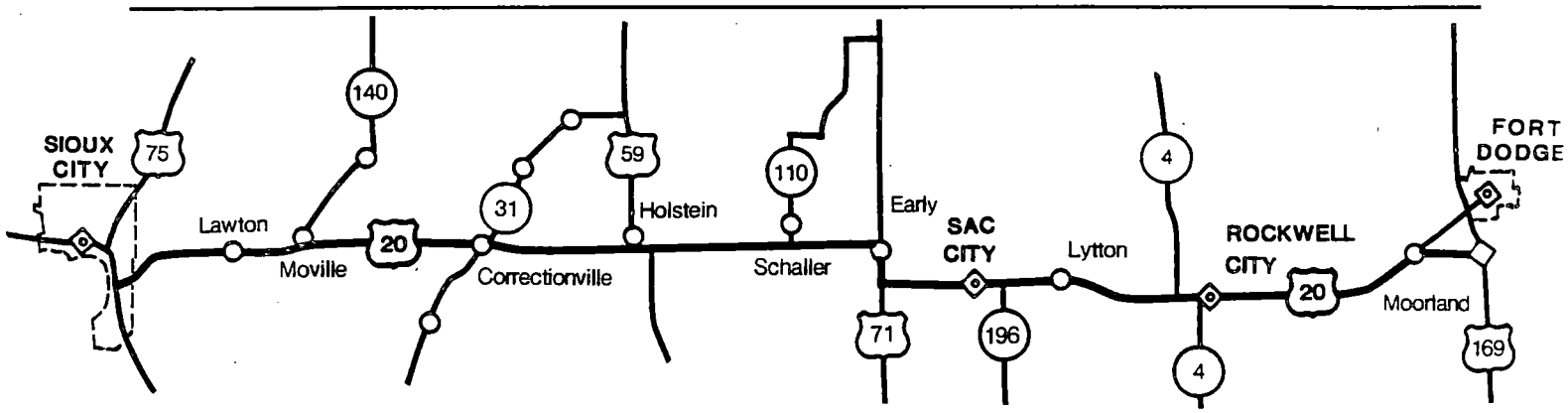
REPORT B: IMPROVEMENT ALTERNATIVES, COSTS AND TRAFFIC



U.S. HIGHWAY 20

CORRIDOR DEVELOPMENT STUDY

Submitted to:

Iowa Department of Transportation

in cooperation with

Federal Highway Administration

Region XII Council of Governments

Mid-Iowa Development Association

Sioux Land Interstate Metropolitan Planning Council

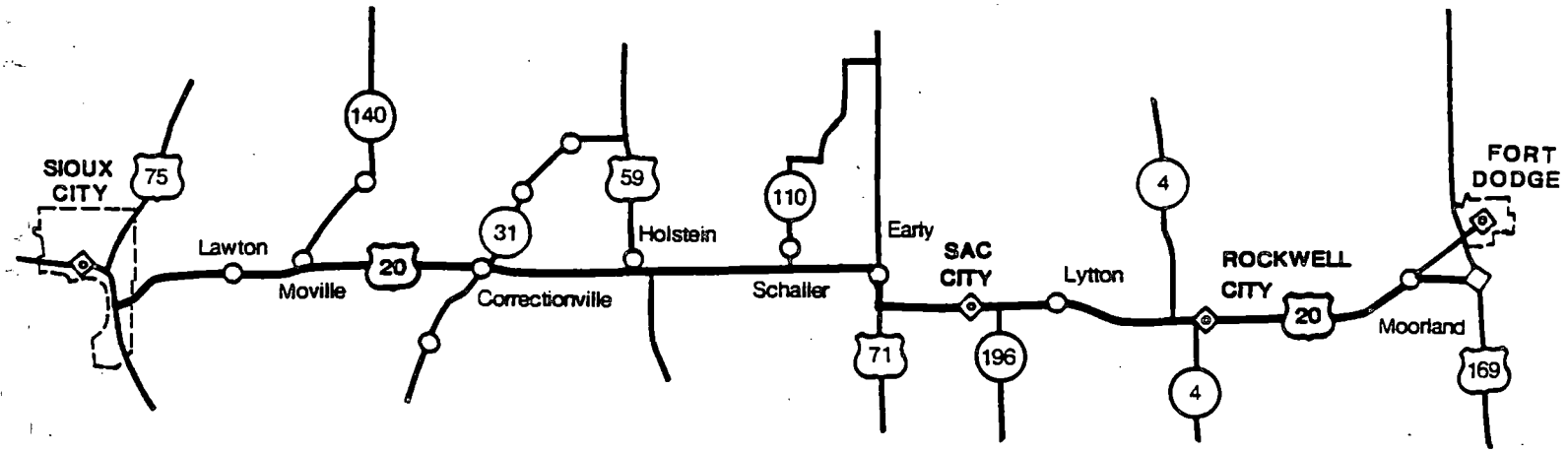
Submitted by:

Wilbur Smith Associates

and

Brice, Petrides-Donohue

REPORT B



REPORT B: ALTERNATIVES, COSTS AND TRAFFIC

This is the second in a series of interim working papers which are intended to document work conducted to date. Because it is a "working paper," its statistics and analyses should be viewed as preliminary, subject to modification as the work progresses. The entire study is scheduled for completion in September, 1992.

WILBUR
SMITH
ASSOCIATES
ENGINEERS • ARCHITECTS • ECONOMISTS • PLANNERS

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March 20, 1992

Mr. Martin Sankey
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010

RE: US 20 Corridor Development Study
Report B

Dear Mr. Sankey:

Wilbur Smith Associates is pleased to submit Report B relative to the US 20 Corridor Development Study. This report describes the improvement alternatives being evaluated in the study, estimates the construction and maintenance costs associated with each, and estimates the traffic that might utilize each alternative in the base year (1990) and future year (2010).

We would be pleased to meet with the Steering Committee at its convenience to review this report. As is the case with all interim documents, this report is intended for review and comment only. It does not represent study conclusions or recommendations. As the study proceeds, changes and deletions may be made to the information contained herein.

Respectfully submitted,

WILBUR SMITH ASSOCIATES

Robert J. Zuelsdorf
Senior Vice President

RJZ/mr

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EXECUTIVE SUMMARY

In February the U.S. 20 Corridor Development Study's Steering Committee met to review Report A. At that meeting the Committee selected seven alternatives to be evaluated from a cost and traffic perspective. This report, Report B, presents the cost and traffic evaluation of these seven alternatives.

This Report B and its cost and traffic estimates will be reviewed at the next Steering Committee meeting. At that time it is possible that, based on the traffic and cost estimates, one or more of the alternatives will be eliminated from further consideration. After that meeting the Consultant will initiate the more in-depth analyses, including the economic feasibility.

Following is a summary of Report B.

IMPROVEMENT ALTERNATIVES

Seven alternatives are evaluated in this report. These seven range from doing nothing (the "Existing Condition") to minor improvements (the "Base Case") to various types of two-lane improvements and four-lane improvements. In this way the entire spectrum of improvement candidates is considered. Some of the alternatives are mutually exclusive while others could be sequential, e.g., by building something modest now which could be phased into something more significant later.

The seven alternatives are summarized on the following page. "Alternative 0: Existing Situation" is U.S. 20 as it presently exists. This is not a serious candidate. "Alternative 1: Base Case" represents improvements Iowa DOT is already planning to do. As such, the Base Case represents a base against which the six improvement alternatives can be compared.

The real alternatives which this study is investigating are the three two-lane candidates (Alternatives 2, 3 and 4) and the three four-lane candidates (Alternatives 5, 6 and 7).

U.S. 20 ALTERNATIVES

HIGHWAY 20 ALTERNATIVE	DESCRIPTION
0. EXISTING SITUATION	a. U.S. 20 as it presently exists b. Maintained at its present standard c. Existing posted speed limits d. Excludes programmed projects
1. BASE CASE	a. U.S. 20 resurfaced Early to Moorland b. U.S. 20 minor improvements (lighting, drains, etc.) c. U.S. 20 2-lanes Iowa Falls to Waterloo, new alignment d. Existing posted speed limits on U.S. 20 e. Several improvements to U.S. 30
2. IMPROVED TWO-LANE	a. "Base Case #1," plus such U.S. 20 improvements as: b. Build passing lanes and spot reconstruction c. Left turn lanes, at every state highway and some paved county roads d. Widened granular shoulders (10 ft.) e. Improvements through communities f. Acceptable value "Arterial B," access "Priority 3"
3. IMPROVED TWO-LANE WITH BYPASSES	a. "Improved Two-Lane #2" plus Two-Lane Bypasses on Four-Lane right-of-way around: b. Correctionville c. Early d. Sac City e. Rockwell City
4. NEW ALIGNMENT TWO-LANE	a. "Improved Two-Lane with Town Bypasses #3" west of Early, plus b. New two-lane highway built on new four-lane alignment between Early and Fort Dodge c. 55 mph speed on new segment, access control Priority 2"
5. FOUR-LANE ARTERIAL HIGHWAY	a. New four-lane highway built on new alignment between Early and Fort Dodge b. Existing U.S. 20 between Early and Sioux City widened to four-lanes, on existing alignment c. 55 mph on both sections d. Both sections built at-grade. Access control "Priority 3" on old sections, "Priority 3" on new sections (O interchanges)
6. EXPRESSWAY	a. "Four-Lane Arterial Highway #5," plus b. Partial access control "Priority 2" (5 interchanges) c. 55 mph speed limit d. "Expressway B" acceptable value
7. FREEWAY	a. Four-Lane on new alignment entire length b. Full access control c. 16 grade separated interchanges d. 65 mph speed limit e. "Expressway B" acceptable value f. Design exceptions, e.g., 4+% grades g. Freeway across Illinois, Iowa and Nebraska

CAPITAL COST ESTIMATES

The estimated cost of constructing each improvement alternative is based on unit costs from previous experience in Iowa, as provided by Iowa DOT. By applying those unit costs to the estimated number of construction units (miles of road, number of structures, etc.), the following order-of-magnitude cost estimates are derived.

Estimated Construction Costs

	Alternative	Improvement Alternative Cost [a]	Total Cost [b]
1	Base Case	$0	$30,788,000
2	Improved 2-Lane	12,150,000	42,938,000
3	With Bypasses	45,588,000	76,376,000
4	New 2-Lane	68,186,000	98,974,000
5	4-Lane Arterial	159,815,000	190,603,000
6	Expressway	169,878,000	200,666,000
7	Freeway	341,273,000	372,061,000

a Cost in addition to Base Case costs.
b Total Cost including Base Case.

These cost estimates apply only to the Sioux City to Fort Dodge segment of U.S. 20, and they include engineering and administration costs. While sufficient for conducting the feasibility tests, any future engineering design will lead to cost refinements.

TRAFFIC ESTIMATES

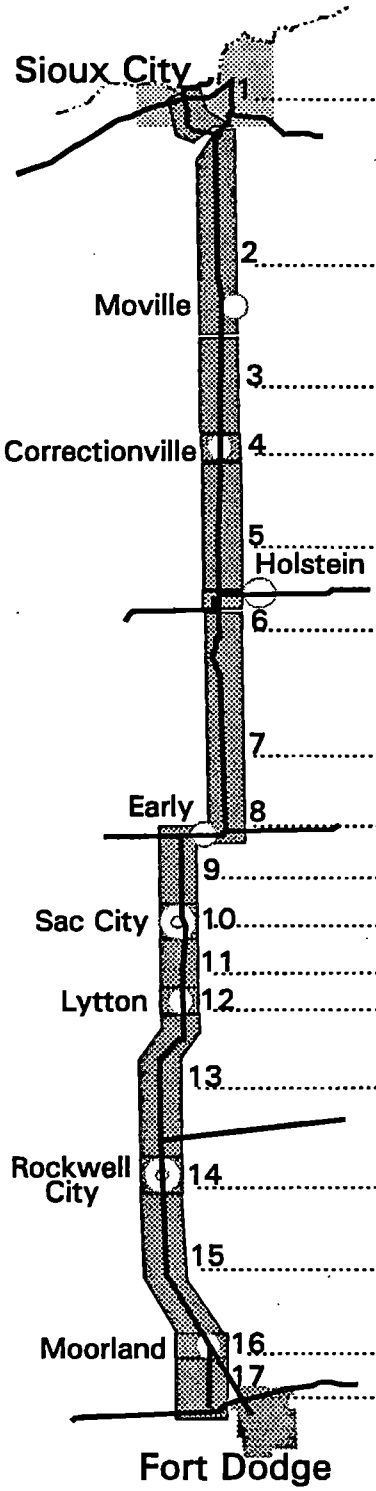
Average daily traffic estimates for each alternative have been prepared for the years 1990 and 2010 (as if the improvements were already in place). These estimates reflect growth in traffic as well as traffic that might be diverted to the improved highway. Included are all types of vehicles.

The basis of the traffic estimates are Iowa DOT historical traffic counts, the roadside surveys conducted in the corridor region and on the two Interstate Highways, the region's (revised) population and jobs forecasts, the trucker and shipper/receiver surveys, and the study's computerized traffic model.

This process led to the average daily traffic forecasts listed on the next page.

what is residual

ESTIMATED DAILY TRAFFIC VOLUMES by HIGHWAY SEGMENT



	Year 1990 Daily Traffic	Two-Lane Alternatives			Four-Lane Alternatives		
		Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	10,464	11,510	11,739	11,894	13,045	13,359	14,031
2	6,649	7,469	7,763	7,956	9,160	9,497	13,682
3	3,595	3,627	3,877	4,042	4,950	5,163	8,989
4	3,340	3,553	3,290	3,489	4,554	4,786	9,683
5	3,067	3,096	3,473	3,686	4,784	5,223	9,250
6	2,723	3,539	3,924	4,131	5,806	6,123	9.921
7	1,964	2,219	2,678	2,882	4,169	4,443	7,992
8	2,883	3,711	2,358	2,775	3,747	4,041	8,472
9	2,443	2,943	2,156	2,361	3,111	3,379	7,153
10	5,580	6,690	2,395	2,539	3,290	3,561	7,280
11	2,392	2,890	3,643	2,701	3,411	3,690	7,493
12	2,213	2,646	3,199	2,998	3,693	3,990	7,784
13	2,010	2,289	2,901	3,369	4,085	4,386	8,132
14	3,970	5,039	4,240	5,188	6,032	6,417	10,753
15	2,667	3,303	3,392	3,401	4,159	4,438	8,384
16	3,410	4,761	4,884	5,352	6,243	6,610	11,013
17	2,607	2,509	2,618	3,768	4,397	4,746	8,492

NOTE: Traffic volumes shown include automobile traffic only on the Alternative study alignments.

Chapter 1
INTRODUCTION

The intent of the U.S. 20 Corridor Development Study is to evaluate alternative improvements to the highway between Sioux City and Fort Dodge. That evaluation process involves a four step process:

1. Identify the key alternative improvement types.
2. Estimate the costs of implementing each, and the traffic that might use each.
3. Possibly eliminate some alternatives based on cost and traffic.
4. Subject the remaining alternative improvements to a series of "tests of feasibility".

Report B presents the results of the first two steps. It defines the alternatives, and it presents the cost and traffic estimates.

Findings and analyses to date are summarized in this six chapter report. In Chapter 2 the seven alternatives are identified and described. In Chapter 3 the increase in construction and maintenance costs associated with each improvement alternative are presented. Chapter 4 presents the study's computerized traffic model, the base year (1990) traffic, and the forecast year 2010 traffic, assuming that the Base Case condition exists through that year. In Chapter 5 the possibility of changing U.S. 20's role is introduced, in that the highway could become a major east-west highway oriented to long-distance travel. Chapter 6 presents the year 1990 and 2010 traffic forecasts associated with each of the improvement alternatives. The Appendix contains the recently revised population and employment forecasts for the corridor region.

Following review of Report B, the Consultant will initiate the sensitivity test process and will initiate the "tests of feasibility".

Chapter 2
U.S. 20 IMPROVEMENT ALTERNATIVES

Iowa DOT could pursue any of a number of alternative approaches in improving U.S. 20. Some of these alternative approaches are mutually exclusive, e.g., if one approach is selected, the other approach is not selected. In other cases, the approaches could be sequential, e.g., a more limited improvement now, followed by a more significant improvement later.

This report chapter identifies and describes the improvement alternatives being examined in this study as selected by the study's Technical Advisory Committee meeting held in Fort Dodge in February.

U.S. 20 ROLES

In devising the alternative improvements, it is recognized that U.S. 20 could serve two possible roles:

- **Subarea Highway** - This is the role currently played by existing U.S. 20. The highway serves a region of Iowa, principally as an intermediate access road to the area between I-80 and I-90. Such a role could be played by a two-lane U.S. 20 as well as by a four-lane U.S. 20. This role can be played regardless of what is done to U.S. 20 elsewhere in Iowa, Illinois or Nebraska.

- **Multi-State Regional Highway** - This role would cause U.S. 20 to become a more major highway that autos and trucks will use for longer distance trips. Under this scenario, the highway would become more of a competitor with I-80 and I-90. Traffic analyses suggest that, for U.S. 20 to play this role, it would have to be a four-lane highway and, to be most effective in this role, U.S. 20 improvements would also be needed in Illinois, Nebraska, as well as in Iowa to the east of I-35.

ALTERNATIVES BEING STUDIED

To evaluate what alternatives are best, the Technical Advisory Committee decided to evaluate a broad range of alternative improvement types, ranging from doing nothing (the "Existing Condition") to minor improvements (the "Base Case") all the way to a fully grade-separated four-lane freeway (the "Freeway" option). The idea is to evaluate all of these alternatives; then, to eliminate some alternatives from further consideration, then to evaluate those which survive in greater detail.

Seven alternatives were selected for evaluation, representing the entire spectrum of options. These seven were sufficiently defined to enable evaluation in the overall feasibility sense. Specific alignments are not defined, because alignment evaluation would occur only in a more detailed study which would follow this feasibility study. For this reason, the alternatives are not depicted on any map.

All seven either follow the existing highway location, or include bypasses around communities, or entail limited new right-of-way acquisition, e.g., between Early and Moorland. Only the "Freeway" option is built entirely on new right-of-way and even this would likely be near the existing alignment.

The seven alternatives are listed and briefly described on Exhibit 2-1. "Alternative O: Existing Situation" is U.S. 20 as it presently exists. This alternative is not being evaluated because Iowa DOT is currently planning to make several improvements to U.S. 20. These currently planned improvements are included in "Alternative 1: Base Case." It is this Base Case with which all other improvements are being compared. The Base Case is defined as the "null," or "do nothing" option.

As a result of adopting "Alternative 1: Base Case" as the do nothing option, the feasibility study is only analyzing six alternatives (Alternatives 2 through 7). Alternatives 2, 3 and 4 are various two-lane highway improvements; Alternatives 5, 6 and 7 are various four-lane highway improvements.

U.S. 20 ALTERNATIVES

HIGHWAY 20 ALTERNATIVE	DESCRIPTION
0. EXISTING SITUATION	a. U.S. 20 as it presently exists b. Maintained at its present standard c. Existing posted speed limits d. Excludes programmed projects
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2. IMPROVED TWO-LANE	a. "Base Case #1," plus such U.S. 20 improvements as: b. Build passing lanes and spot reconstruction c. Left turn lanes, at every state highway and some paved county roads d. Widened granular shoulders (10 ft.) e. Improvements through communities f. Acceptable value "Arterial B," access "Priority 3"
3. IMPROVED TWO-LANE WITH BYPASSES	a. "Improved Two-Lane #2" plus Two-Lane Bypasses on Four-Lane right-of-way around: b. Correctionville c. Early d. Sac City e. Rockwell City
4. NEW ALIGNMENT TWO-LANE	a. "Improved Two-Lane with Town Bypasses #3" west of Early, plus b. New two-lane highway built on new four-lane alignment between Early and Fort Dodge c. 55 mph speed on new segment, access control Priority 2"
5. FOUR-LANE ARTERIAL HIGHWAY	a. New four-lane highway built on new alignment between Early and Fort Dodge b. Existing U.S. 20 between Early and Sioux City widened to four-lanes, on existing alignment c. 55 mph on both sections d. Both sections built at-grade. Access control "Priority 3" on old sections, "Priority 3" on new sections (O interchanges)
6. EXPRESSWAY	a. "Four-Lane Arterial Highway #5," plus b. Partial access control "Priority 2" (5 interchanges) c. 55 mph speed limit d. "Expressway B" acceptable value
7. FREEWAY	a. Four-Lane on new alignment entire length b. Full access control c. 16 grade separated interchanges d. 65 mph speed limit e. "Expressway B" acceptable value f. Design exceptions, e.g., 4+% grades g. Freeway across Illinois, Iowa and Nebraska

Alternative No. 1 (Base Case)

This alternative is existing U.S. 20, plus improvements already announced by Iowa DOT. The base case would include certain improvements to U.S. 20 which are intended to preserve the existing pavement and structures in a serviceable condition. The following projects on U.S. 20 in the current Iowa DOT 5-year plan are included in the base case:

- Repair bridge over Little Sioux River, 1/2 mile west of Iowa 31.
- Overlay pavement at various locations between Sioux City and Moville.
- Install subdrains at various locations between Correctionville and U.S. 59.
- Pavement surface restoration between north corporate limits of Early and Moorland.
- Improve lighting at Iowa 4 intersection in Rockwell City.
  Bridge deck repair over Little Whiskey Creek, 2 miles east of Junction Iowa 12 (EB).
- Replace bridge over Cedar Creek, east of Sac City.
  Grading, paving, erosion control and shoulder improvements, along with structure rehabilitation from the west end of Sac County to Rockwell City.
- Replace bridge over Raccoon River in Sac City.
- Replace culvert near First Street in Early.
- Replace bridge over Camp Creek, 2 miles east of Lytton.
  Fencing and signing from Moorland east to the Des Moines River.

In addition to the Base Case improvements to U.S. 20 between Sioux City and Fort Dodge, there are also improvements to be made to the east of Fort Dodge which are included in the Base Case. It is assumed that a new two-lane highway will be built on a new, direct U.S. 20 alignment between I-35 and the existing four-lane segment of U.S. as it passes Waterloo.

Another set of highway improvements in the Base Case that could affect travel on U.S. 20 are those which will be made on U.S. 30. These include the following.

- Tama/Toledo to U.S. 218 - two-lane/55 mph
- U.S. 169 to U.S. 65 - four-lane/55 mph

- Marshalltown to just east of Tama and Toledo - four-lane/55 mph
- U.S. 318 to Lisbon - four-lane/55 mph

Alternative No. 2 (Improved 2-Lane)

This alternative includes all improvements listed under the base case, plus additional improvements to increase the operating speed and safety characteristics of the roadway. This alternative would meet the minimum design requirements for a "Service Level B Arterial" highway, and would include the following characteristics:

- 60-mph design speed in rural areas, with a posted speed of 55 mph.
- 12-foot lane width.
- 10-foot wide granular shoulders.
  Flattened embankment slopes (6:1/3:1 foreslopes, with a 33-foot clear zone in rural areas).
- Level of Service B

The improved 2-lane alternative uses the existing alignment for U.S. 20, and would not include bypasses of the communities or elimination of any curves or no-passing zones. This alternative would, however, provide passing lanes at periodic locations to increase vehicular operating speed and allow a refuge for slow moving vehicles. Left-turn lanes would also be provided at major crossroads, generally located at the paved county roads and primary highways.

For analysis purposes, it is assumed that passing lanes and left-turn lanes would be constructed at the following locations:

Turn Lanes:

- County Road L25
- County Road L36
- IA 31
- County Road L43*
- County Road M25*
- IA 110*
- U.S. 71*
- County Road D27
- County Road M50
- County Road M54
- IA 196

- County Road N28
- County Road N41
- IA 4*
- County Road N57
- County Road N65
- County Road P19
- County Road P21
- County Road P29
- County Road P33*
- County Road P51

* Existing

Passing Lanes [(1) Each Direction)]:

(2) Between Moville and Correctionville*
Near Correctionville*
Between Cushing and Holstein
Near Galva
Between Schaller and U.S. 71
Between U.S. 71 and Sac City
Between Sac City and Lytton
Between Lytton and Rockwell City
Between Rockwell City and Knierim
Between Knierim and Moorland

* Existing

In addition to the above, Alternative No. 2 would include spot improvements to the existing roadway such as elimination of sight-distance obstructions and capacity or safety improvements through the communities.

Alternative No. 3 (Improved 2-Lane With Bypasses)

This alternative includes all the improvements described under Alternative No. 2, and additionally provides two-lane bypasses on four-lane right-of-way around the following communities:

- Correctionville
- Early
- Sac City
- Rockwell City

The primary function of the bypasses in this alternative is to increase the operating speeds and reduce the conflicts with local traffic. Access to the highway

along the bypasses would generally be allowed at public road intersections only. This design would meet the requirements of the Iowa DOT Access Policy for a "Priority II Highway." This type of roadway is generally suitable for upgrading to a 4-lane facility if warranted by future traffic conditions.

Other sections of this alternative (nonbypass segments) would meet the standards for "Priority III" access control, with private access allowed at 1/4 mile spacing.

Alternative No. 4 (New Alignment 2-Lane)

This alternative is identical to Alternative No. 3 between Sioux City and U.S. 71 near Early, and then considers a new alignment for U.S. 20 between the cities of Early and Moorland. The new alignment would be generally located to the north of existing U.S. 20, and would be located to avoid major environmental constraints and developed areas.

The design standards for the new roadway (east of Early) would meet the requirements of the Iowa DOT for a "Service Level B Arterial" with "Priority II" access control. This type of design would be a high-level design standard, suitable for upgrading to four lanes if future conditions should warrant. Access to the roadway between Early and Moorland would be restricted to public road intersections only. The right-of-way for a 4-lane highway would be acquired along the new highway east of Early.

Alternative No. 5 (4-Lane Arterial)

This alternative provides for upgrading the existing roadway to a 4-lane facility between Sioux City and Early, and for constructing a new 4-lane facility between Early and Moorland. The communities listed under Alternative No. 3 would be bypassed, and the alignment of the roadway east of Early would be similar to that of Alternative No. 4. This alternative is intended to represent the lowest cost 4-lane highway.

The characteristics of this alternative are summarized as follows:

- Roadway would be classified as a "Service Level B Arterial."
- Design speed of 60 mph, with speed limit of 55 mph. Access control between Sioux City and Early would generally be "Priority III," with private access allowed except at bypasses.
- Access control between Early and Moorland would generally be "Priority II," with access allowed only at public intersections.
- Interchanges and grade separations would not be provided unless required for traffic capacity. No such interchanges have been identified for this alternative.

Alternative No. 6 (4-Lane Expressway)

This alternative would provide a high-level 4-lane facility with "Priority II" access control between Sioux City and Moorland. The roadway would generally follow the same alignment as Alternative No. 5, with additional improvements in access control and design speed. The following characteristics describe this alternative:

- Classified as a "Service Level B Expressway."
- Design of 65 mph, with a 55 mph speed limit. (Reduced design speed may be necessary in certain segments between Sioux City and Early in order to incorporate the existing pavement.)
- Frontage roads constructed where necessary to eliminate private access.
- Bypasses constructed at same locations as Alternative No. 5.
- Interchanges constructed where necessary for traffic capacity, and at selected locations to control access on the bypasses. Anticipated interchanges are located at Iowa 31, U.S. 59, U.S. 71, Iowa 4 and at Sac City.

Alternative No. 7 (4-Lane Freeway)

This alternative would provide a new 4-lane freeway, generally meeting the same design standards as used in the Interstate Highway System. To provide the necessary full-access control, it is anticipated that this alternative would be constructed entirely on new alignment. Such a design would eliminate the acquisition of numerous farmsteads and other properties which presently have direct access to U.S. 20. The freeway characteristics are as follows.

- 70 mph design speed, with a speed limit of 65 mph.

- Interchanges provided at 5- to 10-mile spacing. (Average spacing approximately 8 miles.) Interchanges are anticipated at:

  - Iowa 982 East of Sioux City
  - County Road K-42
  - Iowa 140 South of Moville
  - County Road L-21
  - Iowa 31 South of Correctionville
  - County Road L-51 near Cushing
  - U.S. 59 South of Holstein
  - Iowa 110 South of Schaller
  - U.S. 71 near Early
  - County Road M-54 North of Sac City
  - County Road N-28 North of Lytton
  - Iowa 4 North of Rockwell City
  - County Road N-65
  - County Road P-19 near Knierim
  - County Road P-33 North of Moorland

- Paved county roads which are not interchanged will generally be overpassed. Nonpaved county roads will be overpassed if the spacing between paved roads exceeds three (3) miles. Overpasses are anticipated at:

  - County Road K-67
  - County Road L-13
  - County Road L-36
  - County Road L-37
  - County Road L-43
  - County Road L-67
  - County Road M-15
  - County Road M-25
  - County Road M-43
  - County Road M-50
  - County Road N-14
  - County Road N-33
  - County Road N-41
  - County Road N-57
  - County Road P-29
  - County Road P-51

- Access control to be "Priority I," with access only at interchanges.

SEGMENT PLAN

To analyze these various alternatives, each has been divided into "segments," based largely on the segment plan contained in the Task A Report. These segments, and their lengths, are depicted on Exhibit 2-2.

Exhibit 2-2

U.S. 20 SEGMENT PLAN

SEGMENT	DESCRIPTION	ALTERNATIVE 1, 2	3	4, 5, 6,	7
1	State Line to Iowa 12	4.13	4.13	4.13	2.40
2	Iowa 12 to End of 4-Lane	16.09	16.09	16.09	16.09
3 A	End of 4-Lane to Begin Bypass	8.88	8.88	8.88	8.88
3 B*	Begin Bypass to Correctionville	2.64	3.14	3.14	2.84
4 *	Correctionville	0.12	0.12	0.12	0.12
5 A	Correctionville to End Bypass	2.14	2.18	2.18	2.20
5 B	End Bypass West Junction U.S. 59	10.11	10.11	10.11	10.11
6	West Junction U.S. 59 to East Junction U.S. 59	1.41	1.41	1.41	1.41
7 A	East Junction U.S. 59 to North Junction U.S. 71	18.85	18.85	18.85	18.98
7 B*	North Junction U.S. 71 to Early	0.53	N/A	N/A	N/A
8 *	Early	0.41	N/A	N/A	N/A
9 A*	Early to South Junction U.S. 71	2.60	N/A	N/A	N/A
9 B*	South Junction U.S. 71 to Sac City	6.41	6.63	6.63	6.63
10 *	Sac City	2.52	2.90	2.90	2.52
11 A*	Sac City to End Bypass	3.96	4.45	3.96	3.96
11 B	End Bypass to Lytton	1.49	1.49	1.49	1.49
12	Lytton	0.56	0.56	0.56	0.56
13 A	Lytton to Begin Bypass	8.53	8.53	7.88	7.88
13 B*	Begin Bypass to Rockwell City	2.65	3.26	2.65	2.65
14 *	Rockwell City	2.00	2.00	2.00	2.00
15 A*	Rockwell City to End Bypass	3.54	3.98	3.54	3.54
15 B	End Bypass to Moorland	12.69	12.69	12.06	12.06
16	Moorland	1.49	1.49	1.19	1.19
17	Moorland to U.S. 169	5.39	5.39	5.39	5.39
	TOTAL	119.14	118.28	115.16	112.90

* Bypass Segments

Chapter 3
CAPITAL COST ESTIMATES

The costs of building and maintaining each of the seven alternatives identified in Chapter 2 were estimated and the cost estimates are presented in Chapter 3.

APPROACH TO COST ESTIMATING

The capital costs were estimated on the basis of improvement assumptions for each alternative improvement. The cost estimates are approximate order-of-magnitude costs of each alternative, based on unit costs times the assumed number of units for each alternative. These cost estimates are believed to be adequate for feasibility analysis. However, detailed design analyses would be expected to produce more refined cost estimates.

Unit Capital Costs - The unit costs used in this study were taken from the Iowa DOT "Summary of Costs Per Mile of Road Construction," May, 1991, and escalated 10 percent to approximate 1992 costs. The specific unit costs are listed in Exhibit 3-1. These unit costs were applied to the number of miles of shoulder improvements, new 2- or 4-lane construction, right-of-way, etc. and the number of turning lanes, structures, interchanges, etc. to estimate the cost for each alternative under study.

Costs of passing lanes were estimated to be approximately one half of new 2-lane pavement $650,000 per mile x 1/2 = $325,000 per mile (1991), or $360,000 per mile at 1992 price levels.

The development of left-turn lanes with a minimum of 150-foot long left-turn bays requires an equivalent of approximately 0.16 mile of 12-foot pavement per intersection. This results in $52,000 cost in 1991, or $57,000 cost in 1992, per intersection.

Exhibit 3-1

SUMMARY OF UNIT COSTS

(1992 Dollars)

IMPROVEMENT TYPE	UNIT COST
Shoulder Improvements	$175,000/mile
Turn Lane	$57,000 each
Passing Lane	$360,000/mile
Construct 2-lane	$780,000/mile
Construct 4-lane	$1,430,000/mile
Widen existing 2-lane to 4-lane	$715,000/mile
River bridge (2-lane)	$705,000 each (1)
Stream crossing (2-lane)	$235,000 each (2)
Grade separation (2-lane)	$470,000 each (3)
Overpass of railroad (2-lane)	$750,000 each
Diamond interchange	$1,650,000 each
Right-of-way:	
2-lane	$83,000/mile
4-lane	$220,000/mile
Widen from 2-lane to 4-lane	$138,000/mile
4-lane full access control	$310,000/mile
Frontage Road - granular surface	$330,000/mile
Resurfacing	$200,000/mile

(1) $645,000 each for one-way traffic - Alternatives 5, 6 and 7
(2) $215,000 each for one-way traffic - Alternatives 5, 6 and 7
(3) $430,000 each for one-way traffic - Alternatives 5, 6 and 7

Source: Iowa Department of Transportation
Brice, Petrides-Donohue

A 2-lane highway overpass of a railroad crossing was estimated to cost $750,000 (1992 costs) based on preliminary cost estimates from the East Sixth Street construction project in Waterloo.

Bridges were classified as either river crossings, minor stream crossings or grade separations. These types of bridges are estimated to be of the following lengths: 300 feet, 100 feet and 200 feet, respectively. One-way, 2-lane bridges would have an overall width of 43 feet (2 lanes at 12 feet), a 10-foot shoulder on the right side, 6-foot shoulder on the left, and 1.5-foot on each side for concrete barrier curb. Two-way, 2-lane bridges would be similar but have 10-foot shoulders on each side, resulting in an overall width of 47 feet. The unit cost of $50 per square foot was applied.

Engineering and Administrative Costs - To all capital costs are added engineering costs (including planning, design, contract administration, construction surveying and inspection work) which are estimated to be 14 percent of the construction costs, per the Iowa DOT Quadrennial Need Study - Report on Highways, Roads and Streets, 1991. To this total the administrative costs are added. According to Iowa DOT statistics, administrative costs are 7 percent of the total construction, engineering and maintenance costs.

CAPITAL COSTS SUMMARY

Applying the unit costs yields the estimated total capital costs on Exhibit 3-2. The Alternative 1: Base Case costs represent projects already planned. Base Case costs were taken from the Iowa DOT "Five Year Plan" and include programmed costs for 1992-1996 on U.S. 20 between Sioux City and Fort Dodge. Cost estimates for Alternatives 2 through 7 are based on the unit costs.

Exhibit 3-2

CAPITAL COST SUMMARY[a]

($ Million)

	IMPROVEMENT ALTERNATIVE	TOTAL COST[b]	COST ABOVE BASE CASE[c]	INCREMENTAL COST[d]
1.	Base Case	$30.79	$-	$30.79
2.	Improved 2-Lane	42.94	12.15	12.15
3.	With By-Passes	76.38	45.59	33.44
4.	New 2-Lane	98.98	68.19	23.00
5.	4-Lane Arterial	190.61	159.82	91.63
6.	Expressway	200.67	169.88	10.06
7.	Freeway	372.06	341.27	171.39

(a) Capital costs, including engineering and administrative costs.
(b) Cost of each alternative plus the Base Case cost of $30.79 million.
(c) Incremental cost of each alternative improvement (total cost less Base Case cost). This is the cost that is evaluated in this feasibility study.
(d) Cost increment above the next lower cost alternative.

Source: Brice, Petrides-Donohue

The Exhibit 3-2 column entitled "Cost Above Base Case" is the cost which is evaluated in this study. The Base Case costs are a given, (a sunk cost), which will be incurred regardless of what else is done as a result of this study.

CAPITAL COSTS OF EACH IMPROVEMENT ALTERNATIVE

The capital costs of each improvement alternative are estimated on a segment-by-segment basis. The Alternative 1: Base Case costs are listed in Exhibit 3-3; this alternative's total costs were estimated by Iowa DOT and allocated to the segments by the Consultant.

The estimated capital costs for each of the remaining alternatives are depicted in Exhibits 3-4 through 3-9, with a summary on Exhibit 3-10. These are costs over and above the Base Case costs; the Base Case is common (a sunk cost) to all alternatives.

Exhibit 3-3

U.S. 20 CAPITAL COST ESTIMATE

Alternative #1 - Base Case

	SEGMENT	LENGTH (Miles)	COST ($000)
1	State Line to IA 12	4.13	$0
2	IA 12 to end of 4-lane	16.09	946
3A	End of 4-lane to Begin Bypass	8.88	0
3B	Begin Bypass to Correctionville	2.64	122
4	Correctionville	0.12	0
5A	Correctionville to End Bypass	2.14	40
5B	End Bypass to West Jct US 59	10.11	176
6	West Jct US 59 to East Jct US 59	1.41	0
7A	East Jct US 59 to North Jct US 71	18.85	6,547
7B	North Jct US 71 to Early	0.53	391
8	Early	0.41	457
9A	Early to South Jct US 71	2.60	1,818
9B	South Jct US 71 to Sac City	6.41	4,481
10	Sac City	2.52	1,619
11A	Sac City to End Bypass	3.96	1,478
11B	End Bypass to Lytton	1.49	398
12	Lytton	0.56	150
13A	Lytton to Begin Bypass	8.53	2,997
13B	Begin Bypass to Rockwell City	2.65	860
14	Rockwell City	2.00	414
15A	Rockwell City to End Bypass	3.54	382
15B	End Bypass to Moorland	12.69	1,432
16	Moorland	1.49	179
17	Moorland to US 169	5.39	353
		119.14	$25,240
	Engineering and Administration		5,548
	Total Cost Alt. #1		$30,788

Source: Brice, Petrides-Donohue

Exhibit 3-4
U.S. 20 CAPITAL COST ESTIMATE
Alternative #2 -- Improved Two-Lane
($000)

	Segment	LENGTH (MILES)	IMPROVED SHOULDER	TURN LANE	PASSING LANE	TOTAL COST
1	State Line to IA 12	4.13	$303			$303
2	IA 12 to end of 4-lane	16.09	1,183			1,183
3A	End of 4-lane to Begin Bypass	8.88	653	$57		710
3B	Begin Bypass to Correctionville	2.64	194	114		308
4	Correctionville	0.12	9			9
5A	Correctionville to End Bypass	2.14	158			158
5B	End Bypass to West Jct US 59	10.11	744		$360	1,104
6	West Jct US 59 to East Jct US 59	1.41	103			103
7A	East Jct US 59 to North Jct US 71	18.85	733		900	1,633
7B	North Jct US 71 to Early	0.53				0
8	Early	0.41				0
9A	Early to South Jct US 71	2.60		57		57
9B	South Jct US 71 to Sac City	6.41		57	540	597
10	Sac City	2.52		57		57
11A	Sac City to End Bypass	3.96		57	360	417
11B	End Bypass to Lytton	1.49				0
12	Lytton	0.56		57		57
13A	Lytton to Begin Bypass	8.53		57	360	417
13B	Begin Bypass to Rockwell City	2.65				0
14	Rockwell City	2.00	88	57		145
15A	Rockwell City to End Bypass	3.54	261	57		318
15B	End Bypass to Moorland	12.69	933	171	720	1,824
16	Moorland	1.49	110			110
17	Moorland to US 169	5.39	396	57		453
		119.14	$5,866	$855	$3,240	$9,961
	Engineering and Administration					2,189
	Total Cost Alternative #2					$12,150

SOURCE: Brice Petrides-Donohue

Exhibit 3-5
U.S. 20 CAPITAL COST ESTIMATE
Alternative #3 -- Improved Two-Lane with Bypass
($000)

	Segment	Length (Miles)	Improved Shoulder	Turn Lane	Passing Lane	New 2-Lane	River Bridge	Stream Crossing	RR Overpass	Row 2-Lane	Total Cost
1	State Line to IA 12	4.13	$303								$303
2	IA 12 to end of 4-lane	16.09	1,183								1,183
3A	End of 4-lane to Begin Bypass	8.88	653	$57							710
3B	Begin Bypass to Correctionville	3.14		171		$2,449	$705			$261	3,586
4	Correctionville	0.12				94				10	104
5A	Correctionville to End Bypass	2.18		57	$360	1,700				181	2,298
5B	End Bypass to West Jct US 59	10.11	744		360						1,104
6	West Jct US 59 to East Jct US 59	1.41	103								103
7A	East Jct US 59 to North Jct US 71	18.85	733	57	900						1,690
7B	North Jct US 71 to Early	N/A									0
8	Early	N/A									0
9A	Early to South Jct US 71	N/A									0
9B	South Jct US 71 to Sac City	6.63		57		5,171		$235		550	6,014
10	Sac City	2.90		57	360	2,262	705			241	3,625
11A	Sac City to End Bypass	4.45		114	360	3,471		235		369	4,549
11B	End Bypass to Lytton	1.49									0
12	Lytton	0.56		57							57
13A	Lytton to Begin Bypass	8.53		57	360						417
13B	Begin Bypass to Rockwell City	3.26		57		2,543				271	2,870
14	Rockwell City	2.00		57		1,560				166	1,783
15A	Rockwell City to End Bypass	3.98		114		3,104		235	$750	330	4,534
15B	End Bypass to Moorland	12.69	933	171	720						1,824
16	Moorland	1.49	110	57							167
17	Moorland to US 169	5.39	396	57							453
		118.28	$5,157	$1,197	$3,420	$22,355	$1,410	$705	$750	$2,379	$37,373

Engineering and Administration 8,215
Total Cost Alternative #3 $45,588

SOURCE: Brice Petrides-Donohue

Exhibit 3-6
U.S. 20 CAPITAL COST ESTIMATE
Alternative #4 -- Improved Two-Lane with Bypass
($000)

	Segment	Length (Miles)	Improved Shoulder	Turn Lane	Passing Lane	New 2-Lane	River Bridge	Stream Crossing	RR Overpass	Row 2-Lane	Total Cost
1	State Line to IA 12	4.13	$303								$303
2	IA 12 to end of 4-lane	16.09	1,183								1,183
3A	End of 4-lane to Begin Bypass	8.88	653	$57						$261	970
3B	Begin Bypass to Correctionville	3.14		171		$2,449	$705			10	3,335
4	Correctionville	0.12				94				181	275
5A	Correctionville to End Bypass	2.18		57	$360	1,700					2,117
5B	End Bypass to West Jct US 59	10.11	744		360						1,104
6	West Jct US 59 to East Jct US 59	1.41	103								103
7A	East Jct US 59 to North Jct US 71	18.85	733		900						1,633
7B	North Jct US 71 to Early	N/A									0
8	Early	N/A									0
9A	Early to South Jct US 71	N/A		57							57
9B	South Jct US 71 to Sac City	6.63		57	360	5,171		$470		550	6,609
10	Sac City	2.90		57		2,262	705			241	3,265
11A	Sac City to End Bypass	3.96		57	360	3,089		235		329	4,069
11B	End Bypass to Lytton	1.49				1,162				124	1,286
12	Lytton	0.56		57		437				46	540
13A	Lytton to Begin Bypass	7.88		57	360	6,146		235		654	7,452
13B	Begin Bypass to Rockwell City	2.65		57		2,067				220	2,344
14	Rockwell City	2.00		57	180	1,560				166	1,963
15A	Rockwell City to End Bypass	3.54		57	180	2,761		235		294	3,527
15B	End Bypass to Moorland	12.06		114	720	9,407		235	$750	1,001	12,227
16	Moorland	1.19		57		928				99	1,084
17	Moorland to US 169	5.39	396	57							453
		115.16	$4,114	$1,026	$3,780	$39,234	$1,410	$1,410	$750	$4,175	$55,899

Engineering and Administration 12,287
Total Cost Alternative #4 $68,186

SOURCE: Brice Petrides-Donohue

Exhibit 3-7
U.S. 20 CAPITAL COST ESTIMATE
Alternative #5 -- Four-Lane Arterial Highway
($000)

	Segment	Length (Miles)	Improve Shoulder	New 4-Lane	Widen	River Bridge	Stream Crossing	RR Overpass	Inter-Change	Row 4-Lane	Row Widen	Total Cost
1	State Line to IA 12	4.13	$303									$303
2	IA 12 to end of 4-lane	16.09	1,183									1,183
3A	End of 4-lane to Begin Bypass	8.88	326		$6,349		$430			$1,225		8,330
3B	Begin Bypass to Correctionville	3.14		$4,490		$1,290			$691			6,471
4	Correctionville	0.12		172					26			198
5A	Correctionville to End Bypass	2.18		3,117			215		480			3,812
5B	End Bypass to West Jct US 59	10.11	403		6,614		430			1,277		8,723
6	West Jct US 59 to East Jct US 59	1.41	103									103
7A	East Jct US 59 to North Jct US 71	18.85	368		13,442	1,290	645			2,594		18,339
7B	North Jct US 71 to Early	N/A										0
8	Early	N/A										0
9A	Early to South Jct US 71	N/A										0
9B	South Jct US 71 to Sac City	6.63		9,481			645		1,459			11,585
10	Sac City	2.90		4,147		1,290			638			6,075
11A	Sac City to End Bypass	3.96		5,663			215		871			6,749
11B	End Bypass to Lytton	1.49		2,131					328			2,459
12	Lytton	0.56		801					123			924
13A	Lytton to Begin Bypass	7.88		11,268			215		1,734			13,217
13B	Begin Bypass to Rockwell City	2.65		3,790			215		583			4,588
14	Rockwell City	2.00		2,860			215		440			3,515
15A	Rockwell City to End Bypass	3.54		5,062			215		779			6,056
15B	End Bypass to Moorland	12.06		17,246			430	$1,500	$2,653			21,829
16	Moorland	1.19		1,702			215		262			2,179
17	Moorland to US 169	5.39	226		3,303		215			638		4,382
		115.16	$2,910	$71,929	$29,708	$3,870	$4,300	$1,500	$11,066	$5,734		$131,017
									Engineering and Administration			28,798
									Total Cost Alternative #5			$159,815

SOURCE: Brice Petrides-Donohue

Exhibit 3-8
U.S. 20 CAPITAL COST ESTIMATE
Alternative #6 – Expressway
($000)

	Segment	Length (Miles)	Improve Shoulder	New 4-Lane	Widen	River Bridge	Stream Crossing	RR Over	Inter-Change	Row 4-Lane	Row Widen	Total Cost
1	State Line to IA 12	4.13	$303									$303
2	IA 12 to end of 4-lane	16.09	1,183									1,183
3A	End of 4-lane to Begin Bypass	8.88	326		$6,349		$430				$1,125	8,330
3B	Begin Bypass to Correctionville	3.14		$4,490		$1,290			$1,650	$691		8,121
4	Correctionville	0.12		172						26		198
5A	Correctionville to End Bypass	2.18		3,117			215			480		3,812
5B	End Bypass to West Jct US 59	10.11	403		6,614		430				1,277	8,723
6	West Jct US 59 to East Jct US 59	1.41	103						1,650			1,753
7A	East Jct US 59 to North Jct US 71	18.85	368		13,442	1,290	645		1,650		2,594	19,989
7B	North Jct US 71 to Early	N/A										0
8	Early	N/A										0
9A	Early to South Jct US 71	N/A										0
9B	South Jct US 71 to Sac City	6.63		9,481			645			1,459		11,585
10	Sac City	2.90		4,147		1,290			1,650	638		7,725
11A	Sac City to End Bypass	3.96		5,663			215			871		6,749
11B	End Bypass to Lytton	1.49		2,131						328		2,459
12	Lytton	0.56		801								924
13A	Lytton to Begin Bypass	7.88		11,268			215			1,734		13,217
13B	Begin Bypass to Rockwell City	2.65		3,790			215		1,650	583		6,238
14	Rockwell City	2.00		2,860			215			440		3,515
15A	Rockwell City to End Bypass	3.54		5,062			215			779		6,056
15B	End Bypass to Moorland	12.06		17,246			430	$1,500		2,653		21,829
16	Moorland	1.19		1,702			215			262		2,179
17	Moorland to US 169	5.39	226		3,303		215				638	4,382
		115.16	$2,910	$71,929	$29,708	$3,870	$4,300	$1,500	$8,250	$11,066	$5,734	$139,267
										Engineering and Administration		30,611
										Total Cost Alternative #6		$169,878

SOURCE: Brice Petrides-Donohue

Capital Cost

#7

Exhibit 3–9

AUTOMOBILE TRAFFIC VOLUME CHANGE FROM BASE (ALT. #1)

Alternative #7 – Freeway

($000)

	Segments	Length (Miles)	Improv. Shldr.	New 4–Lane	Widen.	River Bridge	Stream Crossing	Grade Sep.	RR Crossing	Inter–change	Frontage Road	ROW 4–Lane	Total Cost
1	Iowa state line to IA 12	2.40	$93	$1,645								$357	$2,095
2	IA 12 to end of 4–Lane	16.09		23,009		$1,290	$1,720	$1,720		$4,950	$5,310	4,987	42,986
3A	End of 4–Lane to Begin Bypass	8.88		12,698			1,075	860		1,650	2,930	2,754	21,967
3B	Begin Bypass to Correctionville	2.84		4,062		1,290	645			1,650	937	880	9,464
4	Correctionville	0.12		172				430			40	36	678
5A	Correctionville to End Bypass	2.20		3,146			215	430			726	682	5,199
5B	End Bypass to West Jct. US 59	10.11		14,457			1,290	1,290		1,650	3,337	3,134	25,158
6	West Jct. US 59 to Ease Jct. US 59	1.41		2,016			215			1,650	465	436	4,782
7A	East Jct. US 59 to North Jct. US 71	18.98		27,141		2,580	645	2,150		3,300	6,263	5,885	47,964
7B	North Jct. US 71 to Early	N/A											
8	Early	N/A											
9A	Early to South Jct. US 71	N/A											
9B	South Jct. US 71 to Sac City	6.63		9,481			645	860			2,188	2,055	15,229
10	Sac City	2.52		3,604		1,290				1,650	832	780	8,156
11A	Sca City to End Bypass	3.96		5,663			215	860			1,307	1,227	9,272
11B	End Bypass to Lytton	1.49		2,131							492	461	3,084
12	Lytton	0.56		801						1,650	185	174	2,810
13A	Lytton to Begin Bypass	7.88		11,268			215	1,290			2,600	2,444	17,817
13B	Begin Bypass to Rockwell City	2.65		3,790			215			1,650	875	822	7,352
14	Rockwell City	2.00		2,860			215	430			660	620	4,785
15A	Rockwell City to End Bypass	3.54		5,062			215	430		1,650	1,168	1,097	9,622
15B	End Bypass to Moorland	12.06		17,246			430	1,720	1,500	1,650	3,980	3,738	30,264
16	Moorland	1.19		1,702			215			1,650	393	368	4,328
17	Moorland to US 169	5.39	226		3,303		215	860			1,525	637	6,766
		112.90	$319	$151,954	$3,303	$6,450	$8,385	$13,330	$1,500	$24,750	$36,213	$33,574	$279,778

Engineering and Administration	61,495
Total Cost Alternative # 7	$341,273

SOURCE : Brice Petrides–Donahue

Exhibit 3-10
U.S. 20 CAPITAL COST ESTIMATE
($000)

	Segment	Alt. 1 Base Case	Alt. 2 Two-Lane	Alt. 3 Town Bypass	Alt. 4 New Two-Lane	Alt. 5 Four-Lane Arterial	Alt. 6 Expressway	Alt. 7 Freeway
1	State Line to IA 12	$0	$303	$303	$303	$303	$303	$2,094
2	IA 12 to end of 4-lane	946	1,183	1,183	1,183	1,183	1,183	42,986
3A	End of 4-lane to Begin Bypass	0	710	710	970	8,330	8,330	21,967
3B	Begin Bypass to Correctionville	122	308	3,586	3,335	6,471	8,121	9,464
4	Correctionville	0	9	104	275	198	198	678
5A	Correctionville to End Bypass	40	158	2,298	2,117	3,812	3,812	5,199
5B	End Bypass to West Jct US 59	176	1,104	1,104	1,104	8,723	8,723	25,158
6	West Jct US 59 to East Jct US 59	0	103	103	103	103	1,753	4,784
7A	East Jct US 59 to North Jct US 71	6,547	1,633	1,690	1,633	18,339	19,989	47,964
7B	North Jct US 71 to Early	391	0	0	0	0	0	0
8	Early	457	0	0	0	0	0	0
9A	Early to South Jct US 71	1,818	57	0	57	0	0	0
9B	South Jct US 71 to Sac City	4,481	597	6,014	6,609	11,585	11,585	15,229
10	Sac City	1,619	57	3,265	3,265	6,075	7,725	8,156
11A	Sac City to End Bypass	1,478	417	4,549	4,069	6,749	6,749	9,272
11B	End Bypass to Lytton	398	0	0	1,286	2,459	2,459	3,084
12	Lytton	150	57	57	540	924	924	2,809
13A	Lytton to Begin Bypass	2,997	417	417	7,452	13,217	13,217	17,817
13B	Begin Bypass to Rockwell City	860	0	2,870	2,344	4,588	6,238	7,351
14	Rockwell City	414	145	1,783	1,963	3,515	3,515	4,785
15A	Rockwell City to End Bypass	382	318	4,534	3,527	6,056	6,056	9,623
15B	End Bypass to Moorland	1,432	1,824	1,824	12,227	21,829	21,829	30,264
16	Moorland	179	110	167	1,084	2,179	2,179	4,328
17	Moorland to US 169	353	453	453	453	4,382	4,382	6,766
		$25,240	$9,961	$37,373	$55,899	$131,017	$139,267	$279,778
	Engineering and Admin.	5,548	2,189	8,215	12,287	28,798	30,611	61,495
	Total Cost	$30,788	$12,150	$45,588	$68,186	$159,815	$169,878	$341,273

SOURCE: Brice Petrides-Donohue

ADDITIONAL OPERATIONS COSTS

When any of the alternatives have been built, Iowa DOT will have additional roadway miles to administer and maintain. In keeping with this study's life cycle cost approach, such costs will be included by year of occurrence in the economic analysis.

Maintenance Costs - Unit costs of maintaining highways in Iowa, as calculated by Iowa DOT, are depicted on Exhibit 3-11. Such costs vary by type of road (recognized in this study), road surface (recognized in this study), and traffic volume (not recognized in this study).

Exhibit 3-11
UNIT MAINTENANCE COSTS
(Dollars Per Roadway Mile Per Year)

	PER UNIT MAINTENANCE COST				
	4-Lane Paved	2-Lane Paved	Treated Surface	2-Lane Gravel Surface	Bridges
Interstate	$16,000	--	--	--	$.20/Sq.Ft.
Arterials	11,500	$8,000	$2,770	--	$.15/Sq.Ft.
Other Primary	5,000	3,650	2,770	$1,940	$.19/Sq.Ft.
Municipal	9,000	7,000	4,000	2,000	$.19/Sq.Ft.
Secondary	5,000	1,830	2,770	1,940	$.29/Sq.Ft.

Source: Iowa DOT

The unit maintenance costs were applied to the new road miles, by type. The results represent annual incremental increases in costs to Iowa DOT, as depicted on on the next page.

Annual Highway Maintenance Cost Increases

	Alternative	Annual Cost
1	Base Case	$0
2	Improved 2-Lane	$49,000
3	With Bypasses	$172,000
4	New 2-Lane Alignment	$246,000
5	4-Lane Arterial	$553,000
6	Expressway	$564,000
7	Freeway	$1,114,000

Periodic Resurfacing Costs - In addition, Iowa DOT will have additional lane miles requiring periodic resurfacing. These costs are assumed to be needed every 15 years with the result that they occur in year 15; by year 30 resurfacing will again be needed. Utilizing the unit resurfacing costs, the every 15 year resurfacing cost for each alternative would be as follows.

Resurfacing Cost Increases

	Alternative	Cost
1	Base Case	$0
2	Improved 2-Lane	$1,926,000
3	With Bypasses	$14,299,000
4	New 2-Lane Alignment	$23,778,000
5	4-Lane Arterial	$60,840,000
6	Expressway	$60,840,000
7	Freeway	$92,936,000

Chapter 4
BASE CASE TRAFFIC FORECASTS

The Base Case alternative assumes that Iowa DOT will complete the highway improvements that are currently planned, but that no other significant improvements are made. This includes not only minor improvements to U.S. 20 between Sioux City and Fort Dodge; it also includes a new 2-lane U.S. 20 on new alignment east of I-35 as well as improvements on other regional highways, e.g., U.S. 30.

Because of these planned highway improvements, the Base Case is expected to have some traffic differences (increases on U.S. 20) compared with the Existing Situation. The Base Case traffic estimates contained in this chapter recognize these differences. In this chapter the estimated Base Case traffic volumes for the years 1990 and 2010 imply the volumes that would exist if the currently planned Base Case highway improvements were already in place. The difference in traffic between 1990 and 2010 reflect what should be construed as "normal growth".

The first part of the Chapter comprises the automobile traffic analysis, the second part comprises the truck traffic analysis, and the concluding section summarizes the total traffic for the Base Case, Alternative #1 Scenario.

AUTOMOBILE TRAFFIC MODEL

A computerized corridor region traffic model procedure was used to simulate existing as well as future automobile traffic along the U.S. 20 study corridor. The TRANPLAN transportation modeling software was used in the analysis.

Roadway Network - The roadway network developed for this study corridor covers a much broader region than just the U.S. 20 study section between Sioux City and Fort Dodge. The large regional network was developed to improve the forecasts and to enable the inclusion of long distance divertible trips. This regional network (Exhibit 4-1) a subset of the National Highway Planning Network produced by the Oak Ridge National Laboratory. It is a detailed network of all major highways compiled from various sources including the USGS digital line graphs (DLG's), state highway maps, county roadway map, and HPMS data base for roadway attributes. Exhibit 4-1 shows the existing roadway network used in the analysis. This computerized network

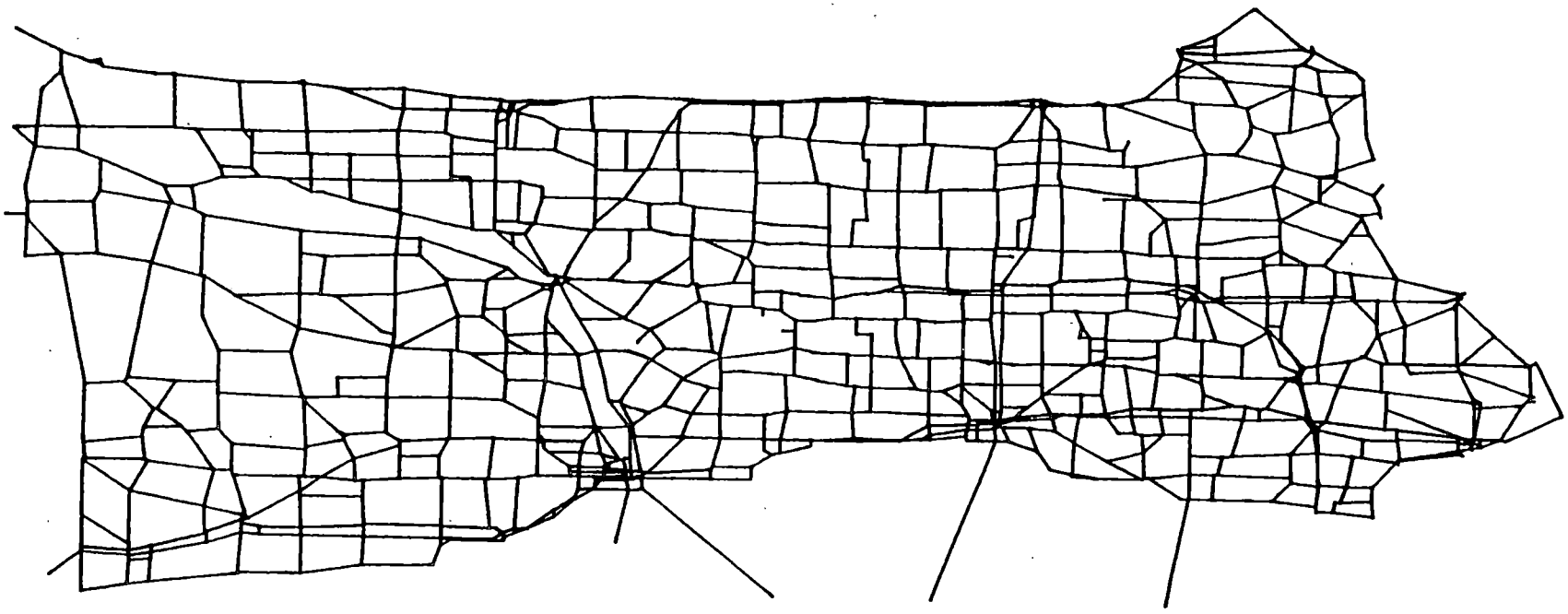


Exhibit 4-2

IOWA ROUTE 20 EXISTING NETWORK

extends south of U.S. 20 to include I-80 and north to include I-90. The network includes all of Iowa to the east and a portion of South Dakota and Nebraska.

The road network is defined by links, nodes and centroids. A link represents a roadway segment in the network and is defined by two numbers (from "node" and to "node"). A "node" is coded to designate an intersection point or other significant change in the roadway. "Centroids" represent traffic analysis zones (TAZ) and are connected to the existing roadway network by special links called "centroid connectors".

All traffic analysis was done using the TRANPLAN modeling software. Exhibit 4-2 depicts the TRANPLAN data format used in coding the roadway links.

Exhibit 4-2
TRANPLAN FORMAT USED IN CODING ROADWAY LINKS

DATA ITEM	COLUMNS	DESCRIPTION
A "node	1-5	From node
B "node"	6-10	To node
Distance	12-15	Miles
Field Option	16	"S" or "T"
Speed/Time	17-20	Speed or Time
Link Group 1	27-28	Link identification
Link Group 2	29-30	Link identification
Link Group 3	31-32	Link identification
Direction	45	2 for two-way link

Link Distances - For each node a set of coordinates (X and Y coordinates) was established. These coordinates were used for plotting purposes only. Distances coded for each link is the actual distance which takes into account the roadway characteristics.

Link Speeds - Each link in the network is coded with speeds in miles per hour. Speeds were initially coded based on their administrative classification, location, and access control as indicated in the original National Highway Planning Network. However, speeds on some links were adjusted to account for lower speeds due to roadway geometry, congestion and existing traffic controls and regulations. Exhibit 4-3 presents the initial speeds coded for various links.

The highway link codes consist of three characters. The first character is the urban flag (indicating urban area), the second character indicates access control and the third character indicates the administrative class. The meaning of each character in the code is defined in Exhibit 4-4.

Exhibit 4-3

SPEEDS CODED ON HIGHWAY LINKS

HIGHWAY LINK CODE	SPEEDS (Mph)
SII	55
SUP	35
SUU	35
SUX	35
TUP	45
TUT	45
UIL	55
UIP	55
UUP	35
UUV	35
UUX	35
VII	55
XGP	55
XII	65
XIP	55
XUP	55
XUS	55
XUT	55
XUU	35
XUX	35

Exhibit 4-4

DESCRIPTION OF HIGHWAY LINK CODES

First character of speed code
- X - Unknown
- S - Small urban towns
- T - Partial urban
- U - Urban
- V - Urban bypass

Second character of speed code
- X - Unknown
- I - Fully controlled
- G - Partially controlled
- U - Uncontrolled

Exhibit 4-4
DESCRIPTION OF HIGHWAY LINK CODES
(continued)

Third character of speed code
- X - Unknown
- I - Federal-Aid Interstate
- P - Federal-Aid Primary
- S - Federal-Aid Secondary
- U - Federal-Aid Urban
- T - Federal-Aid Urban and/or Secondary

Traffic Analysis Zones (TAZ) - Two factors were considered in defining the TAZ scheme. First, the scheme had to be compatible with the sources of base year and 2010 future year population forecasts and 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 TAZ scheme that would allow rural road traffic to be assigned to the network as an interzonal rather than an intrazonal movement (intrazonal trips would not appear in the network assignment).

The study area was divided into three regions to establish the traffic analysis zones (TAZ). The primary region included three rows of counties along the U.S. 20 corridor (Plymouth, Cherokee, Buena Vista, Pocahontas, Humboldt, Wright, Woodbury, Ida, Sac, Calhoun, Webster, Hamilton, Manona, Crawford, Carroll, Greene and Boone). The secondary analysis region included the area surrounding the primary region (Lyon, Sioux, Oscela, O'Brien, Dickinson, Clay, Emmet, Palo Alto, Kossuth, Winnebago, Hancock, Worth, Cerro Gordo, Mitchell, Floyd, Franklin, Buller, Hardin, Grundy, Story, Marshall, Jasper, Manor, Pope, Warren, Dallas, Madison, Guthrie, Adair, Audobon, Cass, Shelby, Pottawattamie, and Harrison). The third region included all remaining counties in Iowa, counties in Nebraska and South Dakota and other states.

The primary and secondary regions were then further subdivided to provide a more detailed zone scheme to better simulate existing traffic. All cities in each county in the primary area were defined as a zone and major cities (population over 1,000) in the secondary area were also defined as a zone.

The TAZ zones used in the network are listed in the Appendix. In total, the TAZ's consist of 328 zones including 92 in the primary region, 91 in the secondary region, 58 in the remaining counties in Iowa, 23 counties in South Dakota, 39 counties in Nebraska, and 25 other states.

Network Model Calibration - An automobile trip table was developed based on the roadside surveys conducted at ten stations in the U.S. 20 study corridor. An initial traffic assignment of the trip table was made on the existing network, and the following checks were made to validate the model:

- As much as possible all origin and destination pairs were crossing at least one of the ten station links.

- Origin and Destination paths (long distance and short distance) were traced to verify the speeds and distances coded in the network and to check for reasonableness.

The model was considered as calibrated when at least ninety (90%) percent of all trips were passing through at least one of the ten survey stations. The remaining ten percent of the trips could be explained by the fact that this is a regional model and does not include all existing local roads.

AUTOMOBILE TRENDS AND GROWTH RATES

With the calibrated automobile traffic model available, the next step was to analyze the future growth rate in travel on U.S. 20. Exhibit 4-5 presents automobile average daily traffic (ADT) counts for each study segment since 1976 and is then presented graphically in Exhibit 4-6. It shows that 1990 traffic volumes along U.S. 20 from Sioux City to Fort Dodge vary from a low of 1,148 on segment #7 to a high of 9,144 on segment #1. The amount of variability also holds true for traffic count data available for 1976, 1980 and 1984.

Weighted averages were calculated for the corridor to estimate automobile growth rates. As shown in Exhibit 4-5, three growth rates were calculated relevant to U.S. 20. The long-term growth rate (1976-1990) indicates almost no growth in traffic (.27% increase per year). The more recent trends, however, suggest greater but still modest growth of slightly more than 1 percent per year. The short-term growth rate (1984-1990) has the greatest traffic increase (1.34% per year) which likely reflects the upturn in jobs and population during that period (following a period of demographic decline).

The Exhibit 4-5 growth rates apply to what would be construed as "normal growth"; that is, traffic increases that would occur without any significant improvement to U.S. 20.

Exhibit 4-5

AUTOMOBILE ADT COUNT BY HIGHWAY SEGMENT

1976-1990

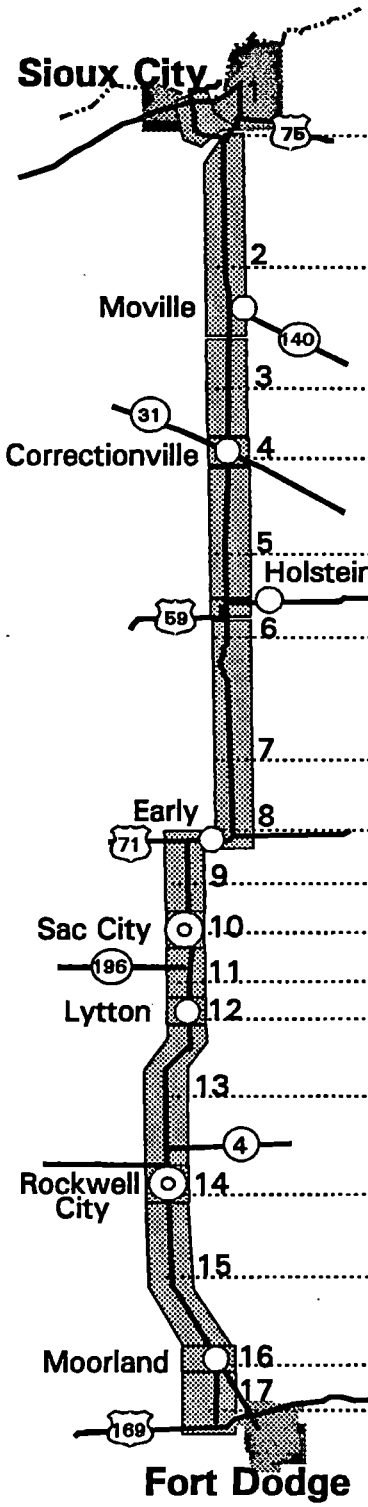
	HIGHWAY SEGMENT	1976	1980	1984	1990
1	Iowa state line to 1A 12	N/A	N/A	N/A	9,144
2	1A 12 to E. Moville	4691	4357	5034	5,731
3	E. Moville to W. Correctionville	2634	2068	2292	2,537
4	Correctionville	2116	2095	2581	2,285
5	E. Correctionville to W Jct US 59	1655	1761	1828	1,773
6	W Jct US 59 to E Jct US 59	2020	1988	2187	1,977
7	E Jct US 59 to N. Early	1205	1157	1183	1,148
8	Early	2892	2608	2482	2,356
9	S. Early to W. Sac City	1795	1857	1742	1,921
10	Sac City	5538	4819	4621	5,085
11	E. Sac City to W. Lytton	1930	1800	1700	1,848
12	Lytton	1808	1547	1516	1,591
13	E. Lytton to W. Rockwell City	1485	1418	1188	1,259
14	Rockwell City	2866	2500	2625	3,196
15	E. Rockwell City to W. Moorland	2052	1855	1709	1,847
16	Moorland	2733	2416	2627	2,752
17	E. Moorland to US 169	N/A	N/A	N/A	1,666
	Weighted Average	**2,327**	**2,154**	**2,233**	**2,418**

- Long Term Growth Rates (1976-1990) 0.27% per annum
- Medium Term Growth Rates (1980-1990) 1.16% per annum
- Short Term Growth Rates (1984-1990) 1.34% per annum

SOURCE: Traffic Counts, Iowa DOT

Exhibit 4-6

HISTORICAL and ESTIMATED DAILY AUTOMOBILE VOLUMES
by HIGHWAY SEGMENT
1976 - 2010



		Historical				Estimated	
	1976	1980	1984	1990	1990	2010
1	N/A	N/A	N/A	9,144	9,144	10,265
2	4,691	4,357	5,034	5,731	5,736	6,188
3	2,634	2,068	2,292	2,537	2,543	2,739
4	2,116	2,095	2,581	2,285	2,286	2,505
5	1,655	1,761	1,828	1,773	1,780	2,045
6	2,020	1,988	2,187	1,977	1,976	2,279
7	1,205	1,157	1,183	1,148	1,163	1,510
8	2,892	2,608	2,482	2,356	2,382	2,930
9	1,795	1,857	1,742	1,921	1,944	2,444
10	5,538	4,819	4,621	5,085	5,107	6,163
11	1,930	1,800	1,700	1,848	1,910	2,410
12	1,808	1,547	1,516	1,591	1,702	2,160
13	1,485	1,418	1,188	1,259	1,367	1,771
14	2,866	2,500	2,625	3,196	3,337	4,397
15	2,052	1,855	1,709	1,847	1,937	2,688
16	2,733	2,416	2,627	2,752	2,884	4,042
17	N/A	N/A	N/A	1,666	1,813	1,993

BASE CASE YEAR 2010 AUTOMOBILE TRAFFIC FORECASTS

Exhibit 4-7 presents the results of the automobile traffic assignments for the "existing network" as well as the "base network". The existing network represents the road network as it exists at the present time. The "base network" includes highway improvements that have been programmed for completion in the near future. These were described in Chapter 2.

Exhibit 4-7
BASE CASE AUTOMOBILE TRAFFIC ASSIGNMENT
U.S. 20

	HIGHWAY SEGMENT	1990 EXISTING	1990 BASE	2010 BASE	RATIO 1990 BASE TO EXISTING	ANNUAL GROWTH RATE(%)
1	Iowa State line to IA 12	9,144	9,144	10,265	1.0000	0.58009
2	IA 12 to E. Moville	5,731	5,736	6,188	1.0009	0.37969
3	E. Moville to W. Correctionville	2,537	2,543	2,739	1.0023	0.37192
4	CORRECTIONVILLE	2,285	2,286	2,505	1.0004	0.45958
5	E. Correctionville to	1,773	1,780	2,045	1.0039	0.69663
6	W Jct US 59 to E Jct US 59	1,977	1,976	2,279	0.9995	0.71542
7	E Jct US 59 to N. Early	1,148	1,163	1,510	1.0131	1.31355
8	EARLY	2,356	2,382	2,930	1.0110	1.04101
9	S. Early to W. Sac City	1,921	1,944	2,444	1.0120	1.15134
10	SAC CITY	5,085	5,107	6,163	1.0043	0.94390
11	E. Sac City to W. Lytton	1,848	1,910	2,410	1.0335	1.17004
12	Lytton	1,591	1,702	2,160	1.0698	1.19943
13	E. Lytton to W. Rockwell City	1,259	1,367	1,771	1.0858	1.30224
14	ROCKWELL CITY	3,196	3,337	4,397	1.0441	1.38934
15	E. Rockwell City to W. Moorland	1,847	1,937	2,688	1.0487	1.65240
16	Moorland	2,752	2,884	4,042	1.0478	1.70294
17	E. Moorland to US 169	1,666	1,813	1,993	1.0882	0.47436
	Weighted Average	2,418	2,458	2,922	1.20832	0.87%

The 1990 and 2010 Base Case automobile ADT estimates are a result of a series of steps taken to convert the assignment numbers to the automobile traffic forecasts as follows:

Step 1. Obtain trip table for base year 1990 and forecast year 2010.

Step 2. Make changes to existing network to reflect the base network.

Step 3. Use TRANPLAN software to distribute trips on the network.

Step 4. Tabulate assignment volumes for every link representing U.S. 20 study corridor.

Step 5. Calculate weighted average assignment for each of the 17 segments.

Step 6. Calculate ratio between base network and existing network assignments.

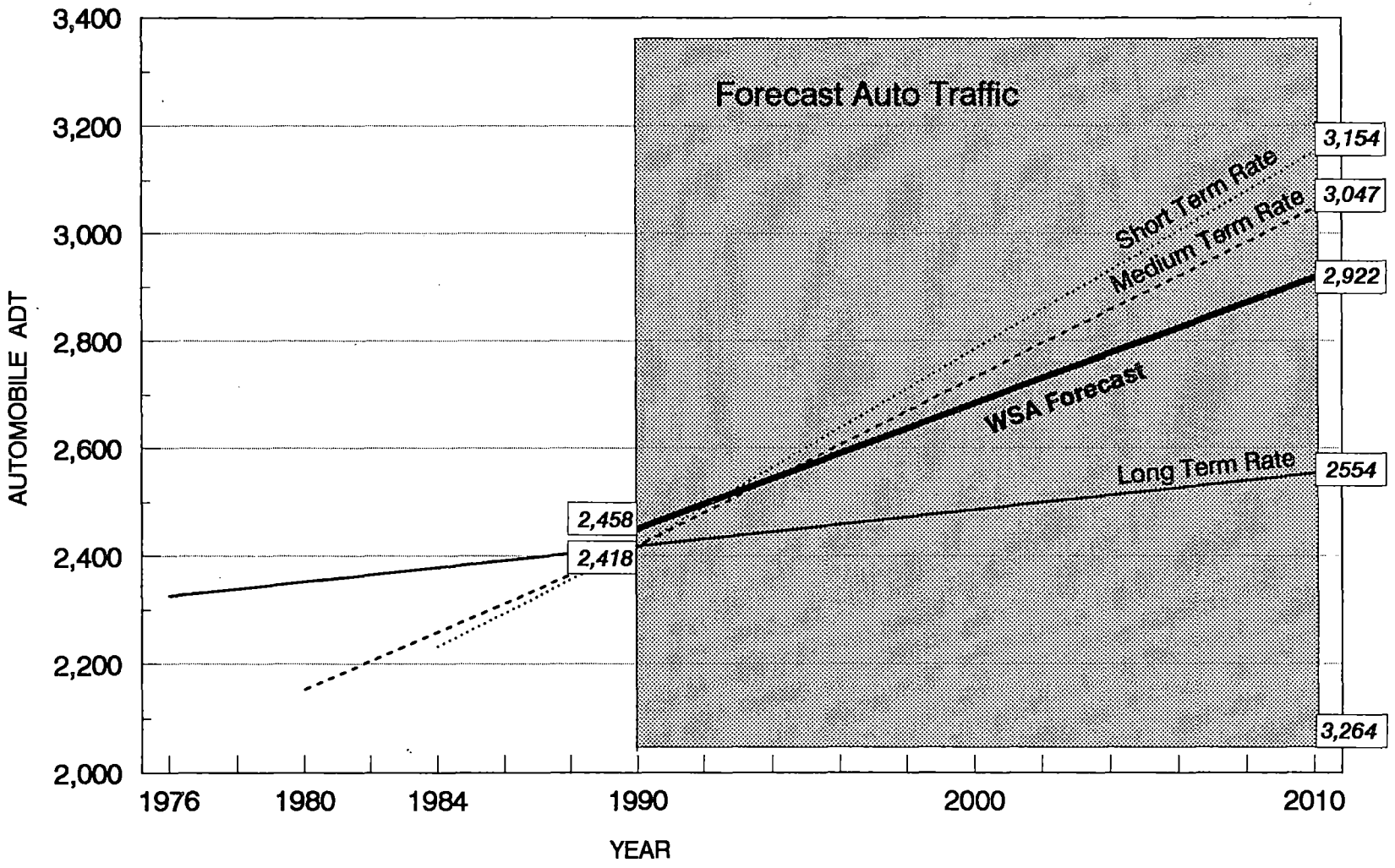
Step 7. Apply the ratio calculated in Step 6 to the through portion of the existing traffic on each segment.

Step 8. The local portion of the existing traffic is assumed to be stable during the 1990 analysis but it is expected to grow at the rate of 0.80% per year for the 2010 analysis, which is the estimated (revised) population growth of the five counties along the corridor

Step 9. Add traffic numbers generated from steps 7 and 8 to represent the forecast automobile ADT on the segment.

Exhibit 4-8 depicts graphically the average auto traffic forecast using the three growth rates. It also shows the forecast from the network model (the "WSA Forecast"). The year 2010 automobile ADT forecast using these three rates could be as high as 3,153 or as low as 2,554 using short-term and long-term growth rates, respectively. The network model estimate of year 2010 automobile ADT (2,922) represents a compound growth rate of 0.87 percent per year. The difference in long term and short term growth rates is due to the fluctuations in traffic volumes along the corridor, probably a result of the downturn of the agricultural economy in the early 1980's and the population and employment declines of earlier years.

Exhibit 4-8
US 20 AUTOMOBILE ADT TRENDS AND FORECASTS
ALTERNATIVE #1: BASE CASE



TRUCK TRAFFIC ANALYSIS

Truck travel in the corridor operates in a manner very different from automobiles. For this reason the truck analyses were done independent of the automobile model. Truck roadside surveys, trucker and shipper/receiver interviews, economic conditions and historical truck trends were used to forecast future truck volumes by truck type and trip type for the Alternative 1: Base Case. The truck origin and destination surveys conducted in the primary impact area were described in Report A. Economic conditions considered include population, employment and retail sales (also detailed in Report A and updated in the Report B Appendix). Historical truck volumes were tabulated from the Iowa DOT's "Volume of Traffic on the Primary Road System" bi-annual reports (1976-1990). The two truck types reflect truck size; small trucks are single unit and large trucks are combination units. Trip types reflect generalized origin and destination; through trips begin and end outside of the primary impact area, external-internal trips have one end in the primary impact area and one end in the external area, and internal-internal trips are completely within the primary impact area.

Truck Trends and Growth Rates - The truck origin and destination surveys found that the U.S. 20 corridor between Sioux City and Fort Dodge primarily carries localized truck traffic. The survey results reveal that nearly 64 percent of all trucks on U.S. 20 are travelling to and from destinations within the Sioux City to Fort Dodge corridor. Twenty-nine percent are travelling from within the corridor to outside areas, while only 6.7 percent of all truck trips on U.S. 20 are through traffic. Therefore, 93.3 percent of all traffic on U.S. 20 has one or both of its trip ends inside the study corridor. These figures indicate the high level of localized truck traffic on U.S. 20. Exhibit 4-9 displays the origin and destination percentages by truck type in the corridor.

Exhibit 4-9
NUMBER OF AVERAGE DAILY TRUCK TRIPS BY VEHICLE TYPE
U.S. 20
1990

	NUMBER OF DAILY TRIPS BY TYPE			
TRUCK TYPE	Through	External-Internal	Internal-Internal	Total
Small Trucks	2	25	108	135
Heavy Trucks	28	107	179	314
Total Trucks	30	132	287	449
Percent	(6.7%)	(29.4%)	(63.9%)	(100%)

NOTE: The percentages found in the Roadside Survey were applied to 1990 average truck traffic on U.S. 20.

SOURCE: U.S. 20 Roadside Survey Results, 1991
Wilbur Smith Associates.

Since truck travel on U.S. 20 is primarily local in nature, existing truck volumes are very dependent on activities within the local region involving shipping and receiving which in turn are dependent on local economic conditions. In order to measure the relationship between economic conditions and truck travel, several statistical analyses were applied. The analyses involved using truck ADT as the dependent variable and economic conditions as the independent variables. Weighted average truck volumes on U.S. 20 within each county within the five county corridor area were estimated. Likewise, the economic variables comprised county totals for the same five counties. The correlation analyses were first conducted for 1980 and 1990, to determine if a significant relationship existed. The statistical results, displayed in Exhibit 4-10, revealed that truck volumes in the U.S. 20 corridor for the years 1980 and 1990 are significantly correlated with population, manufacturing employment and retail activity.

Exhibit 4-10
CORRELATION BETWEEN ECONOMIC INDICATORS AND TRUCK TRAFFIC
U.S. 20

ECONOMIC VARIABLES	TRUCK VOLUME VARIABLES 1980 Small Truck ADT	1980 Heavy Truck ADT	1990 Small Truck ADT	1990 Heavy Truck ADT
Population	0.811	0.688	0.900	0.658
Total Employment	0.890	0.773	0.925	0.695
Mfg. Employment	0.911	0.822	0.947	0.743
Agr. Employment	0.756	0.725	0.475	0.131
Wholesale Employment	0.862	0.732	0.911	0.672
Retail Sales	0.878	0.795	0.859	0.611

NOTE: The correlation is a measure of the strength of the linear relationship between the economic and truck ADT variables, i.e. a figure of 1.0 represents a perfect correlation.

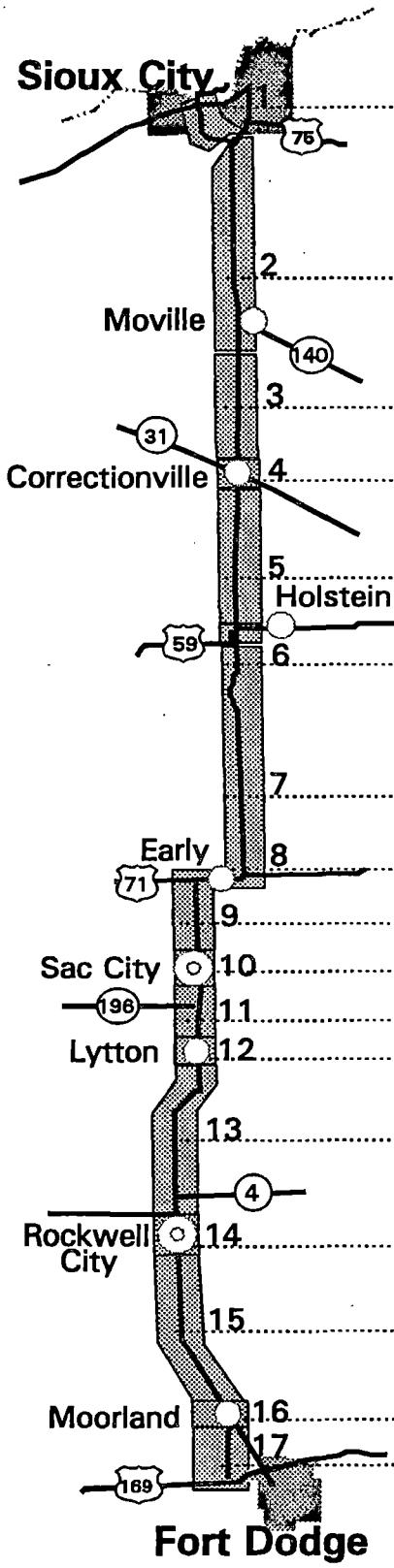
SOURCE: Wilbur Smith Associates.

Since the correlation results for 1980 and 1990 indicate that economic activity is a significant determinant in the number of truck trips generated in the corridor, a correlation analysis was then conducted for all years between 1980 and 1990. The results, however, did not show any significant correlations. The reason is that volumes increased during a period of regional economic decline. This indicates that there are other elements besides economic factors involved in driving truck volumes on U.S. 20.

To assist in forecasting future truck traffic, historical truck traffic counts were also compiled for the corridor. Exhibit 4-11 maps the historical truck volumes for each segment by truck type from 1976 to 1990. The weighted averages for the corridor are listed in Exhibit 4-12. The two tables indicate a fluctuating growth trend for trucks in the corridor. From 1976 to 1984 the corridor experienced a decline in total truck traffic. Since that time truck traffic, particularly heavy truck traffic, has been increasing at a much faster rate. The fluctuating growth pattern can partly be explained by the sluggish agricultural economy in the region of the early 1980's. Various annual compound growth rates truck volumes for several combinations of years are shown in Exhibit 4-13.

Exhibit 4-11

HISTORICAL DAILY TRUCK VOLUMES by HIGHWAY SEGMENT
1976 - 1990



	Small Trucks				Heavy Trucks			
	1976	1980	1984	1990	1976	1980	1984	1990
1	N/A	N/A	N/A	250	N/A	N/A	N/A	486
2	328	191	230	229	331	312	386	520
3	268	138	146	129	378	304	292	374
4	270	142	142	199	284	233	287	406
5	172	144	142	201	303	235	290	406
6	194	201	135	190	336	291	268	523
7	136	93	89	67	239	220	218	325
8	239	132	170	119	309	290	238	325
9	130	93	108	96	185	160	160	193
10	192	170	234	188	230	171	155	147
11	168	84	67	128	162	126	153	164
12	99	77	54	134	213	126	150	165
13	105	92	84	150	190	140	158	171
14	166	128	134	141	228	222	231	239
15	130	123	96	98	238	272	215	255
16	138	156	119	134	239	298	204	284
17	N/A	N/A	N/A	102	N/A	N/A	N/A	202

Exhibit 4-12
AVERAGE DAILY TRUCK VOLUMES
U.S. 20
1976 - 1990

YEAR	SMALL TRUCKS	HEAVY TRUCKS	TOTAL
1976	180	263	443
1980	125	234	359
1984	125	241	366
1990	135	314	449

SOURCES: Iowa Department of Transportation
Wilbur Smith Associates.

Exhibit 4-13
TRUCK TRAFFIC GROWTH RATES
U.S. 20
1976 -1990

GROWTH RATE YEARS	SMALL TRUCKS	HEAVY TRUCKS	TOTAL
Long-Term 1976 - 1990	-2.03%	1.27%	0.10%
Medium-Term 1980 - 1990	0.77%	2.98%	2.26%
Short-Term 1984 - 1990	1.29%	4.51%	3.47%

SOURCES: Iowa Department of Transportation
Wilbur Smith Associates.

BASE CASE YEAR 2010 TRUCK TRAFFIC FORECASTS

Forecasts for future truck volumes by truck types for the Base Case are primarily based on the medium term truck volume growth rates of Exhibit 4-13. These medium term growth rates appear to balance out the effects of the sharp drop in both small and heavy trucks between 1976 and 1990, and the high growth rates of heavy trucks between 1984 and 1990.

The resulting Base Case forecast growth rate for large trucks is 2.98 percent per year, and the forecast growth rate for small trucks is 0.99 percent. These forecasts are for the Base Case (existing plus committed network). The new alignment of U.S. 20 East of Iowa Falls to Waterloo will likely not affect traffic within the primary impact study area. Such traffic comprises 63.9 percent (287 trips) of the total 449 small and heavy average daily truck trips. However, the new alignment to the east will affect some of the traffic with at least one end point outside of the primary study impact area. Of these remaining 162 truck trips, currently 27 trips are small trucks and 135 are large trucks. The Base Case forecast estimates that ten percent of each (3 small and 14 large trucks) will divert.

The combined result of the medium term growth rates and the new alignment to the east are presented as the WSA Forecasts and shown graphically with the other term growth rates on Exhibit 4-14 and 4-15 for small and heavy trucks, respectively. The estimated daily truck volumes by highway segment for 1990 and 2010 are presented in Exhibit 4-16.

Exhibit 4-14

SMALL TRUCK ADT, TRENDS AND FORECASTS

Alternative #1: Base Case

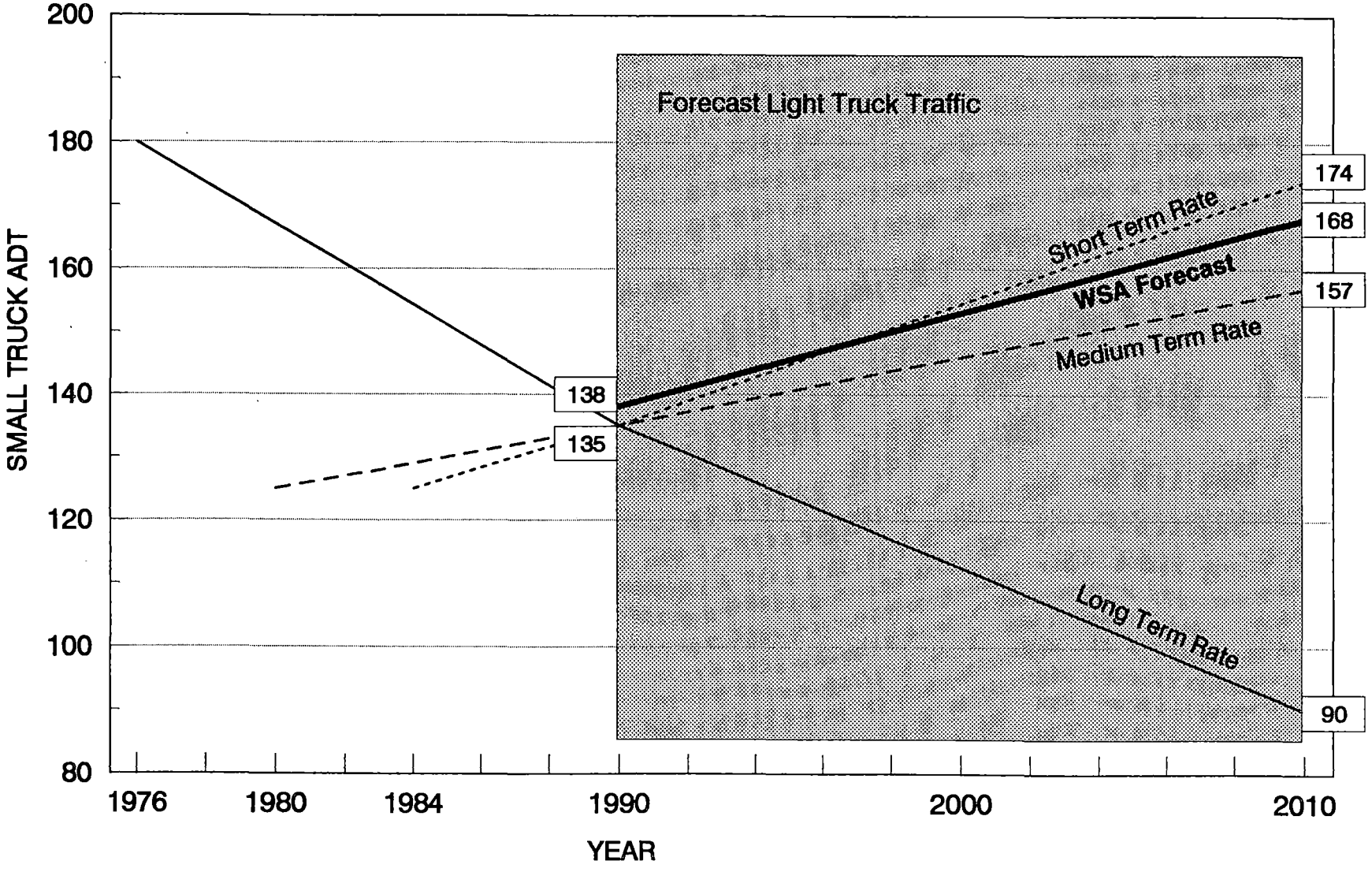


Exhibit 4-15

HEAVY TRUCK ADT, TRENDS AND FORECASTS

Alternative #1: Base Case

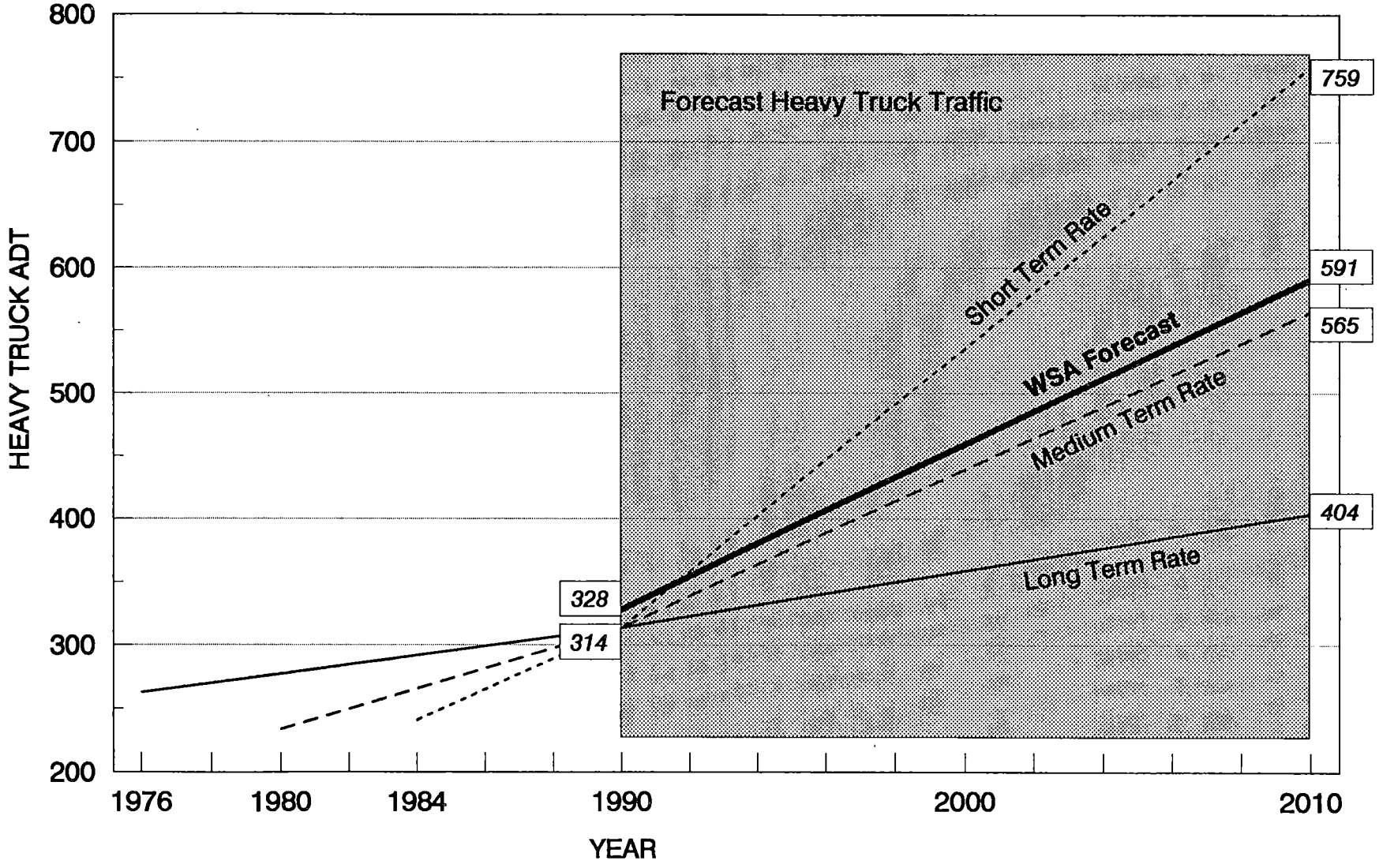
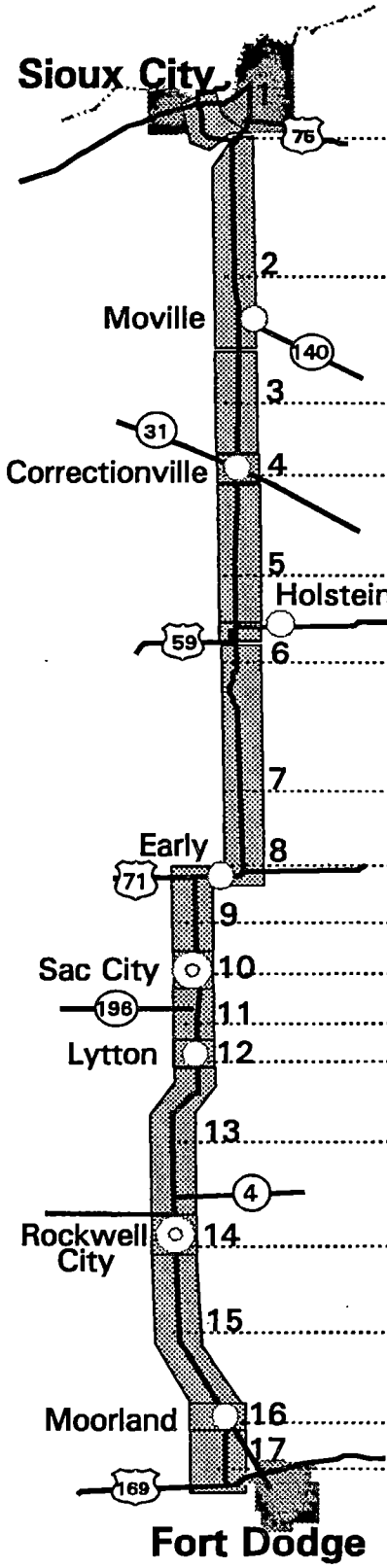


Exhibit 4-16

ESTIMATED TOTAL DAILY TRUCK VOLUMES by HIGHWAY SEGMENT

Alternative #1: Base Case

1990 - 2010



	Truck ADT 1990			Truck ADT 2010		
	Small	Heavy	Total	Small	Heavy	Total
	256	508	764	311	915	1226
2	234	543	777	285	979	1264
3	132	391	523	161	704	865
4	203	424	627	248	764	1012
5	205	424	629	250	764	1014
6	194	546	740	236	984	1220
7	68	339	407	83	612	695
8	122	339	461	148	612	760
9	98	202	300	119	363	482
10	192	154	346	234	277	511
11	131	171	302	159	309	468
12	137	172	309	167	311	478
13	153	179	332	187	322	509
14	144	250	394	175	450	625
15	100	266	366	122	480	602
16	137	297	434	167	535	702
17	104	211	315	127	380	507

BASE CASE YEAR 2010 TRAFFIC FORECASTS

The composit automobile and truck daily volume estimates for the Base Case are listed in Exhibit 4-17. The 1990 volumes are slightly higher than are the actual traffic counts in 1990 because they represent the Base Case (including programmed highway improvements) rather than the Existing Situation.

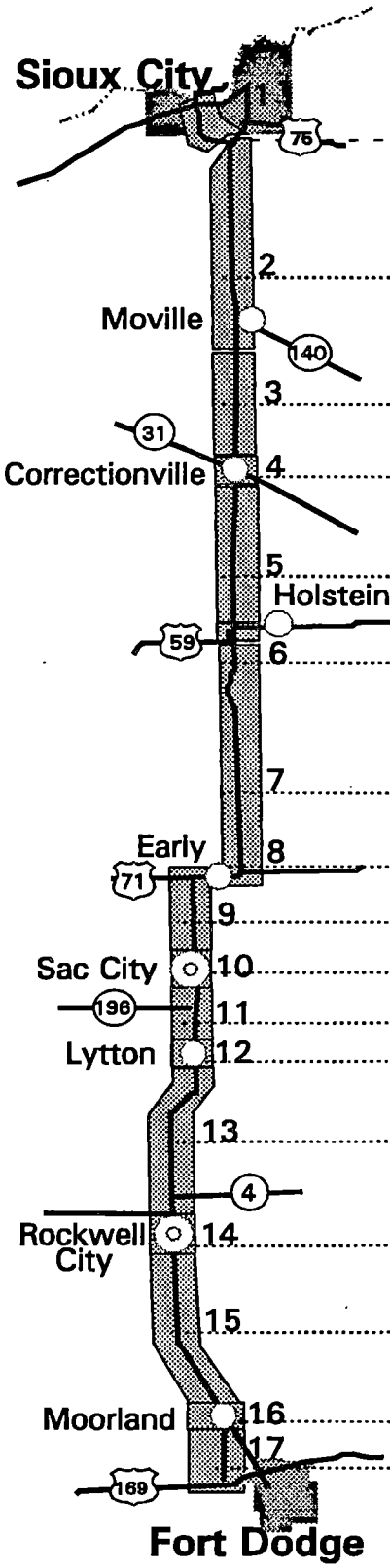
These Base Case volumes are those with which all of the U.S. improved alternatives' volumes are compared in Chapter 6.

Exhibit 4-17

ESTIMATED TOTAL DAILY TRAFFIC VOLUMES by HIGHWAY SEGMENT

Alternative #1: Base Case

1990 - 2010



	1990 ADT			2010 ADT		
	Auto	Truck	Total	Auto	Truck	Total
1	9144	764	9,908	10265	1226	11,491
2	5736	777	6,513	6188	1264	7,452
3	2543	523	3066	2739	865	3,604
4	2286	627	2,913	2505	1012	3,517
5	1780	629	2,409	2045	1014	3,059
6	1976	740	2,716	2279	1220	3,499
7	1163	407	1,570	1510	695	2,205
8	2382	461	2,843	2930	760	3,690
9	1944	300	2,244	2444	482	2,926
10	5107	346	5,453	6163	511	6,674
11	1910	302	2,212	2410	468	2,878
12	1702	309	2,011	2160	478	2,638
13	1367	332	1,699	1771	509	2,280
14	3337	394	3,731	4397	625	5,022
15	1937	366	2,303	2688	602	3,290
16	2884	434	3,318	4042	702	4,744
17	1813	315	2,128	1993	507	2,500

Chapter 5
MULTI-STATE REGIONAL HIGHWAY PROSPECTS

As documented in Report A, U.S. 20 currently performs a "local and regional access" function (only 8% of existing U.S. 20 traffic is "through traffic"). The study is addressing alternative improvements to U.S. 20 that might cause the highway to better perform this local access function. In addition to this subarea function, as introduced in Report A, more significant U.S. 20 improvements might change the highway's role, by causing U.S. 20 to become a multi-state regional highway, able to compete with and somewhat relieve traffic on I-80 and I-90.

The multi-state regional highway concept would require that the Sioux City to Fort Dodge segment be built to four lanes, and that it be connected to a more long distance regional four-lane highway network involving highways in Iowa, Nebraska and Illinois. The regional multi-state highway would basically connect the northern Illinois-Wisconsin-Minnesota area with I-80 in the Grand Island, Nebraska area via U.S. 20 across Iowa. The role of this highway might cause U.S. 20 to become a major highway route that autos and trucks could use for more long distance trips. To allow this change in function to occur, U.S. 20 would likely have to be a four-lane highway able to compete with I-80 and I-90. This would imply freeway standards. ?

MULTI-STATE OPTIONS

Wisconsin ?

The regional multi-state highway alternative would utilize existing and possibly new constructed highways in Nebraska, Iowa and Illinois (Exhibit 5-1). In Iowa the multi-state U.S. 20 regional highway would have to be four lanes all across the state. U.S. 20 across Iowa is already four-lanes from Waterloo to Dubuque. The segment from I-35 to U.S. 65 is currently two-lanes, built on four-lane right-of-way, with grade separated crossings.

In Nebraska, under this four-lane multi-state regional highway concept, the highway would connect Grand Island to South Sioux City via Columbus and possibly Norfolk. There are currently no long range plans in Nebraska to widen the highways connecting these cities; however, recent origin/destination surveys conducted in the

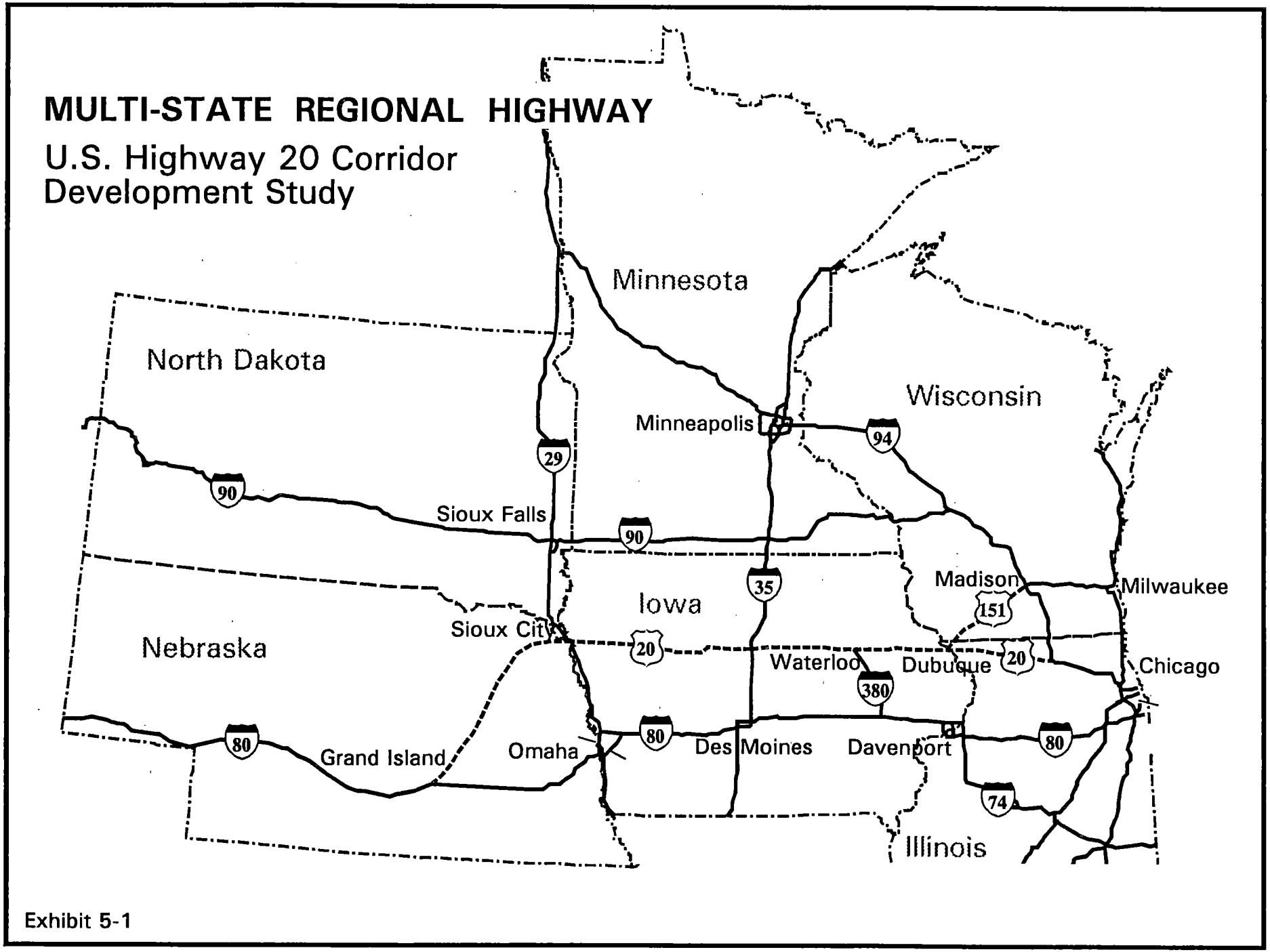

MULTI-STATE REGIONAL HIGHWAY
U.S. Highway 20 Corridor
Development Study
Minnesota
North Dakota
Wisconsin
Minneapolis
94
29
90
Sioux Falls
90
35
Madison
Milwaukee
151
Iowa
Sioux City
Nebraska
20
Waterloo
Dubuque
20
Chicago
380
80
Grand Island
Omaha
80
Des Moines
Davenport
80
74
Illinois

Exhibit 5-1

northeastern portion of that state have led the Nebraska Department of Roads to consider the feasibility of creating highway improvements for this corridor.

The Illinois portion of this multi-state regional highway concept would utilize U.S. 20, essentially between East Dubuque and Freeport. It would then continue on the four-lane section of U.S. 20 bypassing Rockford to the south before tying into I-90, which provides direct access to Chicago. At the present time, the Illinois DOT Five Year Plan is oriented to urban congestion relief. Limited funds will be available for rural highway projects, and there are a number of corridors competing for those funds. Still, there is a special interest group in Illinois lobbying for improvements to U.S. 20, and a preliminary feasibility study has been done.

There are also plans for upgrading U.S. 151 in Wisconsin, from Madison to Dubuque, Iowa. This would provide Milwaukee and the State of Wisconsin access to the U.S. 20 regional highway.

In evaluating the multi-state regional highway concept, this study is assessing the freeway standard (65 mph) option across Illinois, Iowa and Nebraska, and the expressway standard (55 mph) and four-lane arterial option (55 mph) in Iowa only.

UNIVERSE OF TRAFFIC POTENTIAL

Key to the feasibility of such a venture is whether a four-lane corridor across Illinois, Iowa, and on through Nebraska to I-80 could attract sufficient traffic to make it worthwhile. The first step is to identify how many cars and how many trucks have origin/destination pair combinations such that they could use U.S. 20, if they chose to do so. Once this universe of travel is known, then the next step is to estimate how much of this travel would use U.S. 20.

To estimate this universe of long-distance travel, the surveys conducted on I-80 and I-90 (see Report A) were used. These included the automobile license plate observations, the auto surveys at the rest stops, and the truck driver surveys. These 1991 survey results were then checked against other data, e.g., a 1975 Interstate origin/destination survey.

Multi-State Regional Highway - Since U.S. 20 is located between I-80 and I-90, it could conceivably divert traffic from either or both. Principally, such potential is for origin and destination pairs between the Midwest and the Northwest, Mountain, and West regions of the U.S.

Exhibit 5-2 displays the highway distances between areas of the upper midwest. The map also shows the estimated distances between points on the regional highway. Based on these distances, Exhibit 5-3 illustrates the estimated distances for various route options between potential divertable origins and destinations.

Exhibit 5-3

ESTIMATED DISTANCES FOR VARIOUS ROUTE OPTIONS

	ROUTE OPTION MILEAGE DISTANCES			
Origin/Destination Pairs	I-80	I-90	U.S. 20 Regional Highway	I-380/ U.S. 20
Ill./Ind. Border - Sioux Falls, SD	627	592	575	606
Chicago - Grand Island, NE	617	--	642	--
Milwaukee - Grand Island, NE	711	--	647	--
Chicago - Sioux Falls, SD	630	571	554	609
Minneapolis - Grand Island, NE	499	--	489	--
Iowa City - Sioux City	301	--	--	280
Des Moines - Sioux City	200	--	201	--

NOTE: Distances are approximate.

SOURCE: Wilbur Smith Associates.

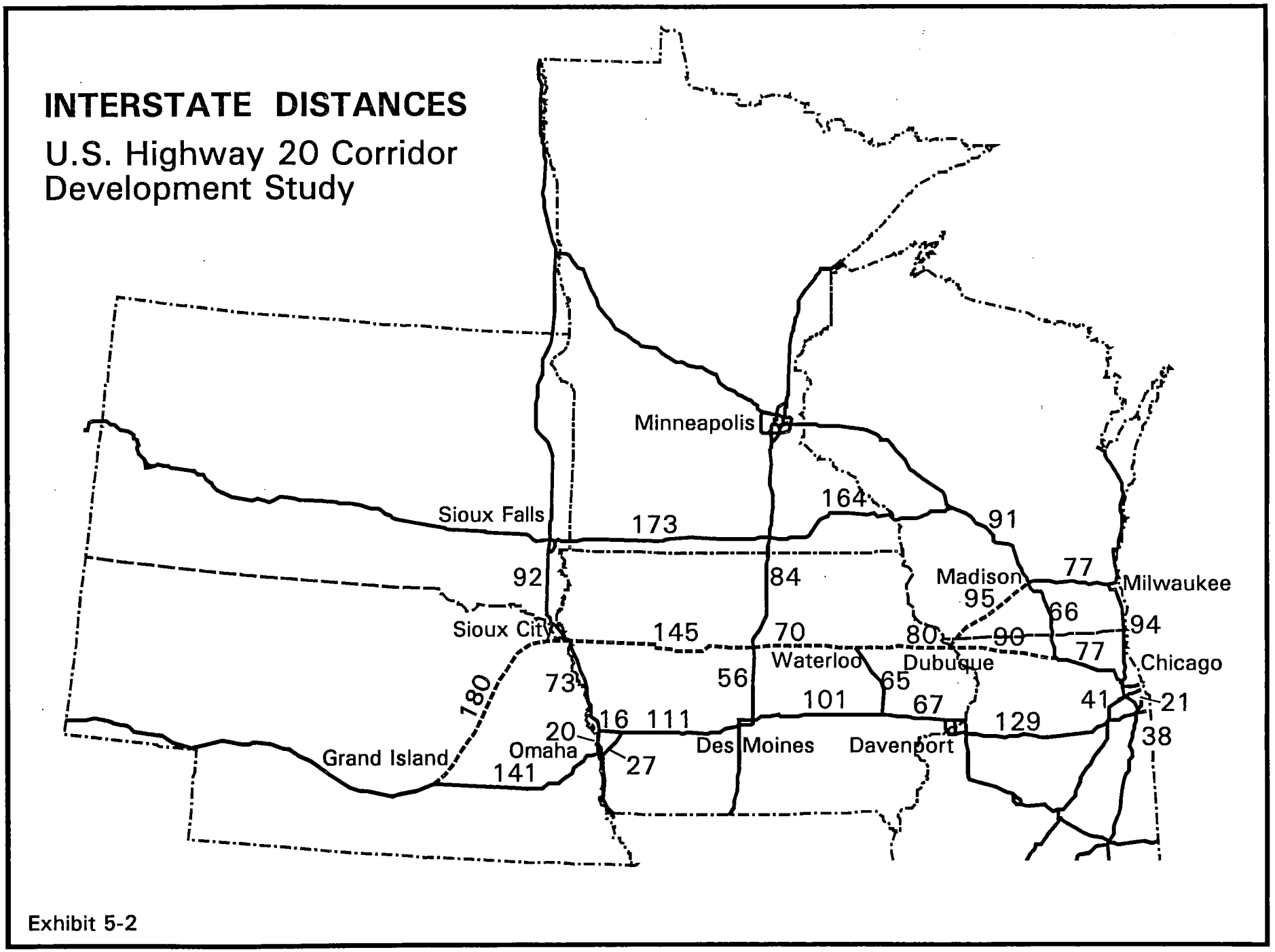

INTERSTATE DISTANCES
U.S. Highway 20 Corridor
Development Study
Minneapolis
Sioux Falls
173
164
91
92
84
Madison
77
Milwaukee
95
66
94
Sioux City
145
70
80
90
77
Waterloo
Dubuque
Chicago
73
56
65
101
67
41
21
180
16
111
129
20
Omaha
Des Moines
Davenport
38
Grand Island
27
141

Exhibit 5-2

Based on these distance comparisons, the regional highway could conceivably divert traffic from I-80 between the following origin and destination pairs (including locations between these origin/destination pairs):

- Northern Chicago Suburbs - Western U.S.
- Chicago Area - Northwestern U.S.
- Eastern U.S. - Northwestern U.S.
- Wisconsin - Western U.S.
- Northern Iowa - Western U.S.
- Iowa - Northwestern U.S.
- Minnesota - Western U.S.
- Des Moines - Sioux City

Also based on these distance comparisons, potentially divertable traffic from I-90 would primarily involve traffic traveling between Chicago and Sioux Falls, South Dakota and points in between. Below is a list of origin/destination pairs that could conceivably divert onto the regional highway from I-90:

- Chicago Area - Northwestern U.S.
- Eastern U.S. - Northwestern U.S.
- Wisconsin - Western U.S.
- Northern Iowa - Western U.S.

The auto and truck origins and destinations on I-80 and I-90 were tabulated based on the surveys and observations. Then, those with origin and destination pairs that could conceivably use U.S. 20 were isolated.

Vehicles that Could Divert - A comparison of trip distances and times between the route options for each origin/destination pair suggests the total trips that could divert to a regional U.S. 20 (not all of these trips will divert). The total trips that could divert are listed on Exhibit 5-4.

Exhibit 5-4

VEHICLE VOLUMES THAT COULD DIVERT

Multi-State Regional Highway

1990

	DAILY VEHICLES FROM		
	I-80	I-90	Total
Automobiles	1,140	520	1,660
Trucks	1,250	410	1,660
Total Vehicles	2,390	930	3,320

SOURCE: Wilbur Smith Associates

The above long-distance vehicles represent trip origin/destination pairs that have the potential to divert to a four-lane regional highway. Only a fraction of them would be expected to actually divert.

ESTIMATED TRAFFIC THAT WOULD DIVERT

The previous section examined the total traffic that could conceivably divert onto the multi-state regional highway from Interstates 80 and 90. This section takes the next step, which is to evaluate the origin and destination pairs to determine the likely number of vehicles that will divert from the two Interstates to the regional highway.

The forecast methodology involved using the origin and destination information from the interstate surveys and estimated time and distance factors between the various locations within the multi-state region. The analysis assumed all segments of the U.S. 20 multi-state highway to be of comparable interstate speeds and standards.

In many cases, the time and distance between origin and destination locations along the interstate option and the U.S. 20 regional highway are very similar. Also, personal preferences or other constraints cannot be accurately modeled. For

Exhibit 5–5
ESTIMATED DIVERTED ORIGIN AND DESTINATION PAIRS
Multi–State Regional Highway
1990

Origin/Destination Pairs	Interstate 80 Potential Autos	Potential Trucks	Est. Mileage Savings	Diverted Autos	Diverted Trucks
Within Iowa	265	65	21 mi.	133	33
West U.S. – Wisconsin	110	215	64 mi.	83	162
West U.S. – Minnesota	220	90	10 mi.	176	72
West U.S. – Chicago Area	60	225	–25 mi.	3	11
West U.S. – North Iowa	200	20	10 mi.	120	12
Northwest U.S. – East U.S.	––	155	52 mi.	––	125
S. Dakota – Iowa	40	115	–1 mi.	20	58
Northwest U.S. – Chicago Area	––	130	76 mi.	––	117
Northwest Iowa – Chicago Area	90	35	76 mi.	81	32
NE Nebraska – Iowa	50	30	20 mi.	30	18
NE Nebraska – Chicago Area	25	40	76 mi.	19	30
S. Dakota – East U.S.	20	30	52 mi.	15	23
S. Dakota – Chicago Area	50	––	76 mi.	45	––
Northwest Iowa – East U.S.	––	45	52 mi.	––	34
Northwest U.S. – Iowa	10	35	–1 mi.	5	18
Northwest Iowa – Wisconsin	––	10	150 mi.	––	10
N. Dakota – Iowa	––	10	–1 mi.	––	5
Total	**1,140**	**1,250**		**730**	**760**

Origin/Destination Pairs	Interstate 90 Potential Autos	Potential Trucks	Est. Mileage Savings	Diverted Autos	Diverted Trucks
S. Dakota – Iowa	200	45	20 mi.	150	34
S. Dakota – Chicago Area	200	95	17 mi.	120	57
Northwest Iowa – Minnesota	100	40	36 mi.	75	30
NE Nebraska – Minnesota	20	––	36 mi.	15	––
S. Dakota – East U.S.	––	115	17 mi.	––	69
NE Nebraska – Wisconsin	––	20	40 mi.	––	15
Northwest U.S. – East U.S.	––	30	17 mi.	––	15
West U.S. – Wisconsin	––	5	40 mi.	––	4
Northwest U.S. – Chicago Area	––	15	17 mi.	––	8
Northwest Iowa – East U.S.	––	5	17 mi.	––	3
Northwest Iowa – Wisconsin	––	30	130 mi.	––	30
Northwest U.S. – Iowa	––	10	–1 mi.	––	5
Total	**520**	**410**		**360**	**270**
GRAND TOTAL	**1,660**	**1,660**		**1,090**	**1,030**

example, it is shorter to travel along the U.S. 20 regional highway between Chicago and Sioux City. However, if the vehicle is traveling to or from the south side of Chicago, it may be an inconvenience or even more time consuming to travel north to U.S. 20 than on I-80. Therefore, not all traffic was assumed to travel along the shortest route.

Exhibit 5-5 details the estimated diverted traffic by origin and destination pair for both Interstate 80 and 90. The universe of potential number of autos and trucks from the previous section are also illustrated to show the difference between the potential and estimated diverted traffic. It is estimated that the total diversions onto the U.S. 20 regional highway from the two interstates in 1990 would be approximately 2,120 vehicles per day (1,090 autos and 1,030 trucks).

Exhibit 5-6 suggests that approximately 11 percent of the traffic on both Interstate 80 and Interstate 90 would divert to the multi-state highway. Using a historical growth trend from Interstate 80, the estimated diversions are calculated for the Year 2010 (Exhibit 5-6). The growth trend used both individual auto and truck annual factors calculated from the Western Iowa portion of Interstate 80 from 1976 to 1990. The assumed annual growth rate is 3.0 percent for autos and 4.0 percent for trucks. These growth rates represent that approximately 4,230 vehicles per day would divert from the two interstates in the year 2010.

Conclusions

There is traffic on I-80 and I-90 that a multi-state regional highway involving U.S. 20 across Iowa could divert. According to the study's calculations, it is estimated that approximately 2,100 trips per day on the two interstate highways that would likely divert to U.S. 20 in 1990.

This analysis was meant to calculate only the diversions from Interstates 80 and 90. The interstate diversions will be added to the local traffic determined through the traffic model to evaluate the total effectiveness of the multi-state freeway alternative.

Exhibit 5-6
DIVERTED TRIPS
Multi-State Regional Highway

	1990		2010	
	I-80	I-90	I-80	I-90
Average Daily Traffic				
Automobiles	8,544	5,000	15,430	9,030
Trucks	5,185	1,000	11,360	2,190
Total Traffic on I-80 and I-90	13,729	6,000	26,790	11,220
Diverted Traffic				
Automobiles	730	360	1,320	650
Trucks	760	270	1,670	590
Total Traffic	1,490	630	2,990	1,240
Percent of Diverted Traffic				
Automobiles	8.5%	7.2%	8.6%	7.2%
Trucks	14.7	27.0	14.7	26.9
Total	10.9%	10.5%	11.2%	11.1%

SOURCE: Wilbur Smith Associates

Chapter 6
TRAFFIC FORECASTS: EACH ALTERNATIVE

Chapter 4 presented 1990 and 2010 traffic volumes under the "Base Case" condition; that is, traffic expected if the currently planned highway improvements are made. Chapter 5 then addressed the issue of possibly attracting long distance traffic if US 20 were made to be competitive with I-80 and I-90.

Chapter 6 utilizes the information from those chapters, and analyzes each of this study's improvement alternatives from the traffic perspective. This evaluation addresses the amount of traffic that might divert to US 20 under each of the alternative improvement types.

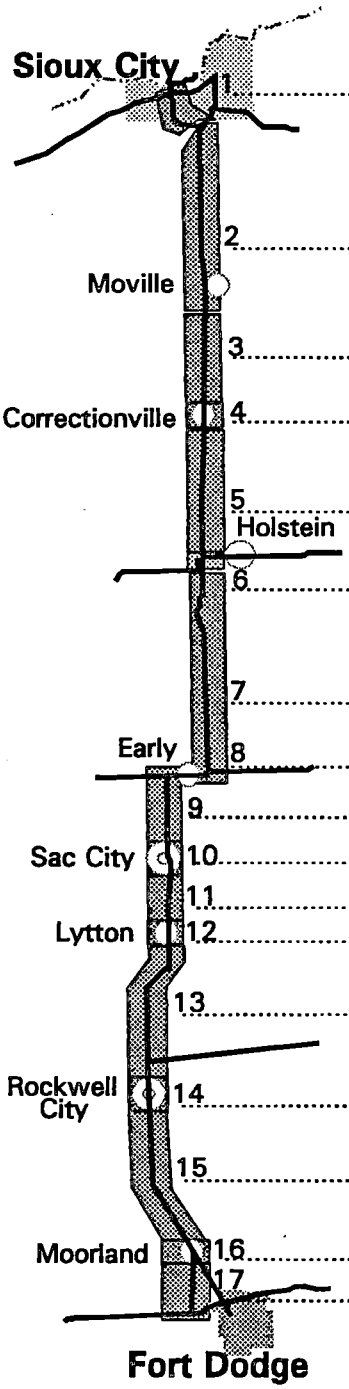
The traffic analyses are presented first for automobiles, second for trucks and then for total daily traffic. The traffic analyses include traffic in the corridor, e.g., on US 20 new alignment plus on the US 20 old alignment e.g., through a town plus on the bypass, as well as traffic on US 20 itself.

The key subject addressed in the chapter is how much traffic will be diverted to US 20 by each of the candidate improvement options.

AUTOMOBILE TRAFFIC FORECASTS

Exhibit 6-1a presents the estimated automobile average daily traffic (ADT) for Alternatives 1 through Alternative 7. It shows the total automobile traffic along the corridor. The corridor is defined as including US 20, including traffic on any new US 20 alignment plus traffic on the existing US 20. Exhibit 6-1b presents the automobile traffic only on the US 20 alternative alignment under study (it excludes traffic volumes that would remain on the old US 20). Exhibit 6-2 shows the percent increase in automobile traffic compared to the Base Case (Alternative 1) and Exhibit 6-3 presents the increment in traffic between the alternatives.

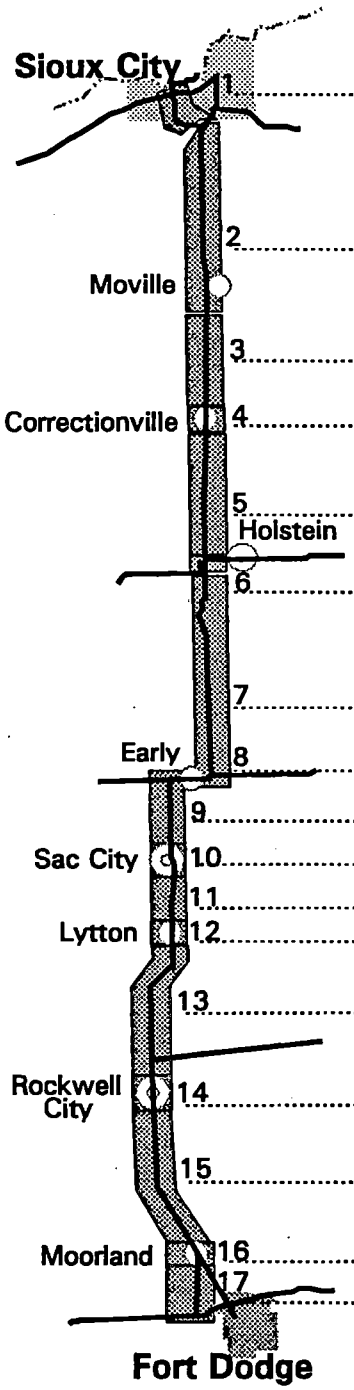
Exhibit 6-1a
ESTIMATED YEAR 2010 TOTAL DAILY AUTOMOBILE VOLUMES
by HIGHWAY SEGMENT



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	10,265	10,269	10,450	10,556	10,804	10,998	15,056
2	6,188	6,191	6,435	6,578	6,848	7,061	9,832
3	2,739	2,753	2,968	3,099	3,368	3,492	5,712
4	2,505	2,529	2,781	2,939	3,258	3,418	5,347
5	2,045	2,070	2,407	2,579	2,929	3,269	5,392
6	2,279	2,304	2,641	2,801	3,569	3,768	6,104
7	1,510	1,516	1,947	2,126	2,890	3,097	5,443
8	2,930	2,942	3,508	3,895	4,302	4,535	7,004
9	2,444	2,454	3,271	3,456	3,849	4,082	6,431
10	6,163	6,173	7,070	7,190	7,579	7,812	10,178
11	2,410	2,417	3,151	3,487	3,858	4,104	6,478
12	2,160	2,163	2,697	3,298	3,647	3,910	6,294
13	1,771	1,774	2,366	3,210	3,559	3,817	6,204
14	4,397	4,406	4,508	5,430	5,816	6,146	8,955
15	2,688	2,694	2,759	3,350	3,661	3,888	6,282
16	4,042	4,051	4,146	5,449	5,821	6,132	8,776
17	1,993	1,996	2,085	3,215	3,471	3,770	6,206

NOTE: Traffic volumes shown include traffic on new alignment plus traffic on existing road.

Exhibit 6-1b
ESTIMATED YEAR 2010 DAILY AUTOMOBILE VOLUMES
by HIGHWAY SEGMENT (ONLY ON ALTERNATIVE ALIGNMENTS)



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	10,265	10,269	10,450	10,556	10,804	10,998	9,304
2	6,188	6,191	6,435	6,578	6,848	7,061	8,809
3	2,739	2,753	2,968	3,099	3,368	3,492	5,164
4	2,505	2,529	2,280	2,438	2,757	2,917	5,446
5	2,045	2,070	2,407	2,579	2,929	3,269	5,113
6	2,279	2,304	2,641	2,801	3,569	3,768	5,501
7	1,510	1,516	1,947	2,126	2,890	3,097	4,833
8	2,930	2,942	1,613	2,000	2,407	2,640	5,109
9	2,444	2,454	1,702	1,887	2,280	2,513	4,894
10	6,163	6,173	1,913	2,033	2,422	2,655	5,021
11	2,410	2,417	3,151	2,243	2,614	2,860	5,234
12	2,160	2,163	2,697	2,529	2,878	3,141	5,525
13	1,771	1,774	2,366	2,879	3,228	3,486	5,873
14	4,397	4,406	3,650	4,572	4,958	5,288	8,097
15	2,688	2,694	2,759	2,812	3,123	3,350	5,745
16	4,042	4,051	4,146	4,640	5,013	5,324	7,967
17	1,993	1,996	2,085	3,215	3,471	3,770	6,206

NOTE: Traffic volumes shown include automobile traffic only on the Alternative study alignments.

Exhibit 6–2

AUTOMOBILE TRAFFIC VOLUME CHANGE FROM BASE (ALT. #1)

2010

HIGHWAY SEGMENTS	PERCENT CHANGES					
	Alt–2	Alt–3	Alt–4	Alt–5	Alt–6	Alt–7
1 Iowa state line to IA 12	0.04	1.80	2.83	5.25	7.14	46.67
2 IA 12 to E. Moville	0.05	3.99	6.30	10.67	14.11	58.89
3 E. Moville to W. Correctionville	0.54	8.38	13.14	22.80	27.50	108.57
4 CORRECTIONVILLE	0.94	10.98	17.30	30.05	36.43	137.36
5 E. Correctionville to W Jct US 59	1.22	17.70	26.11	43.22	59.85	163.66
6 W Jct US 59 to E Jct US 59	1.10	15.89	22.91	56.61	65.34	167.85
7 E Jct US 59 to N. Early	0.40	28.94	40.80	91.40	105.11	260.49
8 EARLY	0.41	19.73	32.93	46.82	54.77	139.04
9 S. Early to W. Sac City	0.41	33.84	41.40	57.48	67.02	164.43
10 SAC CITY	0.16	14.72	16.66	22.98	26.76	65.15
11 E. Sac City to W. Lytton	0.29	30.74	44.68	60.08	70.28	168.78
12 Lytton	0.14	24.86	52.68	68.83	81.01	191.36
13 E. Lytton to W. Rockwell City	0.17	33.60	81.27	100.98	115.55	250.35
14 ROCKWELL CITY	0.20	2.52	23.49	32.27	39.77	103.65
15 E. Rockwell City to W. Moorland	0.21	2.63	24.60	36.19	44.62	133.70
16 Moorland	0.21	2.56	34.80	44.01	51.71	117.11
17 E. Moorland to US 169	0.15	4.62	61.32	74.16	89.16	211.39
Weighted Average for the Corridor	**0.27**	**11.66**	**23.16**	**35.72**	**43.11**	**121.26**

Exhibit 6–3

AUTOMOBILE TRAFFIC CHANGE BETWEEN ALTERNATIVES

2010

HIGHWAY SEGMENTS	PERCENT CHANGES					
	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7
1 Iowa state line to IA 12	0.04	1.76	1.03	2.42	1.89	39.53
2 IA 12 to E. Moville	0.05	3.94	2.31	4.36	3.44	44.78
3 E. Moville to W. Correctionville	0.54	7.84	4.76	9.66	4.70	81.07
4 CORRECTIONVILLE	0.94	10.04	6.32	12.75	6.38	100.93
5 E. Correctionville to W Jct US 59	1.22	16.48	8.41	17.11	16.62	103.81
6 W Jct US 59 to E Jct US 59	1.10	14.79	7.02	33.70	8.73	102.51
7 E Jct US 59 to N. Early	0.40	28.55	11.86	50.60	13.71	155.38
8 EARLY	0.41	19.32	13.21	13.89	7.95	84.26
9 S. Early to W. Sac City	0.41	33.43	7.57	16.08	9.53	97.42
10 SAC CITY	0.16	14.56	1.95	6.31	3.78	38.39
11 E. Sac City to W. Lytton	0.29	30.45	13.94	15.39	10.21	98.49
12 Lytton	0.14	24.72	27.82	16.15	12.17	110.35
13 E. Lytton to W. Rockwell City	0.17	33.43	47.66	19.71	14.57	134.80
14 ROCKWELL CITY	0.20	2.32	20.97	8.78	7.50	63.88
15 E. Rockwell City to W. Moorland	0.21	2.42	21.97	11.58	8.44	89.08
16 Moorland	0.21	2.36	32.24	9.21	7.70	65.40
17 E. Moorland to US 169	0.15	4.47	56.70	12.85	15.00	122.23
Weighted Average for the Corridor	**0.27**	**11.38**	**11.50**	**12.56**	**7.39**	**78.15**

Alternative 2: Improved Two-Lane - The study's traffic analyses suggest that very little automobile traffic will divert to US 20 as a result of the highway improvements contained in Alternative 2. According to the estimates, there is only a 0.27 percent average increase in traffic for Alternative 2 compared with the Base Case. The improved Two-Lane alternative has the largest increase (1.22 percent) on segment #5 just east of Correctionville. Because this alternative only includes passing lanes and turning lanes, this very minor traffic diversion would appear to be reasonable.

Alternative 3: Improved Two-Lane with Bypasses - The addition of bypasses around four communities shows a 11.66 percent increase in automobile traffic from the Base Case; this is a 11.38 percent increase from Alternative 2. The largest increment is near the center of corridor in the vicinity of the towns of Early and Sac City. This 11+ percent diversion is due to the reduced travel time and driver irritation of having to pass through the small communities.

Alternative 4: New Alignment Two-Lane - This alternative is to build a new 2-lane highway between Early and Fort Dodge. The traffic analyses suggest a 23.16 percent increase in traffic from the Base Case and 11.50 percent over Alternative 3. The new alignment which would parallel existing US 20 to the north from Early to Fort Dodge should divert traffic from other roads because of its straight alignment which avoids the jog around segment #8 in Early. Segments on the east end of the corridor show the largest increase in traffic due to the new alignment.

Alternative 5: Four-Lane Arterial - This alternative comprises of a 4-lane highway all the way from Sioux City to Fort Dodge. Analyses suggest that this alternative will be more effective in diverting traffic. The calculations suggest a 35.72 percent increase in automobile traffic compared to the Base Case, and growth of 12.56 percent compared with Alternative 4. This large increase in traffic is due to the four lane alignment north of US 20 from Early to Fort Dodge and the widening of the existing road from Sioux City to Early which provides ample capacity and a continuous passing opportunity along the corridor.

It is also estimated that this four-lane alternative will divert some long distance traffic from Interstates 80 and 90. Approximately 180 automobiles are

estimated to divert from the interstates to the study corridor if US 20 were a 4-lane at-grade highway.

Alternative 6: Expressway - If US 20 were an Expressway, the calculations suggest a very modest 7.39 percent increase in traffic compared with Alternative 5. This modest increase appears logical because Alternative 6 is still a 55 mph four-lane highway, although with partial access control. Alternative 6 is expected to divert only 225 autos per day from Interstates 80 and 90 to the study corridor, partly because the Alternative 6 analyses assumed expressway standards only between Sioux City and Fort Dodge.

Alternative 7: Freeway - The 65 mph Freeway alternative is estimated to yield a 121.3 percent increase in corridor traffic compared with the Base Case. This is a 78.2 percent increase over the Expressway option (Alternative 6). Posted speeds on this Alternative are 65 mph and the Freeway would be built on an entirely new alignment from Sioux City to Fort Dodge. A very significant amount of automobile traffic (approximately 1,950 ADT) is estimated to divert from Interstates 80 and 90; this significant diversion is because of the higher travel speed limit assumption and because of the assumption in Alternative 7 that the freeway is built across not only Iowa but also Illinois and part of Nebraska.

TRUCK TRAFFIC FORECASTS

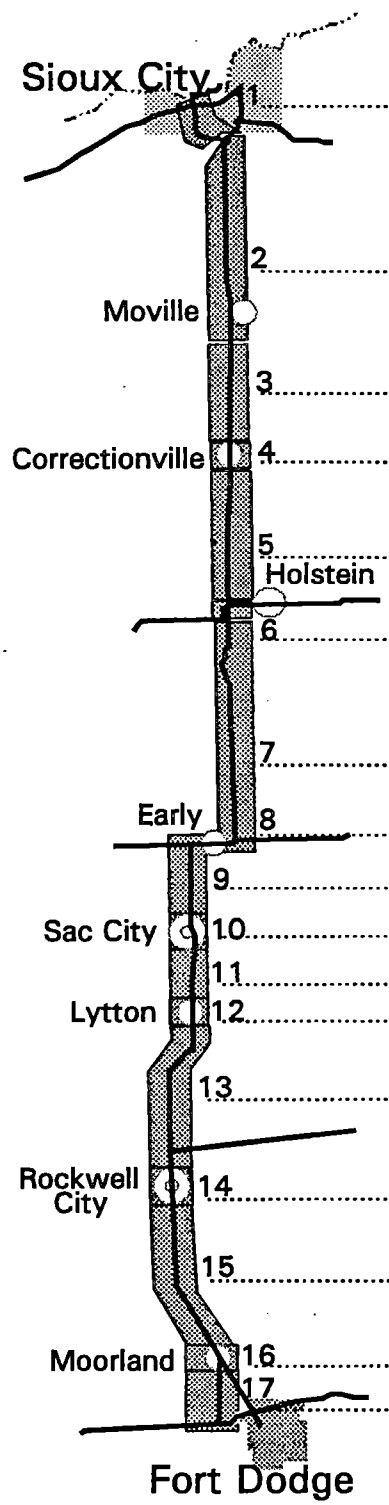
To forecast future truck volumes for the six improvement alternatives (Alternatives 2-7), the Base Case forecasts were segregated by truck type and trip type. The Base Case forecasts, discussed in Section 4, were derived through the evaluation of the roadside travel surveys, and through the analysis of the 1976 to 1990 trends. These trends were subdivided and analyzed for small and large trucks and for through, external-internal and internal-internal trips. The Base Case forecast annual growth rate is 2.98 percent for large trucks and 0.99 percent for small trucks.

The six improvement alternatives were separated into two categories: two-lane alternatives versus four-lane alternatives. Truck counts on I-80 and I-90 between 1978 and 1990 indicate that I-80 and I-90 truck traffic increases at a different rate than that observed on US 20. It is also suggested that a significant volume of the Interstate truck traffic could divert to a four-lane US 20. For the two-lane improvement alternatives the same growth rates as used in the Base Case were used since the traffic composition is expected to remain the same. However, for the four-lane improvement alternatives, both small and large "through" trucks are expected to increase at a higher rate. The long term growth rate of 4.0 percent experienced on I-80 was applied to small and large "through" truck traffic. The external-internal and internal-internal growth rates for small and large trucks remain the same as the Base Case, 0.99 and 2.98 percent respectively.

To determine what diversions to US 20 would arise from the three improvement alternatives, traffic was again analyzed by truck and trip type. The US 20 roadside surveys were used to analyze what regional truck traffic would divert to US 20 based on county origin and destination pairs. In addition, for the four-lane improvement options the potential diverable truck traffic from I-80 and I-90 was also incorporated into the analysis by investigating the interstate truck surveys. The same methodology described in Chapter 5 was used to determine the divertable trips.

Total truck ADT by alternative improvement by highway segment along the corridor including traffic on the new alignment plus traffic on the existing road is presented in Exhibit 6-4a. Truck traffic on the new US 20 alignments only (Alternatives 3-7 only) is presented in Exhibit 6-4b. Total estimated truck ADT in 2010 by alternative and by highway segment is shown for large and small trucks in Exhibits 6-5 and 6-6, respectively. The volume increase in truck traffic compared to the Base Case is presented in Exhibit 6-7, and the incremental change between alternatives shown in Exhibit 6-8.

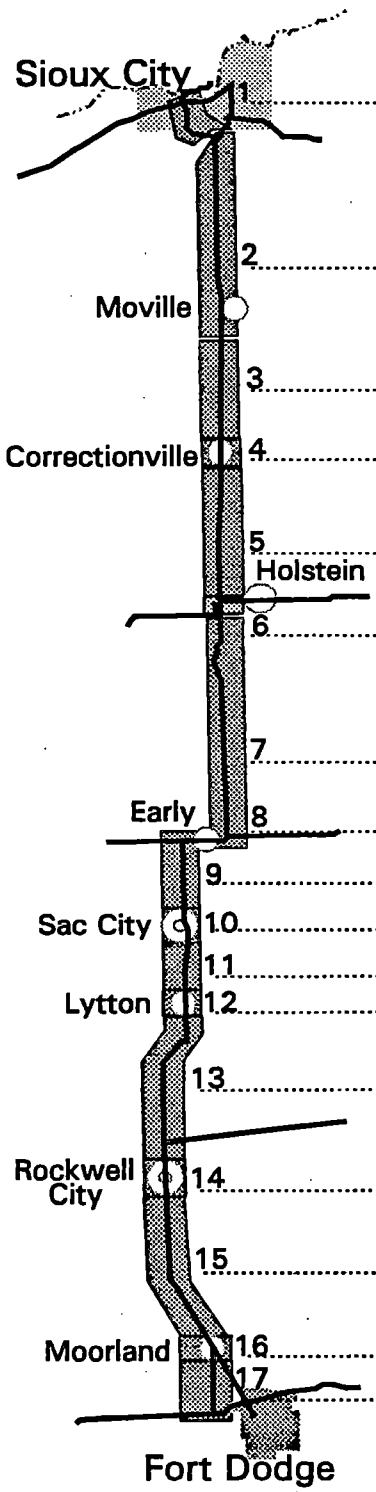
Exhibit 6-4a
ESTIMATED YEAR 2010 TOTAL DAILY TRUCK VOLUMES
by HIGHWAY SEGMENT



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	1,226	1,241	1,289	1,338	2,241	2,361	5,426
2	1,264	1,278	1,329	1,378	2,312	2,436	5,654
3	864	874	909	943	1,587	1,671	3,933
4	1,012	1,024	1,064	1,105	1,851	1,950	4,495
5	1,014	1,026	1,066	1,107	1,855	1,954	4,502
6	1,221	1,235	1,283	1,330	2,237	2,355	5,529
7	695	703	731	756	1,279	1,346	3,246
8	760	769	799	829	1,394	1,468	3,444
9	483	489	508	528	885	933	2,340
10	511	517	536	560	922	973	2,340
11	468	473	492	512	851	897	2,340
12	477	483	502	528	869	916	2,340
13	509	515	535	557	924	974	2,340
14	625	633	657	683	1,141	1,203	2,737
15	602	609	633	656	1,103	1,162	2,720
16	701	710	738	766	1,284	1,353	3,127
17	507	513	533	553	926	976	2,340

NOTE: Traffic volumes shown include traffic on new alignment plus traffic on existing road.

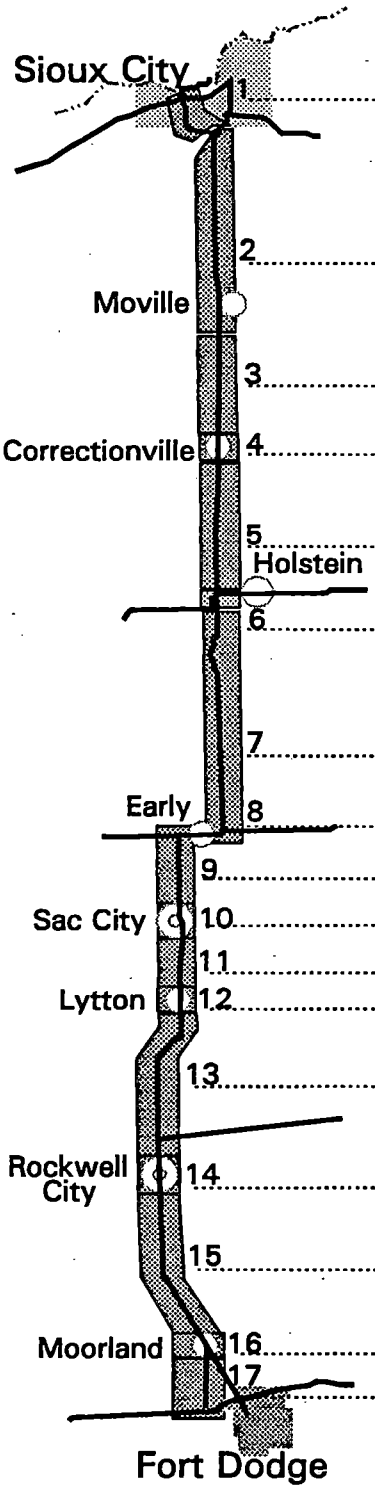
Exhibit 6-4b
ESTIMATED YEAR 2010 TOTAL DAILY TRUCK VOLUMES
by HIGHWAY SEGMENT (ONLY ON ALTERNATIVE ALIGNMENTS)



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	1,226	1,241	1,289	1,338	2,241	2,361	4,727
2	1,264	1,278	1,328	1,378	2,312	2,436	4,873
3	864	874	909	943	1,587	1,671	3,744
4	1,012	1024	1,010	1,105	1,851	1,869	4,237
5	1,014	1,026	1,066	1,107	1,855	1,954	4,137
6	1,221	1,235	1,283	1,330	2,237	2,355	4,420
7	695	703	731	756	1,279	1,346	3,159
8	760	769	745	775	1,340	1,401	3,363
9	483	489	454	474	831	866	2,259
10	511	517	482	506	868	906	2,259
11	468	473	492	458	797	830	2,259
12	477	483	502	469	815	849	2,259
13	509	515	535	490	857	900	2,259
14	625	633	590	616	1,074	1,129	2,656
15	602	609	633	589	1,036	1,088	2,639
16	701	710	738	712	1,230	1,286	3,046
17	507	513	533	553	926	976	2,286

NOTE: Traffic volumes shown include traffic only on the new Alternative study alignments.

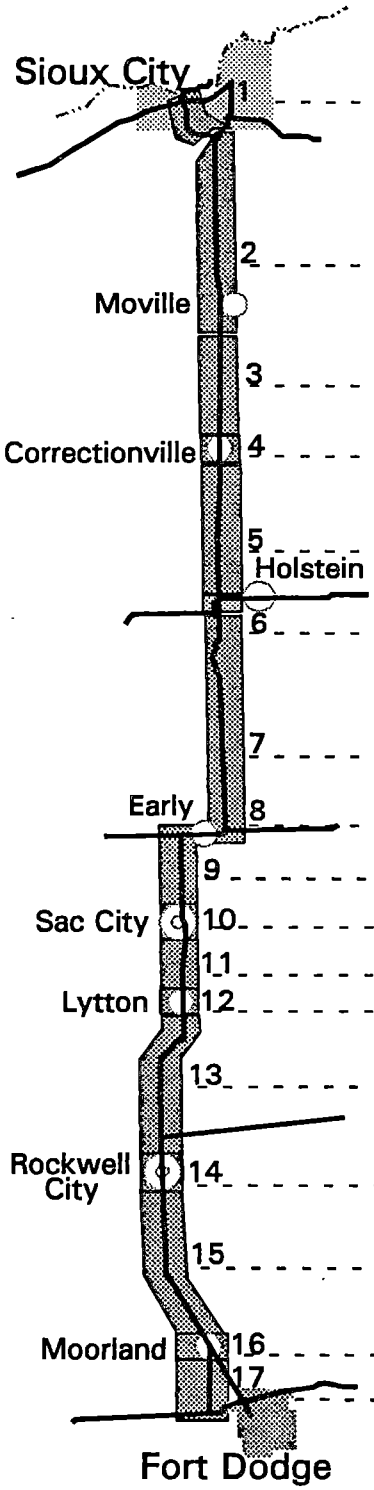
Exhibit 6-5
ESTIMATED DAILY SMALL TRUCK VOLUMES by HIGHWAY SEGMENT
2010



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	311	315	326	346	546	579	967
2	285	288	299	317	500	531	887
3	161	162	168	179	282	299	500
4	248	251	259	276	435	462	772
5	250	253	262	278	439	466	779
6	236	239	248	263	413	438	732
7	83	84	87	93	145	154	360
8	148	150	155	165	260	276	461
9	119	121	125	133	210	223	373
10	234	237	245	260	410	435	727
11	159	161	167	177	279	296	495
12	167	169	175	186	293	311	520
13	187	189	196	208	328	348	581
14	175	178	184	195	309	328	548
15	122	123	128	136	213	226	378
16	167	169	175	186	293	311	520
17	127	128	133	141	222	236	394

NOTE: Traffic volumes shown include traffic on new alignment plus traffic on existing road.

Exhibit 6-6
ESTIMATED DAILY LARGE TRUCK VOLUMES by HIGHWAY SEGMENT
2010



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	915	926	963	992	1,695	1,782	4,459
2	979	990	1,030	1,062	1,812	1,905	4,767
3	704	712	741	763	1,305	1,372	3,433
4	764	773	804	829	1,416	1,488	3,723
5	764	773	804	829	1,416	1,488	3,723
6	984	996	1,036	1,068	1,824	1,917	4,797
7	612	619	644	663	1,134	1,192	2,983
8	612	619	644	663	1,134	1,192	2,983
9	363	368	382	394	675	710	1,980
10	277	280	291	300	512	538	1,980
11	309	312	325	335	572	601	1,980
12	311	314	327	337	576	605	1,980
13	322	326	339	349	596	626	1,980
14	450	455	473	488	832	875	2,189
15	480	486	505	521	890	936	2,342
16	535	541	563	580	991	1,042	2,607
17	380	385	400	412	704	740	1,980

NOTE: Traffic volumes shown include traffic on new alignment plus traffic on existing road.

Exhibit 6–7

TOTAL TRUCK TRAFFIC VOLUME CHANGE FROM BASE (ALT.#1)

2010

Highway Segments	VOLUME CHANGES Alt–2	Alt–3	Alt–4	Alt–5	Alt–6	Alt–7
1 Iowa state line to IA 12	15	63	112	1,015	1,135	4,200
2 IA 12 to E. Moville	14	64	114	1,048	1,172	4,390
3 E. Moville to W. Correctionville	10	45	79	723	807	3,069
4 CORRECTIONVILLE	12	52	93	839	938	3,483
5 E. Correctionville to W Jct US 59	12	52	93	841	940	3,488
6 W Jct US 59 to E Jct US 59	14	62	109	1,016	1,134	4,308
7 E Jct US 59 to N. Early	8	36	61	584	651	2,545
8 EARLY	9	39	69	634	708	2,684
9 S. Early to W. Sac City	6	25	45	402	450	1,857
10 SAC CITY	6	25	49	411	462	1,829
11 E. Sac City to W. Lytton	5	24	44	383	429	1,872
12 Lytton	6	25	46	392	439	1,863
13 E. Lytton to W. Rockwell City	6	26	48	415	465	1,831
14 ROCKWELL CITY	8	32	58	516	578	2,112
15 E. Rockwell City to W. Moorland	7	31	54	501	560	2,118
16 Moorland	9	37	65	583	652	2,426
17 E. Moorland to US 169	6	26	46	419	469	1,833
Weighted Average for the Corridor	**10**	**40**	**70**	**632**	**706**	**2,645**

Exhibit 6–8

TOTAL TRUCK TRAFFIC VOLUME CHANGE BETWEEN ALTERNATIVES

2010

Highway Segments	VOLUME CHANGES 1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7
1 Iowa state line to IA 12	15	48	49	903	120	3,065
2 IA 12 to E. Moville	14	50	50	934	124	3,218
3 E. Moville to W. Correctionville	10	35	34	644	84	2,262
4 CORRECTIONVILLE	12	40	41	746	99	2,545
5 E. Correctionville to W Jct US 59	12	40	41	748	99	2,548
6 W Jct US 59 to E Jct US 59	14	48	47	907	118	3,174
7 E Jct US 59 to N. Early	8	28	25	523	67	1,894
8 EARLY	9	30	30	565	74	1,976
9 S. Early to W. Sac City	6	19	20	357	48	1,407
10 SAC CITY	6	19	24	362	51	1,367
11 E. Sac City to W. Lytton	5	19	20	339	46	1,443
12 Lytton	6	19	21	346	47	1,424
13 E. Lytton to W. Rockwell City	6	20	22	367	50	1,366
14 ROCKWELL CITY	8	24	26	458	62	1,534
15 E. Rockwell City to W. Moorland	7	24	23	447	59	1,558
16 Moorland	9	28	28	518	69	1,774
17 E. Moorland to US 169	6	20	20	373	50	1,364
Weighted Average for the Corridor	**10**	**30**	**30**	**562**	**74**	**1,939**

Alternative 2: Improved Existing Facility - The relatively low cost improvements in Alternative 2 would be helpful; however, they would not appreciably raise average truck speed. Therefore, only modest time and cost savings would arise, resulting in very low truck diversion potential. No through trucks are expected to divert, and only 6 trucks with beginning and/or ending trips within the region are estimated to divert to US 20, as detailed in Exhibit 6-9. These diversions would come from other county and state roads within the corridor region.

Exhibit 6-9
ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE
Alternative 2
1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	0	1	1	2	1.4%
Large	0	2	2	4	1.2%
TOTAL	0	3	3	6	1.3%

Alternative 3: Improved Two-Lane with Bypasses - Building bypasses around four communities in addition to the passing lanes and turning lanes of Anternative 2 would still yield only a small change in average daily truck volumes on US 20. Driving time would only be reduced slightly, and would not be great enough to attract many trucks from other routes. Nevertheless, the increased 24 total trips versus the Base Case is significant versus the small increase of only 6 total trips in Alternative 2. Total anticipated change in truck volumes if bypasses are built is presented in Exhibit 6-10.

Exhibit 6-10
ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE
Alternative 3
1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	1	2	3	6	4.3%
Large	2	7	9	18	5.5%
TOTAL	3	9	12	24	5.2%

Alternative 4: New Alignment Two-Lane with Bypasses - The new alignment would further reduce the traffic impediments around Early as well as completely bypassing Sac City, Lytton and Rockwell City. The effect of doing so would provide a much more direct route from Sioux City and Early to Fort Dodge. This improvement would logically attract more traffic than simply constructing bypasses since the reduced mileage and speed changes would in turn decrease travel times. The improvement would make US 20 more attractive to not only local users, but to more long distance drivers traveling to Sioux City from Dubuque or further East. Total estimated daily truck traffic diversions compared to the Base Case by truck type and trip type is presented in Exhibit 6-11.

Exhibit 6-11
ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE
Alternative 4
1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	4	6	6	16	11.6%
Large	6	10	12	28	8.5%
TOTAL	10	16	18	44	9.4%

Alternative 5: Four-Lane Arterial - A more significant change in truck volumes would be expected if U.S were upgraded to a four-lane highway. Three changes could occur: trucks that currently might be avoiding US 20 in favor of county roads would divert back to US 20; a number of trucks now using I-80 and I-90 could divert to US 20; and, an improved US 20 could stimulate new truck traffic through the attraction of new business.

Analysis of existing US 20 origin and destination pairs indicates that nearly 9 percent of regional truck traffic from Highways SR 3, SR 7, SR 175, US 30, SR 141, US 75 and SR 3 could potentially divert if US 20 were a four-lane highway. This local area traffic diversion would represent 236 of the total 376 divertable trips, listed in Exhibit 6-12. The other 140 generated truck trips are attributable to the I-80 and I-90 traffic diversion.

Exhibit 6-12

ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE

Alternative 5

1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	18	31	39	88	63.8%
Large	132	73	40	245	74.7%
TOTAL	150	104	79	333	71.5%

Alternative 6: Expressway - The total truck volumes for Alternative 6 shown in Exhibit 6-13 represent only slight changes from those of Alternative 5 since the Expressway speed limit would remain at 55 mph. Hence, no noteable time or cost savings would be expected compared with Alternative 5. The estimated potential divertable truck traffic from other county and state roads within the region is 271 trips per day. The other 150 generated trips would arise from I-80 and I-90 diversions, the majority of which are through trips.

Exhibit 6-13

ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE

Alternative 6

1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	23	36	40	99	71.7%
Large	146	76	51	273	83.2%
TOTAL	169	112	91	372	79.8%

Alternative 7 Freeway - By far the most dramatic effect on the US 20 corridor truck traffic would be if a 65 mph freeway were built. As detailed in Chapter 5, the total potential divertable truck traffic from I-80 and I-90 alone would be 1,028 trips per day. This, combined with the 250 regional area truck diversion, would

mean a total potential of 1,278 additional truck trips in the US 20 corridor. This is an increase of 304.7 percent compared to the Base Case. The estimated breakdown of truck trips by truck type is presented in Exhibit 6-14.

Exhibit 6-14

ESTIMATED CHANGE IN DAILY TRUCK TRIPS vs. BASE CASE

Alternative 7

1990

TRUCK TYPE	THROUGH	EXTERNAL-INTERNAL	INTERNAL-INTERNAL	TOTAL NO.	TOTAL PERCENT
Small	112	42	46	200	144.9%
Large	863	159	56	1,078	328.7%
TOTAL	975	201	102	1,278	274.2%

TOTAL TRAFFIC FORECASTS

The composite estimated automobile and truck daily volume estimates for each alternative in the years 1990 and 2010 are listed by highway segment in Exhibits 4-15 and 4-16. The estimates are for the traffic volumes only on the Alternative study alignments.

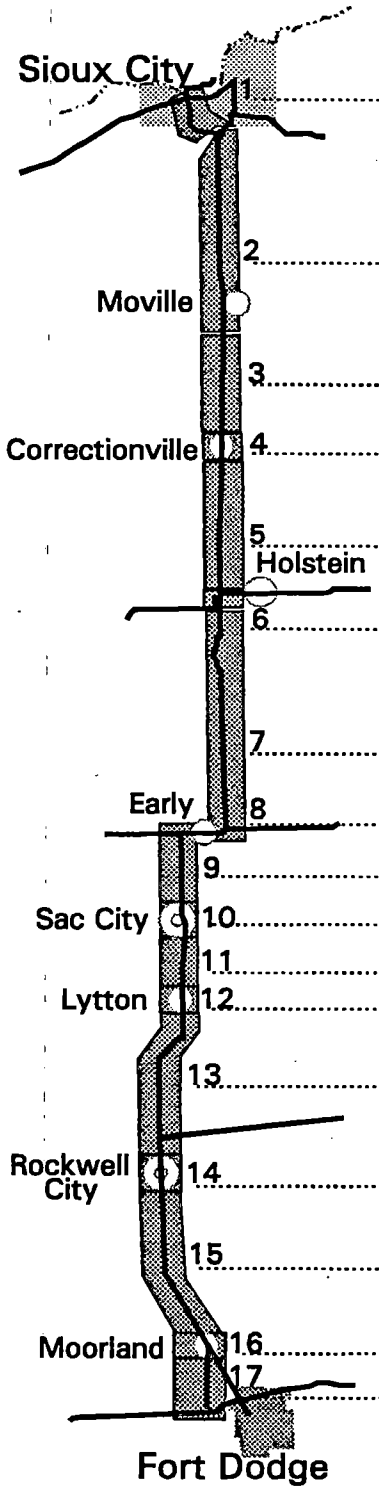
Average daily traffic volumes by vehicle type on I-80 for selected years was compiled to measure the relative use and traffic type on U.S. 20 if the freeway alternative, Alternative 7, was selected. The average ADT volumes for a rural portion of I-80 were used for comparison. This rural portion comprises the segments between the I-80/I-680 interchange in Western Iowa and the Adair-Madison County line to the East. The volumes were compiled for a series of years, which dramatizes the increased share of truck traffic relative to automobiles. These volumes and percents for both I-80 and U.S. 20 Alternative 7 are presented in Exhibit 6-17. The table demonstrates that though the estimated truck volumes on the U.S. 20 Alternative alignment comprise a large share of total traffic at 26.7 percent, this share is still modest when compared to the truck volume percents on I-80.

In summary, Exhibit 6-18 dramatizes the total and incremental impact on average daily traffic of each alternative's cost. For example, the incremental cost of building bypasses areound communities (Alternative 3) is 78.1 percent, which yields an incremental change in ADT of 2.5%. Similarly, the incremental cost of building a new four lane alignment (Alternative 5) is 92.5 percent, and would yield an incremental 17.1 percent increase in traffic.

Exhibit 6-15

ESTIMATED YEAR 1990 DAILY TRAFFIC VOLUMES

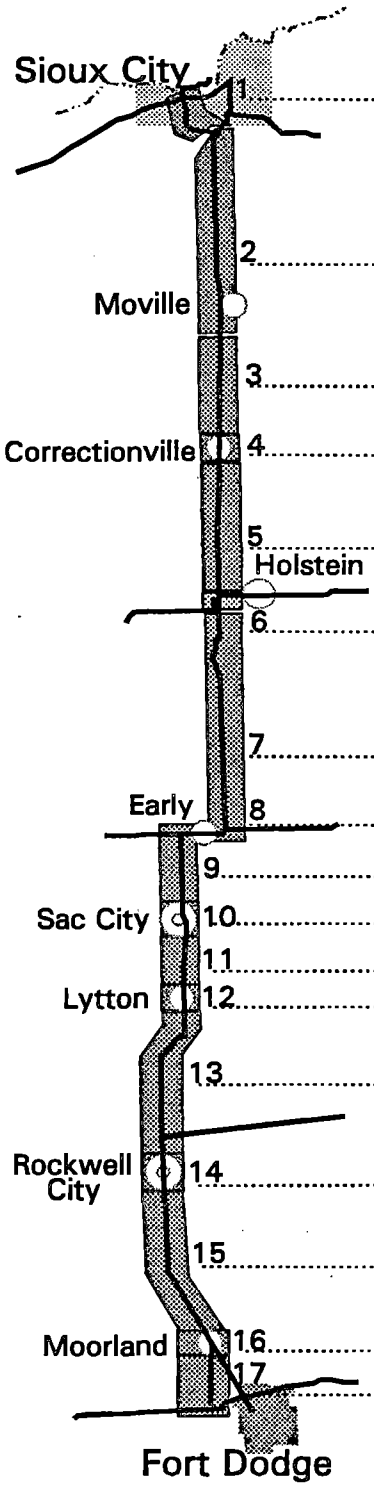
by HIGHWAY SEGMENT ONLY ON ALTERNATIVE ALIGNMENTS



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	9,907	9,922	10,072	10,186	10,817	11,052	10,182
2	6,513	6,533	6,727	6,871	7,537	7,792	9,785
3	3,066	3,090	3,260	3,385	3,895	4,042	5,929
4	2,914	2,950	2,642	2,797	3,413	3,579	6,356
5	2,410	2,448	2,719	2,887	3,531	3,734	5,914
6	2,717	2,757	3,033	3,190	4,276	4,506	6,398
7	1,571	1,591	1,926	2,086	2,976	3,184	5,021
8	2,843	2,864	1,659	2,018	2,599	2,824	5,344
9	2,244	2,261	1,614	1,726	2,184	2,395	4,732
10	5,453	5,469	1,776	1,897	2,368	2,582	4,833
11	2,212	2,224	2,821	2,005	2,434	2,661	5,050
12	2,011	2,018	2,436	2,236	2,641	2,886	5,218
13	1,699	1,707	2,174	2,535	2,952	3,199	5,498
14	3,731	3,745	3,067	3,841	4,343	4,655	7,138
15	2,304	2,315	2,385	2,455	2,886	3,103	5,311
16	3,318	3,331	3,431	3,864	4,382	4,676	7,209
17	2,128	2,136	2,224	3,162	3,537	3,824	6,141

NOTE: Traffic volumes shown include traffic only on the new Alternative study alignments.

Exhibit 6-16
ESTIMATED YEAR 2010 DAILY TRAFFIC VOLUMES
by HIGHWAY SEGMENT ONLY ON ALTERNATIVE ALIGNMENTS



	Two-Lane Alternatives				Four-Lane Alternatives		
	Alt-1	Alt-2	Alt-3	Alt-4	Alt-5	Alt6	Alt-7
1	11,491	11,510	11,739	11,894	13,045	13,359	14,031
2	7,452	7,469	7,763	7,956	9,160	9,497	13,682
3	3,603	3,627	3,877	4,042	4,950	5,163	8,989
4	3,517	3,553	3,290	3,489	4,554	4,786	9,683
5	3,059	3,096	3,473	3,686	4,784	5,223	9,250
6	3,500	3,539	3,924	4,131	5,806	6,123	9.921
7	2,205	2,219	2,678	2,882	4,169	4,443	7,992
8	3,690	3,711	2,358	2,775	3,747	4,041	8,472
9	2,927	2,943	2,156	2,361	3,111	3,379	7,153
10	6,674	6,690	2,395	2,539	3,290	3,561	7,280
11	2,878	2,890	3,643	2,701	3,411	3,690	7,493
12	2,637	2,646	3,199	2,998	3,693	3,990	7,784
13	2,280	2,289	2,901	3,369	4,085	4,386	8,132
14	5,022	5,039	4,240	5,188	6,032	6,417	10,753
15	3,290	3,303	3,392	3,401	4,159	4,438	8,384
16	4,743	4,761	4,884	5,352	6,243	6,610	11,013
17	2,500	2,509	2,618	3,768	4,397	4,746	8,492

NOTE: Traffic volumes shown include traffic only on the new Alternative study alignments.

Exhibit 6–17
TRAFFIC COMPARISON OF RURAL I–80 and ALTERNATE 7 STUDY ALIGNMENT

	Interstate 80								US 20	
	1976		1980		1984		1990		Alt 7 1990	
	Volume	Per.	Volume	Per.	Volume	Per.	Volume	Per.	Volume(1)	Per.
Trucks	3,014	26.3%	3,322	33.2%	3,916	34.3%	5,231	36.3%	1,665	26.7%
Autos	8,446	73.7%	6,698	66.8%	7,494	65.7%	9,199	63.7%	4,561	73.3%
Total	**11,460**	**100%**	**10,020**	**100%**	**11,410**	**100%**	**14,430**	**100%**	**6,226**	**100%**

(1) Volume includes weighted Truck plus Automobile ADT only on the Alternative 7 study alignment.

Exhibit 6–18
COMPARISON OF COST and ADT CHANGES BETWEEN STUDY ALTERNATIVES
1990

	Cost in $ Million				Weighted Total ADT			
	Total	% Change	Incremental			% Change	Incremental	
Alternate	Cost	Vs. Base	Cost	% Change	ADT	Vs. Base	ADT	% Change
1	$30.8	Na.	Na.	Na.	3,153	Na.	Na.	Na.
2	42.9	39.3%	12.1	39.3%	3,171	0.6%	18	0.6%
3	76.4	148.1%	33.5	78.1%	3,250	3.1%	79	2.5%
4	99.0	221.4%	22.6	29.6%	3,409	8.1%	159	4.9%
5	190.6	518.8%	91.6	92.5%	3,993	26.6%	584	17.1%
6	200.7	551.6%	10.1	5.3%	4,214	33.7%	221	5.5%
7	$372.1	1108.1%	$171.4	85.4%	6,226	97.5%	2,012	47.7%

Weighted total ADT includes Truck plus Automobile traffic only on the Alternative study alignments.

Appendix A

DEMOGRAPHIC FORECASTS

Appendix A
DEMOGRAPHIC FORECASTS

INTRODUCTION

As input into the analysis procedure for the U.S. Highway 20 corridor study, demographic forecast data was collected and analyzed. The results of this analysis were used in the traffic forecast and economic analysis of the surrounding 9-county impact area, the state and the 38-county region, when appropriate.

The demographic forecast consists of the following economic indicators:

- Population
- Employment
- Retail Sales

Population, employment and retail sales are all indicators of a county's or region's growth or decline. Employment and population forecasts are particularly important for two reasons: 1) they reflect the flow of economic activity as industries emerge or relocate in growing areas, and 2) they indicate peoples migration patterns in relation to job opportunities. The employment outlook for Iowa is a very important input into the population projections. Furthermore, population growth for working age people (ages 20 to 64) depends on economic conditions.

Woods and Poole Forecasts - The forecast analysis relies on the Woods and Poole 1991 projected data and the Woods and Poole Alternative Forecast Scenario for the 9-county primary impact area completed in March, 1992. The specific economic forecasting models used by Woods and Poole to generate employment forecasts for each county follow a standard economic base approach. The Woods and Poole methodology is based on a comprehensive county data base which integrates the economic activities of each county to capture regional flows. According to Woods and Poole, this methodology is used because changes in one county affect growth or decline in other counties. Woods and Poole believes that this method avoids using simple extrapolations of recent historical trends that frequently create overly optimistic or pessimistic forecasts.

One of the shortcomings of using the Woods and Poole 1991 data is that the projected numbers (1989-2015) rely only on data that was available before 1989. Hence, any growth or decline that has occurred since 1988 was not considered in the 1991 Woods and Poole forecast methodology. After analyzing the impact area, it was determined that most of the 9 counties in the impact area did experience considerable decline during the early to mid-1980s but have since started to recover from this economic slump. Therefore, an alternative forecast was completed in March, 1992, by Woods and Poole at the request of the U.S. Highway 20 Technical Advisory Committee (TAC) using 1989-1991 employment data. However, this 1992 Woods and Poole Alternative Forecast Scenario only includes the 9-county impact area. The state and the region were not included in the revised forecast based on the assumption that the 9-county impact area population decline was caused by out-of-state migration, not intrastate migration. A revised forecast would not significantly impact the 1991 state and regional forecasts. In fact, both would most likely experience similar, if not slightly greater, increases than those based on the 1991 Woods and Poole projected data (personal communication, Martin Holdrich, Senior Economist, Woods and Poole Economics). Therefore, data for both the 9-county impact area (1992 Woods and Poole Alternative Forecast Scenario) and the region and the state (1991 Woods and Poole projected data) are included even though these data are not directly comparable.

The 1991 Woods and Poole forecasts and the 1992 Alternative Forecast Scenario are both included to document the forecast outcomes and for evaluation purposes. All of the A tables represent 1991 Woods and Poole forecasts. Tables labeled with a B show revised 1992 forecasts for the 9-county impact area based on current employment data. The forecasts in this report assume that no highway improvements have been made. The following sections describe the three economic indicators for the 9-county primary impact area and a brief comparison of this area to the state and region.

POPULATION

Introduction - The population analysis includes a brief description of total population and past trends of migration, age breakdown and urban/rural population patterns.

Total Population - According to the Woods and Poole 1991 projections, the long-term outlook for the state of Iowa indicates a halt to the modest population declines of recent years (1980-1990). The state of Iowa is predicted to experience population growth between 1990 and 2015. The 38-county region is also expected to realize a similar trend (Table 1A).

The 9-county primary impact area is predicted to have an equally bright future, according to the 1992 Woods and Poole Alternative Forecast Scenario. The area is expected to gradually experience a 15 percent increase in population (Table 1B), or 35,620 people, between 1990 and the year 2015 (Table 2B). Ida and Cherokee are the only two counties in the area forecasted to realize population decline during this same time period. The remaining seven counties are forecasted to have population growth ranging from 0.3 percent (Sac County) to 73.3 percent (Webster County). These population gains are usually attributed to several factors. The two most significant factors being the projected increases in the number of working people (age 20 to 64), who are more likely to marry and produce children and total employment growth (Tables 3B and 5B). The 20-64 age group is also the most likely group to be employed by the manufacturing and service sector firms. This age group will increase as jobs continue to become available.

One of the net results of the projected population increase for the total 9-county impact area is an increasingly older (65+) and decreasing younger (0-19) age population (Table 3B). This population shift is likely to put new demands on the area as more young people move out of the area to find employment opportunities elsewhere, leaving the 65+ population to pay a higher tax bill spread out among fewer residents. Cities and communities will potentially find it more and more difficult to raise local taxes and issue bonds to support industry and community improvements.

EMPLOYMENT

Introduction - The employment discussion will focus on manufacturing, agriculture and wholesale trade since these employment sectors generate significant amounts of truck and commercial traffic, which are highly dependent on state highway systems and links. These sectors are also included because they are considered "basic." This means that the sectors produce output that is not consumed locally but is exported out of the

region for national or international consumption. Normally, the "basic" sectors are mining, agriculture, manufacturing, wholesale trade and the federal government. In contrast, "nonbasic" sectors are those that do retail trade, transportation, communication and construction, the output of which is usually consumed locally. The growth of the "nonbasic" sectors depends largely on the growth of the basic sectors that form the basis of the region's economy.

Prior to 1920 and for a few years during the Great Depression in the 1930s, the farming sector in Iowa employed more people than any other sector of the American economy. However, technology and other types of improvements in farm productivity and the corresponding declines in farm employment during the last two decades have contributed to the increasing labor supply for emerging manufacturing industries. Similarly, improvements in manufacturing in more recent years have been important to increasing the supply of labor for the growth in the service sector, which is dominated by health care, business services, repair services, hotels/lodging places and education.

The Iowa economy has therefore evolved from a once dominated farm employment sector to manufacturing and now finally to services (Woods and Poole, 1991 State Profile). A good example of this shift is evident in the recent announcement by Iowa Job Services spokeswoman Ann Wagner stating that HyVee Foods, Inc., (service sector) has taken the lead as Iowa's number one private employer over the once dominating John Deere Company (manufacturing sector). Both the 9-county primary impact area and the state of Iowa reflect this predicted employment shift from manufacturing to services between 1990-2015 (Table 4B).

Total Employment - Total employment for the state of Iowa is forecasted to increase between 1990 and 2015. The 38-county region is predicted to follow a similar trend for the same time period (Table 5A). The employment outlook for the 9-county primary impact area is predicted to also increase between 1990 and 2015. Overall, the area is expected to gain approximately 16 percent, or 21,230, jobs for this same time period (Tables 5B and 6B). Only two counties, Cherokee and Sac, are predicted to realize decreases in total employment during this same time period. Sac County's predicted decline represents such an insignificant (0.5 percent) loss that it should actually be labeled as a "no growth period" instead of a decline.

Manufacturing - Manufacturing includes establishments engaged in the mechanical or chemical transformation of materials or substances into new products. Included in manufacturing are establishments engaged in assembling component parts not associated with structures and in blending materials such as lubricating oils or liquor.

Much of the sharp decline in manufacturing employment the state of Iowa experienced in the early 1980s is expected to be part of Iowa's history and not its future (Woods and Poole, 1991 State Profile). Overall, manufacturing employment is expected to increase in Iowa, as well as the 38-county region, over the next two decades (Table 7A). The 9-county primary impact area is also predicted to follow this same growth trend. Overall, the 9-county area is forecasted to gain 34.5 percent, or approximately 5,400 manufacturing jobs between 1990 and 2015 (Table 7B).

Farm - The Woods and Poole data has two agriculture-related employment categories -- farm and agriculture. The farm employment category primarily includes farm operations engaged in the production of crops and livestock and is a good representation of agriculture-related employment. The agriculture employment category covers a variety of establishments that are engaged in agriculture-related services, such as fisheries, horticulture, veterinary medicine and forestry. The farm category is used in this report because it best depicts the type of farm employment in Iowa and is the most similar to the agriculture sector described in Subtask A-13, Existing Regional Characteristics.

According to Woods and Poole's 1991 and 1992 forecasts, farm employment is expected to continue to uniformly decline over the next 2 decades. This holds true for the entire state of Iowa, the 38-county region and the 9-county primary impact area (Tables 8A and 8B). The impact of this predicted reduced employment trend will be felt differently in different parts of the state and the two localities. Because farming has always been especially germane to the rural economies of Iowa, the nonbasic industries in rural communities (such as the majority of those found in the 9-county primary impact area which depend on the number of farmers) are expected to continue to decline as farm employment declines. However, industries in rural and metropolitan areas of the state which depend on the output of the farm sector, e.g., food processing and transportation, are not expected to be negatively affected by the changes in farm

employment as long as farm output continues to grow. Overall, farm output, income and earnings per farmer are expected to rise in Iowa over the next 25 years (Woods and Poole, 1991).

Wholesale Trade - Wholesale trade includes establishments primarily engaged in selling merchandise to retailers or to industrial, commercial, institutional, farm, construction, contractors or professional business users or to other wholesalers or brokers.

Overall, the state and the 38-county region are both expected to realize increased employment in the wholesale trade sector between 1990 and 2015. The 9-county primary impact area is predicted to follow this same trend for the same time period (Tables 9A and 9B).

RETAIL SALES

Introduction - Retail sales for the years 1980-1990 for the state, the 38-county region and the 9-county primary impact area are tracked based on fiscal years that run from April 1 through March 31. Constant dollar sales have been used instead of current dollar sales. Constant dollar sales are current dollar sales that have been adjusted for price inflation and represent the real changes in terms of 1982 dollars. The base year for inflation adjustments was 1982.

Total Retail Sales - According to Woods and Poole's 1991 State Profile for Iowa, retail sales for the state and the 38-county region are predicted to increase between 1990 and 2015 (Table 10A). The 9-county primary impact area is forecasted to also experience an increase in retail sales for the same time period (Table 10B).

All of the 9 counties in the area are forecasted to realize increases in retail sales. These increases range from Cherokee County (6 percent) to Ida County (95 percent) for the 1990-2015 time period. Counties such as Ida, with predicted robust retail growth, usually will have an increase in the number of firms and real sales per firm. Therefore, it is also possible that the forecasts indicate that the number of retail businesses will decline but the real sales per firm will increase. This could be brought about by the entry of a few large firms and the loss of several small firms, thereby raising real sales per firm

(Iowa State University Agriculture and Home Economics Experiment Station and Cooperative Extension Service, June, 1991).

SUMMARY

Population - The state and 38-county region are predicted to experience steady total population gains between 1990 and 2015. The 9-county primary impact area is forecasted to realize the same trend. During the 1990-2015 time period, the impact area is expected to continue to experience population increases, especially people in the working age (20-64) and 65+ brackets.

Employment - Total employment for the state and 38-county region is forecasted to increase between 1990-2015. The 9-county primary impact area is predicted to also gain total employment between 1990 and 2015. The state, 38-county region and 9-county impact area are expected to realize gains in all employment sectors analyzed for this report, except agricultural, between 1990 and 2015.

Retail Sales - Retail sales for the state, 38-county region and 9-county primary impact area are predicted to increase at a steady rate between 1990 and 2015.

Table 1A
PRIMARY IMPACT AREA FUTURE POPULATION PROJECTIONS
FOR YEARS 1990-2015*

	Year 1990	Year 2000	Year 2010	Year 2015	% Change 1990-2015
Buena Vista	19,940	20,450	20,690	20,790	4.3
Calhoun	11,470	10,800	10,160	9,890	-13.8
Cherokee	14,050	12,600	11,560	11,190	-20.4
Ida	8,350	8,310	8,220	8,160	-2.3
Plymouth	23,380	23,550	23,600	23,600	0.9
Pocahontas	9,480	9,090	8,900	8,810	-7.1
Sac	12,300	11,860	11,340	11,070	-10.0
Webster	40,220	38,110	36,330	35,690	-11.3
Woodbury	98,160	93,920	88,960	87,130	-11.2
9-County Primary Impact Area Total	237,350	228,690	219,760	216,330	-8.9
38-County Region Total	1,067,120	1,104,090	1,142,520	1,163,850	9.1
State Total	2,771,960	2,837,850	2,924,750	2,975,360	7.3

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

NOTES: * Due to Woods and Poole's rounding methods, the subtotals in this table may not exactly equal the components in Table 2A.

Table 1B
PRIMARY IMPACT AREA FUTURE POPULATION PROJECTIONS
FOR YEARS 1990-2015

	Year 1990	Year 2000	Year 2010	Year 2015	% Change 1990-2015
Buena Vista	19,940	20,040	21,250	21,900	9.8
Calhoun	11,470	12,340	13,450	14,010	22.1
Cherokee	14,050	13,070	11,710	11,080	-21.1
Ida	8,350	8,230	8,150	8,180	-2.0
Plymouth	23,380	23,650	23,630	23,820	1.9
Pocahontas	9,480	9,520	9,780	9,920	4.6
Sac	12,300	12,230	12,310	12,340	0.3
Webster	40,220	51,480	64,160	69,720	73.3
Woodbury	98,160	101,400	101,980	102,000	3.9
9-County Primary Impact Area Total	237,350	252,960	266,420	272,970	15.0

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 2A
FORECASTED POPULATION TRENDS
FOR YEARS 1990-2015

	Change in Total Residential Population 1990-2015*
Buena Vista	850
Calhoun	-1,580
Cherokee	-2,860
Ida	-190
Plymouth	220
Pocahontas	-670
Sac	-1,230
Webster	-4,530
Woodbury	-11,030
9-County Primary Impact Area Total	-21,020
38-County Region Total	96,740
State Total	203,410

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

NOTES: * Due to Woods and Poole's rounding methods, the components in this table may not exactly equal the subtotals in Table 1A.

Table 2B
FORECASTED POPULATION TRENDS
FOR YEARS 1990-2015

	Change in Total Residential Population 1990-2015*
Buena Vista	1,960
Calhoun	2,540
Cherokee	-2,970
Ida	-170
Plymouth	440
Pocahontas	440
Sac	40
Webster	29,500
Woodbury	3,840
9-County Primary Impact Area Total	35,620

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 3A

FORECASTED PRIMARY IMPACT AREA POPULATION: AGE BREAKDOWN
FOR YEARS 1990-2015

	0-19			20-64			65+		
	1990	2000	2015	1990	2000	2015	1990	2000	2015
Buena Vista	6,050	6,400	6,270	10,300	10,450	10,870	3,590	3,610	3,640
Calhoun	3,110	3,010	2,710	5,700	2,540	2,420	2,660	2,540	2,420
Cherokee	3,810	3,310	2,660	7,700	6,930	5,970	2,540	2,370	2,570
Ida	2,410	2,520	2,340	4,240	4,080	4,020	1,700	1,710	1,800
Plymouth	7,420	7,360	6,640	12,030	11,980	12,180	3,920	4,210	4,780
Pocahontas	2,560	2,480	2,280	4,900	4,660	4,470	2,030	1,950	2,060
Sac	3,390	3,330	2,860	6,170	5,810	5,410	2,730	2,720	2,800
Webster	11,440	10,460	9,070	21,470	19,970	18,390	7,310	7,680	8,230
Woodbury	29,320	28,290	25,510	53,950	51,040	47,030	14,890	14,590	14,590
9-County Primary Impact Area Total	69,510	67,160	60,340	126,460	117,460	110,760	41,370	41,380	42,890
38-County Region Total	304,980	314,450	315,620	596,460	613,200	646,020	171,570	179,310	204,890
State Total	803,660	817,350	813,950	1,544,390	1,578,180	1,649,300	423,910	442,330	512,110

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

Table 3B

FORECASTED PRIMARY IMPACT AREA POPULATION: AGE BREAKDOWN
FOR YEARS 1990-2015

	0-19			20-64			65+		
	1990	2000	2015	1990	2000	2015	1990	2000	2015
Buena Vista	6,050	6,360	6,530	10,300	10,090	11,570	3,590	3,590	3,790
Calhoun	3,110	3,310	3,480	5,700	6,230	7,430	2,660	2,800	3,100
Cherokee	3,810	3,410	2,650	7,700	7,220	5,870	2,540	2,440	2,560
Ida	2,410	2,520	2,360	4,240	4,000	4,010	1,700	1,710	1,810
Plymouth	7,420	7,430	6,720	12,030	11,960	12,260	3,920	4,250	4,840
Pocahontas	2,560	2,570	2,500	4,900	4,920	5,160	2,030	2,030	2,260
Sac	3,390	3,420	3,110	6,170	6,010	6,180	2,730	2,800	3,040
Webster	11,440	12,800	13,930	21,470	30,280	43,170	7,310	9,400	12,630
Woodbury	29,320	29,870	28,450	53,950	56,120	57,280	14,890	15,410	16,270
9-County Primary Impact Area Total	69,510	71,690	69,730	126,460	136,830	152,930	41,370	44,430	50,300

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 4A
9-COUNTY PRIMARY IMPACT AREA FUTURE EMPLOYMENT SHIFTS
FOR YEARS 1970-2015

	Manufacturing			Farm			Services		
	1970	1990	2015	1970	1990	2015	1970	1990	2015
Buena Vista	1,270	2,140	2,980	1,830	1,430	1,200	1,570	3,290	4,490
Calhoun	120	320	280	1,690	1,270	1,050	970	1,310	1,220
Cherokee	1,130	1,060	970	1,820	1,330	1,030	1,120	1,400	1,130
Ida	250	1,060	2,700	1,360	920	660	700	980	1,390
Plymouth	630	1,460	2,560	2,830	2,090	1,580	1,420	2,250	2,650
Pocahontas	470	580	610	1,730	1,210	950	680	112	1,260
Sac	520	270	230	2,020	1,420	1,140	990	1,250	1,300
Webster	4,680	2,670	1,410	2,060	1,650	1,380	4,520	6,360	6,310
Woodbury	8,510	6,410	5,230	2,520	1,680	1,220	10,120	18,660	20,310
9-County Primary Impact Area Total	17,580	15,970	16,970	17,860	13,000	10,210	22,090	35,612	40,060
State Total	221,250	230,570	242,090	171,190	129,740	102,100	214,110	404,920	552,670

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

Table 4B
9-COUNTY PRIMARY IMPACT AREA FUTURE EMPLOYMENT SHIFTS
FOR YEARS 1970-2015

	Manufacturing			Farm			Services		
	1970	1990	2015	1970	1990	2015	1970	1990	2015
Buena Vista	1,270	1,660	2,980	1,830	1,430	1,200	1,570	3,290	4,970
Calhoun	120	300	280	1,690	1,270	1,050	970	1,310	2,540
Cherokee	1,130	1,230	970	1,820	1,330	1,030	1,120	1,400	1,030
Ida	250	930	2,700	1,360	920	660	700	980	1,430
Plymouth	630	1,560	2,560	2,830	2,090	1,580	1,420	2,250	2,660
Pocahontas	470	650	600	1,730	1,210	950	680	1,120	1,610
Sac	520	230	230	2,020	1,420	1,140	990	1,250	1,570
Webster	4,680	2,790	4,640	2,060	1,650	1,380	4,520	6,360	13,460
Woodbury	8,510	6,410	6,240	2,520	1,680	1,220	10,120	18,660	24,080
9-County Primary Impact Area Total	17,580	15,760	21,200	17,860	13,000	10,210	22,090	36,620	53,350
State Total	221,250	230,570	242,090	171,190	129,740	102,100	214,110	404,920	552,670

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 5A
FORECASTED PRIMARY IMPACT AREA TOTAL EMPLOYMENT
FOR YEARS 1990-2015*

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	12,610	13,450	14,050	14,240	12.9
Calhoun	5,600	5,200	4,850	4,680	-16.4
Cherokee	7,650	6,880	6,390	6,210	-18.8
Ida	5,250	5,820	6,580	6,910	31.6
Plymouth	11,840	12,470	13,140	13,350	12.8
Pocahontas	5,370	5,190	4,990	4,880	-9.1
Sac	5,890	5,640	5,350	5,190	-11.9
Webster	22,510	20,770	19,430	18,820	-16.4
Woodbury	57,290	53,530	51,080	50,170	-12.4
9-County Primary Impact Area Total	134,010	128,950	125,860	124,450	-7.1
38-County Region Total	663,240	694,970	710,600	718,960	8.4
State Total	1,609,280	1,676,180	1,726,370	1,741,470	8.2

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

NOTES: * Due to Woods and Poole rounding methods, the subtotals in this table may not exactly equal the components in Table 6A.

Table 5B
FORECASTED PRIMARY IMPACT AREA TOTAL EMPLOYMENT
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	11,870	13,180	14,440	15,010	26.5
Calhoun	5,580	5,950	6,420	6,630	18.8
Cherokee	7,940	7,140	6,460	6,140	-22.6
Ida	5,070	5,760	6,530	6,930	36.6
Plymouth	12,000	12,530	13,160	13,480	12.3
Pocahontas	5,480	5,440	5,490	5,500	0.4
Sac	5,820	5,820	5,820	5,790	-0.5
Webster	22,700	28,600	34,310	36,770	62.0
Woodbury	57,290	57,800	58,560	58,730	2.5
9-County Primary Impact Area Total	133,750	142,220	151,190	154,980	15.8

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 6A
FORECASTED EMPLOYMENT TRENDS
FOR YEARS 1990-2015

	Change in Total Employment 1990-2015*
Buena Vista	1,630
Calhoun	-920
Cherokee	-1,440
Ida	1,660
Plymouth	1,510
Pocahontas	-490
Sac	-700
Webster	-3,690
Woodbury	-7,120
9-County Primary Impact Area Total	-9,560
38-County Region Total	55,720
State Total	132,190

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

NOTES: * Due to Woods and Poole's rounding methods, the components in this table may not exactly equal the subtotals in Table 5A.

Table 6B
FORECASTED EMPLOYMENT TRENDS
FOR YEARS 1990-2015

	Change in Total Employment 1990-2015
Buena Vista	3,140
Calhoun	1,050
Cherokee	-1,800
Ida	1,860
Plymouth	1,480
Pocahontas	20
Sac	-30
Webster	14,070
Woodbury	1,440
9-County Primary Impact Area Total	21,230

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 7A
FORECASTED PRIMARY IMPACT AREA EMPLOYMENT IN MANUFACTURING
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	2,140	2,550	2,870	2,980	39.3
Calhoun	320	290	280	280	-12.5
Cherokee	1,060	1,010	990	970	-8.5
Ida	1,060	1,730	2,420	2,700	154.7
Plymouth	1,460	1,960	2,400	2,560	75.3
Pocahontas	580	600	610	610	5.2
Sac	270	250	240	230	-14.8
Webster	2,670	1,910	1,520	1,410	-47.2
Woodbury	6,410	5,770	5,370	5,230	-18.4
9-County Primary Impact Area Total	15,970	16,070	16,700	16,970	-6.3
38-County Region Total	74,530	76,710	78,760	79,440	6.6
State Total	230,570	233,670	239,120	242,090	5.0

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

Table 7B
FORECASTED PRIMARY IMPACT AREA EMPLOYMENT IN MANUFACTURING
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	1,660	2,190	2,720	2,980	79.5
Calhoun	300	280	280	280	6.6
Cherokee	1,230	1,130	1,020	970	-21.1
Ida	930	1,640	2,350	2,700	190.3
Plymouth	1,560	1,960	2,360	2,560	64.1
Pocahontas	650	610	600	600	-7.7
Sac	230	230	230	230	0
Webster	2,790	3,610	4,300	4,640	66.3
Woodbury	6,410	6,320	6,270	6,240	2.6
9-County Primary Impact Area Total	15,760	17,970	20,130	21,200	34.5

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 8A and 8B
FORECASTED PRIMARY IMPACT AREA EMPLOYMENT IN FARM*
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	1,430	1,330	1,240	1,200	-16.1
Calhoun	1,270	1,170	1,090	1,050	-17.3
Cherokee	1,330	1,190	1,080	1,030	-22.6
Ida	920	800	700	660	-28.3
Plymouth	2,090	1,850	1,660	1,580	-24.4
Pocahontas	1,210	1,090	990	950	-21.5
Sac	1,420	1,290	1,190	1,140	-19.7
Webster	1,650	1,540	1,440	1,380	-16.4
Woodbury	1,680	1,460	1,290	1,220	-27.4
9-County Primary Impact Area Total	13,000	11,720	10,680	10,210	-21.5
38-County Region Total	50,240	45,050	40,940	39,120	-22.1
State Total	129,740	116,970	106,710	102,100	-21.3

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

NOTES: * Farm = Includes all establishments such as farms, orchards, greenhouses and nurseries primarily engaged in the production of crops, plants, vines, trees (excluding forestry operations), specialties such as sod, bulbs and flower seed, ranches, dairies, feedlots, egg production facilities, poultry hatcheries primarily engaged in the keeping, grazing or feeding of cattle, hogs, sheep, goats, poultry of all kinds, and special animals such as horses, bees, pets and fish in captivity.

Table 9A
FORECASTED PRIMARY IMPACT AREA EMPLOYMENT
IN WHOLESALE TRADE
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	640	630	630	640	0
Calhoun	320	340	340	330	3.1
Cherokee	310	330	350	350	12.9
Ida	230	240	260	260	13.0
Plymouth	490	520	550	560	14.3
Pocahontas	440	470	470	450	22.3
Sac	470	500	500	490	4.3
Webster	1,090	850	690	630	-42.2
Woodbury	3,070	2,570	2,270	2,170	-29.3
9-County Primary Impact Area Total	7,060	6,450	6,060	5,880	-16.7
38-County Region Total	43,890	47,030	49,170	49,550	12.9
State Total	87,820	95,240	100,070	100,890	14.9

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

Table 9B
FORECASTED PRIMARY IMPACT AREA EMPLOYMENT
IN WHOLESALE TRADE
FOR YEARS 1990-2015

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	600	620	650	670	11.6
Calhoun	320	340	440	460	43.7
Cherokee	320	340	350	350	9.4
Ida	220	240	260	260	18.2
Plymouth	490	520	550	560	14.3
Pocahontas	450	490	510	510	13.3
Sac	470	520	540	540	14.9
Webster	1,100	1,170	1,220	1,240	12.7
Woodbury	3,070	2,770	2,610	2,540	-17.3
9-County Primary Impact Area Total	7,040	7,010	7,130	5,130	27.1

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

Table 10A
FORECASTED PRIMARY IMPACT AREA TOTAL RETAIL SALES
FOR YEARS 1990-2015 (MILLIONS - 1982 $)*

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	$ 96.59	$111.06	$131.33	$142.50	47.5
Calhoun	33.58	33.79	35.50	36.50	8.7
Cherokee	64.63	63.97	68.15	71.18	10.1
Ida	31.60	40.25	52.83	59.28	87.6
Plymouth	88.52	104.50	127.44	139.05	57.1
Pocahontas	35.95	38.23	41.93	43.89	22.1
Sac	38.09	39.30	41.82	43.18	13.4
Webster	215.12	212.12	224.37	233.54	8.6
Woodbury	558.57	564.41	618.47	656.51	17.5
9-County Primary Impact Area Total	$1,162.65	$1,207.63	$1,341.84	$1,425.63	22.6
38-County Region Total	$5,470.86	$6,216.53	$7,337.29	$7,989.85	46.0
State Total	$13,149.44	$14,853.55	$17,504.55	$19,068.08	45.0

SOURCE: Woods and Poole Economics, Inc., Washington, D.C., 1991. Projected Data 1990-2015 From Woods and Poole, Copyright 1991.

NOTES: * Constant dollar sales (a.k.a. real dollar sales) are current dollar sales that have been adjusted for price inflation. The base year for inflation adjustments was 1982).

Table 10B
FORECASTED PRIMARY IMPACT AREA TOTAL RETAIL SALES
FOR YEARS 1990-2015 (MILLIONS - 1982 $)*

	1990	2000	2010	2015	% Change 1990-2015
Buena Vista	$ 90.20	$107.71	$133.02	$147.75	63.8
Calhoun	33.43	37.95	44.58	48.07	43.8
Cherokee	67.08	66.30	69.09	70.93	5.7
Ida	30.26	39.54	52.00	59.08	95.2
Plymouth	90.32	104.87	127.30	140.35	55.4
Pocahontas	36.80	39.91	45.22	48.04	30.5
Sac	37.77	40.32	44.46	46.68	23.6
Webster	217.04	281.95	369.92	419.51	93.3
Woodbury	558.58	603.31	694.40	749.43	34.2
9-County Primary Impact Area Total	$1,161.48	$1,321.86	$1,579.99	$1,729.84	48.9

SOURCE: Woods and Poole Economics, Washington, D.C., March, 1992, Alternative Forecast Scenario for the 9-County Primary Impact Area Based on Assumptions Listed in Attachment B.

NOTES: * Constant dollar sales (a.k.a. real dollar sales) are current dollar sales that have been adjusted for price inflation. The base year for inflation adjustments was 1982).

Attachment A
LITERATURE SOURCES

Attachment A

LITERATURE SOURCES

1. Iowa State University Agriculture and Home Economics Experiment Station and Cooperative Extension Service. Iowa Retail Sales, 1980-91.

2. Woods and Poole Economics, Inc., Washington, D.C. 1991 State of Iowa Profile.

3. Woods and Poole Economics, Inc., Washington, D.C. 1992 Alternative Forecast Scenario for 9-County Primary Impact Area.

Attachment B

The projections are based on alternative assumptions for manufacturing, transportation, finance and service sector employment growth from 1989 to 2015. The alternative assumptions used in these projections are as follows:

Buena Vista, Iowa

Manufacturing Employment, 2015: 2,984
Finance Employment Growth, 1991-2015: +9.4%
Transportation Employment Growth, 1991-2015: -18.1%
Service Employment Growth, 1991-2015: +49.2%

Calhoun, Iowa

Manufacturing Employment, 2015: 275
Finance Employment Growth, 1991-2015: -18.8%
Transportation Employment Growth, 1991-2015: +17.9%
Service Employment Growth, 1991-2015: +94.4%

Cherokee, Iowa

Manufacturing Employment, 2015: 970
Finance Employment Growth, 1991-2015: +2.9%
Transportation Employment Growth, 1991-2015: +8.4%
Service Employment Growth, 1991-2015: -24.7%

Ida, Iowa

Manufacturing Employment, 2015: 2,702
Finance Employment Growth, 1991-2015: +5.6%
Transportation Employment Growth, 1991-2015: -22.4%
Service Employment Growth, 1991-2015: +45.6%

Plymouth, Iowa

Manufacturing Employment, 2015: 2,558
Finance Employment Growth, 1991-2015: +23.2%
Transportation Employment Growth, 1991-2015: +57.3%
Service Employment Growth, 1991-2015: +17.9%

Pocahontas, Iowa

Manufacturing Employment, 2015: 600
Finance Employment Growth, 1991-2015: 0.0%
Transportation Employment Growth, 1991-2015: +50.0%
Service Employment Growth, 1991-2015: +42.3%

Sac, Iowa

Manufacturing Employment, 2015: 230
Finance Employment Growth, 1991-2015: +11.1%
Transportation Employment Growth, 1991-2015: +14.5%
Service Employment Growth, 1991-2015: +24.7%

Webster, Iowa

Manufacturing Employment, 2015: 4,638
Finance Employment Growth, 1991-2015: +5.5%
Transportation Employment Growth, 1991-2015: +13.4%
Service Employment Growth, 1991-2015: +112.7%

Woodbury, Iowa

Manufacturing Employment, 2015: 6,240
Finance Employment Growth, 1991-2015: -5.7%
Transportation Employment Growth, 1991-2015: -6.0%
Service Employment Growth, 1991-2015: +29.2%

Appendix B

TRAFFIC ANALYSIS ZONES

TRAFFIC ANALYSIS ZONES

County/State	City/County	ZONE
Boone	Fraser	1
Boone	Ogden	1
Boone	Pilot Mound	1
Boone	Boone	1
Boone	Boxholm	1
Boone	Madrid	2
Boone	Moingena	2
Boone	Luther	2
Boone	Woodward	2
Boone	Sheldahi	3
Boone	Napier	3
Boone	Berkley	4
Boone	Beaver	4
Greene	Farlin	5
Greene	Churdan	5
Greene	Ripply	6
Greene	Grand Jct	6
Greene	Jefferson	6
Greene	Cooper	6
Greene	Scarnton	7
Greene	Paton	8
Greene	Dana	8
Carroll	Carroll	9
Carroll	Lidderdale	10
Carroll	Lanesboro	10
Carroll	Dedham	11
Carroll	Coon Rapids	11
Carroll	Glidden	11
Carroll	Wiley	11
Carroll	Ralston	11
Carroll	Roselle	12
Carroll	Halbur	12
Carroll	Manning	13
Carroll	Templeton	13
Carroll	Maple River Jct	14
Carroll	Mount Carmel	14
Carroll	Breda	14
Carroll	Arcadia	14
Crawford	Aspinwall	15
Crawford	Manilla	15
Crawford	Vail	16
Crawford	Westside	16
Crawford	Denison	17
Crawford	Kiron	18
Crawford	Deloit	18
Crawford	Charter Oak	19
Crawford	Ricketts	19
Crawford	Schleswig	19
Crawford	Dow City	20
Crawford	Buck Grove	20

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
Crawford	Arion	20
Crawford	Dunlap	21
Monona	Onawa	22
Monona	Whiting	22
Monona	Soldier	23
Monona	Mapleton	23
Monona	Turin	23
Monona	Ute	23
Monona	Castana	23
Monona	Rodney	24
Monona	Moorehead	25
Monona	Blencoe	26
Woodbury	Sioux City	27
Woodbury	Moville	28
Woodbury	Cushing	29
Woodbury	Pierson	29
Woodbury	Correctionville	29
Woodbury	Anthon	30
Woodbury	Climbing Hill	30
Woodbury	Brenson	30
Woodbury	Oto	30
Woodbury	Hornick	31
Woodbury	Smithland	31
Woodbury	Sergent Bluff	32
Woodbury	Luton	32
Woodbury	Salix	32
Woodbury	Sloan	32
Woodbury	Lawton	32
Woodbury	Danbury	33
Plymouth	Struble	34
Plymouth	Le Mars	34
Plymouth	Craig	34
Plymouth	Burnsville	34
Plymouth	Akron	35
Plymouth	Westfield	35
Plymouth	Hinton	36
Plymouth	Merrill	36
Plymouth	Seney	37
Plymouth	Remsen	37
Plymouth	Oyens	37
Plymouth	Kingsley	38
Cherokee	Washta	39
Cherokee	Quimby	39
Cherokee	Cherokee	40
Cherokee	Cleghorn	41
Cherokee	Marcus	41
Cherokee	Meriden	41
Cherokee	Larrabee	42
Cherokee	Aurelia	43
Buena Vista	Sioux Rapids	44

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
Buena Vista	Rumbrandt	44
Buena Vista	Linn Grove	44
Buena Vista	Albert City	45
Buena Vista	Marathan	45
Buena Vista	Alta	46
Buena Vista	Storm Lake	46
Buena Vista	Truesdale	46
Buena Vista	Sulphur Springs	47
Buena Vista	Newell	47
Buena Vista	Lakeside	47
Pocahontas	Laurens	48
Pocahontas	Havelock	48
Pocahontas	Fonda	49
Pocahontas	Varina	49
Pocahontas	Pocahontos	50
Pocahontas	Palmer	50
Pocahontas	Plover	51
Pocahontas	Rolfe	52
Humbold	Ottosen	53
Humbold	Bode	53
Humbold	Bradgate	53
Humbold	Livermore	53
Humbold	Rutland	54
Humbold	Gilmore City	54
Humbold	Pioneer	54
Humbold	Humbolt	55
Humbold	Dakota City	55
Humbold	Renwick	56
Humbold	Thor	56
Humbold	Handy	56
Wright	Galt	57
Wright	Dows	57
Wright	Rowan	57
Wright	Belmond	58
Wright	Goldfield	59
Wright	Clarion	59
Wright	Holms	59
Wright	Eagle Grove	60
Wright	Woolstock	60
Hamilton	Stanhope	61
Hamilton	Randall	62
Hamilton	Ellsworth	62
Hamilton	Stratford	63
Hamilton	Jewell	64
Hamilton	Kamrar	65
Hamilton	Webster City	66
Hamilton	Blairsburg	67
Hamilton	Williams	68
Webster	Ft. Doge	69
Webster	Badger	70

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
Webster	Vincent	70
Webster	Otho	71
Webster	Kalo	71
Webster	Coalville	71
Webster	Burnside	72
Webster	Lehigh	72
Webster	Harcourt	73
Webster	Dayton	73
Webster	Moorland	74
Webster	Gowrie	75
Webster	Farhmville	75
Webster	Callender	75
Webster	Barnum	76
Webster	Clare	76
Webster	Duncombe	77
Calhoun	Knierim	78
Calhoun	Manson	78
Calhoun	Somers	79
Calhoun	Lohrville	79
Calhoun	Rinard	79
Calhoun	Rockwell City	80
Calhoun	Pomeroy	81
Calhoun	Jolley	81
Calhoun	Lake City	82
Calhoun	Yetter	82
Sac	Carnarvon	83
Sac	Auburn	83
Sac	Ulmer	83
Sac	Wall Lake	84
Sac	Lake View	84
Sac	Sac City	85
Sac	Lytton	86
Sac	Nemaha	87
Sac	Early	88
Sac	Odebolt	89
Sac	Schalley	90
Ida	Battle Creek	91
Ida	Arthur	91
Ida	Ida Grove	91
Ida	Galva	92
Ida	Holstein	92
Adair	Greenfield	93
Audubon	Audubon	94
Butler	Allison	95
Butler	Aplington	96
Butler	Clarkesville	97
Butler	Greene	98
Butler	Parkersburg	99
Butler	Shell Rock	100
Cass	Anita	101

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
Cass	Atlantic	102
Cass	Griswold	103
Cerro Gordo	Clear Lake	104
Cerro Gordo	Mason City	105
Cerro Gordo	Rockwell	106
Clay	Spencer	107
Dallas	Adel	108
Dallas	Perry	109
Dickinson	Arnolds Park	110
Dickinson	Lake Park	111
Dickinson	Milford	112
Dickinson	Spirit Lake	113
Emmet	Armstrong	114
Emmet	Esterville	115
Floyd	Charles City	116
Floyd	Nora Springs	117
Floyd	Rockford	118
Franklin	Ackley	119
Franklin	Hampton	120
Franklin	Sheffield	121
Grundy	Conrad	122
Grundy	Grundy Center	123
Grundy	Reinbeck	124
Guthrie	Guthrie Center	125
Guthrie	Panora	126
Guthrie	Staurt	127
Hancock	Britt	128
Hancock	Garner	129
Hardin	Eldora	130
Hardin	Iowa Falls	131
Harrison	Logan	132
Harrison	Missouri Valley	133
Harrison	Woodbine	134
Jasper	Colfax	135
Jasper	Newton	136
Jasper	Prairie City	137
Kossuth	Algona	138
Kossuth	Bancroft	139
Lyon	George	140
Lyon	Rock Rapids	141
Madison	Earlham	142
Madison	Winterset	143
Marshall	Marshalltown	144
Marshall	State Center	145
Mitchell	Osage	146
Mitchell	St. Ansgar	147
Osceola	Sibley	148
O'brien	Hartley	149
O'brien	Paullina	150
O'brien	Primghar	151

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
O'brien	Sanborn	152
O'brien	Sheldon	153
Palo Alto	Emmetsburg	154
Polk	Altoona	155
Polk	Ankeny	156
Polk	Des Moines	157
Polk	Johnston	158
Polk	Mitchellvile	159
Polk	Polk City	160
Pottawattamie	Avoca	161
Pottawattamie	Council Bluff	162
Pottawattamie	Oakland	163
Shelby	Harland	164
Sioux	Hawarden	165
Sioux	Hull	166
Sioux	Orange City	167
Sioux	Rock Valley	168
Sioux	Sioux Center	169
Story	Ames	170
Story	Hurley	171
Story	Neveda	172
Story	Roland	173
Story	Slater	174
Story	Story City	175
Warren	Carlisle	176
Warren	Indianola	177
Warren	Norwalk	178
Winnebago	Buffalo Center	179
Winnebago	Forest City	180
Winnebago	Lake Mills	181
Worth	Manly	182
Worth	Northwood	183
IA	Adams	184
IA	Allamakee	185
IA	Benton	186
IA	Black Hawk	187
IA	Bremer	188
IA	Buchanan	189
IA	Cedar	190
IA	Cerro Gordo	191
IA	Chickasaw	192
IA	Clay	193
IA	Clayton	194
IA	Clinton	195
IA	Dallas	196
IA	Davis	197
IA	Decatur	198
IA	Delaware	199
IA	Des Moines	200
IA	Dickinson	201

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
IA	Dubuque	202
IA	Fayette	203
IA	Franklin	204
IA	Fremont	205
IA	Grundy	206
IA	Hancock	207
IA	Henry	208
IA	Howard	209
IA	Iowa	210
IA	Jackson	211
IA	Jefferson	212
IA	Johnson	213
IA	Jones	214
IA	Keokuk	215
IA	Lee	216
IA	Linn	217
IA	Lucas	218
IA	Lyon	219
IA	Mahaska	220
IA	Marion	221
IA	Mills	222
IA	Mitchell	223
IA	Montgomery	224
IA	Muscatine	225
IA	Osceola	226
IA	Page	227
IA	Palo Alto	228
IA	Polk	229
IA	Pottawattamie	230
IA	Poweshiek	231
IA	Ringold	232
IA	Scott	233
IA	Sioux	234
IA	Tama	235
IA	Taylor	236
IA	Wapello	237
IA	Washington	238
IA	Wayne	239
IA	Winnebago	240
IA	Winneshiek	241
SD	Beadle	242
SD	Brookings	243
SD	Brown	244
SD	Brule	245
SD	Campbell	246
SD	Clay	247
SD	Codington	248
SD	Custer	249
SD	Davison	250
SD	Douglas	251

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
SD	Fall River	252
SD	Hutchinson	253
SD	Lincoln	254
SD	Mead	255
SD	Mellette	256
SD	Minnehaha	257
SD	Pennington	258
SD	Roberts	259
SD	Sully	260
SD	Todd	261
SD	Turner	262
SD	Union	263
SD	Yankton	264
NE	Antelope	265
NE	Box Bute	266
NE	Brown	267
NE	Buffalo	268
NE	Burt	269
NE	Butler	270
NE	Cass	271
NE	Cedar	272
NE	Cherry	273
NE	Cuming	274
NE	Dakota	275
NE	Dawes	276
NE	Deuel	277
NE	Dixon	278
NE	Dodge	279
NE	Douglas	280
NE	Gage	281
NE	Gosper	282
NE	Hall	283
NE	Holt	284
NE	Johnson	285
NE	Keith	286
NE	Knox	287
NE	Lancaster	288
NE	Lincoln	289
NE	MAdison	290
NE	Nance	291
NE	Nemaha	292
NE	Otoe	293
NE	Pierce	294
NE	Platte	295
NE	Saline	296
NE	Saunders	297
NE	Seward	298
NE	Thurston	299
NE	Valley	300
NE	Washington	301

TRAFFIC ANALYSIS ZONES (Continued)

County/State	City/County	ZONE
NE	Wayne	302
NE	York	303
Alabama		304
Arkansas		305
California		306
Colorado		307
Illinois		308
Indiana		309
Kansas		310
Maryland		311
Michigan		312
Minnesota		313
Mississippi		314
Missouri		315
Montana		316
New Hampshire		317
New Jersey		318
New Mexico		319
North Dakota		320
Ohio		321
Oklahoma		322
Tennessee		323
Texas		324
Virginia		325
Washington		326
Wisconsin		327
Wyoming		328