alignment which could be expanded to four lanes without extraordinary efforts. However, there are a number of towns which would probably have to be bypassed in order to minimize dislocations and construction costs. There is one deficient bridge on the route north of Crawfordsville, but it has already been programmed for improvement by the Iowa DOT together with the widening of U.S. 218 to a four-lane cross-section from north of Mount Pleasant to the current four-lane, limited access cross-section which begins some 18 miles south of I-80.

In summary, this segment of highway would be relatively easy to expand to a four-lane cross-section. In fact, several segments have already been programmed for widening by the respective state highway agencies.

Iowa City to Waterloo via I-380 (Alternatives B, C & E) - This Interstate segment is approximately 85 miles long, and has 30 interchanges. It begins with an interchange at I-80, northwest of Iowa City, and becomes a limited access expressway with traffic signals on the southern edge of Waterloo. Because it is already constructed to Interstate standards, the only improvements required to adapt it for use as a portion of the St. Louis to St. Paul highway would be the erection of trail blazer signs along the route.

Waterloo to St. Paul via Mason City (Alternative B) - South of Waterloo, this alternative would swing to the west on U.S. 20, a four-lane limited access highway. The alternative would then utilize the planned Cedar Falls bypass (relocated Route 58) which will be a four-lane divided expressway connecting U.S. 20 to U.S. 218 north of the urban boundary. As currently planned, this facility could include up to three future traffic signals at key cross streets serving Cedar Falls. Grade separation of these intersections (for north/south traffic) would be necessary in order to maintain the free-flow expressway standard.

After bypassing Cedar Falls and Waterloo, this alternative would follow the U.S. 218/U.S. 18 alignment towards Mason City. The Iowa DOT has already programmed monies to widen the facility to four lanes as far north as a bypass of the community of Waverly. North of that point, U.S. 218 (becoming U.S. 18 in Charles City) is a two-lane highway with a number of horizontal curvature deficiencies, but right-of-way for expansion to four lanes is available except through the small communities of Plainfield, Nashua, Charles City, Rudd, and Nora Springs. Four miles east of the Mason City limits, U.S. 18 becomes a four-lane, undivided urban facility



FOUR "FINALIST" ROUTE OPTIONS

FIGURE 4-1

with no access control, a speed limit of 35 mph and several actively used at-grade railroad crossings. Throughout the urban area, traffic is controlled by closely spaced traffic signals. Therefore, to maintain a free-flow expressway standard, it would be necessary to construct a major urban bypass around the city. The Iowa DOT has conducted preliminary investigations of both northern and southern bypasses, finding both to be currently feasible. However, no monies have been programmed for these improvements.

After bypassing Mason City, this alternative would connect to I-35 for the remainder of the trip to St. Paul/Minneapolis. Since I-35 is also built to Interstate standards, no improvements would be necessary to provide the type of highway envisaged for this project. However, portions of I-35 immediately south of the Twin Cities are experiencing significant rush hour congestion today, and undoubtedly these deficiencies will increase over time. Due to the insignificant volume of traffic which would be expected to be added to the facility by this project, no attempt has been made to identify or estimate the costs of solving these problems. It should also be noted that there is one deficient bridge on I-35 south of the Twin Cities which the Minnesota DOT has not yet programmed for improvement.

Overall, from an engineering standpoint, the highway segment between Waterloo and St. Paul which would pass near Mason City is feasible, and makes good utilization of already planned and programmed highway improvements as well as the existing portion of I-35.

<u>Waterloo to St. Paul via Rochester (Alternatives C&E)</u> - An alternative routing to St. Paul would involve the bypassing of Waterloo to the east rather than the west. Utilizing the existing and programmed (Interstate Substitution Project) surface arterials through downtown Waterloo would not be practical for the purposes of this study in view of the large number of traffic signals and commercial driveways which slow traffic to as little as 25 mph. An eastern bypass would have to begin on I-380 south of the Interchange with U.S. 20 in order to avoid traffic operational problems associated with constructing or modifying one of the closely spaced interchanges on the outskirts of Waterloo.

The bypass would traverse largely undeveloped tracts of land prior to intersecting U.S. 63 north of Waterloo. This two-lane primary highway is currently programmed for widening to Iowa Route 3. It has a relatively flat and straight alignment throughout Iowa, with the ability to be expanded to four lanes except within the communities of New Hampton, Lourdes and Chester. These will require the construction of bypasses. While two of the existing bridges along the route are deficient, both have already been programmed for improvement by the Iowa DOT.

On crossing the Iowa/Minnesota border, the condition of pavement and sufficiency of horizontal clearances declines somewhat along U.S. 63, but it would still be possible to expand this two-lane highway to a four-lane cross-section suitable for use as a St. Louis to St. Paul Highway. Bypasses of Spring Valley and Stewartville will be required to minimize community disruption, and the highway alignment would have to be adjusted at the western intersection of U.S. 63 with MN Route 16. At Stewartville, U.S. 63 becomes a four-lane highway through its intersections with U.S. 52 south of Rochester.

U.S. 52 is a four-lane controlled access facility which essentially forms a western bypass of Rochester. This same cross-section is maintained for 70 miles, where it reaches the outskirts of St. Paul. The Minnesota DOT has already programmed highway improvements to Minnesota Route 3 in order to provide a direct four-lane connection to an interchange with I-494 in St. Paul.

From an overall standpoint, this route could be improved to a four-lane expressway. The segment is part of the most direct route from St. Louis to St. Paul, and by using the existing four-lane sections of U.S. 63 and U.S. 52, construction could be minimized.

St. Louis to the Quad Cities via U.S. 67 (Alternatives D&E) - The most direct north-easterly route out of St. Louis to St. Paul would be via Missouri Route 367 and U.S. 67 into Illinois. The route crosses both the Missouri River (Lewis Bridge) and the Mississippi River (Clark Bridge). The Clark bridge is programmed for replacement with a modern four-lane structure. However, U.S. 67 narrows to only two lanes through Alton, Illinois. Without constructing an additional four-lane bridge across the Mississippi River on new alignment, it is impossible to create a four-lane highway providing free-flow movement through Alton. While it is possible to travel on four-lane roads (I-270 across the Mississippi River and then north into Alton on Illinois Route 3), the large number of traffic signals and peak hour congestion along Route 3 make such a routing unsuitable for the proposed St. Louis to St. Paul highway.

However, the Illinois DOT has been studying the possibility of constructing an Alton bypass route, and has already programmed $50 million towards its construction. The route would begin with the existing I-255 terminus at I-270 and extend to the northwest, skirting Alton and intersecting U.S. 67 just north of Godfrey, Illinois. This entire bypass would be a controlled access four-lane freeway.

Once on U.S. 67, St. Louis to St. Paul traffic would travel north to the Quad Cities. U.S. 67 is a two-lane highway with limited right-of-way and significant horizontal as well as vertical curvature. The route currently passes through numerous small communities as well as Jacksonville, Beardstown and Macomb. All of these communities would require a bypass in order to minimize dislocation. Additionally, a new bridge would be required across the Illinois River near Beardstown. Because of the large number of bypasses (16) required, coupled with the need to rebuild many sections because of poor alignment, it would be more cost effective to build most of a St. Louis to St. Paul highway on new alignment through this segment. Additionally, the current U.S. 67 alignment does not include direct access to I-280 in Rock Island. Therefore, constructing an interchange in the existing location could result in significant commercial/business dislocations.

In summary, this segment will present numerous challenges to the construction of highway improvements which will make the segment suitable for use as part of the proposed highway. These constraints can, however, be overcome, especially if portions of the route are built on new alignment. It should also be noted that the Illinois DOT has already programmed a portion of U.S. 67 from Monmouth to Good Hope for widening to four lanes.

Quad Cities to Iowa City via I-80 (Alternative E) - From U.S. 67 motorists could travel northwest on I-280 to I-80, and then directly west on I-80 to Iowa City where travelers can join I-380. The 52 mile route has 15 interchanges. Because it is already constructed to Interstate standards, the only improvements required to adapt it for use as a portion of the St. Louis to St. Paul highway would be the erection of trail blazer signs along the route.

Quad Cities to St. Paul via U.S. 61 (Alternative D) - Using the circumferential interstate system (I-74 or I-280) motorists can travel from U.S. 67 to U.S. 61 without utilizing slow moving surface arterials through the urban area. The first nineteen miles of U.S. 61 north of the Quad Cities consist of a four-lane divided, access controlled highway. An additional 18 miles have already been programmed for widening to comparable four-lane status as far north as Maquoketa, Iowa. The remaining 31 miles of U.S. 61 south of Dubuque is a relatively straight, two-lane road which passes through the communities of Fulton and Zwingle. Adequate right-of- way could be obtained to widen the existing alignment to four lanes, except in the two communities, which would require bypasses.

The entrance into Dubuque on U.S. 61 requires negotiating a relatively steep slope. Because the highway is built into the side of a ridge, significant amounts of cut and fill would be required in places. The Iowa DOT is in the process of building a four-lane expressway which will carry through traffic around the east side of the urban area and across the existing four-lane Mississippi River bridge into Wisconsin.

With the completion of a five-mile segment of four-laning project already programmed by the Wisconsin DOT, U.S. 61 will be a four-lane facility north to Dickeyville as it climbs out of the river basin. From Dickeyville, U.S. 61 is a narrow, two-lane highway which follows a series of ridge lines, and negotiates some of the study area's most rolling terrain, for about 120 miles. There is significant horizontal and vertical curvature with a number of truck climbing lanes provided along the route. The existing right-of-way is limited, and is constricted by the steep surrounding terrain as well as communities such as Tennyson, Rockville, Fennimore, Boscobel, Mt. Zion, Solders Grove, Readstown, Viroqua, Westby and Coon Valley. Each of these communities will require the construction of a bypass in order to maintain the 55 mph free-flow concept of the route and to minimize dislocations. It should be noted that a bypass has already been built around Lancaster (Route 129).

Immediately north of Boscobel, the route crosses the Wisconsin River. The existing two-lane bridge is on an alignment which requires traffic to negotiate a 90 degree turn on the north side of the river due to a sheer ridge formation. Providing a free-flow expressway movement through this area would necessitate the construction of a four-lane bridge on new alignment. The most promising alternative from an engineering standpoint may be an eastern bypass of Boscobel, coupled with an eastern river crossing.

At the southern outskirts of La Crosse, U.S. 61 becomes a four-lane facility with numerous traffic signals and an average operating speed of 30 mph. A series of high bluffs would prohibit a cost-effective bypass of the city to the east. The west side of the city is bounded by the Mississippi River. Plans have been considered to construct an elevated freeway along the river bank. This bypass facility also would also be very expensive, and would result in numerous business displacements.

U.S. 61's route across the Mississippi River from La Crosse to La Crescent, Minnesota is effected on a series of two-lane bridges which are presently rated as structurally deficient. No monies have been programmed by Wisconsin and Minnesota for their replacement, but planners acknowledge the long term need to build four-lane replacement structures.

After crossing the river, U.S. 61 becomes a four-lane facility for several miles as it skirts La Crescent. U.S. 61 then joins I-90 for approximately seven miles, before becoming a distinct, four-lane divided expressway paralleling the Mississippi River to Wabasha. North of Wabasha, U.S. 61 narrows to two lanes, and its location in a narrow corridor between the river and an adjacent series of high bluffs would make it slightly more difficult to expand the facility to four lanes, particularly where the route passes through the communities of Lake City, Frontenac Station and Wacouta. The presence of a SOO LINE railroad track in the same narrow corridor would compound these problems. Although the route widens to four lanes for several miles as it passes through Red Wing, traffic is slowed by signals at major intersections in the urbanized area. Therefore, a bypass or some type of grade separation will be required to maintain desired speed and flow.

North of Red Wing the Alternative D alignment would utilize a shortcut along MN 316, a relatively flat, two-lane rural route which rejoins U.S. 61 just south of Hastings. U.S. 61 is a four-lane facility through Hastings, with very constricted right-of- way. On the north side of the city, there is a two-lane bridge which crosses the Mississippi River. To avoid major urban dislocations, and the cost of a new four- lane river crossing, the best option would be for the construction of a southern bypass of Hastings which could be tied into MN 55. MN 55 is also currently a flat, straight two-lane road which could easily be expanded to four lanes. This 9-mile facility would permit traffic to enter St. Paul via U.S. 52 and the programmed MN Route 3 interchange with I-494 (in the same fashion as Alternatives C and E).

In summary, the U.S. 61 route negotiates some of the most difficult terrain in the study area and, as a result, would be the most difficult to expand to four lanes. Existing horizontal and vertical alignment issues may necessitate some construction on new alignment. In addition, the Wisconsin River crossing has the potential to create environmental impacts, as discussed later.

Cost Estimates

The capital costs of widening the existing highways to a four lane expressway as well as the increased annual costs of maintaining those widened highways, were estimated based on data provided by each state highway agency. To a large degree, these cost estimates reflect the extensiveness of existing four lane cross sections, and the amount of four lane improvements already programmed by each state regardless of the outcome of this study. These highway segment types are identified on Figure 4-2 together with those highway improvements which are included in the capital cost estimates of this study.

Capital Costs - Capital costs were developed for each route alternative, and were periodically revised as alignments changed and additional data became available. In some instances, detailed cost estimates had already been developed for some segments. Where detailed cost estimates had not previously been prepared, the consultants worked closely with the respective state highway agencies to develop cost estimates based on average unit costs experienced on similar projects.

These capital costs were then reduced by the amounts of money already programmed by each state highway agency for such improvements. In some instances, a state already planned to widen a highway segment to four lanes and had already included the project within its five-year plan (e.g., had already committed the funds for the improvement). Thus, the capital cost estimates summarized in Table 4-1 exclude those capital costs which have already been funded by individual states. All costs are expressed in 1989 dollars.

Table 4-1

EXPRESSWAY COST ESTIMATES

St. Louis to St. Paul Corridor Study

(In 1989 $)

Route	Unfunded Capital Cost	Increase in Annual Maintenance
B	$ 358,500,000	$294,600
C	457,600,000	401,800
D	1,317,200,000	773,900
E	1,092,300,000	702,000

Road Operations Costs - In addition to the one-time capital costs which would be necessary to develop a continuous four-lane highway between St. Louis and St. Paul, there would be certain ongoing costs related to the maintenance of the improved highway. Maintenance includes the physical repair of highways and bridges such as patching pot holes and resurfacing pavements, as well as ongoing activities such as litter collection, mowing and snow removal.

Maintenance cost data supplied by the states indicate that total maintenance costs increase on a per mile basis when two-lane highways are widened to four lanes. This is because more maintenance activities are conducted on highways in which major investments have been made, and because there is a relationship between some maintenance activities and traffic volumes. The annual maintenance cost increases are also summarized on Table 4-1 in 1989 dollars. The maintenance cost increases of Routes D and E are estimated to be greater than for Routes B and C because of the greater extent of road widening needed on those routes.

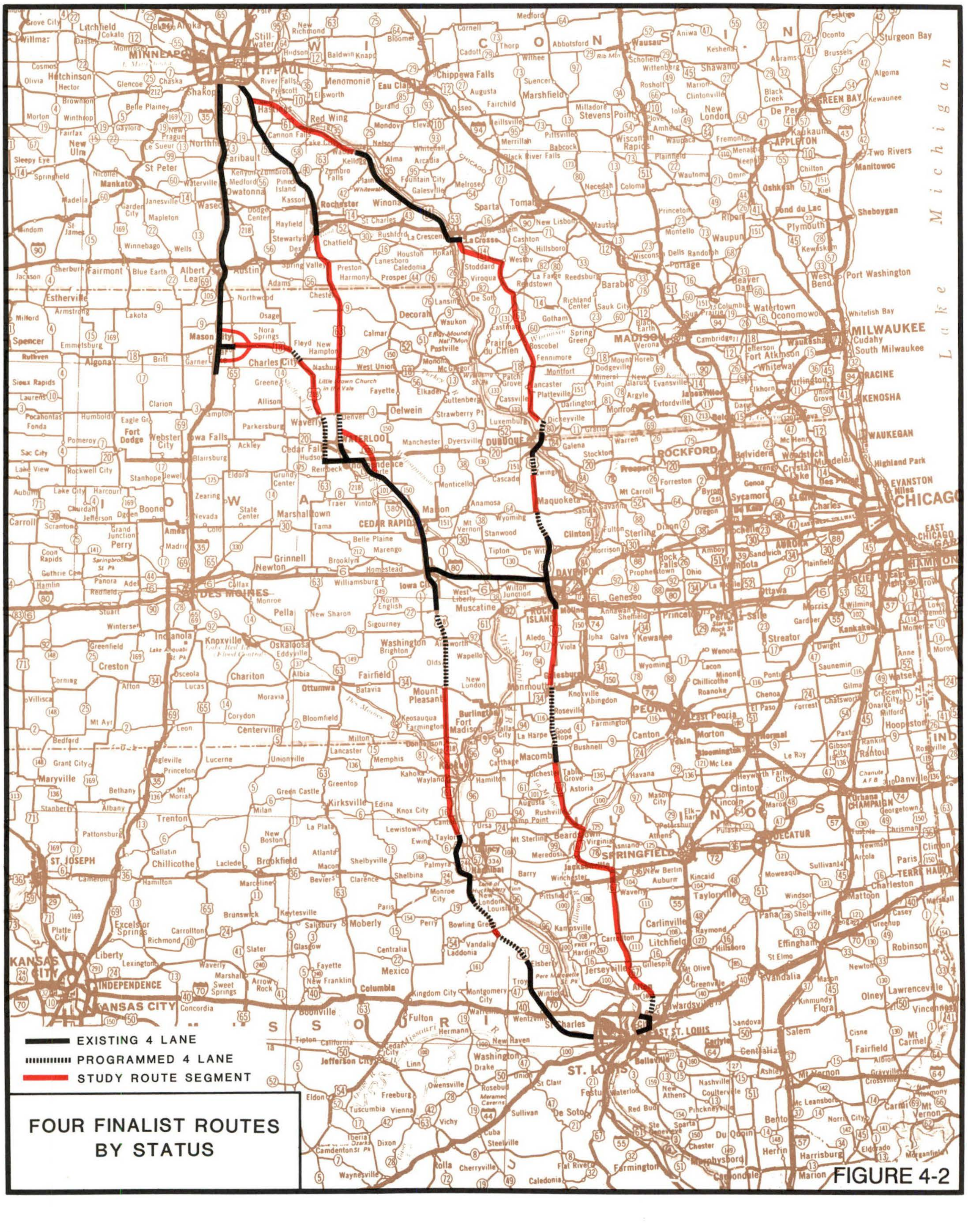
Environmental Feasibility

In considering potential highway improvements which could create a continuous four-lane highway between St. Louis and St. Paul, it is important to consider possible impacts on the environment, and whether such impacts might be so serious as to cause one or more routes to be found to be environmentally impractical. The environmental implications vary from route to route, and at this time can only be expressed in a generalized fashion. In the future, more detailed alignment and impact studies will be required to define the specific impact implications on the recommended route. As a part of those investigations, more detailed environmental investigations should be conducted.

The environmental investigations in this study were limited to determining whether there are any environmental issues concerning any route that might be so severe as to cause the route to be discarded. To determine this, each state's environmental agency was asked to review the routes, and to comment on any known or suspected environmental issues. In addition, county, town and other local agencies were asked to identify any key concerns. Finally, field inspections were used to identify observable environmentally sensitive areas. The sensitive areas so identified are summarized on Figure 4-3, and described below.

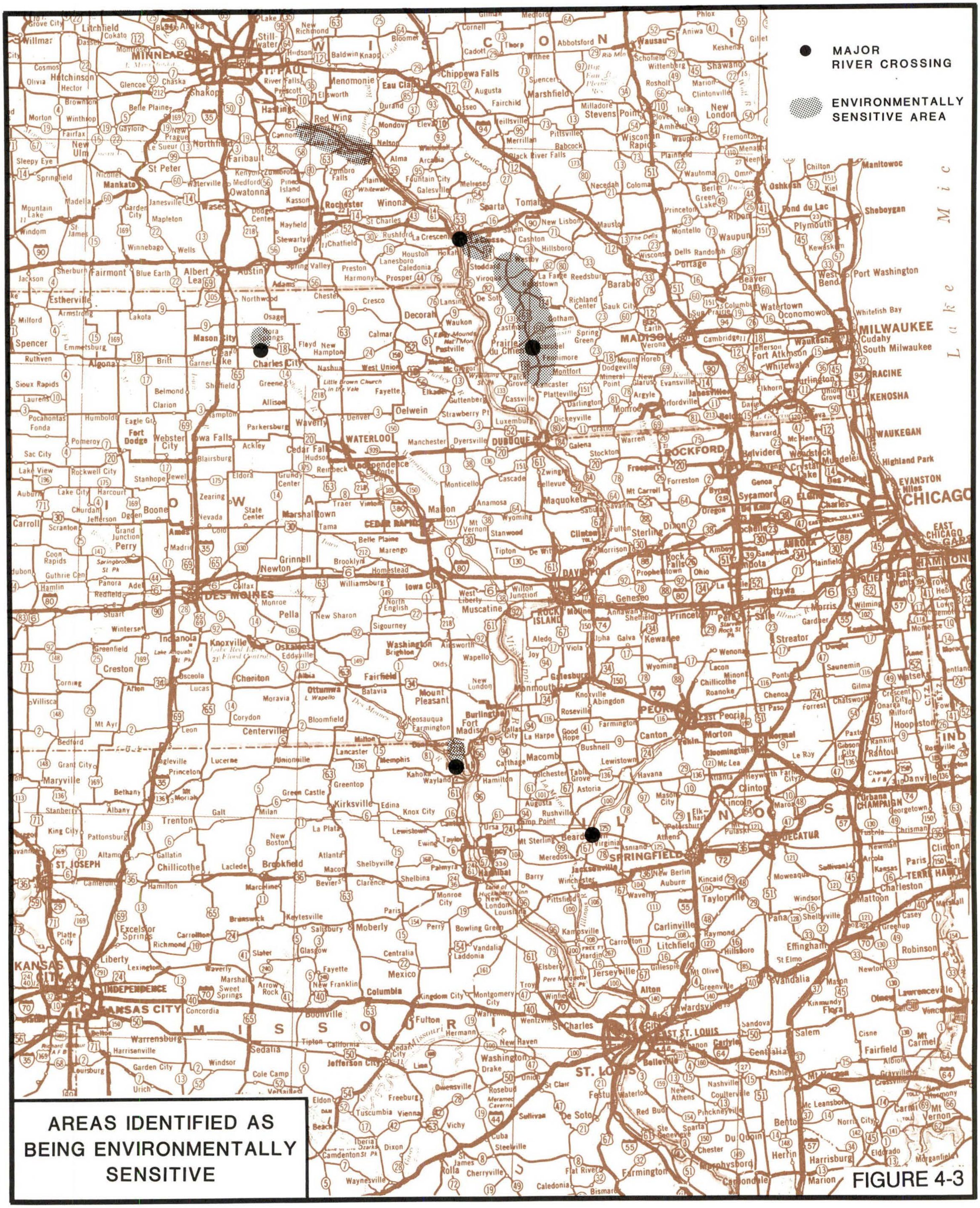
U.S. 61 From Red Wing to Wabasha, Minnesota - This existing two-lane segment of highway is located in a narrow corridor between the Mississippi River and a series of high bluffs. The widening to a four-lane cross-section could negatively impact water quality due to increased runoff from pavements, and the aesthetic beauty of the bluffs could be impaired by construction of bypasses. The widening of the existing highway on its present alignment could also result in a number of residential and business dislocations. All of these factors would have to be considered during more detailed design activities.

La Crosse Area - If the proposed highway were to follow the existing U.S. 61 alignment, both two-lane bridges over the Mississippi River would need to be replaced. Special design and construction techniques would need to be employed in order to avoid disturbing wildlife, harming environmentally sensitive areas of the river and associated marshes, including hydraulic implications. If a bypass of La Crosse were to be built, care would have to be taken to minimize adverse impacts on the aesthetic vistas and water quality for both eastern and western bypasses. The western bypass' impact on marshlands would also have to be considered in detail.



FOUR FINALIST ROUTES BY STATUS

FIGURE 4-2



AREAS IDENTIFIED AS BEING ENVIRONMENTALLY SENSITIVE

FIGURE 4-3

__U.S. 61 in Wisconsin__ - This portion of highway follows a series of ridges, and would cross the Wisconsin River basin near Boscobel. The Wisconsin Department of Natural Resources has indicated its concern about the potential impacts on scenic quality, fish and wildlife habitat, as well as forest resources, particularly in the Wisconsin River basin. While planning and design considerations may alleviate many of these impacts, the area is extremely sensitive, and any negative impacts would be contrary to Wisconsin's efforts to preserve this portion of the state for recreational lands and wildlife preserves.

__U.S. 18 near Nora Springs, Iowa__ - At the western outskirts of Nora Springs, U.S. 18 crosses the Shell Rock River on a two-lane bridge. A four-lane highway cannot be feasibly built on the existing alignment through Nora Springs because of residential and commercial business developments having been built up to the existing two-lane highway. Thus, either a northern or southern bypass would have to be built around the community. Both would require a new four-lane river crossing. These crossings could have a negative impact on wildlife and habitat if care is not taken both the design and construction. Additionally, the northern bypass would cross the Shell Rock River Greenbelt and Preserve.

__Iowa Route 394 and Bridge over Des Moines River__ - During the course of field reviews, a number of wetland areas were identified in proximity to the existing highway. Improvement of this highway to a four-lane cross-section could result in the need to fill in some of these environmentally sensitive habitats. More detailed alignment studies for this segment should focus on impacts reduction through use of special design techniques such as compressed cross-sections, enclosed drainage systems and berms or retaining walls. Where disruption is unavoidable, particularly in fill sections, efforts should be directed to creating equivalent wetland areas wherever fill material is excavated.

The existing two-lane bridge over the Des Moines River would have to be replaced with a new four-lane structure. Without careful design and construction, the bridge could have an adverse impact on both river wildlife and habitat as well as hydraulic flows.

__Illinois River Crossing near Beardstown, Illinois__ - U.S. 67 meanders through downtown Beardstown and across the Illinois River as a two-lane highway. Should this highway segment be selected to be part of the proposed St. Louis to St. Paul route, a four-lane bypass with a new bridge across the Illinois River would have to be constructed. As with all such river crossings, care would have to be exercised in the design and construction in order to minimize adverse environmental impact to the river and adjacent wetlands as well as the wildlife which uses both as habitat.

Feasibility Based on Travel Demand

Investments in additional highway capacity and other types of highway improvements are made because they are needed and feasible. "Need" is generally measured in terms of traffic and travel demand. The issue is whether the highway has sufficient capacity to safely and efficiently handle existing and forecast traffic volumes.

To address this issue, traffic on each route was forecast, and compared with existing highway conditions and capacities.

Overall Traffic Volumes - Table 4-2 summarizes regional vehicle miles of travel (VMT) and vehicle hours of travel (VHT) for the base and improved finalist alternatives. Because a common trip table was used for all assignments, VMT and VHT changes relate entirely to road network changes (the alternative route improvements).

Table 4-2

REGIONAL DAILY VEHICLE MILES AND HOURS OF TRAVEL

Each Route Option Compared With Base Case[a]

St. Louis to St. Paul: Expressway Standard

1986 and 2010

	DAILY TRAVEL STATISTICS				
	Base	Route B	Route C	Route D	Route E
Daily Vehicle Miles of Travel:					
1986 (million)	60.962	60.901	60.962	60.799	60.979
2010 (million)	98.302	98.205	98.303	98.000	98.327
Daily VMT Change From Base:					
1986 (million)	---	-0.061	0	-0.163	+0.017
2010 (million)	---	-0.097	+0.001	-0.302	+0.025
Daily Vehicle Hours of Travel:					
1986	1,165,622	1,161,340	1,161,874	1,155,479	1,160,778
2010	1,882,954	1,876,180	1,876,994	1,865,767	1,875,317
Daily VHT Change From Base:					
1986	---	-4,282	-3,748	-10,143	-4,844
2010	---	-6,774	-5,960	-17,187	-7,637

(a) "Base" VMT and VHT are travel characteristics on the regional highway network if no route is improved. The "route" VMT and VHT would exist if the route improvements are made. All improved routes will save travel time, due principally to higher average travel speeds. Routes B and D will save VMT because some existing trips currently go out of their way to got to other routes, while Route E will in the future increase VMT due to its circuitous nature.

SOURCE: Wilbur Smith Associates

As shown on Table 4-2, all alternatives produce a net reduction in vehicle hours of travel. Two of the alternatives, B and D also result in net VMT reductions (related to changes in travel route choice that reduce trip distance as well as trip time). In other words, the base condition trips were sometimes travelling a longer distance in order to use a road where travel time savings could be achieved).

Traffic Diversion to the Improved Routes - Another measure of need concerns how well an improved facility increases transportation system efficiency via its propensity to attract or divert travel from other, less efficient highways. Table 4-3 summarizes the amount of VMT diverted to each alignment when that alignment is improved. All alternatives exhibit a significant increase in traffic due to diversion of traffic from other roads, ranging from 15 percent increase for Alternative B to a 57 percent increase for Alternative D. The relatively large diversions suggest that a significant potential exists for the improvement of transportation efficiency in each of the alternative improvement corridors.

Table 4-3

DAILY TRAFFIC DIVERSION TO EACH ROUTE OPTION

St. Louis to St. Paul: Expressway Standard

1986 and 2010

	DAILY "ON ROUTE" TRAFFIC STATISTICS			
	Route B	Route C	Route D	Route E
VMT Diverted to Route:[a]				
1986	+723,000	+837,000	+1,524,000	+813,000
2010	+1,180,000	+1,458,000	+2,612,000	+1,314,000
Percent Increase Due to Diversion:				
1986 (%)	+15.3	+19.1	+56.1	+24.0
2010 (%)	+15.8	+20.7	+57.8	+23.6

(a) Daily VMT attracted to the routes once they are improved.

SOURCE: Wilbur Smith Associates

Daily Traffic on Each Route - The ultimate determinent of need, at least from the travel demand perspective, is the amount of traffic that will use the highway once it is improved. Table 4-4 summarizes the traffic estimates, with and without the highway improvements. These statistics only include inter-zonal trips and therefore exclude "local" traffic (traffic within a city, for example). Average daily traffic volumes of between 12,400 and 16,900 are forecast for the year 2010. These volumes suggest that a four-lane route will ultimately be needed and should seriously be considered.

Table 4-4
DAILY TRAFFIC ON EACH ROUTE OPTION
St. Louis to St. Paul: Expressway Standard
1986 and 2010

	DAILY INTERZONAL TRAFFIC ON ROUTE			
	Route B	Route C	Route D	Route E
Average Daily Traffic Base Condition[(a)]				
1986	8,890	8,680	4,950	6,090
2010	14,040	14,000	8,230	10,010
Average Daily Traffic Improved Condition[(a)]				
1986	10,250	10,340	7,720	7,550
2010	16,260	16,890	12,990	12,380

(a) Daily on-route VMT divided by route length equals average inter-zonal ADT on entire route length.

NOTE: Excludes urban and other intra-zonal traffic.

SOURCE: Wilbur Smith Associates

Route Traffic Volumes Compared With Other Road Volumes - The St. Louis to St. Paul route volumes are forecast to be sufficient for four-lane highway consideration. However, they are low in terms of needing a freeway (Interstate highway) standard. To illustrate this, a comparison of traffic volumes on each route option with observed traffic volumes on other existing high quality roadways in the region is presented. Recent rural traffic volumes on existing Interstate highways are shown below:

Existing Interstate Highway	Corridor Served	Current Rural Volume Range (ADT)
I-80	Des Moines - Chicago	11,000 - 17,000
I-35	Minneapolis/St. Paul - Kansas City	8,000 - 12,000
I-55	St. Louis - Chicago	14,000 - 17,000
I-70	St. Louis - Kansas City	19,000 - 23,000
I-90/94	Chicago/Milwaukee - Minneapolis/St. Paul	17,000 - 28,000

It should be noted that the volumes shown above are for highway sections away from the immediate vicinity of major cities and therefore represent primarily intercity traffic.

By way of comparison, the average volume (total VMT divided by alignment length) for each of the alternative alignments is shown below. The low end of the volume range represents year 1986 travel demand for the unimproved road system. The high end of the range represents year 2010 traffic if the 55 mile per hour improvement option is in place.

Route	**Average Daily Volume Range**
B	8,900 - 16,300
C	8,700 - 16,900
D	4,900 - 13,000
E	6,100 - 12,400

The average volumes forecast for the candidate improvement corridors fall within the middle to low range of the volumes currently carried by existing Interstate highways in the region. This comparison suggests, at least over the planning period considered in this analysis, that the four finalist routes serve very significant travel demands, (but not quite the magnitude of demand served by existing Interstate highways in the corridor). This suggests traffic forecasts are reasonable, and that highway improvements on the routes may be warranted.

Estimated Volume/Capacity Relationship - Another test of the need for highway improvements is a comparison of existing and projected traffic volumes on the routes with the capacity of the existing highway segments. Capacity is a quantitative measure of the ultimate number of motor vehicles which can travel over a particular roadway during the course of a day. A two-lane rural highway on level terrain might have the capacity for as many as 16,000 vehicles per day. However, these vehicles would be stacked bumper to bumper, traveling at slow speeds. Therefore, transportation engineers create various degrees of capacity (called levels of service) in order to provide qualitative measurements of capacity. These levels of service (LOS) are generally designated by letters "A" through "F," with LOS "A" representing the best operating conditions (free-flow) and LOS "F" the worst (forced or breakdown flow). For the purposes of this study, the states suggest that "B" represents the desirable LOS and "C" the minimum tolerable LOS.

Capacities at the various levels of service for two-lane and four-lane divided rural highways were calculated for study area roads using methodologies outlined in the 1985 *Highway Capacity Manual*. Using these capacities, the base condition estimated traffic volumes for 1986 and 2010 were analyzed, with a view to determining the likely need for improvement to four lanes during the study period. Representative levels of service determined for each alignment, assuming no improvements beyond those already programmed, are summarized on Tables 4-5 through 4-8.

Table 4-5

LEVELS OF SERVICE ON KEY HIGHWAY SEGMENTS

Route B

St. Louis to St. Paul: Expressway Standard

FACILITY	GENERAL LOCATION	LEVEL OF SERVICE Existing	Year 2010
U.S. 18	Mason City Area	C	D
U.S. 218	South of Charles City	B	C
U.S. 218	North of Mount Pleasant	B	C
U.S. 61	Northern Missouri	B	C*
U.S. 61	Bowling Green Area	C/D	B*

* Programmed for Widening to four lanes

Table 4-6

LEVELS OF SERVICE ON KEY HIGHWAY SEGMENTS

Route C

St. Louis to St. Paul: Expressway Standard

FACILITY	GENERAL LOCATION	LEVEL OF SERVICE Existing	Year 2010
U.S. 52	Southern Minnesota	B	C
U.S. 63	Northern Iowa	B	C
U.S. 218	Southern Iowa	B	C
U.S. 61	Northern Missouri	B	C*
U.S. 61	Bowling Green Area	C/D	B*

* Note: Programmed for widening to four lanes

Table 4-7

LEVELS OF SERVICE ON KEY HIGHWAY SEGMENTS

Route D

St. Louis to St. Paul: Expressway Standard

FACILITY	GENERAL LOCATION	LEVEL OF SERVICE	
		Existing	Year 2010
U.S. 61	Southern Minnesota	C	D
U.S. 61	Southwestern Wisconsin	C	D/E
U.S. 61	Iowa	B	C
U.S. 67	Northern Illinois	C	D
U.S. 67	Central Illinois	B	C
U.S. 67	Southern Illinois	B	C

Table 4-8

LEVELS OF SERVICE ON KEY HIGHWAY SEGMENTS

Route E

St. Louis to St. Paul: Expressway Standard

FACILITY	GENERAL LOCATION	LEVEL OF SERVICE	
		Existing	Year 2010
U.S. 52	Southern Minnesota	B	C
U.S. 63	Northern Iowa	B	C
U.S. 67	Northern Illinois	B	C
U.S. 67	Central Illinois	B	C
U.S. 67	Southern Illinois	B	C

The investigations reveal that all rural highway segments currently operate at LOS B or C. Since these are generally acceptable levels of service, there does not appear to be an urgent need for widening of existing two-lane rural highways to four lanes, at least at the present time.

By year 2010, however, traffic volumes will increase. As a result, the existing highway network, together with all programmed improvements, will generally operate at one level of service lower than those found in the existing condition. Thus, facilities currently operating at LOS "B" will only operate at LOS "C" by year 2010. Therefore, most highways will operate at LOS "C" or "D" in the future, assuming that no additional improvements are constructed. LOS "D" is not considered an acceptable condition, and specific roadway links which are expected to experience capacity needs include:

- U.S. 18/218 between Mason City and Waverly, IA (Route B);
- U.S. 61 between Red Wing and Wabasha, MN (Route D); and
- U.S. 61 south of La Crosse, WI (Route D).

The improvement of Alternative "B" would relieve the capacity problem on U.S. 18 in Iowa (providing a LOS of "B" or better). This alternative would also divert traffic from U.S. 61 in Minnesota to marginally improve the year 2010 LOS to "C/D." The stretch of U.S. 61 in Wisconsin would remain at LOS "D" however.

Improving Alternative D to four lanes would relieve the capacity problems on U.S. 61 in both Wisconsin and Minnesota. This improvement would also divert traffic from U.S. 18/218 in Iowa so as to marginally improve the year 2010 LOS to "C/D."

Improving Alternative C or E to four lanes would also divert enough traffic from U.S. 18/218 in Iowa, and U.S. 61 in Minnesota to relieve the anticipated capacity problems there in year 2010, but would not resolve the capacity problem on U.S. 61 in Wisconsin.

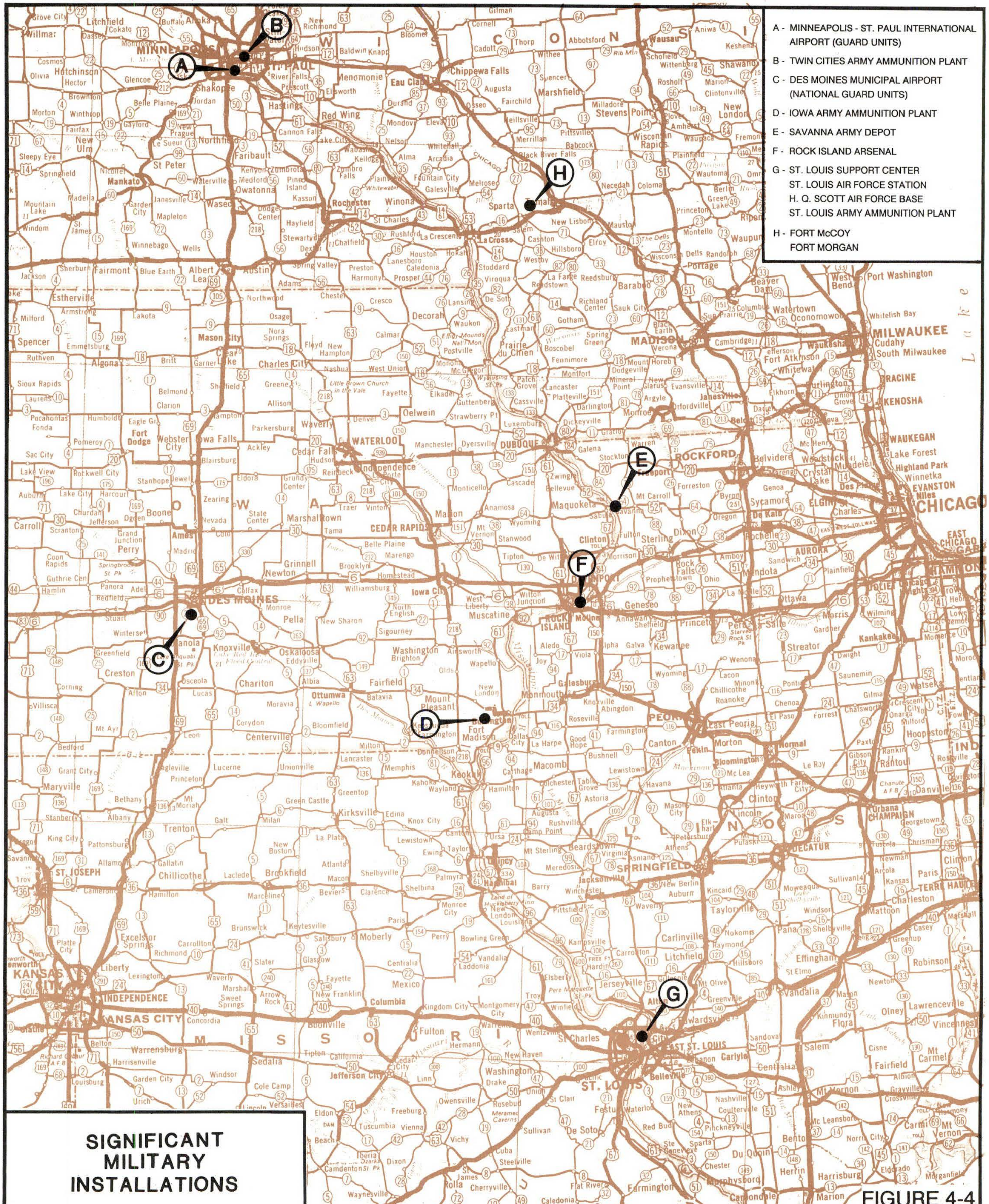
Therefore, some improvements to all four routes will be needed, regardless of what is ultimately decided regarding the St. Louis to St. Paul highway.

Military Traffic Implications in Study Corridor

One of the original purposes of constructing our nation's interstate and highway system was to serve the needs of our military forces. A good highway network is vital in mobilizing forces to meet hostile military threats and for resupply efforts in time of war and, in peacetime, the military still has a need for a good highway network to conduct manuevers, perform logistical tasks and respond to natural disasters.

Based on discussions with the Department of Defense and the Military Traffic Management Command, a total of ten significant military installations were identified within the corridor area, and two more are located on the fringe. The locations of these installations are shown on Figure 4-4. One-half of the installations are ammunition plants or depots which were established during WWII. Ft. McCoy and Ft. Morgan are located on the fringe of the study area, adjacent to I-90 and I-94. There are two airports (Minneapolis - St. Paul and Des Moines) which serve as national guard bases; the other three facilities are all located in the St. Louis area.

The Military Traffic Management Command indicated that there is very little military traffic movement in the corridor. Therefore, while the agency is generally in favor of improving mobility throughout the nation, the military has no strong need for an improved route between St. Louis and St. Paul at this time. Based on a review of military installation locations, none of the options provides significantly more service to these military installations than any other. Therefore military implications do not favor one route over any others.



SIGNIFICANT MILITARY INSTALLATIONS

FIGURE 4-4

Highway Corridor's Agriculture Implications

While the corridor area has experienced economic diversification, especially in the urban areas and cities, the predominant economic force in the region is agriculture, agriculture support industries, and other agriculture-oriented related industries. The farms and related industries will certainly benefit from increased travel efficiency created by a St. Louis - St. Paul highway, simply because they use the roads. It is possible, however, that the farms and related agriculture industries might also benefit due to improved access to markets and in other ways. To determine the extent to which agriculture as an industry might benefit, the agricultural industry was examined in terms of what products are produced, how the crops and livestock are transported, how the envisaged highway improvements might affect agriculture shipments and efficiencies, and whether there are agricultural reasons for favoring one or more of the route options. During these investigations, it became clear that long distance bulk shipments by truck cannot compete from a price standpoint with railroad and barge services. Therefore, the only agricultural transport benefits which could be derived from a St. Louis to St. Paul route would occur for movements of less than 100 miles and/or transport efficiencies (cost savings) for those movements which can only be made by truck.

Route by Route Agriculture Implications - The potential impact on agriculture and related industries is summarized as follows.

Route B - This route would be of substantial benefit to farmers and truckers in north central Iowa. It would also be of benefit to the transport of fertilizer into north central Iowa. This route would also be of substantial benefit to the livestock, meat and slaughtering and processing industry.

Route C - Route C has essentially the same agricultural impacts as Route B.

Route D - Route D would provide few grain or fertilizer benefits and only small livestock benefits, particularly with the scheduled closing of the Monmouth, Illinois slaughtering plant.

Route E - Route E would combine the livestock industry benefits of North Central Iowa and to a lesser degree those of Illinois. Fertilizer transport might also be enhanced to some degree in North Central Iowa.

Impacts on Other Modes of Transportation

Highway improvements of the scale envisaged for the corridor could, conceivably, impact or be impacted by other modes of corridor transportation. To gauge these possibilities, each mode (railroad, barge, aviation) was studied to determine whether any such modal implications might have a bearing on the route screening process. Overall the analyses suggest that the highway improvements should have very minor effects on the other modes and, similarly, should not be impacted by the other modes. These impacts are summarized below.

Railroads - No route option will affect or be affected by railroad passengers or railroad passenger services. Routes B, C, D, and E should also have little or no effect on railroad freight. Route Option B, however, could adversely affect two short-line railroads (if certain grain elevator and agriculture shipment patterns change as a result of the highway improvement). Both of these short line railroads (Iowa Northern RR, and Cedar Valley RR) already have financial difficulties, and the Route B option would directly compete with both.

Barge - Analysis of barge rates and trucking rates suggests that the barge rate advantage is so great that the highway improvements will not divert traffic and therefore will not affect barge operations or use. Highway Route D and conceivably Routes C and E could cause several truck to barge movement patterns to change slightly, but this would lead to greater efficiency rather than any adverse impact.

Aviation - Every route option serves five to seven commercial service airports and, in this respect, there is little or no difference between the options. The airports could benefit from slightly improved access, but the road is not expected to compete with the airports because of the distances and travel times involved.

Expressway Need and Impact Findings

The need and impact of a continuous four lane expressway between St. Louis and St. Paul is summarized as follows.

Overall Engineering Feasibility - The engineering analyses and field inspections indicated, from an engineering feasibility perspective, that:

1. Each of the routes could be improved to a four-lane cross-section, although each will have engineering challenges to avoid undue cost or undue environmental impact.

2. Routes B and C would be the easiest to improve to four lanes, since some right-of-way has already been reserved, and other right-of-way can be obtained. Both routes also make good use of existing and/or programmed four-lane highways.

3. The portion of Route D and E which passes through Illinois will present a number of engineering challenges which may require some construction on new alignment.

4. The portion of Route D which passes through Wisconsin and Minnesota negotiates some of the most difficult terrain of the study area and, as a result, would be the most difficult to improve to four lanes.

5. Several river crossings occur in sensitive areas, requiring considerable study to find acceptable crossing solutions.

Cost Estimates - Preliminary cost estimates suggest that:

1. Route B is the least expensive St. Louis to St. Paul Expressway alternative, because it would require the least centerline miles of highway improvements (137) and because it follows terrain which does not create real difficulties for expansion of existing two lane roads to a four lane expressway.

2. Route C is also relatively inexpensive to improve to a four lane expressway. Again, its low cost is related to limited centerline miles of highway improvements (186) required, as well as the general ease of construction along the alignment.

3. Route D, and to a slightly lesser degree Route E, would be significantly more expensive to improve to a four lane expressway because of the extensiveness of improvements required (358 and 325 centerline miles respectively) as well as the challenging terrain that the alignments must negotiate.

Environmental Feasibility - Highway improvement projects have a potential to create environmental impacts. Preliminary reviews suggest that:

1. There are a number of environmentally sensitive areas within the study area, and each route contains at least one such area which may pose engineering challenges to construction of a four lane expressway in an acceptable manner.

2. The greatest potential for environmental impacts appears to be along Route "D" through Wisconsin and Minnesota.

Travel Demand Feasibility - Based on traffic forecasts and capacity analyses, the following conclusions can be drawn:

1. All of the four finalist routes have the potential to reduce region-wide vehicle hours of travel if improved to a continuous four lane expressway.

2. Routes B and D also have the potential to reduce vehicle miles of travel for region-wide travel.

3. Regional average daily traffic forecasts of between 12,400 and 16,900 suggest that a four lane route will be needed and appropriate.

4. Comparisons of traffic demand and capacity suggest that some highway improvements will be needed on all four routes.

Military Traffic Implications - The U.S. military traffic management command indicates that there is very little military traffic which moves through the study area; thus, the military has no strong need for an improved route between St. Louis and St. Paul at this time.

Agricultural Implications - Routes B, C, and to a lesser extent D as well as E, would be of substantial benefit to agricultural industries located throughout the corridor area.

Chapter 5

PRINCIPLES OF ECONOMIC FEASIBILITY

A public investment such as a major new highway is "economically feasible" if the economy is better off with the highway than without it. Without question, a well planned north-south highway will be a significant asset to the region, and will be of help to the economic future of communities and activities located in proximity to the highway. Ample evidence exists to support the contention that the corridor's economy will benefit from the highway.

Government is often asked to make highway investments for "economic development" purposes. The rationale, and it is correct from the corridor perspective, is that the 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 improved corridor economy is sufficient to cause the overall economy to be better off, and that economic improvement is more significant than the cost of the highway, then the highway is an "economically feasible" investment.

Definition of Economic Development

For purposes of this study, economic development is defined as "an increase in the prosperity and incomes of people and institutions". Economic development of this nature in a given area occurs when the incomes and product generated in the area are caused to increase. Such increases occur in either of two ways:

1. **More Resources** - If output increases in an area, the increased output will require more resources (land, labor, materials, capital) which means that more people are employed, more incomes are earned and more profits are made. If a highway enables the attraction of additional business in the corridor (new firms, or expanded firms), then the highway has aided the economic development process, to the benefit of the corridor area.

2. **Efficiency** - Even if the highway does not help to create increased output, it can still help economic development by causing the area's output to be achieved at less total cost. Reduced transportation costs due to the highway improvement in this way yields increased prosperity and income.

Evidence compiled in this study suggests that an improved St. Louis to St. Paul highway will do both: it will enable the attraction of "more resources" and it will create greater "efficiency". As a result, the highway has very definite "economic development" roles to play within the selected corridor.

Economic Basis for Observed Impacts

Highways are essentially "tools" used in transporting goods and people from one place to another. Investments in improvements to existing highways contribute to economic development only to the extent that they lower transportation and/or logistics costs, and how those reduced transport costs affect the economy. Such cost reductions may be realized in numerous ways, including safety, decreases in fuel and other operations costs, and reductions in noise or air pollution. But in the final analysis, all of the benefits of a highway, and therefore the justification for investing in it, flow from using it for transportation.

Highway benefits may not only accrue to persons and businesses whose vehicles use the highway. 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 highway without traveling on it.

It is important to keep in mind that for any of these benefits to occur, the highway investment must enable significant reductions in transportation costs. If the amount of these savings is small for each trip and if the number of vehicles using the highway is not sufficiently large, the investment will not produce benefits that exceed its cost. Highway investment must be based on reasonable estimates of traffic volumes they will service and on the cost savings travelers will experience.

Investing in a highway 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. These higher taxes work against economic growth within the taxing jurisdiction (normally a state) because they reduce post-tax return to businesses and households. Therefore it is imperative that the highway investment be economically feasible; if it is not, it is counterproductive.

The Question of Impact Area

A highway investment contributes to economic development if it significantly reduces transportation costs, making it possible for businesses to obtain a better return. By improving the return relative to that at competing locations, the investment helps attract new businesses. If the impact area of interest is a rather narrow corridor along the highway (e.g., counties adjacent to it), an increase in economic activity is almost certain.

If instead the impact area of interest is the entire five-state region or the U.S. as a whole, the overall amount of economic development resulting from the highway investment will be considerably less. A certain number of businesses within the region, especially those that are relatively mobile, will relocate to higher access sites along a corridor. While an increase in economic activity may be evident near the highway, it often is not a net gain to the region or the nation.

From a national perspective, the highway investment contributes to economic growth to the extent that travel costs within the country are reduced. Lower travel costs help improve productivity which, in turn, increases income to firms and individuals. Productivity gains also help enable U.S. - produced goods to be more competitive in international markets. The key point here is that for a highway investment to contribute to national economic growth, it must significantly reduce transportation costs.

In this study impacts are examined at two levels: the corridor or local level (the "primary impact area") and the national level. In either case only "net" changes are recognized.

Economic Benefits to the Local Economy - For purposes of this study's calculations, the "local economy" comprises those counties that are located in proximity to the improved highway, e.g., within about 25 miles of the road. Study calculations suggest that these local corridor economies will benefit from the improved highway in a number of ways.

- **Travel Efficiency** - Vehicle users will benefit due to faster average travel speeds (time savings), reduced accident rates (safety), and improved traffic flow (vehicle operating costs). Truck travel will similarly be faster, cheaper and more reliable.

- **Improved Competitive Position** - Such transportation improvements will remove one impediment to industrial and service industries 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 economy.

- **Travel and Tourism** - This part of the Midwest offers a variety of tourism attractions and, if the road causes additional visitors to arrive, the visitors will spend money in the local economy thereby increasing the area's income and general prosperity.

- **Roadside Business** - Similarily, the highway will divert traffic to the corridor, and this additional traffic will increase the local economy revenues of such roadside businesses as gasoline stations, motels, restaurants and others.

Any and all of the above are of economic value to the "local" economy, all have economic development implications, and all are included in this study at the local economy level.

Economic Benefits to the National Economy - Sometimes benefits to the local economies may also benefit the national economy, but only when they comprise net increases in national (U.S.) economic development (travel effficiency and/or more resources). Improved travel efficiency is, without question, of value to the national economy, regardless of where in the U.S. the travel efficiency gains occur. This means that resources are used more productively and that national prosperity and incomes (economic development) are therefore increased.

The other elements of local economic development (improved competitive position, travel and tourism, as well as roadside businesses) that are of benefit to the local corridor economy do not necessarily improve the national economy.

- **Improved Competitive Position** - The communities along the corridor compete with other U.S. communities for manufacturing plants and other forms of economic activity. If the highway causes a plant to locate along the route rather than in some other U.S. community, the net result on the national economy usually will be zero. Only if there is a net gain in productivity does the national economy benefit. Therefore, while improved competitive position is certainly a proper criterion at the local level, it is not a national criterion unless it causes the nation to be more competitive in the world economy, or unless there are other national objectives that would favor one corridor region over another region.

- **Travel and Tourism** - If the highway causes a Missouri resident to vacation at a Minnesota lake rather than a Colorado mountain, Minnesota (the corridor) is better off, but at a cost to Colorado. Therefore, tourism is a legitimate local corridor criterion but not necessarily a National criterion, relative to a highway investment.

- **Roadside Businesses** - Similarly, diversion of traffic to the improved highway will yield benefits to the highway businesses which serve the traffic such as gasoline stations, motels, etc., but at a loss to similar businesses on other competing highways. Consequently, the roadside business impact is valuable at the local corridor level, but not at the national level.

Treatment of "Transfer" Impacts

This study recognizes these differences by estimating economic feasibility at two different levels: the national level, and the local level. Only "net" changes are recognized. Transfers of economic value from one part of the U.S. to another part of the U.S. (from one group of people or firms to another) are excluded from the national calculations. Similarly, transfers from one part of the corridor to another part of the corridor are also excluded.

The calculation of economic benefits, therefore, is different at the national level than at the corridor level, as shown below:

TREATMENT OF ECONOMIC BENEFITS BY IMPACT AREA

	IMPACT AREA	
ECONOMIC IMPACT TYPE	**National**	**Corridor**
Travel Efficiency	X	X
Improved Competitive Position		X
Travel and Tourism		X
Roadside Businesses		X

Underinvestment vs. Overinvestment

The objective of this study is to determine that level of highway investment that is warranted. There are economic consequences of either underinvesting or overinvesting in the highway corridor. If Government underinvests in the corridor, 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 highways. If Government overinvests in the corridor, overall efficiency will suffer because those funds could have been put to better use elsewhere (put to more efficient use). There is therefore an economic cost associated with overinvestment in highways.

Recognizing these facts, this study has sought to define those highway investments, and those levels of investment, that are efficient (neither underinvested nor overinvested). This implies efficient and feasible use of both federally administered highway funds and state administered highway funds. The proper level of investment is calculated in terms of travel efficiency and economic development.

Indicators of "Economic Feasibility"

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

- **Net Present Value** - All costs and benefits in future years are discounted at ten percent per year. The future stream of discounted costs are subtracted from the future stream of discounted benefits. If 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 at ten percent per year, the sum of the discounted benefits are divided by the sum of the discounted costs. If 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 ten percent or more, then the highway improvement is "economically feasible."

Included in the above economic feasibility calculations are all quantifiable public sector financial costs attributable to the road projects (cost of planning, designing, building and maintaining the road improvements) and all quantifiable economic benefits including road user benefits (vehicle operating costs savings, value of time savings, accident cost savings) and also including economic development benefits (competitive advantage benefits, roadside business benefits, and travel and tourism benefits). Excluded from the cost-benefit calculations are the road improvement implications that cannot accurately be tabulated in monetary terms (environmental or social implications, impacts on other modes of transportation, population served, etc.). As a result, the economic feasibility calculation is important to the route selection and funding decision, but should not be viewed as the only criterion.

Economic Principles Findings

Proper use of economic principles in the evaluation of highway projects suggests two things:

1. From the point of view of businesses, communities and counties located along a highway, a highway improvement of the magnitude of that envisaged in this study is, almost by definition, economically feasible. It is feasible from the local corridor perspective because the highway will not only create travel efficiency, but will also cause economic development along the route.

2. However, from the National point of view, most of those economic development impacts are transfers, from one location to another. Consequently, the National funding decision should be based more on the travel efficiencies impact and less on the more localized economic development impact.

Chapter 6

EXPRESSWAY TRAVEL EFFICIENCY FEASIBILITY

Transportation efficiency is a legitimate local corridor, state and national goal. If a road improvement creates road user cost savings that, over time, exceed the cost of the road improvement, then that road improvement should be implemented. Therefore, travel efficiency is relevant to the funding decision for FHWA, the state highway agencies, and local agencies.

Cost and Benefit Estimation Methodology

The initial feasibility tests are for a four-lane highway all the way from St. Louis to St. Paul, constructed to "Expressway" standards (55 mph travel speed). All monetary values are expressed in 1989 constant price levels (they exclude future inflation).

Highway Improvements Attributable to "Avenue of the Saints" - All four finalist routes have some existing four-lane sections, and all four also have some two-lane sections that are already programmed to be improved to four-lane. Those programmed sections are assumed to be in place for this study's purposes, and are therefore not attributable to this study. Only the existing two-lane sections not already programmed for widening to four-lanes are included in the calculation of costs and benefits. Table 6-1 lists the miles of road on each route between St. Louis and St. Paul, and how much of each is not yet programmed for improvement to four lanes.

Road Improvement Costs - The cost side of the cost-benefit calculation includes two costs: 1) the "capital costs" of constructing the highway, and 2) the annual increase in maintenance costs. Only the capital costs attributable to the road sections that are not yet programmed for improvement are included. The miles of road that are not yet programmed for improvement are identified on Table 6-1.

- **Capital Costs** - Capital costs comprise the cost of improving the "not programmed" road sections from two-lane to four-lane, including right-of-way acquisition, planning, design, and construction. The capital costs associated with the "Not Programmed" sections, as calculated earlier in this report, are:

Route	Capital Cost
B	$358,540,000
C	457,600,000
D	1,317,180,000
E	1,092,290,000

Table 6-1
TWO-LANE AND FOUR-LANE CENTERLINE MILES OF HIGHWAY
St. Louis to St. Paul: Expressway Standard
January 1990

	MILES OF HIGHWAY St. Louis to St. Paul			
	Route B	**Route C**	**Route D**	**Route E**
PRESENT STATUS:				
Four-Lane	330	258	124	183
Less than Four-Lane	202	246	425	373
Total Miles St. Louis to St. Paul	**532**	**504**	**549**	**556**
PLANNED STATUS:				
Currently Four-Lane	330	258	124	183
Programmed for Four-Lane[a]	65.6	60	66.7	48
Not Programmed[b]	136.4	186	358.3	325
Total Miles St. Louis to St. Paul	**532**	**504**	**549**	**556**

(a) Road sections that are currently two-lane, but that are programmed by state highway agencies to be widened to four-lane. Costs and benefits of these programmed improvements are not included in this study.

(b) It is these miles of currently two-lane highway that are evaluated in this study. The capital costs and economic benefits apply to these road miles.

SOURCE: Wilbur Smith Associates

- **Road Maintenance Cost** - Once the two-lane road sections are improved to four-lane, there will be more road to maintain than previously. The maintenance cost increase is estimated to be $2,160 per centerline mile of widened highway.

Economic Benefits Attributable to Road Improvements - The travel efficiency benefits of the highway improvements are of three types: vehicle operating cost savings, accident cost savings, and value of travel time savings. Such benefits are calculated for three vehicle types: cars, light trucks, and heavy trucks. The road user benefits are based on highway network travel, rather than merely on travel on the route itself. All benefits are assumed to start in the year 1993 (the first year following the capital cost outlays) and are expressed by year of occurrence. The network model was used to estimate benefits in 1986 and 2010; intermediate year benefits were interpolated between the two years in straight line fashion, and benefits following 2010 were extrapolated in the same manner. Benefits were calculated through the year 2022 to enable calculation of a 30-year benefits timespan (1993-2022).

- **Vehicle Operating Cost Savings** - Car, light truck and heavy truck operating cost savings estimates were made using the FHWA "Highway Investment Analysis Program" HIAP, as modified by Wisconsin DOT to replicate conditions in the Upper Midwest. The costs are developed using the network model, so the cost savings accurately depict savings not only to common traffic (traffic on the route both before and after the highway improvements) but also to diverted traffic (traffic diverted from other regional highways). The vehicle operating cost changes reflect differences in vehicle miles of travel, travel speed changes, curvature and gradient changes, reduced numbers of speed change cycles, and other changes that affect vehicle operations.

- **Accident Cost Savings** - Road improvements from two-lane to four-lane, including bypasses around towns and urban places, will reduce accident potentials. Changes in accident rates were established by highway type based on accident histories provided by the states. Accident rates were established for three accident types, with monetary values of:

Accident Type	Cost
Fatal Accidents	$1,965,200
Injury Accidents	16,700
Property Damage Only	3,300

These monetary values were obtained from the FHWA Technical Advisory Entitled "Motor Vehicle Accident Costs," dated June 30, 1988 and updated to 1989/1990 price levels.

- **Travel Time Savings** - All of the route options, if improved, will save car and truck travel time. The network traffic model was used to develop estimates of travel time savings, with the result that the travel time saved includes both common and diverted traffic. As recommended by the FHWA, time value methods contained in the AASHTO publication "A Manual on User Benefit Analysis of Highway and Bus - Transit Improvements" were used. The specific values used are:

Vehicle Type	Per Vehicle-Hour Time Value
Automobiles	$8.00 per vehicle hour
Trucks	$15.00 per vehicle hour

The calculation of all three types of transportation efficiency impacts (vehicle operating costs, accident costs, time value costs) are therefore completely consistent with FHWA procedures and policies.

Discount Rate - Throughout the analysis of economic feasibility, all monetary values are discounted to the year 1989. A real discount rate of 10 percent is used, as recommended by FHWA and as prescribed by the U.S. Office of Management and Budget (OMB) Circular A-94 for use in the analysis of all Federal government decisions and project evaluations. The rationale for the OMB rate is a belief that investments in the public sector should have their future benefits discounted at approximately the same rate as a minimal risk investment in the private sector will yield, net of taxes paid by businesses. That real post-tax return is currently in the 10 percent range. As is standard practice, benefits (present and future) in this study are presented in 1989 dollars (inflation is not factored in). To be consistent, the discount rate does not have an inflation component either; it is a real rate.

Comparisons with "Do Nothing" Base Case - To calculate each route's costs and benefits, the four-lane "improved case" all the way from St. Louis to St. Paul is compared with the "base case." The base case includes both four-lane and two-lane sections. The four-lane sections include those sections that are either already four-lane or that are already programmed to be widened to four-lane. The base case two-lane sections comprise those road sections that are not currently four-lane and that are not currently programmed for improvement to four-lanes. The benefits for each individual route are made by comparing that route's "improved case" with that route's "base case." In this manner, each route's "feasibility" is determined and, implicitly, the route options can be compared one with the other.

Road User Economic Benefit Estimates

The road user costs (vehicle operating costs, accident costs, travel time costs) are calculated for the study's base year (1986) and forecast year (2010). The base year of 1986 was used because it is the most current year that traffic volumes were available from all five states. The calculations assume an "improved case" four-lane "Expressway" highway, St. Louis to St. Paul, built for a 55 mph travel speed. The results for those two years are then used to interpolate and extrapolate to all other study years (1986-2022). The estimated road user economic benefits for these two years are presented on Table 6-2.

Table 6-2
ESTIMATED TRAVEL EFFICIENCY ECONOMIC BENEFITS
Four-Lane St. Louis to St. Paul: Expressway Standard
Years 1986 and 2010

Annual Economic Benefits	**ANNUAL ROAD USER BENEFITS ($million)** Route B	Route C	Route D	Route E
Year 1986:				
Vehicle Operating Cost Savings				
Automobile	$3.35	$0.06	$8.41	$-1.13
Truck	9.76	5.68	9.88	-2.16
Total	13.11	5.74	18.29	-3.29
Accident Cost Savings	7.32	10.66	9.13	8.58
Value of Time Savings				
Automobile	9.49	8.31	22.49	10.74
Truck	5.63	4.92	13.32	6.36
Total	15.12	13.23	35.81	17.10
Total 1986 Road User Benefits	$35.55	$29.63	$63.23	$22.39
Year 2010:				
Vehicle Operating Cost Savings:				
Automobile	$5.08	$0.05	$14.22	$-1.15
Truck	18.11	8.67	21.82	-1.12
Total	23.19	8.72	36.04	-2.87
Accident Cost Savings	11.47	17.27	16.61	13.91
Value of Time Savings				
Automobile	13.89	12.22	35.24	15.66
Truck	11.02	9.69	27.95	12.42
Total	24.91	21.91	63.19	28.08
Total 2010 Road User Benefits	$59.57	$47.90	$115.84	$39.12

NOTE: The above benefits are calculated for the base year (1986) and forecast year (2010) as if all of the road improvements were open by 1986. Intermediate and future year benefits are then interpolated and extrapolated based on these 1986 and 2010 calculations. Excluded are the highway "economic impact" benefits.

SOURCE: Wilbur Smith Associates

On an overall composite basis, the year 2010 travel efficiency economic benefit components are:

Benefit Type	**Percent of Total Road User Benefits**
Vehicle operating cost savings	24.8%
Accident cost savings	22.6%
Value of travel time savings	52.6%
	100.0%

Travel Efficiency Feasibility Results

The results of the travel efficiency benefit-cost calculations for each of the four finalist routes are presented on Table 6-3. That table indicates the economic feasibility of each route based on travel efficiency (it excludes economic benefits that may occur as a result of economic development).

Table 6-3
ECONOMIC FEASIBILITY AS MEASURED BY ROAD USER TRAVEL EFFICIENCY BENEFITS
St. Louis to St. Paul: Expressway Standard

	ECONOMIC FEASIBILITY INDICATORS			
	Route B	**Route C**	**Route D**	**Route E**
Net Present Value ($million)[a]	$74.4	$-72.1	$-361.1	$-633.6
Discounted Benefit/Cost Ratio[a]	1.26	.80	.65	.27
Internal Rate of Return (%)	12.57%	7.84%	6.15%	.04

(a) At 10% discount rate.

Note: This travel efficiency feasibility test should be included in the local, state and federal decisions.

SOURCE: Wilbur Smith Associates

The Table 6-3 feasibility indicators are limited to feasibility in the travel efficiency sense and, from that perspective, indicate a number of things:

1. Route B is feasible, justified and warranted on a travel efficiency basis. On the basis of travel efficiency alone (before economic development impacts are added), Route B is a legitimate contender for consideration.

2. Routes C and D are nearly feasible, but do not quite attain the tests of travel efficiency feasibility (see Chapter 7 which adds economic development impacts to the travel efficiency gains, and see Chapter 8 on staging, before reaching route selection feasibility conclusions).

3. Route E is less feasible, from a travel efficiency point of view. This is principally due to the nature of this route which increases vehicle miles of travel (Routes B, C and D cause decreases in VMT while Route E causes a VMT increase).

Travel Efficiency at Six Percent Discount Rate

The above test of efficiency is based on a discount rate of 10 percent. Of course, the higher the discount rate, the more that benefits occurring in future years will be discounted or reduced in present value terms. An analysis based on a lower, 6 percent discount rate is presented for two important reasons.

First, if interest rates and the yield on minimal risk corporate financial instruments fall, the private sector yield opportunities foregone by investing in public projects will be lower. A correspondingly lower public sector discount rate then would be appropriate. In other words, it is not clear that a 10 percent discount rate will be appropriate for the entire life of a project.

A second, and related, reason for presenting an efficiency analysis based on a 6 percent discount rate is simply to illustrate the sensitivity of the analysis outcome to the discount rate that is used. It is quite possible for a project that is economically infeasible with a higher discount rate to be feasible when a lower rate is applied. This is particularly true if the relevant cost generally occur in the short run and benefits are apread over a long-term period, as is the case with the St. Louis to St. Paul highway.

The discount rate to be applied in evaluating proposed public capital projects is, of course, a public policy decision. A lower discount rate reflects a belief that the benefits of longer-term capital improvements are more valuable than is reflected by present day capital markets that are based more on short-run yields. Presenting a parallel efficiency analysis based on a 6 percent discount rate enables the implications of this public policy decision to be understood.

Feasibility at 6 Percent - Table 6-4 presents the travel efficiency results using the 6 percent constant price level discount rate.

Table 6-4
ECONOMIC FEASIBILITY AS MEASURED BY
ROAD USER TRAVEL EFFICIENCY BENEFITS AT 6 PERCENT
St. Louis to St. Paul: Expressway Standard

	ECONOMIC FEASIBILITY INDICATORS			
	Route B	Route C	Route D	Route E
Net Present Value ($ million)[(a)]	$297.9	$94.7	$22.1	$-554.6
Discounted Benefit/Cost Ratio[(a)]	1.95	1.24	1.02	.42
Internal Rate of Return (%)	12.57%	7.84%	6.15%	.04%

(a) At 6 percent discount rate.

Note: This travel efficiency feasibility test should be included in the local, state and federal decisions.

SOURCE: Wilbur Smith Associates

The 6 percent discount rate indicates that the expressway investments are much more feasible than they are at 10 percent. More specifically:

1. At the 6 percent rate, the Route B expressway remains economically feasible, but Routes C and D also are shown to be feasible.

2. Route E is still not feasible.

3. The overall feasibility rankings, one route compared with the others, remain unchanged.

4. The rationale for investing in the corridor, and perhaps for investing in more than one corridor, is stronger.

Sensitivity Tests

The travel efficiency feasibility tests are based on forecasts and assumptions, any one of which might be inaccurate. Four such estimates or assumptions are particularly important:

- **Traffic Estimates** - The traffic forecasts are based on a thorough evaluation of traffic trends, a license plate survey, and a computerized network model. Over the period 1990-2022, however, traffic could increase at a rate other than that forecasted in this study. In addition, the road improvements could generate additional trips that, without the road improvements, would not be made. Such "generated" or induced traffic is not included in the study forecasts. Therefore, the feasibility analyses are subjected to a sensitivity analysis wherein the "with improvement" traffic ADT on each route is increased by ten percent.

- **Capital Costs** - The capital costs were estimated based on unit costs developed by each state using relevant highway construction experience. The costs, on a per mile basis, were estimated without the benefit of detailed engineering or environmental studies. Actual costs could therefore vary from those estimated herein. To gauge that cost level that might make the routes more feasible, a sensitivity test was conducted at a 20 percent reduced capital cost.

- **Discount Rate** - A ten percent discount rate was used in the tests of economic feasibility. This is the rate prescribed by OMB for Federal project evaluations. To illustrate the importance of the discount rate, a lower, 6 percent discount rate was tested.

- **Travel Time Saved** - The travel time saved includes all time savings, including time saving increments of as little as one or two minutes. Some would argue that savings of just a few mintes per trip are not noticeable to the trip maker, cannot be put to productive alternative use, and therefore should not be included. This sensitivity test excludes all time savings increments of five minutes or less.

Table 6-5 lists the sensitivity test results relative to the travel efficiency feasibility calculations. The sensitivity tests indicate a number of things:

1. The overall feasibility rankings are largely insensitive to the assumptions and other calculations when applied on a consistent manner to all route options.

2. Route B retains its feasibility rank in every instance.

Table 6-5
TRAVEL EFFICIENCY SENSITIVITY TESTS
St. Louis to St. Paul: Expressway Standard

	ECONOMIC FEASIBILITY INDICATORS			
	Route B	**Route C**	**Route D**	**Route E**
OVERALL FEASIBILITY:				
Net Present Value ($ Million)	$74.4	$-72.1	$-361.1	$-633.6
Discounted Benefit/Cost Ratio	1.26	.80	.65	.27
Internal Rate of Return (%)	12.57%	7.84%	6.15%	.04%
SENSITIVITY FEASIBILITY				
Traffic (10% increase):				
Net Present Value ($ Million)	$110.3	$-43.0	$-292.8	$-609.8
Discounted Benefit/Cost Ratio	1.39	.88	.72	.30
Internal Rate of Return (%)	13.75%	8.74%	6.95%	.61%
Cost (20% reduction):				
Net Present Value ($ Million)	$131.0	$0.1	$-153.3	$-460.8
Discounted Benefit/Cost Ratio	1.57	1.00	.82	.34
Internal Rate of Return (%)	15.43%	10.00%	8.06%	1.37%
Discount Rate (6%):				
Net Present Value ($ Million)	$297.9	$94.7	$22.1	$-554.6
Discounted Benefit/Cost Ratio	1.95	1.24	1.02	.42
Internal Rate of Return (%)	12.57%	7.84%	6.15%	.04%
Travel Time (Six min. +)				
Net Present Value ($ Million)	$68.0	$-81.3	$-386.3	$-648.1
Discounted Benefit/Cost Ratio	1.24	.78	.63	.25
Internal Rate of Return (%)	12.34%	7.59%	5.91%	-.13%
Combined Sensitivity Tests:				
Net Present Value ($ Million)	$412.3	$210.7	$332.2	$-346.0
Discounted Benefit/Cost Ratio	2.64	1.66	1.36	.55
Internal Rate of Return (%)	16.50%	10.70%	8.64%	1.76%

Note: These travel efficiency sensitivity tests should be included in the local, state and federal decisions.

SOURCE: Wilbur Smith Associates

3. Route C becomes feasible with a 20 percent cost reduction, or with a six percent discount rate, and/or with all sensitivity tests combined.

4. Route D becomes feasible at a six percent discount rate, and/or with all sensitivity tests combined.

5. Route E is not feasible according to the travel efficiency criteria, for any of the sensitivity tests.

Travel Efficiency Feasibility Findings of the Expressway Option

Travel efficiency is but one indicator of feasibility. It is a key, important indicator, however, because it is of importance at all decision levels -- federal, state, and local. On this basis:

1. From a national, state, and/or local perspective, Route B and major portions of Routes C and D are economically feasible, at any relevant discount rate.

2. At a constant dollar discount rate of 6 percent, expressways built on Routes B, C or D are economically feasible.

3. If any route is to be built at a four-lane Expressway standard over its entire length, Route B would be the most cost effective. The reason is its implementation cost ($358.5 million) which is less than the other costs (Route C $457.6 million; Route D $1,317.2 million, Route E $1,092.3 million) while its travel efficiency benefits slightly exceed those of Routes C and E. Route D's benefits are larger but still insufficient to overcome its cost disadvantages (except at the 6 percent discount rate).

4. The reason that the Route B costs are less is that it will require fewer miles of new construction than will the other routes. This is because much of Route B is already four lane (330 miles) and other portions are already programmed for widening to a four-lane cross section (65.6 miles).

On this basis, if the most cost-effective route is to be chosen based solely on efficiency, Route B would be selected. However, efficiency is only one of the criteria that could be considered, together with other criteria and evaluation factors that are described in the following chapter.

Chapter 7

EXPRESSWAY ECONOMIC DEVELOPMENT POTENTIAL

A major highway improvement of the scale envisaged for the St. Louis to St. Paul corridor will make travel faster, easier and more efficient. In the process it will divert traffic from various roads to the selected route, it could generate traffic, and transportation will be more efficient. All of these events would be most welcome, not only because of the travel efficiencies (Chapter 6) but also because of what these travel efficiencies could mean to corridor and more localized economies.

It is widely believed by corridor residents and by the corridor's business community that the corridor area will be better off economically with the highway improvements than without them. Most certainly this is true; the issues are: 1) what magnitude of economic impact can be expected? 2) should the economic impact benefits be added to the travel efficiency benefits? and 3) is that impact sufficient cause to warrant major investments in the corridor?

Economic Impact Model

To gauge the impact of the highway improvements on the corridor's economy and on more localized economies within the corridor, the study used the IMPLAN Input/Output (I/O) Model. The IMPLAN Model is the USDA Forest Service I/O model as utilized at Iowa State University. The model was acquired for each of the five states and was applied on a consistent basis to each route and each impact area. The model utilized price levels and output levels for the year 1982; all results were then increased to 1989 price levels utilizing appropriate producer price deflators.

Economic Impact Terms and Definitions

A major set of highway improvement projects can yield many different forms of benefit to local economies. 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.

Indicators of Economic Impact - The economic impact of the highway improvements is expressed in terms of five "indicators of economic impact:"

- **Economic Activity** - Defined as "Total Gross Output" in the input/output sense, Economic Activity is the value of the final demand created by the highway improvements, plus the sum of all of the intermediate goods and services needed to produce that final demand, plus the induced impacts of increased household consumption (respending). Total economic activity is the total value of each commodity produced by all industries as a result of highway construction and highway use.

- **Final Demand** - The sum of all purchases for final use or consumption that are attributable to the improved highway.

- **Value Added** - The value of the corridor area's 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 areas, including employee compensation, proprietary income, indirect business taxes, and other property income.

- **Wages** - Total increases in payroll costs (wages and salaries and benefits) paid by local industries due to the improved highways. In this study when economic impact benefits are added to the travel efficiencies, it is the "wages" impact which is added to the travel efficiencies. Wages are used because they include no "double counting".

- **Jobs** - Job impacts are expressed as "full-time equivalents" (FTE's) and include the number of person job years due to road construction and road use, plus the share of those that are employed in sectors that directly or indirectly support the construction process, the road users, and the firms that might expand in or locate to the corridor region.

All of the above indicators of economic impact are legitimate for use; however, they should not be added together and, when used, the user should understand what they mean so as to avoid misinterpretation.

Other Relevant Definitions - Other terms or assumptions used in the economic impact calculations include the following:

- **Price Levels** - All calculations are expressed at 1989 price levels (unless otherwise stated).

- **Transfer Payments** - Economic impacts that benefit one entity or one group of corridor residents to the equal disbenefit of other corridor entities or group of residents. There is no net economic impact associated with such transfers.

- **Corridor Impact Area** - A defined area which is the same for all routes.

- **Route "Primary" Impact Areas** - A defined area which reflects the immediate geographic area impacted by each individual route option. Each route option has its own "primary impact area."

Economic Impact Types

Development of a major north-south four-lane highway through the corridor will cause a number of events to occur that will be beneficial to local economies. These events are categorized into three types, and are evaluated in terms of their likely magnitude.

Act of Highway Construction - The act of spending money in the corridor to build the improved roads will be of immediate economic benefit to the corridor area. These impacts are temporary in nature, since they exist only during the construction activity and terminate when the road construction is complete (when the highway is open to traffic). These "direct" impacts of highway construction should not be used as evidence that the highway improvements are feasible.

Corridor Competitive Position - A greatly improved highway reduces the cost of transportation. Reductions in trucking time and cost lead to reduced costs of production, which in turn lead to marginally reduced prices and/or increased profits, which can lead to increased production (expansion of existing firm production and/or attraction of new firms), which in turn generates economic impact value. These "competitive position" impacts are calculated herein and they are valuable to the corridor and to the states involved.

Roadside Service Industries - A more efficient north-south highway will lead to revised travel patterns involving greater traffic density on the selected route. Greater traffic density generally causes increased sales for roadside businesses (motels, restaurants, gasoline stations, tourist visitation places, others that cater to highway users). These "roadside service industry" impacts are calculated herein; they are valuable to the specific route's primary impact area, although they are transfers from other routes and therefore not net impacts in the national sense.

Route Impact Areas

To gauge the economic impact of the highway improvements it is necessary that the impact be for some defined area; for example, is the impact on the national economy, or the five states' economy, or is it for the corridor region? For this study's economic impact purposes, the impacts are tabulated for "primary impact areas" reflecting each route's location. The number of counties and their resident population included in each of these impact areas, by state, are shown on Table 7-1.

The "primary" economic impact areas of the individual routes are quite narrowly defined. They include all counties near the routes, including the Metropolitan Statistical Areas (MSA's). They are all of approximately the same geographic size and population which enables reasonably consistent evaluation, while still enabling the reflection of economic and demographic differences. Figures 7-1 through 7-4 depict the defined impact areas for Route Options B, C, D, and E.

Economic Impacts of Highway Construction

The completion of a four-lane expressway between St. Louis and St. Paul is estimated to cost between $358 million and $1,317 million, depending on which route is selected. The very act of spending large sums of construction money in an area is of economic value to that area, since contractors and construction workers are hired, gravel is purchased, etc. This report section estimates the economic value that is created in the corridor due to the act of spending such construction funds in the corridor.

Table 7-1
COUNTIES AND RESIDENT POPULATION IN ECONOMIC IMPACT AREAS[a]
St. Louis to St. Paul
January 1990

	IMPACT AREA NUMBER OF COUNTIES				
	Corridor	Route Primary Impact Areas			
		B	C	D	E
Illinois	27	9	9	24	21
Iowa	54	23	24	5	18
Minnesota	22	15	17	14	17
Missouri	18	15	15	5	5
Wisconsin	12	1	1	12	1
Total No. of Counties	133	63	66	60	62

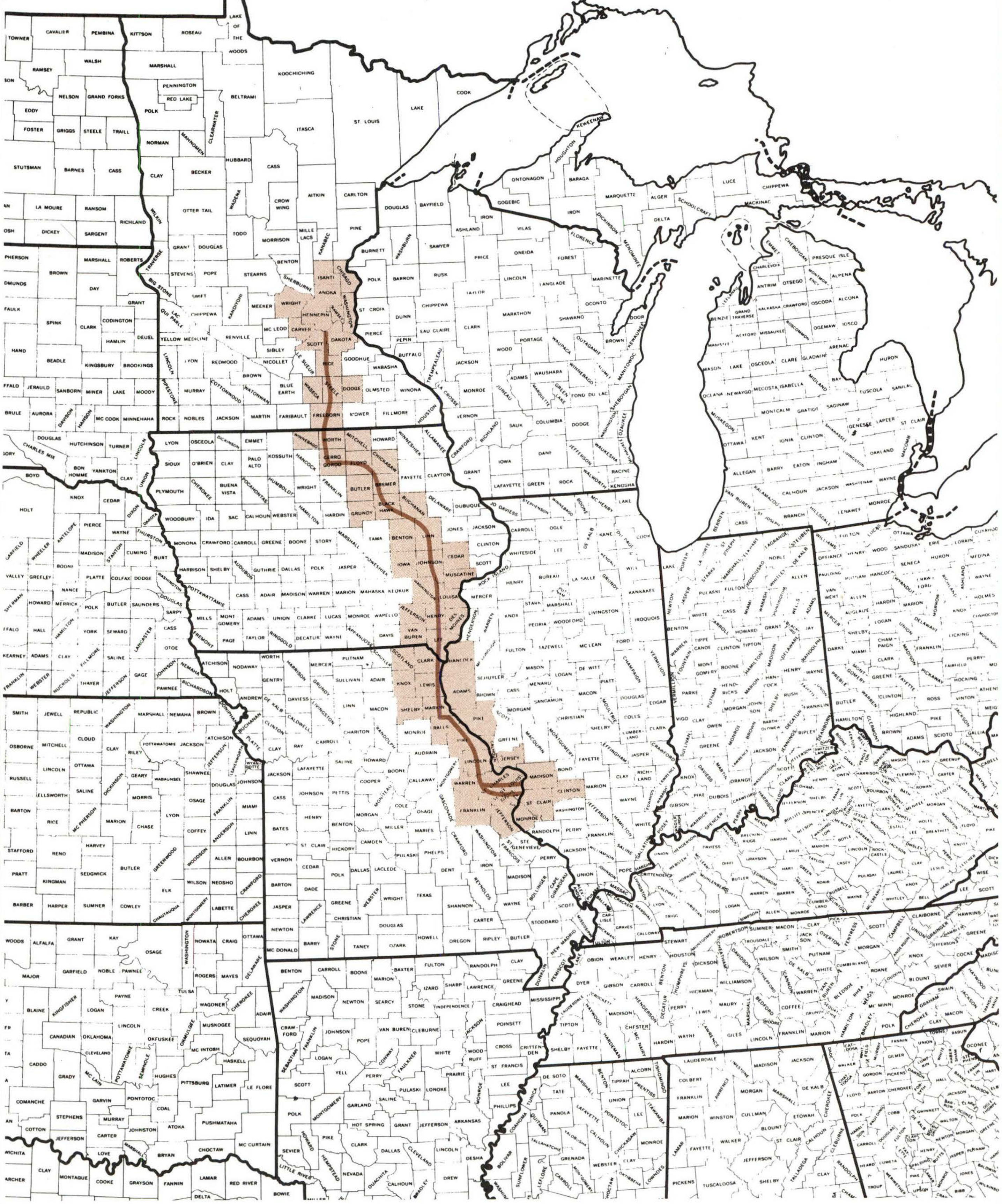
	IMPACT AREA RESIDENT POPULATIONS (000)				
	Corridor	Route Primary Impact Areas			
		B	C	D	E
Illinois	1,339.5	709.6	709.6	1,242.8	1,139.2
Iowa	2,053.7	818.5	817	343.7	851.5
Minnesota	2,676.6	2,394.1	2,528.7	2,372.9	2,528.7
Missouri	2,022.3	1,977.1	1,977.1	1,842.8	1,842.8
Wisconsin	371.3	46.4	46.4	371.3	46.4
Total Population	8,463.4	5,945.7	6,078.8	6,173.5	6,408.6

(a) Each impact area includes the endpoint MSA's.

To gauge the construction impacts, each route option's costs were estimated, and the costs were input into the IMPLAN Input/Output Model. That model was used to develop the economic impacts.

Project Construction Costs - Each route's capital costs were estimated in terms of construction cost and right-of-way cost. The construction costs are treated as increases in final demand and are input into the IMPLAN Model. The right-of-way costs are treated as transfers and are not included. The construction costs are assumed to be spent, initially, within the corridor's defined impact areas.

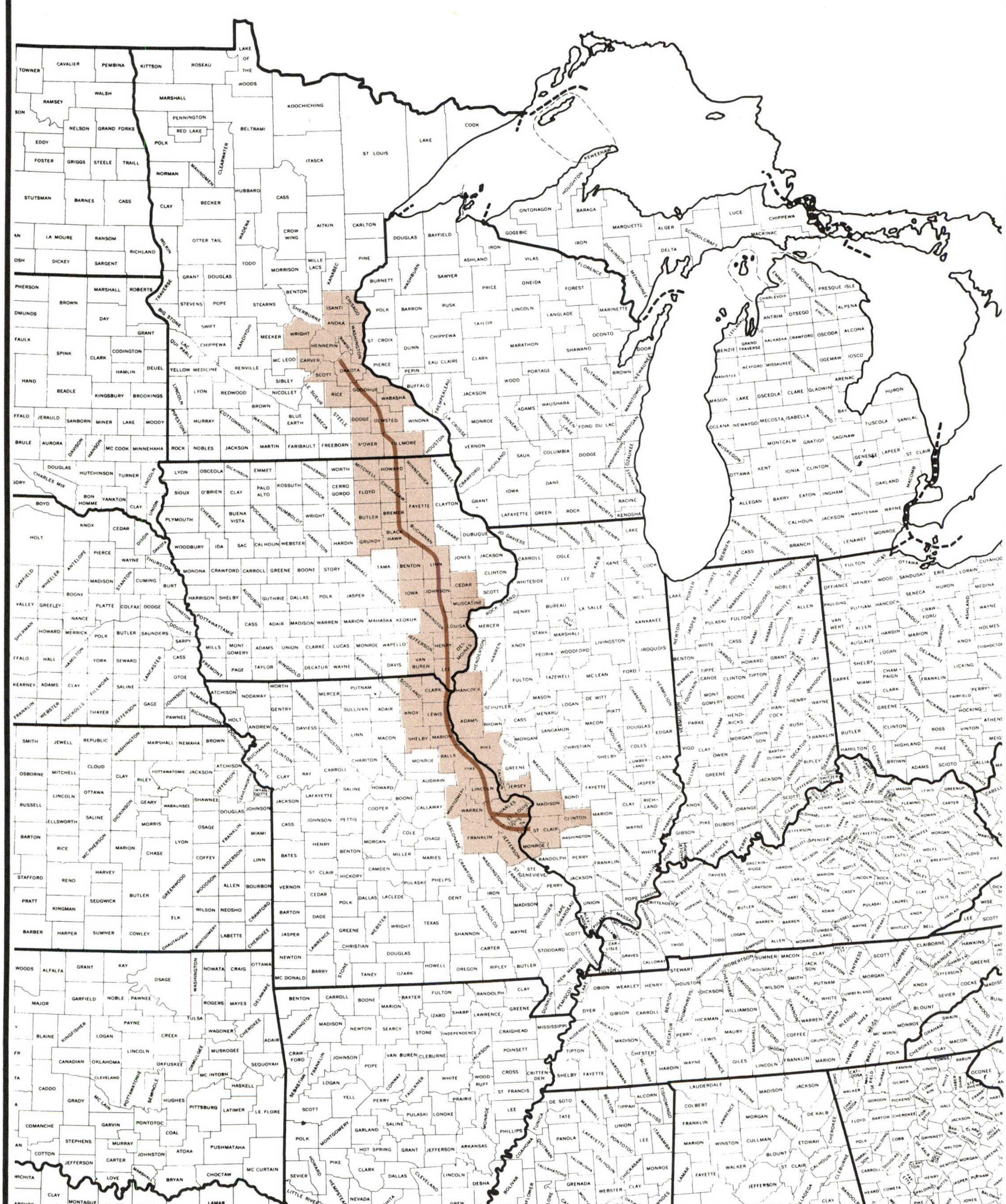
Project Construction Impacts - The economic impacts due to the act of construction comprise the monies spent in the corridor and the flow of those monies in terms of respending. The impacts include the labor and expenses associated with planning, design and construction, plus the respending of those funds to the extent that such respending occurs within the corridor.



PRIMARY IMPACT AREA

ROUTE OPTION "B"

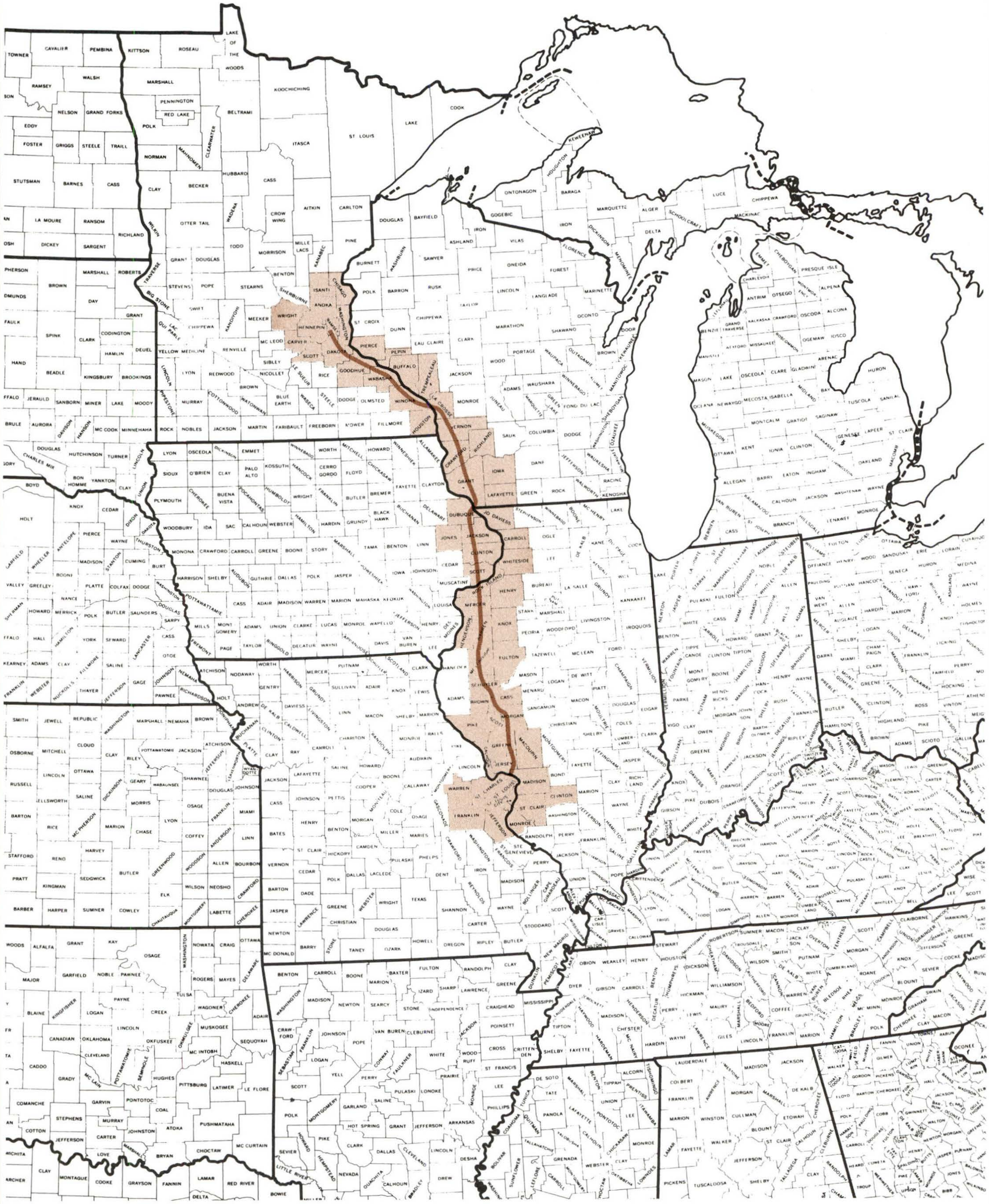
FIGURE 7-1



PRIMARY IMPACT AREA

ROUTE OPTION "C"

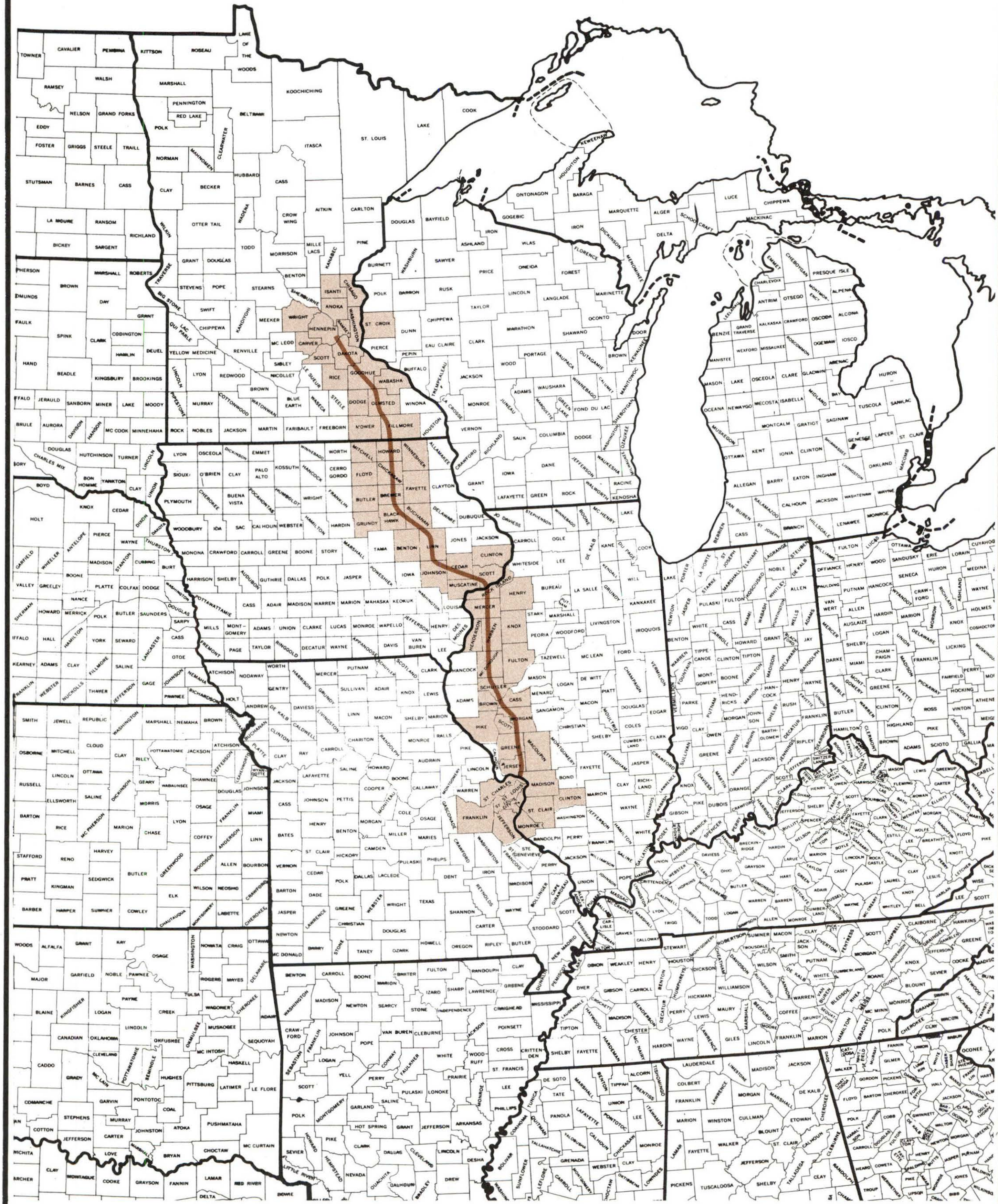
FIGURE 7-2



PRIMARY IMPACT AREA

ROUTE OPTION "D"

FIGURE 7-3



PRIMARY IMPACT AREA

ROUTE OPTION "E"

FIGURE 7-4

Construction Impacts Not to be Used for Feasibility Purposes - The construction impacts should only be used to indicate the extent to which a local region might benefit economically from the expenditure of construction monies in that region. Once the construction is complete, these construction impacts no longer occur.

In addition, the construction impacts should not be used as indicators of road improvement "feasibility" or "justification". This is because the construction-cost-caused "Economic Activity" impacts and the "Final Demand" impacts are always greater than the construction costs themselves (due to the respending of the funds). The construction impacts merely show that the local corridor is better off, and by how much, if money from outside is spent in the local area.

Construction Impacts on Each Route's "Primary Impact Areas - Table 7-2 presents the construction economic impact estimates for each of the primary impact areas. While the impacts generally follow the construction cost estimates, the impacts also reflect the varying size and economic base of the impact areas. These construction cost impact comparisons are informative; however, they should not be used to select a route option and should not be used to justify such an expenditure.

Impact on Corridor's Competitive Position

A continuing theme in discussions with corridor area people is the desire and need for the region to expand existing businesses, to attract new businesses, and to diversify the area's economic base. This general goal was also emphasized in many of the 400+ letters received from corridor residents and the area's business community. To attract business, the corridor must be competitive with other areas.

The Need to be Competitive - The St. Paul to St. Louis corridor has experienced great economic change over the past several decades, with the most dramatic change occurring during the 1980s. In general, agriculture and related industries suffered the greatest declines. Those declines were felt in metropolitan areas, just as in rural areas. For example, between 1978 and 1986, Waterloo, the Quad Cities area, and Dubuque lost a total of 17,604 jobs in farm machinery production, a 78 percent decline.

The 1980s saw the rise of other economic activities within the corridor area. Finance, insurance, and related industries gained 24,088 jobs in the Twin Cities metropolitan area between 1978 and 1986, a 34 percent increase. The St. Louis metropolitan area gained 13,403 jobs in these industries, a growth of 42 percent, while Des Moines gained 9,353 jobs, a 47 percent growth. Business services grew in the three metropolitan areas by 87, 74, and 65 percent, respectively. La Crosse experienced an 80 percent growth in business services, Rochester grew by 82 percent, Iowa City by 177 percent, and Hannibal by 235 percent.

The five most concentrated industries found in each of the metropolitan areas in the St. Paul to St. Louis corridor are presented in Table 7-3. Concentration is measured by comparing the percent of workers in a city employed in a given industry to the percent of all workers nationally employed in that industry. Also indicated in the table is the percentage change in employment between 1978 and 1986. Finally,

Table 7-2
ECONOMIC IMPACT OF HIGHWAY CONSTRUCTION ON EACH ROUTE'S PRIMARY IMPACT AREA[a]
St. Louis to St. Paul: Expressway Standard
1989

	IMPACTS ON EACH ROUTE'S PRIMARY IMPACT AREA			
	B	C	D	E
	($ Million Dollars)			
CAPITAL COST:[b]				
Construction	$328.5	$415.2	$1,238.6	$1,029.6
Right-of-Way	30.0	42.4	78.6	62.7
Total	$358.5	$457.6	$1,317.2	$1,092.3
TOTAL ECONOMIC IMPACT:[c]				
Economic Activity[d]	$667.8	$844.1	$2,398.3	$2,061.4
Final Demand[e]	429.5	542.9	1,591.2	1,336.0
Value Added				
Wages[f]	$185.5	234.5	658.2	573.5
Other[g]	93.9	118.6	324.9	284.2
Total[h]	$279.4	353.1	983.1	857.2
JOBS IMPACT[i]				
Job Years (FTE)	7,377	9,325	25,405	22,333
RETURN PER[k] CONSTRUCTION DOLLAR:				
Economic Activity	2.03	2.03	1.94	2.00
Final Demand	1.31	1.31	1.28	1.30
Value Added	.85	.85	.79	.83

(a) Impact on St. Louis and St. Paul MSA's plus intermediate counties along each route from construction of a four-lane expressway.
(b) Incremental cost attributable to St. Louis - St. Paul project (excludes programmed projects).
(c) Total impacts of construction over entire construction period. These impacts no longer occur when construction is finished.
(d) Total commodity output, involving total value of each commodity produced by all industries due directly to the road improvement process.
(e) Sum of all purchases for final use or consumption due to the road improvement process.
(f) Total payroll costs (wages and salaries and benefits) paid locally due to the construction process.
(g) Indirect business taxes (sales and excise), proprietary income, corporate income, rental income, interest and corporate transfer payments.
(h) Sum of employee compensation, proprietary income, indirect business taxes and other property income attributable to the road improvement process.
(i) Total job years attributable to road improvement process, including regarding, expressed in "full time equivalent" person years of work.
(j) Total economic impacts divided by construction cost.

Note: This table should not be used relative to a route's feasibility. It only shows the impact of spending construction funds in the area.

SOURCE: Wilbur Smith Associates

Table 7-3
CORRIDOR INDUSTRIES AND TRENDS
1978-1986

METROPOLITAN STATISTICAL AREA (MSA's)	MOST CONCENTRATED INDUSTRIES	EMPLOYMENT CHANGE 1978-1986	EXPORT WORKERS
Twin Cities	General Machinery	27.60%	42,474
Total Employ Change	Rubber Products	34.10%	8,045
1978-86: 196,380	Fabricated Metals	1.70%	18,376
	Refrigeration Machinery	-35.50%	3,150
% change: 22.2	Public Utilities	30.20%	33,754
Rochester	General Machinery	23.70%	8,096
Total Employ Change	Dairy Products	-5.10%	653
1978-86: 8,046	Health	29.80%	11,241
	Printing and Publishing	392.30%	404
% change: 18.6	Hotels	8.50%	916
Mason City	Prepared Feeds	-47.80%	53
Total Employ Change	Refrigeration Machinery	53.70%	259
1978-86: -890	Stone, Clay, Glass Products	-41.20%	421
	Farm Products	-12.90%	78
% change: -5.2	Bakery Products	29.60%	134
La Crosse	Refrigeration Machinery	7.20%	2,714
Total Employ Change	Rubber Products	-2.90%	820
1978-86: 5,535	Metal Forgings	549.20%	2,692
	General Machinery	-61.20%	2,692
% change: 16.4	Fabricated Metals	-90.70%	1,042
Dubuque	Meat Packing	-23.20%	1,955
Total Employ Change	General Machinery	missing	3,817
1978-86: -2,873	Valves and Pipe Fittings	2.20%	276
	Engines and Turbines	-42.70%	178
% change: -7.4	Printing and Publishing	135.90%	871
Quad Cities	Farm and Garden Machinery	-48.70%	6,923
Total Employ Change	General Machinery	-74.60%	12,797
1978-86: -14,057	Construction Machinery	85.60%	3,148
	Iron and Steel Foundaries	-58.90%	1,028
% change: -10.4	Meat Packing	-57.00%	756
Cedar Rapids	Wet Corn Milling	-1.90%	603
Total Employ Change	Meat Packing	-5.90%	1,928
1978-86: 533	Electrical and Communications Equipment	-20.60%	
% change: 0.7	Special Industrial Machinery	-32.00%	1,357
	Prepared Feeds	-57.80%	231

Table 7-3
CORRIDOR INDUSTRIES AND TRENDS
1978-1986
(continued)

METROPOLITAN STATISTICAL AREA (MSA's)	MOST CONCENTRATED INDUSTRIES	EMPLOYMENT CHANGE 1978-1986	EXPORT WORKERS
Iowa City	Prepared Feeds	101.40%	281
Total Employ Change	Rubber Products	missing	1,162
1978-86: 4,355	Miscellaneous Plastics	48.60%	1,058
	Bakery Products	missing	185
% change: 23.6	Dairy Products	118.30%	93
Quincy-Hannibal	Truck and Bus Bodies	missing	62
Total Employ Change	Rubber Products	missing	209
1978-86: 625	General Machinery	10.40%	197
	Stone, Clay, Glass Products	missing	183
% change: 9.0	Chemical Products	21.70%	389
St. Louis	Transportation Equipment	25.10%	34,734
Total Employ Change	Refrigeration Machinery	53.90%	3,326
1978-86: 133,843	Rubber Products	-32.00%	2,817
	Printing and Publishing	38.20%	5,950
% change: 23.7	Public Utilities	24.20%	26,852
Waterloo	Farm and Garden Machniery	-34.20%	8,782
Total Employ Change	General Machinery	-33.60%	10,386
1978-86: -11,992	Engines and Turbines	-20.50%	844
	Truck and Bus Bodies	missing	65
% change: -18.1	General Industrial Machinery	-18.40%	467
Des Moines	Farm and Garden Machinery	-51.00%	2,085
Total Employ Change	Printing and Publishing	-23.40%	5,828
1978-86: 18,445	Insurance Carriers	54.70%	14,330
	Rubber Products	-38.20%	2,010
% change: 12.2	Meat Packing	82.90%	848

NOTE: Missing percentages are those where a value was suppressed because the number of firms was too small or there were no employees in the category in one or the other years.

Table 7-3 shows an estimate of the number of workers in the industry who produce goods that are sold outside the city (i.e., whose goods are exported from the city).

Table 7-3 provides several key insights. First, the metropolitan areas along the corridor have economies that depend on manufacturing of one form or another. Second, with some exceptions, employment in manufacturing has been declining, and this has contributed to net employment losses in four metropolitan areas (Mason City, Dubuque, Quad Cities, and Waterloo). Third, these industries still account for many export workers; those whose products are sold outside the area (presumably transported by road).

The question arises as to whether and to what extent an upgraded highway along the corridor would benefit the industries in which the several metropolitan areas specialize. A related question is what the highway could do to help foster growth of other, emerging industries that are likely to flourish nationally.

It is clear that competition will be great among regions to maintain as high a level of manufacturing as possible and to attract activities demonstrating growth potential nationally. Keeping transportation costs as low as possible is one of the most effective actions government can take to make the St. Paul to St. Louis corridor competitive.

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

Highway Improvement's Role in Economic Development - The ability to attain such economic growth is a function of many things, one of which is the ability of the area 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 area's economic development goals.

All areas of the corridor already have street and highway access. Therefore, lack of access is not the issue; rather, the issue is the efficiency of that access, and whether improved efficiency might lead to some degree of increased economic development.

Figure 7-5 presents a sequential flow of activities involved in moving from the 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 Highway Improvement** - The act of building the improved highway has a short-term economic impact; that impact is assessed elsewhere in this report.

2. **Use of the Improved Highway** - The improved road will be used by existing and diverted and possibly induced traffic. The transportation model quantifies the estimated use of each alternative highway improvement.

3. **Reduced Transportation Cost** - The highway improvements lead 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 Corridor** - Transportation cost is one factor in the cost of doing business in the corridor. If transportation costs, especially trucking costs, decline in the corridor, this means that the total cost of doing business in the corridor will also slightly 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 into the area.

6. **Increased Competitiveness of 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 the better roads than without them.

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.

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

The above sequence makes sense, and it does occur. It should be emphasized, however, that the highway improvements are "incremental," in that they only improve transportation to areas that already have transportation service. Therefore, the impacts are somewhat modest.

Competitiveness of Corridor Impacts - To quantify the anticipated economic impacts due to the reduced costs of doing business in the corridor, the results of the Transportation Model and the IMPLAN Model were used.

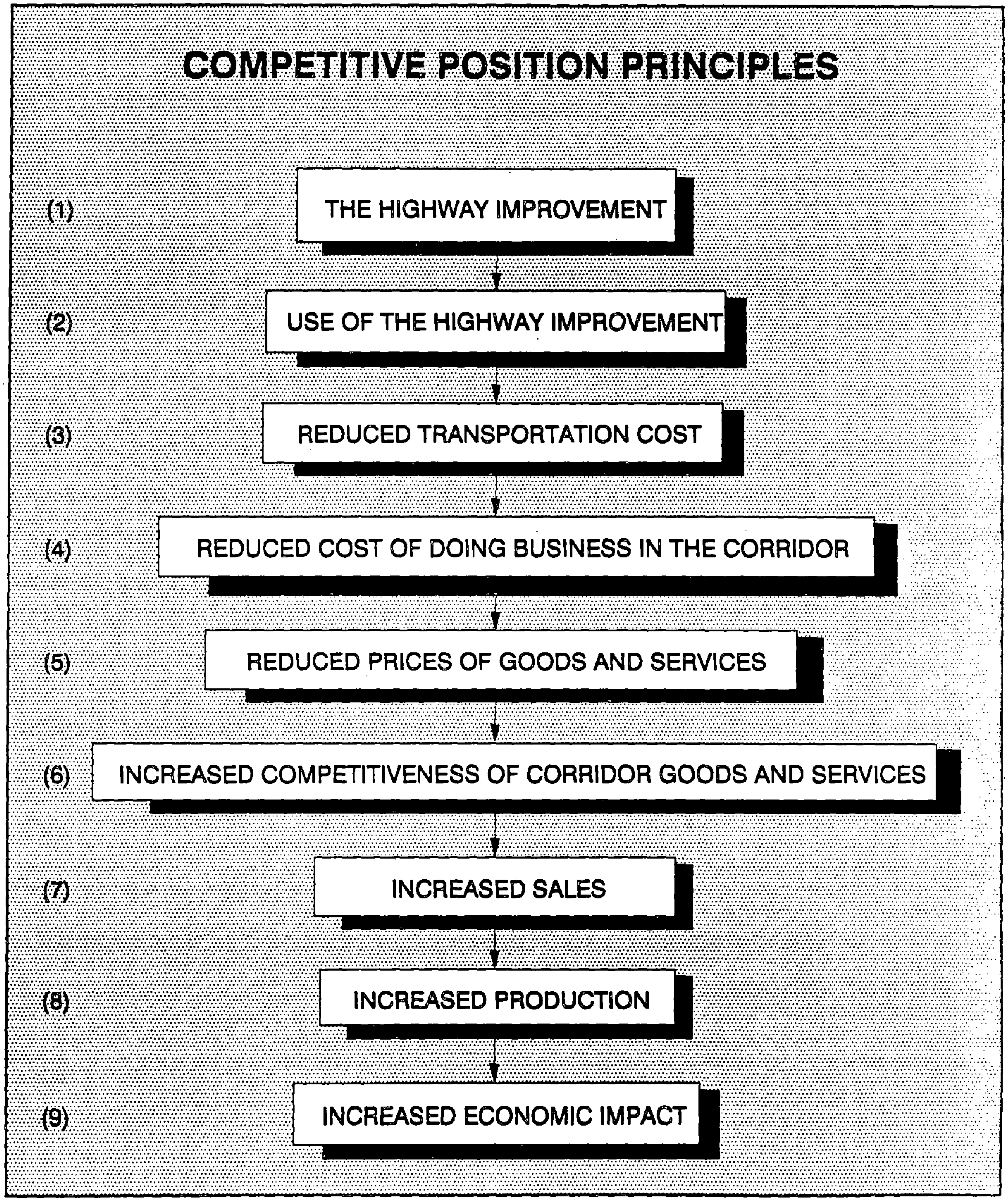

COMPETITIVE POSITION PRINCIPLES
(1) THE HIGHWAY IMPROVEMENT
(2) USE OF THE HIGHWAY IMPROVEMENT
(3) REDUCED TRANSPORTATION COST
(4) REDUCED COST OF DOING BUSINESS IN THE CORRIDOR
(5) REDUCED PRICES OF GOODS AND SERVICES
(6) INCREASED COMPETITIVENESS OF CORRIDOR GOODS AND SERVICES
(7) INCREASED SALES
(8) INCREASED PRODUCTION
(9) INCREASED ECONOMIC IMPACT

FIGURE 7-5

IMPLAN was used to define total "final demand" in each impact area. Final demand in each primary impact area totaled between $102 billion (Route B) and $106 billion (Routes D and E) annually, indicating that the size and economy of the various routes' impact areas are of the same general magnitude. IMPLAN was also used to determine the for-hire trucking industry's share of intermediate demand. To derive trucking's share, the total trucking costs were divided by the corridor area's total "intermediate demand." The calculation indicates that trucking's share is only 2.97 percent corridor-wide. The corridor-wide percent is used because the location of the trucking companies, if recognized, would tend to bias the calculations.

In terms of total truck transportation in the corridor, only a very minor share will use the improved highway. This is reflected by the Transportation Model results which present the small changes in truck vehicle miles of travel (VMT) and vehicle hours of travel (VHT) with and without each route improvement. Table 7-4 indicates the percent reduction in total network trucking costs due to each route option. As shown, Route D is most effective in reducing truck costs (.4 percent reduction) while the other routes reduce truck costs by .18 to .27 percent. The change in overall truck operations throughout each impact area is very modest because there is truck travel on all roads, not just the improved highway. Additionally, considerable truck travel is oriented in the east-west direction rather than north-south, and most truck trips will benefit for only a portion of the journey.

Table 7-4 also presents the "direct" economic impacts estimated to accrue due to competitive advantage changes associated with each alternative route. These direct impacts will be due to increased production in the corridor area (manufacturing, etc.). These impacts exclude increased business accruing to roadside businesses such as gas stations, motels, etc. The direct impacts can be expected to occur annually, and should be in a range between $5 million and $19 million. These analyses suggest that the greatest economic impact advantage occurs along Route D through Wisconsin and Illinois. However, that route is also the most expensive to build.

The direct competitive position impacts associated with the expansion of existing firms and the attraction of new firms were run through the IMPLAN model, and the results are summarized on Table 7-5. Those competitive position statistics indicate that:

1. The availability of an efficient St. Louis to St. Paul four-lane expressway will help the corridor to compete with other regions for economic activities. Such competitive advantage is worth several hundred basic industry jobs (excluding roadside service jobs) and between $11 and $42 million in annual economic activity.

2. On a competitive position basis, Route D would create more benefits than the other route options, although all would benefit.

3. Routes B and E are about equal in terms of their competitive position benefits, while Route C is slightly less than the others.

Table 7-4
DIRECT ECONOMIC IMPACTS DUE TO IMPROVED COMPETITIVE POSITION
St. Paul to St. Louis: Expressway Standard
1989 Price Levels

	ROUTE B	ROUTE C	ROUTE D	ROUTE E
Primary Impact Area Final Demand ($ Million):				
1986[a]	$102,904.2	$106,350.7	$103,988.8	$106,350.7
2010[b]	$155,968.8	161,192.6	157,612.7	161,192.6
Trucking Share of Final Demand (%)[c]	2.97	2.97	2.97	2.97
Trucking Cost Reduction (%)[d]	.267	.184	.403	.255
Impact Factor	.0000792	.0000546	.0001196	.0000757
Direct Impact Due to Improved Competitive Position ($ Million):				
1986	$8.15	$5.07	$12.44	$8.05
2010	$12.35	8.80	18.85	12.20

(a) IMPLAN Final Demand at 1989 price levels.
(b) Increased at two percent per year compounded in constant price levels.
(c) Purchases from trucking divided by corridor "intermediate demand".
(d) Truck operating cost and travel time percent reduction throughout corridor due to highway improvements.

SOURCE: Wilbur Smith Associates.

Table 7-5
ECONOMIC IMPACT DUE TO IMPROVED COMPETITIVE POSITION ALONG EACH ROUTE'S PRIMARY IMPACT AREA[a]
St. Louis to St. Paul: Expressway Standard
1989 Price Levels

	ANNUAL ECONOMIC IMPACT			
	Route B	Route C	Route D	Route E
1986 ECONOMIC IMPACTS	($ Million Dollars)			
DIRECT COMPETITIVE POSITION	$ 8.15	$ 5.07	$12.44	$ 8.05
TOTAL ECONOMIC IMPACT[b]				
Economic Activity[c]	$19.25	11.75	27.94	17.72
Final Demand[d]	$13.14	8.06	19.05	12.11
Value Added				
Wages[e]	$ 5.32	3.33	7.88	5.01
Other[f]	3.79	2.27	5.33	3.38
Total[g]	$ 9.11	5.60	13.21	8.39
JOBS IMPACT[h]				
Job Years (FTE)	304	188	451	284
2010 ECONOMIC IMPACTS				
DIRECT COMPETITIVE POSITION	$12.35	$ 8.80	$18.85	$12.20
TOTAL ECONOMIC IMPACT[b]				
Economic Activity[c]	$29.17	20.39	42.34	26.86
Final Demand[d]	$19.91	13.99	28.87	18.35
Value Added				
Wages[e]	$ 8.06	5.78	11.94	7.60
Other[f]	$ 5.74	3.94	8.08	5.12
Total[g]	$13.80	9.72	20.02	12.72
JOBS IMPACT[h]				
Job Years (FTE)	460	326	683	430

(a) Impact on St. Louis and St. Paul MSA's plus intermediate counties along route.
(b) Total annual impacts due to improved competitive position.
(c) Total commodity output, involving total value of each commodity produced by all industries due to truck efficiencies.
(d) Sum of all purchases for final use or consumption due to road efficiencies.
(e) Total local payroll costs due to road efficiencies.
(f) Indirect business taxes (sales and excise), proprietary income, corporate income, rental income, interest and corporate transfer payments.
(g) Sum of employee compensation, proprietary income, indirect business taxes and other property income attributable to the road efficiencies.
(h) Total job years attributable to economic expansion including respending.

Note: The impacts on this table are of benefit to the local corridor's primary impact area and possibly to the states; they are transfers at the national level (from one place to another).

SOURCE: Wilbur Smith Associates

4. The competitive position impacts are not nearly sufficient, by themselves, to justify the highway investments. One reason for this is that improved highways, by themselves, are not sufficient to attract large numbers of industries.

Economic Impacts Due to Increased Traveler Expenditures

In addition to development caused by improved competitive position, the improved 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.

Selection of any of the highway routes, with subsequent highway improvement, will cause greater traffic density and consequently the attraction of additional roadside services to serve those increased traffic volumes.

Evidence from Existing Four-Lane Routes - To gain an indication of the possible extent of roadside business that might be attracted, inventories were made of the extent of roadside services development along two existing Interstate highway routes -- I-35 between Kansas City and Minneapolis/St. Paul, and I-380 between Cedar Rapids and Waterloo. I-35 was selected because it is of a similar length as the St. Louis - St. Paul corridor, carries similar traffic volumes, and passes through countryside of a similar nature. I-380 was selected because it is a part of three of the four route options. Both have been open to traffic long enough to yield good indications of roadside service development.

A windshield survey counted the development at each interchange. The urban interchanges in Kansas City, Des Moines, Minneapolis/St. Paul, Waterloo and Cedar Rapids were excluded due to the extent of development and the dominance of local urban area traffic rather than longer-distance intercity traffic.

Interstate 35 Roadside Development - Serving the 459 I-35 road miles between Kansas City and Minneapolis/St. Paul are 39 gas stations, 15 restaurants, 8 hotels/motels, 1 truck stop plus 15 other business establishments (excluding such business types located in Kansas City, Des Moines and Minneapolis/St. Paul). This indicates, for example, that there is an average of one gas station every 12 miles along I-35. Of the 42 interchanges along I-35, 20 have at least one gas station, 11 have one or more restaurants, seven have at least one hotel/motel and 12 have one or more other businesses. Thirteen interchanges have no development at all. There are four quadrants per interchange (SW, SE, NE, NW) or 168 total quadrants along the route. Out of these 168 quadrants, 110 quadrants (65.5 percent) are undeveloped and 58 quadrants (34.5 percent) are developed. The interchange quadrant inventory along I-35 is as follows:

Interstate 35 Existing Development at Interchanges

- 22 Quadrants filled by gas stations
- 2 Quadrants filled by restaurants
- 2 Quadrants filled by hotels/motels
- 13 Quadrants filled by other businesses
- 1 Quadrant filled by a neighborhood
- 18 Quadrants filled by a combination of businesses
- 110 Quadrants with no development

Interstate 380 Roadside Development - A windshield survey was also taken of existing I-380 between but excluding Waterloo and Cedar Rapids. There has been very little development at the interchanges between these two cities, due in part to the general lack of utilities (water and sewer) at the interchange quadrants. Only two gas stations, one restaurant and no motels exist over this segment (excluding those in the cities). Clearly little roadside development has occurred. Other development has occurred in the cities, however, as well as development in communities off I-380 (not at the interchanges).

Existing Roadside Businesses Along the Four Route Options - To gain an indication of the extent of existing roadside businesses along the four finalist route options, inventories were made of all four route options from Minneapolis/St. Paul to St. Louis. Only the two endpoints were excluded from the inventory. The survey counted the business development along each route, with Table 7-6 depicting the number of gas stations, hotels/motels, and restaurants along each route.

Table 7-6
ROADSIDE BUSINESSES ALONG EACH ROUTE OPTION
November 1989

	NUMBER OF EXISTING ROADSIDE BUSINESSES			
	Route B	Route C	Route D	Route E
Gas Stations	138	117	201	156
Hotels/Motels	47	34	86	45
Restaurants	175	108	234	160

SOURCE: Wilbur Smith Associates.

- **Route B** - Serving the 532 road miles of Route B are 138 gas stations, 47 hotels/motels, and 175 restaurants. This indicates, for example, that there is an average of one gas station every four miles. Most of the businesses along Route B (74 percent) are located between Minneapolis/St. Paul and Iowa City. The majority of businesses are located near the big cities of Mason City, Waterloo/Cedar Falls, Cedar Rapids and Iowa City.

- **Route C** - This route has 117 gas stations, 34 hotels/motels, and 108 restaurants along its 504 road miles. On average, there is one gas station every four miles. As along Route B, the majority of these businesses (64 percent) are between St. Paul and Iowa City, with most clustering around the big cities of Waterloo, Cedar Rapids, and Iowa City.

- **Route D** - The 549 road miles of Route D have 201 gas stations, 86 hotels/motels, and 234 restaurants. On average, there is one gas station for every three miles of highway. Most of these businesses (70 percent) are between St. Paul and the Quad Cities, with the La Crosse, Dubuque and the Quad Cities urban areas having the majority. Jacksonville and Alton also have a good share of the business.

- **Route E** - The 156 gas stations, 45 hotel/motels, and 160 restaurants are slightly more evenly located along Route E's 556 road miles. There is no dominant area as in the other routes. However, throughout the route, the businesses do seem to be more heavily located around the cities of Waterloo, Cedar Rapids, Iowa City, Jacksonville and Alton.

Potential Roadside Development - Since the route options already have gasoline station, motel, and restaurant development, the issue to consider is, what increase might be expected due to new/diverted traffic associated with the highway improvement and whether that development represents a net increase suitable for use in the economic impact calculations.

Roadside business increases will be due to traffic increases. Between 1989 and 2010 there will be normal traffic growth, even if the road improvements are not made. In addition, there will be increased traffic due to the road improvement, which will principally be diverted from other regional highways. Using this study's traffic model, the percent change in vehicle miles of travel (VMT) on each route option due specifically to the road improvements were summarized and are shown on Table 7-7.

According to Table 7-7, the VMT on the routes could increase between 15 percent and 58 percent due to the road improvements. This increase will bring with it 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 regional highways and therefore from other regional businesses.

Table 7-7
ROUTE DAILY VEHICLE MILES OF TRAVEL
St. Louis to St. Paul: Expressway Standard

	VMT ON EACH ROUTE (000 MILES)			
	Route B	Route C	Route D	Route E
Without Road Improvements				
Base Year	4,731	4,374	2,716	3,386
Year 2010	7,469	7,056	4,517	5,567
With Road Improvements				
Base Year	5,454	5,211	4,240	4,199
Year 2010	8,649	8,514	7,129	6,881
Percent Change Due to Road Improvements				
Base Year	+15.3	+19.1	+56.1	+24.0
Year 2010	+15.8	+20.1	+57.8	+23.6

SOURCE: Traffic Model, Wilbur Smith Associates

<u>Roadside Economic Impact Implications</u> - The increased roadside sales of 15 to 58 percent, (representing increases in direct impact), will lead to increased local employment, tax receipts, etc., and therefore are of economic benefit to the local towns and counties along the route. Table 7-8 shows the direct impacts estimated to accrue to each route option due to the road improvements. For example, Route D has the largest increase in VMT in the base year at 56.1 percent, which corresponds to the largest direct benefit among the routes of $92.9 million.

Table 7-8
ESTIMATED DIRECT IMPACTS FROM INCREASED TRAVELER EXPENDITURES
St. Louis to St. Paul: Expressway Standards
($Millions)

	INCREASED TRAVELER EXPENDITURES			
YEAR	Route B	Route C	Route D	Route E
1986	$44.1	$51.1	$92.9	$49.6
2010	$71.9	$88.9	$159.2	$80.1

SOURCE: Wilbur Smith Associates

The direct impacts caused by increased traveler expenditures were run through the IMPLAN model, to gauge the value of those expenditures to the local (primary impact area) economies. Table 7-9 summarizes the results. As shown by those statistics:

1. All route impact areas would benefit from increased traveler expenditures.

2. The Route D impact area would benefit the most, with Route D impacts being nearby double that of the other routes. This is because Route D involves the greatest traffic diversion of the various route options.

3. In terms of roadside business increases, Route D has the greatest impact, while Route C is second and Route E is third. The Route C, E and B impacts are so close, however, as to almost be equal.

The traffic increases are due to traffic diversion, from routes not programmed for improvement, to the selected improved routes. As a result, the business that is gained along the route is lost business elsewhere in the corridor. 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 each route's "primary impact area," perhaps are relevant to the states, but nationally are a net transfer.

Tourism Implications

One form of increased traveler expenditures impact comprises tourists and other travelers who might choose to visit the corridor area if the improved highway access were in place. If additional visitors did come, they would spend money in the area and this would be good for the local economy, unless the highway also caused local corridor residents to travel away from the corridor, and as a result spend additional money outside of the corridor.

Visitor Attractions - The corridor area has a wide variety and a lengthy list of tourist attractions. An evaluation of the corridor's list of tourist attractions suggests several things:

- There are a great many existing and proposed tourist attractions in the corridor which are worth serving via improved access.

- All four routes have such attractions; the attractions are not focused on only one or two routes.

- The attractions are excellent, but are principally of regional interest (as opposed to national interest); there are some exceptions: The Amana Colonies, Mark Twain's Home, the Mississippi River in general, the proposed "Riverboat Gambling," and perhaps a few others.

- Many of the attractions are in St. Paul and St. Louis MSA's and other cities, most of which already have Interstate Highway access (not necessarily north-south access).

Table 7-9
ECONOMIC IMPACT DUE TO INCREASED TRAVELER EXPENDITURES ALONG EACH ROUTE'S PRIMARY IMPACT AREA[a]
St. Louis to St. Paul: Expressway Standard
1989 Price Levels

	ANNUAL ECONOMIC IMPACT			
	Route B	Route C	Route D	Route E
1986 ECONOMIC IMPACTS	($ Million Dollars)			
DIRECT TRAVEL EXPENDITURES	$ 44.1	$ 51.1	$ 92.9	$ 49.65
TOTAL ECONOMIC IMPACT[b]				
Economic Activity[c]	$133.16	151.40	285.69	149.38
Final Demand[d]	$ 88.54	100.72	189.88	99.59
Value Added				
Wages[e]	$ 39.29	44.53	83.67	44.00
Other[f]	$ 30.60	34.78	65.75	34.37
Total[g]	$ 69.89	79.31	149.42	78.37
JOBS IMPACT[h]				
Job Years (FTE)	3,101	3,532	6,596	3,463
2010 ECONOMIC IMPACTS				
DIRECT TRAVEL EXPENDITURES	$ 71.9	$ 88.9	$159.2	$ 80.1
TOTAL ECONOMIC IMPACT[b]				
Economic Activity[c]	$217.10	263.39	489.58	241.24
Final Demand[d]	$144.35	175.23	325.39	160.83
Value Added				
Wages[e]	$ 64.06	77.47	143.38	71.06
Other[f]	$ 49.89	60.51	112.68	55.50
Total[g]	$113.95	137.98	256.06	126.56
JOBS IMPACT[h]				
Job Years (FTE)	5,055	6,145	11,303	5,592

(a) Impact on St. Louis and St. Paul MSA's plus intermediate counties along route.
(b) Total annual impacts due to increased traveler expenditures.
(c) Total commodity output, involving total value of each commodity produced by all industries due to increased traveler expenditures.
(d) Sum of all purchases for final use or consumption due to traveler expenditures.
(e) Total local payroll costs due to increased traveler expenditures.
(f) Indirect business taxes (sales and excise), proprietary income, corporate income, rental income, interest and corporate transfer payments.
(g) Sum of employee compensation, proprietary income, indirect business taxes and other property income attributable to the increased traveler expenditures.
(h) Total job years attributable to economic expansion including respending.

Note: The impacts on this table are of benefit to the corridor's primary impact area; they are transfers at the state and national levels (from one place to another).

SOURCE: Wilbur Smith Associates

- There is a greater density of attractions on and near the Mississippi River than elsewhere.
- Many of the these attractions are relatively unknown, even to in-state residents.

Visitor Expenditures - Travel expenditure data was provided by the states, as made available to the states by the U.S. Travel Data Center. Such data defines travel as "activities with all overnight trips away from the traveler's origin." As a result, visitor expenditures include all trip purposes (vacation, business, etc) and include only people staying overnight or at least traveling 100 miles from their home. Visitors to the corridor are valuable economically because those vistors spend money on goods and services available in the corridor. To gauge the value of tourism, visitor expenditures were estimated for each Primary Impact Area. The intent was to determine whether tourism might be more important along one route than the other routes.

The visitor expenditure analyses were performed at the county level in order to estimate expenditures within each route's primary impact area. Table 7-10 presents the visitor expenditure estimates for each route's area.

Table 7-10
VISITOR EXPENDITURES BY ROUTE IMPACT AREA

	ANNUAL VISITOR EXPENDITURES ($ MILLION)							
	ROUTE B		ROUTE C		ROUTE D		ROUTE E	
Impact Area By State	Total	Excluding Interstate Access	Total	Excluding Interstate Access	Total	Excluding Interstate Access	Total	Excluding Interstate Access
Iowa	470.0	95.4	446.3	107.8	164.8	3.3	462.5	45.2
Illinois	25.2	25.2	25.2	25.2	158.9	65.2	130.1	49.8
Minnesota	52.6	0	292.6	33.9	61.8	33.9	292.6	33.9
Missouri	38.1	38.1	38.1	38.1	0	0	0	0
Wisconsin	0	0	0	0	195.1	145.9	0	0
Total	585.9	158.7	802.2	205.0	580.6	248.3	885.2	128.9

(a) Expenditures by visitors within 25 miles of each route, excluding transportation costs themselves.

SOURCE: Wilbur Smith Associates

Two estimates were made for each route:

- **Total** - This comprises total estimated visitor expenditure within 25 miles of each route, excluding the St. Louis and St. Paul MSA's.
- **Excluding Interstate Access** - This comprises the total visitor expenditures in impact area counties that do not already have an Interstate Highway within the county.

The expenditure statistics indicate:

1. In terms of total visitor expenditures by route, Route E has the most, followed by Routes C and then B and D which are about equal. However, these patterns are influenced by the large cities, where most of the visitor expenditures occur.
2. By excluding those counties that already have Interstate Highway access, a different conclusion is reached. Route D, for example, has the most visitor expenditures in places that do not currently have Interstate Highway access, and Route B has the least.

The visitor expenditures consist principally of such travel related expenditures as those on motels, restaurants, gift shops, sight-seeing, gasoline, etc. All of these are included in the previous section dealing with impacts attributable to increased traveler expenditures. Because the traffic model includes a broad region of the Upper Midwest, and because the traveler expenditure impact calculations already include expenditures by tourists and visitors, additional impacts solely for visitors are not warranted. They are already included in the previous calculations.

Impact on Employment

The retention of existing jobs and the attraction of new job opportunities is an important goal of all jurisdictions along each highway route. An improved highway will aid in the achievement of this jobs goal, at least for the selected route's "primary impact area." Jobs will be created in the impact area in four ways.

- **Construction Jobs** - The firms engaged to construct the highway will spend large sums of money in the area. These expenditures will be used to pay contractors, subcontractors and suppliers of goods and services. These construction caused jobs will exist only during the construction process itself.
- **Competitive Position Jobs** - By making the corridor area more competitive, output will increase and with it existing firms will be expanded and new firms attracted. Both forms of business activity expansion will employ additional people.

- <u>**Traveler Expenditure Jobs**</u> - Increased traffic volumes on the improved route will lead to increased business along the route for businesses that cater to vehicular traffic. These businesses will therefore employ increasing numbers of people.

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

The estimates of jobs attributable to the highway improvements are summarized on Table 7-11. In every case the job estimates include the "multiplier" effect (the jobs created due to Consumer Respending).

Table 7-11
JOB ATTRACTION DUE TO HIGHWAY IMPROVEMENTS
St. Louis to St. Paul: Expressway Standard

	FULL-TIME JOBS ATTRACTED (a)			
JOBS ATTRACTED BY	**Route B**	**Route C**	**Route D**	**Route E**
Highway Construction Activity[b]	7,377	9,325	25,405	22,333
1986 Jobs:[c]				
Competitive Position[d]	304	188	451	284
Traveler Expenditures[e]	3,101	3,532	6,596	3,463
Total	3,405	3,720	7,047	3,747
2010 Jobs:				
Competitive Position[d]	460	326	683	430
Traveler Expenditures[e]	5,055	6,145	11,303	5,592
Total	5,515	6,471	11,986	6,022

(a) Jobs expressed as "Full-Time Equivalents" attracted to each route's "Primary Impact Area" due to the improved highway. Includes jobs created by the respending of money. These are job transfers and not to be included in state or federal decisions.
(b) Job years created during construction.
(c) Jobs that would exist if the highway improvements were already in place.
(d) Basic jobs in industries attracted by the reduced costs of doing business in the corridor.
(e) Roadside service jobs attracted by the increased traffic volumes. These are job transfers and are not to be included in state or federal decisions.

SOURCE: Wilbur Smith Associates

The Table 7-11 jobs are expressed as "Full Time Equivalent" jobs. The Construction jobs are job years involved in improving the highways, including respending. The Competitive Position and Traveler Expenditure jobs are jobs that will continue to exist as long as the road improvements are functioning. An important point, however, is that most of these jobs are "transfers." For example, the jobs created by construction could have existed elsewhere if the construction funds had been used elsewhere. The Competitive Position jobs were attracted from other regions, and the Traveler Expenditure jobs were attracted from other parallel highways in this region of the country.

From the point of view of each route's primary impact area, however, the job benefits are very real and indicate that more jobs will be attracted to the Route D impact area than to the other route impact areas.

Total Economic Benefits of the Expressway Option

The total quantifiable economic benefit of completing a four-lane expressway (55 mph travel speed) between St. Louis and St. Paul comprises four benefit types:

1. Travel Efficiency Benefits - These are economic resource benefits that are of benefit to national, state and local economies and therefore represent "net" benefits to the economy.

2. Construction Expenditure Benefits - These are benefits that accrue to the local "primary impact area" economies when construction dollars are spent locally. They are relevant locally, but should never be used to justify the highway improvement because they are "transfers."

3. Competitive Position Benefits - These are benefits that accrue to "primary impact area" economies when improved transport efficiency reduces the total cost of doing business in the corridor. They comprise increases in manufacturing activity and other actitivies and they are benefits at the local level, could be construed as benefits to the states, but should be thought of as transfers at the national economy level.

4. Traveler Expenditure Benefits - These are roadside business benefits that also accrue to the "primary impact area" economies. They are legitimate economic benefits at the local level, but they are "transfers" at the state and national levels.

Table 7-12 summarizes the estimated total economic benefits in the year 2010. Which of these benefits to include in the route decision depends on one's viewpoint:

- National Decision - At the federal level, "travel efficiency benefits" should certainly be a key criterion, since they are net increases in productivity. The economic development benefits (competitive position and traveler expenditures) might also be considered, but only if it is national policy to assist in the economic development and economic diversification of rural and agricultural areas.

- **State Decision** - At the states' level, "travel efficiency benefits" should also be a key criterion, and quite likely "competitive position benefits" should also be considered. "Traveler expenditure benefits" should be considered only if it is state policy to assist in the development of these route areas at the expense of other routes in the state.

- **Primary Impact Area** - At the local area (along the route), all of these benefit types are relevant to the decision.

Table 7-12
TOTAL ANNUAL ECONOMIC BENEFITS
St. Louis to St. Paul Four-Lane: Expressway Standard
Year 2010

	ANNUAL ECONOMIC BENEFITS ($ Millions)			
	Route B	Route C	Route D	Route E
TRAVEL EFFICIENCY BENEFITS[a]				
Vehicle Operating Cost Savings	$ 23.19	$ 8.72	$ 36.04	$ -2.87
Accident Cost Savings	11.47	17.27	16.61	13.91
Travel Time Savings	24.91	21.91	63.19	28.08
Total Travel Efficiency	$ 59.57	$ 47.90	$115.84	$ 39.12
ECONOMIC DEVELOPMENT BENEFITS				
Improved Competitive Position[b]	$ 8.06	$ 5.78	$ 11.94	$ 7.60
Travel Expenditures[c]	64.06	77.47	143.38	71.06
Total Economic Development	$ 72.12	$ 83.25	$155.32	$ 78.66
TOTAL ECONOMIC BENEFITS	**$131.69**	**$131.15**	**$271.16**	**$117.78**

(a) Of benefit to national, state and local economies (from Table 6-2).
(b) Of benefit to state and local corridor economies (from Table 7-5).
(c) Of benefit to local corridor economies (from Table 7-9).

NOTE: Excludes benefits of the act of road construction.

SOURCE: Wilbur Smith Associates

Within the context of which economic benefits to include in the decision process, Table 7-12 indicates the following:

1. Route D creates greater travel efficiency benefits than do any of the other routes. In this respect, Route D is about twice as beneficial as are Routes B, C or E.

2. Route D is also more effective in attracting economic development benefits.

3. On an economic benefits basis, Route D is the best route.

Table 7-13
OVERALL ECONOMIC FEASIBILITY OF EACH ROUTE
St. Louis to St. Paul: Expressway Standard

FEASIBILITY ACCORDING TO ECONOMIC BENEFIT TYPE	ECONOMIC FEASIBILITY INDICATORS Route B	Route C	Route D	Route E
NET PRESENT VALUE ($ Million) [a]				
Travel Efficiency (by itself) [b]	$ 74.4	$ -72.1	$-361.1	$-633.6
Competition Position (by itself) [c]	$-235.0	-329.3	-970.6	-819.6
Travel Expenditures (by itself) [d]	$ 104.2	99.1	-184.5	-433.8
Travel Eff. + Comp. Position	$ 124.3	$ -37.6	$-287.1	$-586.1
Travel Eff. + Comp. Pos. + Travel Exp.	$ 513.6	425.3	572.9	-153.2
BENEFIT/COST RATIO: [a]				
Travel Efficiency (by itself) [b]	1.3	.8	.7	.3
Competitive Positive (by itself) [c]	.2	.1	.1	.1
Travel Expenditures (by itself) [d]	1.4	1.3	.8	.5
Travel Eff. + Comp. Position	1.4	.9	.7	.3
Travel Eff. + Comp. Pos. + Travel Exp.	2.8	2.2	1.6	.8
INTERNAL RATE OF RETURN (%):				
Travel Efficiency (by itself) [b]	12.6%	7.8%	6.2%	.04%
Competitive Position (by itself) [c]	-2.6%	-5.5%	-6.9%	-8.1%
Travel Expenditures (by itself) [d]	13.6%	12.7%	8.1%	4.0%
Travel Eff. + Comp. Position	14.2%	8.9%	7.0%	1.1%
Travel Eff. + Comp. Pos. + Travel Exp.	25.5%	20.4%	15.2%	8.1%

(a) At 10% discount rate.
(b) This is the key criterion at the national level. It is a net impact.
(c) This is important locally, but a transfer at the national level (not a net impact nationally).
(d) This is important only along the route, but a transfer at the state and national levels (not a net impact).

SOURCE: Wilbur Smith Associates

Overall Economic Feasibility Findings of the Expressway Option

While Route D may generate the greatest economic benefits, it is also the most costly to improve to four lanes, and both benefits and costs should be included in the decision process. Table 7-13 presents the total, overall economic benefit and cost indicators of feasibility for each route. The feasibility indicators are also shown for each type of benefit. This all-inclusive economic feasibility table indicates that, from the economic standpoint and for the expressway option:

1. Route B is the most feasible of the various expressway route options in terms of both travel efficiency and economic development. Route C ranks second, Route D third, and Route E ranks a distant fourth.

2. Route B is economically feasible (see Chapter 8 for greater detail concerning which sections to build).

3. From a travel efficiency perspective (at 10 percent discount rate), only portions of Routes C and D are feasible (see Chapter 8). At a 6 percent constant dollar discount rate (see Chapter 6), Routes B, C or D are all economically feasible.

4. If one includes total economic development in the feasibility test, then Routes C and D are also feasible. Route E is not feasible, even when all benefit types are included.

5. Evidence from this study's inventories and calculations, as well as evidence compiled in other studies, suggests that most of the economic benefits will occur in the mid-sized and larger communities along the selected route. For example:

   - There is no real evidence that development along the corridor of a new or upgraded highway will occur in rural areas.

   - Smaller, rural communities located near major highways have not experienced significantly different growth rates that those located in other places.

   - The greatest increases in economic activity following a highway investment have taken place in communities along the corridor that are near metropolitan areas.

   - In some cases, highway investments have spurred relocation of retail activities from smaller communities to metropolitan areas.

   - Occasionally, light industry has located in smaller communities within easy shipping distance to a metropolitan area, but there is little evidence to suggest that four-lane versus two-lane highways influence this location.

6. Travel efficiency should be the key decision criterion at the national level.

Chapter 8

EXPRESSWAY STAGING FEASIBILITY

Construction of a four-lane highway between St. Louis and St. Paul will likely occur over a potentially lengthy time period. This implies that portions of the highway will be built first, and other portions will be built last. To gain insights into which road section types are most feasible, and which section types might be built first, this study examined three distinct highway improvement categories.

Three Highway Improvement Categories

To determine which project types are most feasible, each of the four finalist routes were divided into three improvement categories: 1) town bypasses, 2) large city bypasses, and 3) rural sections. Table 8-1 lists the miles of road construction projects associated with each of the three improvement types. Table 8-1 also lists the number of cities and towns associated with each of the two bypass categories.

Each improvement category was evaluated as a grouping of projects. For example, all bypasses around towns were evaluated together. As a result, conclusions are possible regarding the type of project (town bypasses versus urban bypasses versus rural sections) but are not possible regarding specific towns, specific urban places, or specific rural sections.

Table 8-1
NEW CONSTRUCTION ROUTE MILES
St. Louis to St. Paul: Expressway Standard

	MILES OF HIGHWAY TO BE BUILT[a]			
	Route B	Route C	Route D	Route E
Town Bypasses	39	34	84	46
Urban Bypasses	31	36	36	48
Rural Sections	66.4	116	238.3	231
Total Miles	136.4	186	358.3	325

	NUMBER OF BYPASSES INVOLVED			
	B	C	D	E
Town Bypasses	13	14	36	20
Urban Bypasses	3	3	4	3

---

[a] Miles of two-lane road not yet programmed for four-lane.

SOURCE: Wilbur Smith Associates

Town Bypasses - The bypasses designated as "town bypasses" represent generally smaller places wherein bypass construction will typically be less expensive than will be the bypasses around the "urban" places. In the evaluation, the costs and benefit calculations assume that town bypass right-of-way will be purchased for a four-lane bypass, but only two-lanes will initially be constructed. The right-of-way for the other two-lanes will be reserved, and widened to a four-lane later, as demand warrants and funding allows.

Urban Bypasses- The bypasses designated as "urban bypasses" are generally around the larger cities and/or represent bypasses that will be more expensive to construct. Cities where bypasses already exist (Dubuque, Iowa City, etc.) and cities where bypasses are already programmed (Waterloo/Cedar Falls for Route B) are excluded from the list and from the benefit/cost calculation. Urban bypass construction is assumed to be four-lane.

Rural Sections - Each route's rural sections comprise the road sections not included as town or urban bypasses. Costs and benefits included in the rural sections are due to the widening of the rural sections from two to four-lanes as well as the widening of the town bypasses to four-lanes.

Capital Costs by Highway Improvement Category

The estimated costs of planning, designing and constructing each of the three highway types (town bypasses, urban bypasses, rural sections) to a 55 mph travel speed are summarized in Table 8-2. The town bypass costs are for four-lane right-

Table 8-2
CAPITAL COSTS BY HIGHWAY IMPROVEMENT CATEGORY
55 mph Travel Speed

HIGHWAY IMPROVEMENT CATEGORY	CAPITAL COST ($Million)			
	Route B	Route C	Route D	Route E
Town Bypasses	$27.77	$30.30	$162.05	$97.25
Urban Bypasses	73.70	86.30	203.00	216.00
Rural Sections	257.07	341.00	952.13	779.04
Total Cost	**$358.54**	**$457.60**	**$1,317.18**	**$1,092.29**

SOURCE: Wilbur Smith Associates

of-way acquisition and two-lane construction, the urban bypass costs include right-of-way and four-lane construction, and the rural section costs include widening the rural sections from two to four-lanes as well as constructing an additional two lanes (to provide a four-lane section) on the town bypasses.

Travel Efficiency Benefits by Highway Improvement Category

One goal of the proposed St. Louis to St. Paul highway is to improve travel efficiency. Improving travel efficiency means that motorists are able to travel somewhere faster, at less cost, and/or in a safer manner.

Each of the Highway Improvement Categories attempts to reduce inefficiencies in the existing highway network. Building town typasses should increase the efficiency of travel for motorists not intending to stop in a particular community by permitting them to bypass the downtown area. Today, in most of the small communities within the study area, traffic is required to decelerate from the average rural operating speed of approximately 50 mph, to whatever the posted speed limit is within the town limits (typically 25 to 35 mph) and then to reaccelerate to 50 mph after passing through the town. The "speed change cycle" usually consumes more of a motorist's travel time than traveling slightly longer distance on a bypass at a constant speed. Vehicle operating costs (including fuel consumption) are also sensitive to speed change cycles, and it should be noted that, in addition to the speed change cycle caused by the town's speed limit, there may be several other speed change cycles caused by traffic entering or exiting the highway from local streets and driveways. The envisaged access controlled nature of the bypasses would eliminate these local traffic inspired speed change cycles as well as the accident potentials they create.

The travel efficiencies anticipated for major urban bypasses are similar, but potentially greater than those of town bypasses. Urban bypasses will permit motorists to avoid slowing down to urban speed limits in the 30 to 40 mph range as well as the need to come to complete stops at traffic signals and stop signs which may control the flow of traffic along a particular route. Obviously, such flow patterns would result in a series of speed cycle changes and associated travel penalities, as well as increases in vehicle operating costs. The larger amount of vehicular movements within the urban area also creates additional speed change cycles and increased accident potentials.

Widening the rural sections from two to four lanes will also increase travel efficiency, although not necessarily to the degree of bypasses. First, there are more subtle speed change cycles associated with two lane rural traffic operations. These occur when faster moving vehicles are trapped behind slower moving vehicles. By widening to four lanes, faster traffic can pass slower traffic at just about any time rather than waiting for a level, straight segment of road with no traffic moving in the opposite direction. Thus, average travel speed on rural segments would be expected to increase from 50 to 55 mph when widened to four lanes. Accident potentials have also been found to decline on multi-lane rural highways, although not to the same degree as the accident savings observed between urban and bypass facilities.

To measure travel efficiency economic benefits by highway improvement category, the traffic model was run three times in a sequence:

1. **Town Bypasses** - The model was run with only the two-lane town bypasses in place, and travel efficiency benefits were subsequently estimated.

2. **Town and Urban Bypasses** - The model was then run with the town two-lane bypasses and the urban four-lane bypasses in place, and the travel efficiency benefits were subsequently estimated for all bypasses combined.

3. **Total 55 mph Test** - The model was then run for a four-lane highway all the way from St. Louis to St. Paul, and total travel benefits were calculated.

The benefits of the urban bypasses were taken as the difference between model runs #1 and #2, and the rural section plus four-lane town bypass benefits are the difference between model runs #2 and #3.

The travel efficiency benefits for each route and highway improvement categories are summarized on Table 8-3. These statistics indicate a number of things:

1. Route D creates the greatest level of travel efficiency (nearly twice as much as the other routes).

2. The bypasses create greater travel efficiency benefits than do the rural segment improvements.

3. Travel efficiency benefits occur for all routes as well as for all savings types and improvement categories except that there are some vehicle operating cost disbenefits from rural sections. These isolated disbenefits are due to VMT increases caused by vehicles having to drive out of their way to get to the improved route.

Cost Effectiveness by Highway Improvement Category

To gain insights into these travel efficiency benefits, the year 2010 efficiency benefits are compared with the miles of route construction and the costs of highway construction on Table 8-4. The benefits per mile of road effectiveness measures indicate:

1. Hundreds of thousands of dollars of annual benefits (they occur every year) can be expected per mile of road to be widened from two- to four-lanes.

2. Route B creates the greatest travel efficiency per mile, with Route D second.

3. The town and urban bypasses create much more efficiency per mile than do the rural sections.

Table 8-3
ANNUAL HIGHWAY USER TRAVEL EFFICIENCY BENEFITS BY HIGHWAY TYPE
St. Louis to St. Paul: Expressway Standard
1986 and 2010

ROUTE/HIGHWAY TYPE IMPROVEMENT CATEGORY	ANNUAL ECONOMIC BENEFITS ($millions)							
	Vehicle Operating Costs		Accident Costs		Value of Travel Time Savings		Total Annual Efficiency Benefits	
	1986	2010	1986	2010	1986	2010	1986	2010
ROUTE B								
Town Bypasses	$ 4.09	$ 8.02	$ 1.17	$ 1.86	$ 4.05	$ 6.73	$ 9.31	$16.61
Urban Bypasses	$ 6.14	12.04	1.75	2.78	6.09	10.10	13.98	24.92
Total Bypasses	$10.23	20.06	2.92	4.64	10.14	16.83	23.29	41.53
Rural Sections	$ 2.88	3.13	4.40	6.83	4.98	8.08	12.26	18.04
Total Expressway	$13.11	23.19	7.32	11.47	15.12	24.91	35.55	59.57
ROUTE C								
Town Bypasses	$ 2.26	4.70	1.67	2.85	3.70	6.11	7.63	13.66
Urban Bypasses	$ 2.87	5.99	2.89	4.77	4.71	7.78	10.47	18.54
Total Bypasses	$ 5.13	10.69	4.56	7.62	8.41	13.89	18.10	32.20
Rural Sections	$ .61	-1.97	6.10	9.65	4.82	8.02	11.53	15.70
Total Expressway	$ 5.74	8.72	10.66	17.27	13.23	21.91	29.63	47.90
ROUTE D								
Town Bypasses	$11.60	26.98	5.94	10.26	15.07	26.65	32.61	63.89
Urban Bypasses	$ 9.12	21.20	2.43	4.18	11.84	20.94	23.39	46.32
Total Bypasses	$20.72	48.18	8.37	14.44	26.91	47.59	56.00	110.21
Rural Sections	$-2.43	-12.14	.76	2.17	8.90	15.60	7.23	5.63
Total Expressway	$18.29	36.04	9.13	16.61	35.81	63.19	63.23	115.84
ROUTE E								
Town Bypasses	$ -.40	1.75	2.83	4.58	5.61	9.19	8.04	15.52
Urban Bypasses	$ -.51	2.23	3.58	5.88	7.13	11.70	10.20	19.81
Total Bypasses	$ -.91	3.98	6.41	10.46	12.74	20.89	18.24	35.33
Rural Sections	$-2.38	-6.85	2.17	3.45	4.36	7.19	4.15	3.79
Total Expressway	$-3.29	-2.87	8.58	13.91	17.10	28.08	22.39	39.12

SOURCE: Wilbur Smith Associates

Table 8-4
COST EFFECTIVENESS COMPARISONS BY HIGHWAY IMPROVEMENT CATEGORY
St. Louis to St. Paul: Expressway Standard

HIGHWAY IMPROVEMENT CATEGORY	YEAR 2010 HIGHWAY USER BENEFITS PER ROUTE IMPROVEMENT MILE ($Millions)[a]			
	Route B	Route C	Route D	Route E
Town Bypasses	$ .425	$ .402	$ .761	$ .337
Urban Bypasses	$ .804	.515	1.287	.413
Total Bypasses	$ .593	.460	.918	.376
Rural Sections	$.272	.135	.024	.016
Total Expressway	**$ .437**	**$ .258**	**$ .323**	**$ .120**

	YEAR 2010 HIGHWAY USER BENEFITS PER CAPITAL INVESTMENT DOLLAR (Cents)[b]			
	Route B	Route C	Route D	Route E
Town Bypasses	59.8	45.1	39.4	16.0
Urban Bypasses	33.8	21.5	22.8	9.2
Total Bypasses	40.9	27.6	30.2	11.3
Rural Sections	7.0	4.6	.6	.5
Total Expressway	**16.6**	**10.5**	**8.8**	**3.6**

(a) Annual highway user travel efficiency benefits in the single year 2010 divided by the number of centerline miles of highway improvement from two- to four-lanes.

(b) Annual highway user travel efficiency benefits in the single year 2010 divided by the total capital cost of expanding from two- to four-lanes.

SOURCE: Wilbur Smith Associates

4. The urban bypasses are better, per mile, than are the town bypasses.

5. The greatest benefit per construction mile is the Route D urban bypasses, with the second best being the Route B urban bypasses.

6. Route E, on a benefit per construction mile basis, suffers in comparison with the other route options.

However, the effectiveness measures change when travel efficiency benefits are compared with the capital cost needed to create those efficiencies. The cost effectiveness measures on the lower portion of Table 8-4 indicate:

1. Route B generates that greatest travel efficiency per dollar spent.

2. The bypasses are signficantly more cost effective than are the rural sections.

3. The town bypasses are more cost effective than are the urban bypasses, due principally to the higher cost of building the urban bypasses.

4. The rural sections along Routes D and E are significantly less cost effective than on Routes B and C, due to the higher cost of Routes D and E.

5. All of the town and urban bypasses, on all routes, have cost effectiveness arguments in their favor.

Expressway Economic Feasibility Findings by Improvement Category

The true test of feasibility, however, is not the single year cost effectiveness but instead is the life cycle comparison of costs and benefits. Table 8-5 summarizes the feasibility indicators for each route and each highway improvement category. This table yields a number of findings:

1. On a total route basis (all the way from St. Louis to St. Paul), Route B is the most feasible (on a travel efficiency basis). In fact it is the only route that is completely feasible on this basis (B/C greater than 1.0, positive net present value, rate of return over 10 percent).

2. The town bypasses, on every route (B, C, D, E) are feasible and could be built.

3. The urban bypasses on Routes B, C and D are feasible and could be built.

4. Composite rural sections are less feasible, at this time, than the bypasses. This indicates that the bypasses could be built (both town and urban), and the rural construction projects could be delayed if sufficient funding is unavailable.

5. When the entire route is considered (St. Louis to St. Paul), Route B is best on an economic basis.

6. If the decision is made to build only the bypasses, the bypasses on Route D are economically better using net present value, while the bypasses on Route B are better using discounted benefit/cost and internal rate of return.

7. Construction of Route B, C and D bypasses are economically feasible. Route E is not economically feasible.

8. Because the analyses were done by improvement type rather than by specific improvement project (e.g., specific bypass or a specific rural section), conclusions about any specific bypass or specific rural section are not appropriate.

All of the above highway improvement type conclusions are based on travel efficiency. However, before final conclusions are reached, the economic development implications of each route could also be considered.

Table 8-5
ECONOMIC FEASIBILITY BY HIGHWAY TYPE
AS MEASURED BY ROAD USER TRAVEL EFFICIENCY BENEFITS
St. Louis to St. Paul: Expressway Standard

FEASIBILITY INDICATORS	**ECONOMIC FEASIBILITY INDICATORS** Route B	Route C	Route D	Route E
NET PRESENT VALUE ($ million)				
Town Bypasses	$76.2	$56.6	$241.9	$13.0
Urban Bypasses	89.4	41.7	107.6	-55.8
Rural Sections	-91.2	-170.4	-710.6	-590.3
Total NPV	**$74.4**	**-72.1**	**-361.1**	**-633.1**
DISCOUNTED BENEFIT/COST				
Town Bypasses	4.39	3.32	2.87	1.17
Urban Bypasses	2.52	1.61	1.67	.67
Rural Sections	.55	.37	.06	0.04
Total B/C	**1.26**	**.80**	**.65**	**.27**
INTERNAL RATE OF RETURN (%)				
Town Bypasses	37.01%	29.28%	25.49%	11.65%
Urban Bypasses	23.12%	15.66%	16.05%	6.43%
Rural Sections	4.68%	1.73%	-9.23%	-10.06%
Total Rate of Return	**12.57%**	**7.84%**	**6.15%**	**.04%**

Note: The above feasibility tests use a 10 percent discount rate. If a 6 percent constant dollar rate were used, any improvement type with an Internal Rate of Return of 6.00 percent or greater would be feasible, e.g., all bypasses on all routes. Also, no intra-zonal traffic is included. Therefore, these feasibility estimates are conservative.

SOURCE: Wilbur Smith Associates

Chapter 9

FREEWAY FEASIBILITY

All of the preceding analyses focused on the feasibility of constructing a four-lane St. Louis to St. Paul highway at an expressway design standard sufficient for vehicular travel at 55 mph (except for those sections that might already be 65 mph). One alternative to that expressway standard is construction of a St. Louis to St. Paul highway at "Freeway" standards. This "Freeway" option implies a 65 mph signed speed limit in rural areas, and a 55 mph limit speed within the urban areas.

The "Freeway" option does not involve the widening of existing highways from two to four lanes; rather, it generally involves the construction of four new lanes of highway, built on a combination of existing right-of-way and new right-of-way. As a result, the "Freeway" option would sometimes involve two highways in a given corridor -- the existing route, plus the new freeway, except in places where the freeway could use the existing highways or when the existing highway might be truncated.

To evaluate the Freeway option, this study conducted the same analyses at 65 mph as were conducted for the 55 mph expressway option. All freeway findings are summarized in this report chapter.

Freeway Cost Estimates

The cost of constructing the freeway (planning, design, right-of-way, construction) and the cost of maintaining the new freeway sections were estimated.

Freeway Capital Cost Estimate - Given the width, grade separation, gradient and curvature standards associated with freeway design, the total improvement costs of constructing to a freeway standard are considerably higher than building to an expressway design (29 percent to 90 percent higher, depending on the route).

Table 9-1 summarizes the miles of freeway highway that might be built for each route option and the estimated capital cost of such construction. The cost estimate is based on average freeway construction costs provided by each state highway agency. The cost estimates are therefore representative, but could change considerably, based on more detailed study and/or highway design.

Freeway Maintenance Cost Estimate - Data supplied by the states suggest that the average cost per mile spent on maintaining a freeway is $16,950. As a result, the freeway option will require significantly more annual maintenance expenditures than do the expressway alternatives. The annual maintenance costs for both design options for each route are summarized on Table 9-2.

Freeway Environmental Implications

The freeway option will likely have greater potential for adverse environmental impacts than will the expressway options. This is due to the design standard differences and the need to use new alignment. In order to permit higher travel speeds, freeways are built to higher design standards, including wider right-of-way, and more gradual horizontal and vertical curves. Therefore, not only will the freeway option require more right-of-way per mile of construction, but because more gradual

Table 9-1
FREEWAY CAPITAL COST ESTIMATE
St. Louis to St. Paul: Freeway Standard

	MILES AND COST ($ Million)			
	Route B	Route C	Route D	Route E
Miles of Freeway:				
Existing Freeway	192.0	62.0	41.0	150.0
To be Built:				
Improved Expressway	122.2	177.2	6.0	70.0
New Freeway	217.5	269.5	508.0	342.0
Total Improvements	339.7	446.7	514.0	412.0
Total Miles	531.7	508.7	555.0	562.0
Estimated Capital Cost ($ million)	$674.9	$874.0	$2,060.4	$1,411.2

SOURCE: Unit costs provided by state highway agencies; cost estimates by Wilbur Smith Associates.

Table 9-2
ANNUAL MAINTENANCE COST ESTIMATES
St. Louis to St. Paul: Freeway vs. Expressway

	ANNUAL MAINTENANCE COST INCREASES	
ROUTE	Freeway Option	Expressway Option
B	$4,693,600	$294,600
C	6,028,200	401,800
D	8,660,000	773,900
E	6,373,700	702,000

SOURCE: Unit costs provided by state highway agencies; cost estimates by Wilbur Smith Associates.

curves must be used, the alignment may have less flexibility to avoid sensitive areas and may require slightly more cut and fill in rolling terrain. As shown on Table 9-3, the freeway options will also require more miles of highway construction than will the expressway options.

Table 9-3
COMPARISON OF NEW CONSTRUCTION REQUIREMENTS
St. Louis to St. Paul: Freeway vs. Expressway

	MILES OF HIGHWAY			
	Route B	Route C	Route D	Route E
Miles of New Freeway	217.5	269.5	508.0	342.0
Miles of Unprogrammed Highway Improvement (Expressway)	136.4	186	358.3	325.0
Percent Change	+59.5	+44.9	+41.8	+5.2

Because of the wider right-of-way required for freeways, and because most of the freeway would have to be built on new alignment, the freeway options will require the acquisition of more acres of right-of-way, as shown on Table 9-4.

Table 9-4
RIGHT-OF-WAY REQUIREMENTS
St. Louis to St. Paul: Freeway vs. Expressway

	ACRES OF LAND NEEDED			
	Route B	Route C	Route D	Route E
Freeway	9,200	11,400	21,550	14,500
Expressway	2,500	3,400	6,500	5,900
Percent Increase	268.0	235.3	231.5	145.8

Without detailed alignments, it is not possible to conduct a detailed study to be certain whether the freeway option is environmentally acceptable or not. Being on new alignment, it will certainly remove considerable quantities of land from agricultural production, and it will require new river crossings. Since major portions of the route would be on new alignment, however, it could be aligned to avoid some environmentally sensitive areas. There is insufficient environmental knowledge, at this time, to reject any freeway route option for environmental reasons.

Freeway Travel Demand Evaluation

To analyze the potential travel and economic implications of constructing to a freeway standard, the study's traffic assignment procedures were modified. The expressway assignments assumed that all improvements (with the exception of city bypasses and very limited new construction) would occur along existing roadways. However, with the freeway option, essentially a new highway would be constructed, paralleling the existing B, C, D or E alignments.

Freeway alignments were not identified in this study. For analysis purpose the freeway options were assumed to be located some distance away from the existing routes (1-10 miles) and, therefore, would require residents of cities along the existing roads to travel additional distances to access the freeway (over that required to get to the expressway option).

The problem presented in estimating usage of the candidate freeway alignments was that travelers could have two potential routes to choose from: the existing route, with close in access that might better serve relatively short trips; and the freeway option that would require traveling some distance out of one's way to get to the freeway but would offer significant travel time savings for longer trips.

To estimate the diversion between the two highway types, it was assumed that trips saving at least 15 minutes by using the freeway option would choose this route. Other trips, where the freeway would save less than 15 minutes were assumed to remain on their next best (in terms of travel time) alternative route. Table 9-5 presents the average daily traffic volume estimated for each alternative freeway alignment under this set of assumptions. This "freeway" volume applies to the freeway alignment when the existing route would be eliminated; when both the freeway and the existing route parallel each other and exist, the Table 9-5 volumes refer to both routes combined.

Table 9-5
ESTIMATED AVERAGE FREEWAY TRAFFIC VOLUME
St. Louis to St. Paul: Freeway Standard

	DAILY AVERAGE TRAFFIC VOLUMES[a]			
	Route B	Route C	Route D	Route E
1986	6,300	5,730	6,220	4,200
2010	10,010	9,410	10,400	6,980

(a) Total inter-zonal VMT divided by the route's length. Excludes intra-zonal traffic such as that near cities.

SOURCE: Wilbur Smith Associates

As indicated on Table 9-5, forecast traffic volumes for the freeway options are quite low, even for the 2010 forecast year. Existing Interstate highways in the corridor (I-35, etc.) currently carry 10,000 to 25,000 vehicles per day on most sections. In some places the freeway route would "compete" with the existing highway. In those places the traffic projections on the St. Louis to St. Paul freeway routes would actually be less than similar traffic projections for the improved primary highway alternative (expressway option). The average traffic volumes for rural segments of each route as a freeway (65 mph) and as an improved primary highway (expressway) are summarized on Table 9-6.

Table 9-6
ESTIMATED DAILY TRAFFIC VOLUMES
Freeway vs. Expressway Option
1986 and 2010

	AVERAGE DAILY ESTIMATED TRAFFIC			
	Route B	**Route C**	**Route D**	**Route E**
Year 1986:				
Freeway Option:				
New Freeway[(a)]	6,290	5,740	6,220	4,300
Existing Route	4,230	4,920	2,420	3,560
Total[(b)]	10,520	10,660	8,640	7,860
Expressway Option:				
Improved Route	10,250	10,340	7,720	7,550
Do Nothing "Base" Option	8,890	8,680	4,950	6,090
Year 2010:				
New Freeway[(a)]	10,000	9,200	10,400	6,980
Existing Route	6,680	8,060	3,970	5,890
Total[(b)]	16,680	17,260	14,370	12,870
Expressway Option:				
Improved Route	16,260	16,890	12,990	12,380
Do Nothing "Base" Option	14,040	14,000	8,230	10,010

(a) This is the freeway volume when the freeway parallels and competes with the existing highway.

(b) This is the freeway volume when the freeway takes the place of the existing highway.

NOTE: All volumes on this table are inter-zonal VMT divided by route length. No intra-zonal traffic is included.

SOURCE: Wilbur Smith Associates

Using route-wide averages for traffic volumes, the expressway options would all provide travel over the St. Louis to St. Paul highway at a level of service "A" in the base condition, and at a level of service "B" or better in the year 2010. Such conditions permit uninterrupted flow at prevailing speed limits with little or no restrictions on manueverability. Therefore, from a capacity needs standpoint, the freeway option is not justified. Furthermore, 20 to 25 percent of the traffic on the new freeways would be traffic diverted from the existing Interstates (I-35 and I-90/94). Considering the above, it is suggested that the forecast traffic volumes do not warrant serious consideration of implementing the freeway option, at least at present.

Freeway Travel Efficiency Results

While the freeway standard will cost more than the expressway option, the freeway standard yields travel efficiency benefits which also exceed those of the lower expressway standard.

Travel Efficiency Economic Benefits - In terms of travel efficiency, the higher speeds on the freeway have three impacts:

1. **Vehicle Operating Costs (VOC)** - Per mile vehicle operating costs are typically greater at 65 mph than they are at 55 mph (fuel consumption increases, etc.) Therefore, there is typically a vehicle operating cost disbenefit associated with the speed increases. In some instances, however, VMT reductions save more vehicle operating costs than caused by the speed increases. In these instances there is a VOC benefit due to the highway improvement.

2. **Travel Time** - On every route the freeway option's higher average travel speeds save travel time, with consequent economic travel time savings on the rural links. In urbanized areas, freeway speed limits would be 55 mph as prescribed by law. Therefore, in the urban areas, the freeway option is comparable to the 55 mph option.

3. **Accidents** - The higher design of the freeway standard is safer, with resulting accident cost savings, despite the higher average travel speeds.

Table 9-7 summarizes the travel efficiency benefits associated with the construction of a freeway 65 mph highway between St. Louis and St. Paul. For comparison purposes, the respective benefits associated with the expressway option are also shown.

The travel efficiency benefits that would be caused by construction of a freeway are clearly much greater than those associated with an expressway. The percent increase in travel efficiency in going from expressway to a freeway is shown below:

	Percent Increase in Travel Efficiency Due to Freeway			
Year	Route B	Route C	Route D	Route E
1986	+40%	+71%	+117%	+160%
2010	+22%	+46%	+102%	+104%

Table 9-7
ESTIMATED TRAVEL EFFICIENCY ECONOMIC BENEFITS OF THE FREEWAY OPTION
St. Louis to St. Paul: Freeway vs. Expressway
1986 and 2010

ANNUAL ECONOMIC BENEFITS	ANNUAL ECONOMIC BENEFITS ($millions) Route B	Route C	Route D	Route E
Year 1986:				
Vehicle Operating Cost Savings				
Freeway	$ .19	$ -7.21	$ 43.39	$ 1.25
Expressway	$ 13.11	5.74	18.29	-3.29
Accident Cost Savings				
Freeway	$ 20.77	26.63	41.92	28.03
Expressway	$ 7.32	10.66	9.13	8.58
Travel Time Savings				
Freeway	$ 28.93	31.47	52.31	29.11
Expressway	$ 15.12	13.23	35.81	17.10
Total Benefits				
Freeway	$ 49.89	50.89	137.62	58.39
Expressway	$ 35.55	29.63	63.23	22.39
Year 2010:				
Vehicle Operating Cost Savings				
Freeway	$ -6.33	-25.18	72.65	-14.26
Expressway	$ 23.19	8.72	36.04	-2.87
Accident Cost Savings				
Freeway	$ 32.62	43.27	69.47	45.21
Expressway	$ 11.47	17.27	16.61	13.91
Travel Time Savings				
Freeway	$ 46.86	52.21	92.42	48.68
Expressway	$ 24.91	21.91	63.19	28.08
Total Benefits				
Freeway	$73.15	70.30	234.54	79.63
Expressway	$59.57	47.90	115.84	39.12

NOTE: The travel efficiency benefits for the expressway are shown on this table merely for comparison purposes.

SOURCE: Wilbur Smith Associates

These efficiencies associated with the freeway option are due to the time savings caused by the higher speeds, and the accident savings associated with the safer freeway design standards. The most important travel efficiency benefit findings from Table 9-7 and from the above statistics are:

1. Construction to a freeway standard will create greater travel efficiencies than using an expressway standard.

2. The freeway standard is more effective in creating efficiencies on the east side of the corridor (Routes D and E) than on the west side of the corridor (Routes B and C).

<u>Travel Efficiency Economic Evaluation</u> - The freeway option was subjected to the same three tests of economic feasibility as was the expressway option. The results based on Travel Efficiency (exclusive of Economic Development benefits) are summarized on Table 9-8.

The Table 9-8 feasibility indicators are limited to feasibility in the travel efficiency sense and, from that perspective, indicate a number of things:

1. When economic benefits are limited to travel efficiency (exclude economic development benefits), no end-to-end freeway standard route is feasible (at 10 percent discount rate).

2. For Routes B and C, the expressway standard is more feasible than is the freeway standard.

3. For Routes D and E, the freeway standard is more feasible than is the expressway standard.

This implies that, on an efficiency basis, if an expressway standard is to be implemented, the selected route should be Route B or conceivably Route C. If a freeway standard is to be implemented, then Route D should seriously be considered (as an equal to Route B in terms of feasibility).

<u>Travel Efficiency Feasibility at Six Percent Discount Rate</u>

As is the case with the expressway option, the above freeway analyses are calculated with a 10 percent discount rate. Earlier in this report the rationale for examining the results using a lower 6 percent discount rate was discussed. As was done in the expressway analysis, a sensitivity test is carried out for the freeway option using a 6 percent discount rate.

Table 9-9 lists the freeway feasibility indicators at 6 percent. As shown, at this rate a freeway built on Route B, or C, or D would be feasible in the travel efficiency sense.

Table 9-8
ECONOMIC FEASIBILITY AS MEASURED BY ROAD USER TRAVEL EFFICIENCY BENEFITS
St. Louis to St. Paul: Freeway Standard

	ECONOMIC FEASIBILITY INDICATORS			
	Route B	Route C	Route D	Route E
Freeway Feasibility				
Net Present Value ($ million)[a]	$-108.1	$-284.8	$-278.0	$-649.7
Discounted Benefit/Cost Ratio[a]	.81	.61	.84	.44
Internal Rate of Return (%)	7.78%	5.15%	8.19%	2.61%
Expressway Feasibility				
Net Present Value ($ million)[a]	$74.4	$-72.1	$-361.1	$-633.6
Discounted Benefit/Cost Ratio[a]	1.26	.80	.65	.27
Internal Rate of Return (%)	12.57%	7.84%	6.15%	.04%

(a) At 10 percent discount rate.

Note: This travel efficiency feasibility test should be included in the federal decision.

SOURCE: Wilbur Smith Associates.

Table 9-9
ECONOMIC FEASIBILITY AS MEASURED BY ROAD USER TRAVEL EFFICIENCY BENEFITS AT 6 PERCENT
St. Louis to St. Paul: Freeway Standard

	ECONOMIC FEASIBILITY INDICATORS			
	Route B	Route C	Route D	Route E
Net Present Value ($ million)[a]	$133.0	$-75.3	$518.0	$-441.8
Discounted Benefit/Cost Ratio[a]	1.21	.91	1.28	.66
Internal Rate of Return (%)	7.78%	5.15%	8.19%	2.61%

(a) At 6% discount rate

Note: This travel efficiency feasibility test should be included in the federal decision.

SOURCE: Wilbur Smith Associates

Economic Development Benefits Attributable to Freeway Standard

The freeway options were subjected to the same economic development tests as were the expressway options. The same two categories of economic development inputs were used: 1) impacts due to improved "competitive position," and 2) impacts due to traveler expenditures.

Competitive Position Economic Impacts - The travel efficiencies associated with the higher speeds of the freeway option will reduce the costs of doing business in the primary impact area near the new freeway. These reduced costs will make the area better able to compete for commerce and industry and, as such industries are expanded, economic development benefits will occur.

Utilizing the methods described earlier, the "direct" impacts associated with these improved competitive positions were estimated, then run through the IMPLAN Model. These direct impacts are summarized on Table 9-10. These calculations suggest:

1. All four route economies would benefit from the freeway.
2. The area surrounding Route D would benefit the most. This is because Route D would create greater travel efficiencies than would the other routes.
3. The competitive advantages afforded by Routes B, C and E are about the same.

The overall competitive advantage benefits as calculated by the IMPLAN Model are listed on Table 9-11. The results are very similar to the direct impact results -- Route D is more effective in creating competitive advantage economic benefits.

Traveler Expenditure Economic Impacts - The freeway will divert traffic from other regional highways and will generally help the tourism industries in the region. This is caused by increasing numbers of visitors to the region as well as more vehicles on the highway, all of which cause increased expenditures.

Table 9-12 summarizes the economic benefits estimated to be due to these increased traveler expenditures. Because Route D is more effective in diverting traffic, it will have the greatest benefit to its primary impact area. Once again, however, it is important to understand that these traveler expenditure benefits are "transfers" -- from other parts of the region.

Job Increases - Both the competitive advantage impacts as well as the traveler and visitor expenditure impacts will create new jobs in the route's primary impact area. These job estimates are summarized on Table 9-13. These are jobs that should continue to exist as long as the highway is functioning.

The freeway option is shown to cause the attraction of between 4,000 and 17,000 jobs through the year 2010. Route D is shown to be the most effective in job creation, although all route areas would benefit. Once again, however, most of these jobs are transfers from other routes in other parts of the Upper Midwest of the U.S.

Table 9-10
ANNUAL DIRECT ECONOMIC IMPACTS DUE TO IMPROVED COMPETITIVE POSITION
St. Louis to St. Paul: Freeway Standard

	Route B	Route C	Route D	Route E
Primary Impact Area				
Final Demand ($ Million):				
1986[(a)]	$102,904.2	$106,350.7	$103,988.8	$106,350.7
2010[(b)]	$155,968.8	161,192.6	157,612.7	161,192.6
Trucking Share of Final Demand (%)[(c)]	2.97	2.97	2.97	2.97
Trucking Cost Reduction (%)[(d)]				
1986	.483	.476	1.690	.540
2010	.388	.350	1.283	.374
Impact Factor				
1986	.0001434	.0001413	.0005019	.0001603
2010	.0001152	.0001039	.000381	.000111
Impact Due to Improved				
Competitive Position ($ Million):				
1986	$14.76	$15.03	$52.19	$17.05
2010	$17.97	16.75	60.05	17.89

(a) IMPLAN Final Demand at 1989 price levels.
(b) Increased at two percent per year compounded in constant price levels.
(c) Purchases from trucking divided by corridor "intermediate demand".
(d) Truck operating cost and travel time percent reduction throughout corridor due to highway improvements.

SOURCE: Wilbur Smith Associates

Table 9-11
ECONOMIC IMPACT DUE TO IMPROVED COMPETITIVE POSITION ALONG EACH ROUTE'S PRIMARY IMPACT AREA[(a)]
St. Louis to St. Paul: Freeway Standard
1989 Price Levels

	ANNUAL ECONOMIC IMPACT			
	Route B	Route C	Route D	Route E
1986 ECONOMIC IMPACTS	($ Million Dollars)			
DIRECT COMPETITIVE POSITION	$14.76	$15.03	$52.19	$17.05
TOTAL ECONOMIC IMPACT[(b)]				
Economic Activity[(c)]	$34.91	34.87	117.26	37.59
Final Demand[(d)]	$28.83	23.93	79.95	25.69
Value Added				
Wages[(e)]	$ 9.65	9.88	33.07	10.64
Other[(f)]	$ 6.88	6.74	22.40	7.16
Total[(g)]	$16.53	16.62	55.47	17.80
JOBS IMPACT[(h)]				
Job Years (FTE)	552	559	1,893	602
2010 ECONOMIC IMPACTS				
DIRECT COMPETITIVE POSITION	$17.97	$16.75	$60.05	$17.89
TOTAL ECONOMIC IMPACT[(b)]				
Economic Activity[(c)]	$42.50	38.86	134.92	39.44
Final Demand[(d)]	$29.01	26.67	91.99	26.96
Value Added				
Wages[(e)]	$11.75	11.01	38.05	11.16
Other[(f)]	$ 8.37	7.51	25.77	7.52
Total[(g)]	$20.12	18.52	63.82	18.68
JOBS IMPACT[(h)]				
Job Years (FTE)	672	623	2,178	632

(a) Impact on St. Louis and St. Paul MSA's plus intermediate counties along route.
(b) Total annual impacts due to improved competitive position.
(c) Total commodity output, involving total value of each commodity produced by all industries due to truck efficiencies.
(d) Sum of all purchases for final use or consumption due to road efficiencies.
(e) Total local payroll costs due to road efficiencies.
(f) Indirect business taxes (sales and excise), proprietary income, corporate income, rental income, interest and corporate transfer payments.
(g) Sum of employee compensation, proprietary income, indirect business taxes and other property income attributable to the road efficiencies.
(h) Total job years attributable to economic expansion including respending.

SOURCE: Wilbur Smith Associates

Table 9-12
ECONOMIC IMPACT DUE TO INCREASED TRAVELER EXPENDITURES ALONG EACH ROUTE'S PRIMARY IMPACT AREA[(a)]
St. Louis to St. Paul: Freeway Standard
1989 Price Levels

	ANNUAL ECONOMIC IMPACT			
	Route B	Route C	Route D	Route E
1986 ECONOMIC IMPACTS	($ Million Dollars)			
DIRECT TRAVEL EXPENDITURES	$52.8	$60.8	$123.7	$59.7
TOTAL ECONOMIC IMPACT[(b)]				
Economic Activity[(c)]	$159.73	180.15	380.46	179.83
Final Demand[(d)]	$106.21	119.85	252.86	119.89
Value Added				
Wages[(e)]	$ 47.13	52.99	111.42	52.87
Other[(f)]	$ 36.70	41.38	87.57	41.37
Total[(g)]	$83.83	94.37	198.99	94.34
JOBS IMPACT[(h)]				
Job Years (FTE)	3,720	4,202	8,784	4,169
2010 ECONOMIC IMPACTS				
DIRECT TRAVEL EXPENDITURES	$85.5	$100.2	$205.5	$99.2
TOTAL ECONOMIC IMPACT[(b)]				
Economic Activity[(c)]	$258.17	296.89	632.04	298.82
Final Demand[(d)]	$171.67	197.52	420.07	199.22
Value Added				
Wages[(e)]	$76.17	87.33	185.09	88.02
Other[(f)]	$ 59.32	68.20	145.48	68.75
Total[(g)]	$135.49	155.53	330.57	156.77
JOBS IMPACT[(h)]				
Job Years (FTE)	6,012	6,925	14,593	6,927

(a) Impact on St. Louis and St. Paul MSA's plus intermediate counties along route.
(b) Total annual impacts due to increased traveler expenditures.
(c) Total commodity output, involving total value of each commodity produced by all industries due to increased traveler expenditures.
(d) Sum of all purchases for final use or consumption due to traveler expenditures.
(e) Total local payroll costs due to increased traveler expenditures.
(f) Indirect business taxes (sales and excise), proprietary income, corporate income, rental income, interest and corporate transfer payments.
(g) Sum of employee compensation, proprietary income, indirect business taxes and other property income attributable to the increased traveler expenditures.
(h) Total job years attributable to economic expansion including respending.

SOURCE: Wilbur Smith Associates

Table 9-13
JOB ATTRACTION DUE TO HIGHWAY IMPROVEMENTS
St. Louis to St. Paul: Freeway Standard

JOBS ATTRACTED BY	FULL-TIME JOBS ATTRACTED (a)			
	Route B	Route C	Route D	Route E
1986 Jobs:[b]				
Competitive Position [c]	552	559	1,893	602
Traveler Expenditures[d]	3,720	4,202	8,784	4,169
Total	4,272	4,761	10,677	4,771
2010 Jobs:				
Competitive Position[c]	672	623	2,178	632
Traveler Expenditures[d]	6,012	6,925	14,593	6,927
Total	6,684	7,548	16,771	7,559

(a) Jobs expressed as "Full-Time Equivalents" attracted to each route's "Primary Impact Area" due to the freeway. Includes jobs created by the respending of money.
(b) Jobs that would exist if the freeway was already in place.
(c) Basic jobs in industries attracted by the reduced costs of doing business in the corridor.
(d) Roadside service jobs attracted by the increased traffic volumes.

SOURCE: Wilbur Smith Associates

Total Economic Benefits of Freeway Option

The total economic benefits of each route comprise 1) the travel efficiency benefits, 2) the benefits of improved competitive position, and 3) the traveler expenditure benefits. To those who live in the primary impact area, all three are important. To the nation as a whole, only the travel efficiency benefits are relevant; unless it is national public policy to aid rural agricultural areas, in which case all benefit types might be relevant.

Within the context of which economic benefits to include in the decision process, Table 9-14 indicates the following:

1. Freeway Route D would create significantly greater (three times more) travel efficiency benefits than would any of the other routes.

2. Freeway Route D is also more effective in attracting economic development benefits.

3. On an economic benefits basis, Route D is the best of the freeway route options.

Table 9-14

TOTAL ANNUAL ECONOMIC BENEFITS

St. Louis to St. Paul Four-Lane: Freeway Standard

Year 2010

	ANNUAL ECONOMIC BENEFITS ($ Millions)			
	Route B	Route C	Route D	Route E
TRAVEL EFFICIENCY BENEFITS[a]				
Vehicle Operating Cost Savings	$ -6.33	$-25.18	$ 72.65	$-14.26
Accident Cost Savings	32.62	43.27	69.47	45.21
Travel Time Savings	46.86	52.21	92.42	48.68
Total Travel Efficiency	$ 73.15	$ 70.30	$234.54	$ 79.63
ECONOMIC DEVELOPMENT BENEFITS				
Improved Competitive Position[b]	$ 11.75	$ 11.01	$ 38.05	$ 11.16
Travel Expenditures[c]	76.17	87.33	185.09	88.02
Total Economic Development	$ 87.92	$ 98.34	$223.14	$ 99.18
TOTAL ECONOMIC BENEFITS	**$161.07**	**$168.64**	**$457.68**	**$178.81**

(a) Of benefit to national, state and local economies.
(b) Of benefit to state and local corridor economies.
(c) Of benefit to local corridor economies.

NOTE: Excludes benefits of the act of road construction.

SOURCE: Wilbur Smith Associates

Table 9-15
OVERALL ECONOMIC FEASIBILITY OF EACH FREEWAY OPTION
St. Louis to St. Paul: Freeway Standard

FEASIBILITY ACCORDING TO ECONOMIC BENEFIT TYPE	ECONOMIC FEASIBILITY INDICATORS Route B	Route C	Route D	Route E
NET PRESENT VALUE ($ Million)[(a)]				
Travel Efficiency (by itself)[(b)]	$-108.1	$-284.8	$-278.0	$-649.7
Competitive Position (by itself)[(c)]	$-487.9	-657.2	-1,430.2	-1,080.7
Travel Expenditures (by itself)[(d)]	$-101.8	-203.1	-567.7	-626.5
Travel Eff. + Comp. Position	$ -30.4	$-209.8	$-21.4	$-795.9
Travel Eff. + Comp. Pos. + Travel Exp.[(e)]	$ 433.5	319.3	1,097.6	-264.1
BENEFIT/COST RATIO:[(a)]				
Travel Efficiency (by itself)[(b)]	.81	.61	.84	.44
Competitive Position (by itself)[(c)]	.14	.10	.15	.07
Travel Expenditures (by itself)[(d)]	.82	.72	.66	.46
Travel Eff. + Comp. Position	.95	.71	.99	.31
Travel Eff. + Comp. Pos. + Travel Exp.	1.77	1.44	1.65	.77
INTERNAL RATE OF RETURN (%):				
Travel Efficiency (by itself)[(b)]	7.78%	5.15%	8.19%	2.61%
Competitive Position (by itself)[(c & f)]	-6.03%	-8.64%	-4.64%	-10.75%
Travel Expenditures (by itself)[(d)]	7.95%	6.77%	6.09%	3.16%
Travel Eff. + Comp. Position	9.39%	6.53%	9.86%	-1.61%
Travel Eff. + Comp. Pos. + Travel Exp.	17.59%	14.50%	16.30%	7.21%

NOTE: To compare these freeway feasibility tests with those of the expressway option, refer to Table 7-13.

(a) At 10% discount rate.
(b) This is the key criterion at the national level. It is a net impact.
(c) This is important locally, but a transfer at the national level (not a net impact nationally).
(d) This is important only along the route, but a transfer at the state and national levels (not a net impact).
(e) All benefits above this row are less than the cost of building the road. When all of the benefit types are added together, their sum is greater than the highway's costs; therefore, the NPV turns positive (feasible).
(f) A negative IRR exists when the discounted benefits, at any discount rate, are always less than the discounted costs.

SOURCE: Wilbur Smith Associates

Overall Economic Feasibility Findings of the Freeway Option

While freeway Route D may generate the greatest economic benefits, it is also the most costly to construct to freeway standards, and both benefits and costs should be included in the decision process.

Table 9-15 presents the total, overall economic benefit and cost indicators of feasibility for each freeway route. The feasibility indicators are also shown for each type of benefit. This all-inclusive economic feasibility table indicates that, from the economic standpoint and for the freeway option:

1. When all three types of economic benefit are included, freeway Routes B, C and D are economally feasible, while Route E is not feasible. This clearly indicates that, from the perspective of those residing in a "primary impact area," the routes are feasible and warranted.

2. When only the travel efficiency and competitive position benefits are included (excluding the traveler expenditure benefits, which are largely inter-regional transfers) at 10 percent discount rate, no freeway route is feasible, although Routes B and D are nearly feasible.

3. When only travel efficiency benefits are included, then no freeway route is feasible (at 10 percent discount rate).

4. In terms of overall freeway route comparisons, Routes B and D are the best and nearly equal, Route C is not quite as good as B or D, and Route E is a distant fourth.

5. When a 6 percent discount rate is used, freeway Routes B and D are economically feasible when only travel efficiency benefits are included, and freeway Routes B, C or D are all feasible when economic development benefits are also included.

These feasibility statistics indicate that the freeway option is not expected to be feasible over the time period analyzed in this study. Rather, the expressway option is more feasible. If it was possible to build an expressway now, and to later improve it to a freeway, it would be a logical course of action. However, this study found that most of the freeway option would have to be built on new alignment, rather than to upgrade the existing routes. Therefore, a phased-in freeway does not appear to be the best option. Rather, construction of an expressway is suggested.

Chapter 10
STUDY FINDINGS

While the Consultant's Study was never intended to select or recommend a definitive course of action or to select a specific route, the Consultant's work did yield a number of findings that will help to define a specific approach to the corridor's problems.

FOUR-LANE FEASIBILITY

The analyses suggest that the concept of completing a four-lane highway between St. Louis and St. Paul is, overall, feasible. More specifically:

1. Traffic forecasts suggest that such a route will be needed.
2. It appears that an environmentally acceptable route can be found, although detailed environmental study will be needed.
3. The routes are feasible in the engineering sense, although several engineering challenges exist to avoid undue cost or environmental impacts.
4. From the local economic development impact perspective, all of the route options are economically feasible.
5. However, the national funding decision should be based on those impacts that improve the nation's economy (travel efficiency feasibility) rather than the more localized economic development benefits which are localized in nature (transfers from one region to another). Selection of one route is feasible according to this travel efficiency measure.
6. The "expressway" design standard (55 mph) is more feasible than is the "freeway" design standard (65 mph).
7. Construction of urban area and town bypasses are feasible and a top priority.

ROUTE B, C AND D ADVANTAGES

No single route is superior to the other routes in all respects. Rather, each route has certain advantages which makes each a legitimate contender for selection. For example:

ROUTE B has the advantages that it would be the least expensive to build ($359 million), it would make maximum use of existing and programmed four-lane highways (only 136 miles of new construction needed), it is currently the most heavily traveled (ADT), it is the most feasible route in terms of travel efficiency (1.3 benefit/cost) and economic development (2.8 benefit/cost), it would be easy to construct with few if any environmental implications, and it is a very cost effective approach to linking the two metropolitan areas.

ROUTE C has the advantages that it is the shortest, most direct route between St. Louis and St. Paul (504 miles), entails the fastest inter-city travel time (8 hours 59 minutes), is forecast to be the heaviest traveled route if built to four lanes (16,890 ADT), it would be easy to construct with few if any environmental implications, it is also a very cost-effective approach to linking the two metropolitan areas, and it is a close second in terms of construction cost ($458 million), new route miles to be constructed (186 miles) and economic feasibility (benefit/cost).

ROUTE D has the advantages that it would provide four-lane services to the greatest number of people, would provide four-lane services to the greatest population size currently without four-lane north-south highways, would improve the route which is in greatest need of upgrading based on volume/capacity calculations, would provide better access to the Mississippi River environs, would create the greatest savings in travel efficiency ($115.8 million annually), would create the greatest localized economic development benefit ($155.3 million annually), and would be the most effective in diverting traffic to the improved four-lane highway.