APPENDIX A
Previous Studies

CHIEF DRAFTSM.	LOCATING ENG'R	DESIGN ENG'R	BRIDGE ENG'R	CONSTRUCTION ENG'R	B. P. R.
CEB 2-12-58	G.H.S.	J.B.M.	D.I.M.	J.J.S.	

4-28-58

FED. ROAD DIST. NO.	STATE	F.A. PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
6	OKLA.	F-162(10)(11)		1	88

GRADE CROSSINGS 0
GRADE CROSSINGS ELIMINATED 0
BY SEPARATION { OVERPASS 0 / UNDERPASS 0
BY RELOCATION 0
GRADE CROSSINGS REMAINING 0

INDEX OF SHEETS

F.A.P. NO. F-162(10)(11)		
162(10)	162(11)	162(11) Sodding
1-32 39-88 15A,7A	1-16 8-17 33-38 15A.	1-6 8-13

SEE F.A. PROJ. NO. F-162(12) SODDING FOR P&P SHEETS.

SCALES

PLAN 1"=100'
PROFILE { HOR. 1"=100' / VER. 1"=10'
CROSS SECTIONS 1"=5' & 10'
LAYOUT MAP 1"=2000'
U.S.C.& G.S. LEVEL DATUM
BEARINGS FROM OBSERVATION ON POLARIS

CONVENTIONAL SIGNS

- PROPOSED ROAD
- RAILROADS
- RANGE & TOWNSHIP LINES
- SECTION LINES
- QUARTER SECTION LINES
- FENCES
- BASE LINE
- RIGHT-OF-WAY LINES
- GROUND LINES
- GRADE LINE
- TRAVELLED ROADS
- CULVERTS & BRIDGES
- TELEPHONE & TELEGRAPH
- POWER LINES
- BUILDINGS
- UNLOADING POINTS
- OIL WELLS
- RIGHT OF WAY MARKERS

F.A. SPECIAL PROVISIONS GOVERN AND
STATE STANDARD SPECIFICATIONS GOVERN APPROVED APRIL 28, 1955

	DATE	REV.
TRAFFIC	1-20-58	
GEOM. DES.	E.C.	
CHECKER	P.W.L.	1-22-58
SQUAD BOSS	D.K. BOYD	

S.F.A. 2/1/58

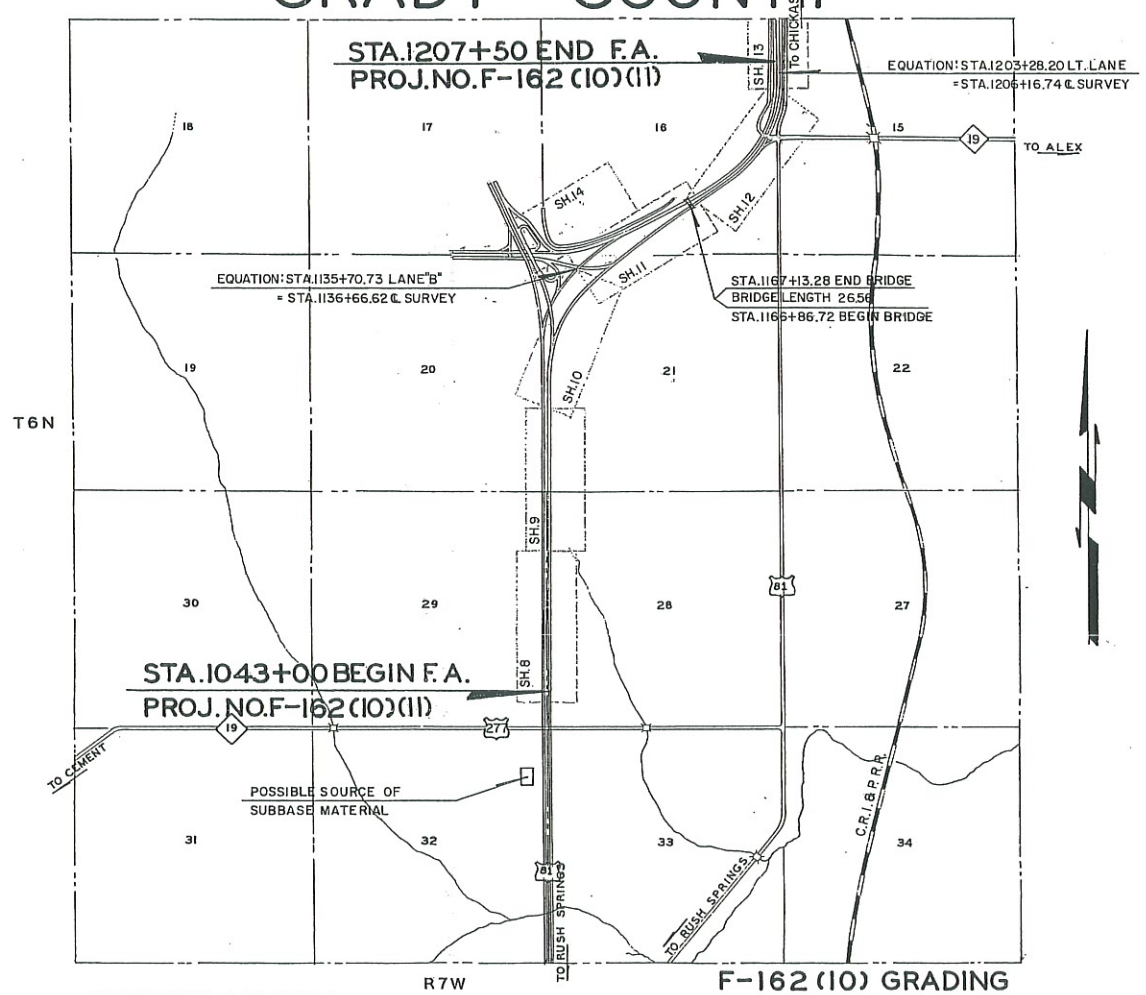
STATE OF OKLAHOMA

DEPARTMENT OF HIGHWAYS

PLAN AND PROFILE OF PROPOSED
STATE HIGHWAY

DF-162(11)
FEDERAL AID PROJECT NO. F-162(10) & (11)
U.S. HIGHWAY NO. 81
CONTROL SECTION NO. 26-07

GRADY COUNTY



	F-162(10) GRADING		F-162(11) SURFACING	
ROADWAY LENGTH	16,039.01 FT.	3.037 MI.	16,065.57 FT.	3.042 MI.
BRIDGE LENGTH	26.56 FT.	0.005 MI.	00.00 FT.	0.00 MI.
PROJECT LENGTH		3.042 MI.		3.042 MI.

EQUATION-STA.1135+70.73 LANE "B" = STA.1136+66.62 ℄ SURVEY
STA.1203+28.20 LT. LANE = STA.1206+16.74 ℄ SURVEY
EXCEPTIONS - NONE

EQUATION - SAME AS GRADING

EXCEPTIONS - NONE

Under the rules and regulations of the Bureau of Public Roads, any change [illegible] to the [illegible] on this [illegible] shall be approved by the Bureau of Public Roads before executing any work.

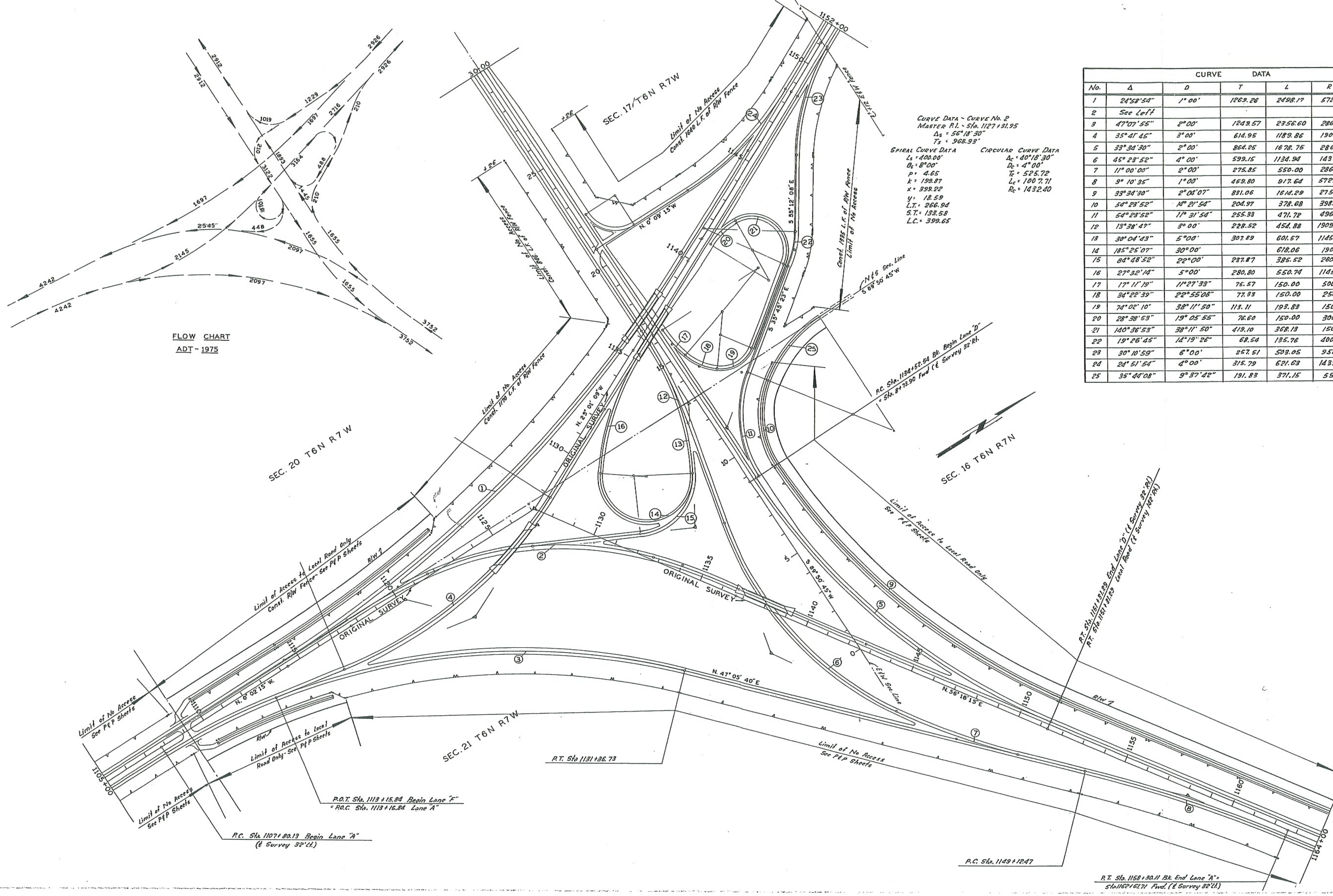
APPROVED
THIS [redacted] DAY OF [redacted]
[redacted]
CHIEF ENGINEER
OKLA. DEPARTMENT OF HIGHWAYS

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
APPROVED DATE [redacted]
[redacted]
DIVISION ENGINEER

S.W.O. - 2028 (1)

F.A. PROJECT NO. F-162(10)(11) SHEET NO. 1

DIETZGEN NO. 139 IMPERIAL



CURVE DATA ~ CURVE No. 2
MASTER P.I. ~ Sta. 1127+31.95
Δ_s = 56°18'30"
T_s = 968.93'

SPIRAL CURVE DATA
L_s = 400.00'
θ_s = 8°00'
p = 4.65
k = 199.87
x = 399.22
y = 18.59
L.T. = 266.94
S.T. = 133.58
L.C. = 399.65

CIRCULAR CURVE DATA
Δ_c = 40°18'30"
D_c = 4°00'
T_c = 525.72
L_c = 1007.71
R_c = 1432.40

CURVE DATA

No.	Δ	D	T	L	R	P.I. ~ Sta.
1	24°58'54"	1°00'	1269.26	2498.17	5729.58	1127+07.73
2	See Left					
3	47°07'55"	2°00'	1249.57	2356.60	2864.79	1120+29.70
4	35°41'45"	3°00'	614.95	1189.86	1909.86	1122+58.22
5	33°34'30"	2°00'	864.25	1678.75	2864.79	1143+16.79
6	45°23'52"	4°00'	599.15	1134.94	1432.40	1135+26.68
7	11°00'00"	2°00'	275.85	550.00	2864.79	1143+38.32
8	9°10'35"	1°00'	459.80	917.64	5729.58	1153+72.27
9	33°34'30"	2°04'07"	831.06	1614.29	2754.79	1143+48.06
10	54°23'52"	14°21'54"	204.97	378.68	398.85	1133+43.29
11	54°23'52"	11°31'54"	255.33	471.72	496.85	1132+36.15
12	13°38'47"	3°00'	228.52	454.88	1909.86	1122+40.42
13	30°04'43"	5°00'	307.89	601.57	1145.92	1123+89.81
14	185°25'07"	30°00'		618.06	190.99	
15	84°48'52"	22°00'	237.87	385.52	260.44	1129+21.36
16	27°32'14"	5°00'	280.80	550.74	1145.92	1135+82.35
17	17°11'19"	11°27'33"	75.57	150.00	500.00	1154+35.94
18	34°22'39"	22°55'06"	77.38	150.00	250.00	1152+87.70
19	74°02'10"	38°11'50"	113.11	193.83	150.00	1151+29.65
20	28°38'53"	19°05'55"	76.60	150.00	300.00	1141+81.66
21	140°36'53"	38°11'50"	419.10	368.13	150.00	1146+74.16
22	19°26'45"	14°19'26"	68.54	135.76	400.00	1124+10.55
23	30°10'59"	6°00'	257.51	503.05	954.93	1117+60.87
24	24°51'54"	4°00'	315.79	621.63	1432.40	1145+49.22
25	35°44'08"	9°37'42"	191.83	371.15	595.06	1129+59.00

Under the rules and regulations of the Bureau of Public Roads, any changes in the design, including entrances to through lanes or location of median openings shall first have written approval from the Department of Highways and the Bureau of Public Roads before executing any work.

PROPOSED INTERCHANGE
U.S. 81 & U.S. 277
GRADY COUNTY

SCALE: 1" = 200'

F.A. PROJECT NO. F-162(10),(11) SHEET NO. 15-A

STATE OF OKLAHOMA
DEPARTMENT OF
TRANSPORTATION

200 N. E. 21st Street
Oklahoma City, Oklahoma 73105

SURVEY DIVISION
RLS 6-2-78
DOC 6/2/78
RDC
PA 5-24-78
AVN 5-23-78
5-16-78

PRELIMINARY

BACKGROUND REPORT

ON

US 81

(CHICKASHA BYPASS)

IN

GRADY COUNTY

From the intersection of US 62 and US 81 on the northwest side of Chickasha, south on new alignment for approximately 6.75 miles to existing US 81.

This report was prepared by the Rural Transportation Planning Branch for the purpose of determining the feasibility of providing a bypass facility around the west side of Chickasha and cost estimates for constructing that bypass to appropriate standards.

Monty C. Murphy, P. E.
Assistant Director-
Planning and Research

PASCAL HOW DOES THIS COMPARE WITH OUR SUR. LINE ECK? [illegible] MADE FOR 4-LANE SWO [illegible](1), SURVEY [illegible] ON ATTACHED MAPS. ON THE ALIGNMENT [illegible] JPA.

FILE: SWO 2737(1)

INTRODUCTION

This report pertains to a segment of US Highway 81 extending through Chickasha, Oklahoma in Grady County. The existing road conditions, previous studies on US 81 and design standards warranted for upgrading this segment of highway are all discussed. Also, a road user benefit analysis was prepared to determine if a bypass facility is justified at this time for Chickasha. Results of that benefit analysis and construction cost estimates for providing the bypass are included in this report.

BACKGROUND

In 1967 the Department of Transportation developed preliminary survey lines and planning studies to determine the most practical and feasible method of improving US 81 through Chickasha, Oklahoma. Based on results of those studies, it was proposed that a bypass facility should ultimately be constructed around the west side of the city.

A bypass was selected for several reasosn. Since US 81 was a part of the State's trunk highway system, and it was functionally classified as a principal arterial, it was determined that US 81 should primarily serve traffic corridor movements of a statewide or interstate nature. To give through traffic priority, a bypass offered many advantages not available on the existing alignment. First, traffic using present US 81 encounters frequent

stops, indirect movements, low operating speeds, and numerous other conflicts characteristic of an urban arterial street. This condition would not exist on a bypass. Furthermore, right-of-way and construction costs would be substantially less for improving US 81 to the warranted design standards on a bypass alignment as opposed to the present alignment.

EXISTING CONDITIONS

As previously stated, existing US 81 in Chickasha exhibits characteristics similar to those of an urban arterial street. This is in part caused by the design of the facility which varies frequently throughout the city. Based on current inventory data, US 81 extending north on present alignment from SH 19, varies in surface width from a 24' minimum to a maximum of 72'. In addition to the number of lanes and surface widths, the highway also has sections containing no median and some portions with medians varying from 10' to 40' in width.

SUFFICIENCY RATINGS

Sufficiency rating procedures have been established to determine the overall adequacy of each section of Oklahoma highways and bridges by evaluating them in terms of design and condition. The procedure involves the assigning of specific point values to each

separate element of design and condition. These values are then added together to determine an overall rating with the total or maximum sum possible being 100 points. The rating values have been grouped according to the following listed categories:

CATEGORY	SUFFICIENCY RATING
Adequate	80-100
Tolerable	70- 79
Inadequate	60- 69
Critically Inadequate	0- 59

The sufficiency ratings for that segment of US 81 being studied in Chickasha vary from 74 to 94. Only 0.75 mile of the total length is in the tolerable range while the remaining 6.48 miles is in the adequate range. Based on this one factor, it does not appear that improvements to existing US 81 are warranted at this time.

DESIGN WARRANTS

Design year traffic volumes were prepared considering a bypass facility in place. Based on the projected year 2000 average daily traffic (bypassable only), the bypass warrants improvement as two lane construction initially on four lanes of right-of-way and to four lane design ultimately (48' divided). As dictated by current Commission policy, this type facility is also to be built with either full or partial control of access as conditions may warrant. Recommendations regarding the necessity for exercising

control of access and degree of control are to be made based on such factors as anticipated future development of the urban community, demand for private access, traffic congestion, accident potential, and other similar items.

Current conditions indicate that partial control of access is needed and the bypass can be constructed in usable stages (two lanes initially and four lanes ultimately) while maintaining this degree of control. Therefore, cost estimates were prepared for the initial 2-lane design with separation structures to be included at the H.E. Bailey Turnpike, one section line road and at the US 81-SH 92 intersection. The remaining section line roads are to be at grade intersections. Cost estimates were also prepared for the ultimate design (48' divided section) with separations to be provided at the same locations as the initial design plus one additional location. A diamond interchange is to be constructed at the US 62 and US 81 intersection.

CONSTRUCTION COST ESTIMATES

The subsequent listed construction cost estimates are for developing a bypass facility around the west side of Chickasha, Oklahoma. Improvements would consist of a two-lane facility initially and a four-lane divided section ultimately with partial control of access. No costs, however, have been included for additional rights-of-way, utilities or for relocation assistance.

Further, costs for an ultimate interchange at existing US 81 and the proposed bypass south of Chickasha are not included in this study. The estimates are as follows:

INITIAL 2-LANE SECTION

ITEM	LENGTH	COSTS
Grade and Drain	6.50 miles	$1,145,300
Surfacing	6.50 miles	2,554,500
Service Roads (24' surface)	3.00 miles	381,000
Bridges:		
Section Line Road Separation	150 feet	191,688
Turnpike Overpass	200 feet	293,216
Separation over SH 92	400 feet	586,432
Line Creek Bridge	130 feet	190,590
Rock Hollow Creek Bridge	180 feet	263,894
	TOTAL CONSTRUCTION COSTS	$5,606,620

ULTIMATE 4-LANE DIVIDED SECTION

ITEM	LENGTH	COSTS
Grade and Drain	6.75 miles	$2,228,200
Surfacing (4-lane)	6.75 miles	4,887,000
Service Roads (24')	3.00 miles	381,000
Bridges:		
Section Line Road Separation	150 feet	191,688
Turnpike Overpass	200 feet	511,168
Separation over SH 92	400 feet	1,022,336
Line Creek Bridge	130 feet	332,259
Rock Hollow Creek Bridge	180 feet	460,051
Rock Hollow Creek Bridge on Ramps	180 feet	270,950
US 62 Interchange	200 feet	511,168
	TOTAL CONSTRUCTION COSTS	$10,795,820

ROAD USER BENEFIT ANALYSIS

Even though a bypass is the most logical choice for future upgrading of US 81, the economic aspects of such an improvement must be considered before funding is committed to construct such a facility. This insures that road users receive maximum benefit from available state and federal funds.

To make this type cost comparison, the American Association of State Highway and Transportation Officials (AASHTO) has published an information report which discusses the various methods available for use in analyzing alternative highway improvements such as the US 81 bypass of Chickasha. Basically, the road user operating costs (direct cost chargeable to users of a facility) are calculated for each alternate, including the existing facility, and compared arithmetically to determine potential savings. Any road user savings is then divided by the difference in highway construction plus highway maintenance costs reduced to an annual basis. If the annual road user savings exceed the difference in annual highway costs of the alternates being compared, the proposed improvement is economically sound and therefore a justifiable expenditure of public funds.

The total highway cost for each alternate improvement are obtained by adding the total capital cost expressed on an annual basis, to the annual maintenance cost. However, when an existing highway with no anticipated improvements is used as the basic

condition, the total annual highway cost for that alternate consists only of the annual maintenance cost of the facility. Based on these factors, total highway cost for present US 81 and the proposed bypass (ultimate 48' divided section only) are as follows:

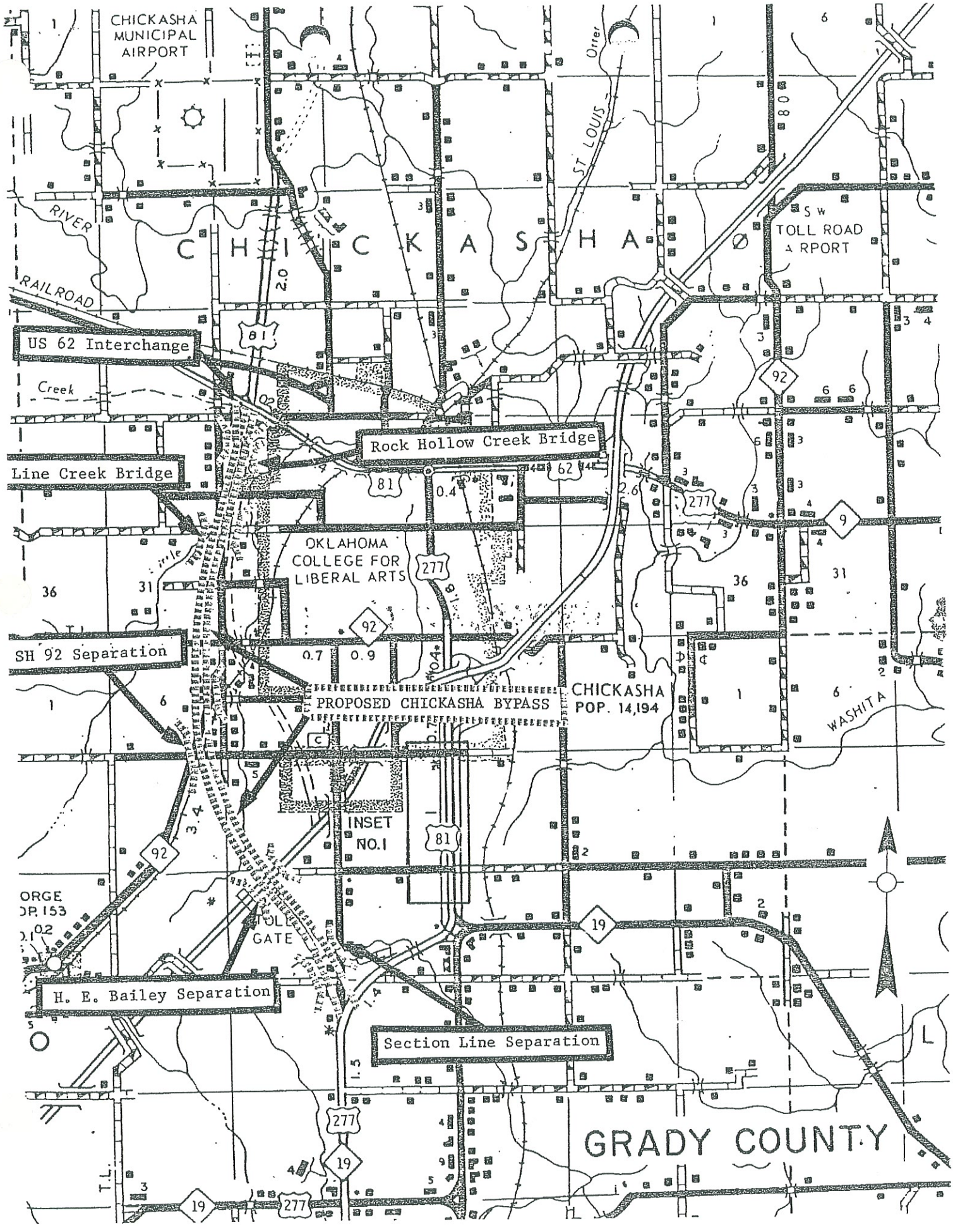
	ANNUAL CAPITAL	ANNUAL MAINTENANCE	TOTAL ANNUAL HIGHWAY COSTS
Existing US 81	0	$18,798.00	$ 18,798.00
Proposed Bypass	$826,969.63	$15,782.00	$842,751.63

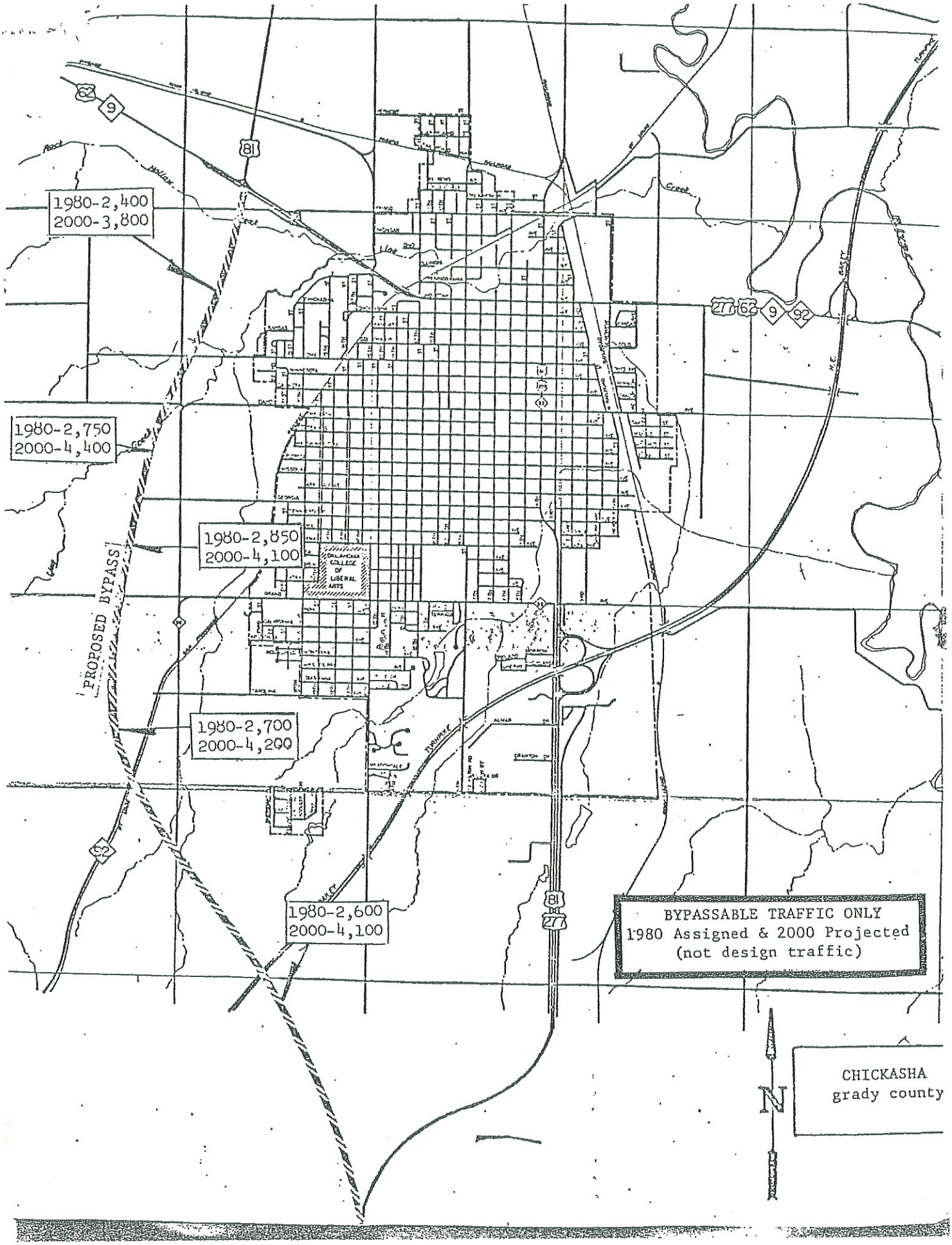
Road user operating costs were calculated next, both with and without the proposed bypass facility. This computation is made by multiplying the annual average daily traffic volume (bypassable only) for the period of analysis, times the section length, times the combined unit operating cost for that type of highway. The derived annual road user operating cost without the proposed bypass is $2,054,575 and with the bypass is $1,641,068. Based on these figures, the annual road user savings amounts to $413,507.

CONCLUSIONS

As stated previously, if annual road user savings exceed the difference in total annual highway costs, for the ultimate 4-lane section, then construction of a bypass facility would be an economical and justifiable expenditure of public funds. In this instance, the difference in total annual highway costs is calculated at $823,953.63 ($842,751.63 - $18,798.00), and annual

road user savings are calculated at $413,507. Based on this analysis and the current sufficiency ratings, the proposed US 81 bypass of Chickasha is not a justifiable expenditure of public funds at this time. However, if traffic volumes continue to increase, the bypass may prove to be a feasible investment in the future.


CHICKASHA MUNICIPAL AIRPORT
CHICKASHA
RIVER
RAILROAD
ST LOUIS
SW TOLL ROAD AIRPORT
US 62 Interchange
Creek
Rock Hollow Creek Bridge
Line Creek Bridge
OKLAHOMA COLLEGE FOR LIBERAL ARTS
SH 92 Separation
PROPOSED CHICKASHA BYPASS
CHICKASHA POP. 14,194
WASHITA
INSET NO.1
TOLL GATE
H. E. Bailey Separation
Section Line Separation
GRADY COUNTY


1980-2,400
2000-3,800
1980-2,750
2000-4,400
1980-2,850
2000-4,100
1980-2,700
2000-4,200
1980-2,600
2000-4,100
PROPOSED BYPASS
OKLAHOMA COLLEGE OF LIBERAL ARTS
81
277
62
9
92
BYPASSABLE TRAFFIC ONLY
1980 Assigned & 2000 Projected
(not design traffic)
N
CHICKASHA
grady county

STATE OF OKLAHOMA

DEPARTMENT OF TRANSPORTATION

FEASIBILITY STUDY

FOR A US 81 BYPASS ROUTE

IN

CHICKASHA, OKLAHOMA

GRADY COUNTY

MARCH 1992

Prepared by

PLANNING DIVISION

TRAFFIC STUDIES BRANCH

TABLE OF CONTENTS

INTRODUCTION

The Planning Division was requested to study the feasibility of constructing a US 81 Bypass for the City of Chickasha in Grady County. The proposed bypass is intended to relieve traffic congestion in the CBD area and provide an alternate route for highway oriented traffic. The present US 81 route through town is primarily a four-lane curbed roadway with frequent stops. The present commercial development prohibits the construction of additional lanes. This study considers two alternate bypass alignments as shown on page 3. These alignments traverse the outlying urban development and farmland located on the west edge of Chickasha. Few residential displacements will be experienced.

PURPOSE

The purpose of this report is to study present traffic system problems in Chickasha, propose a solution and then determine the feasibility of the proposed improvement project. This study has been conducted in accordance with procedures outlined in the AASHTO Report "Road User Benefit Analyses for Highway Improvements."

BACKGROUND

Chickasha is the county seat of Grady County, with a 1990 population of 14,988. Chickasha is a market place for a wide and prosperous region. Diversified crops, large dairy production, numerous medium-sized industries and substantial oil and gas production add to the economic stability of the area.

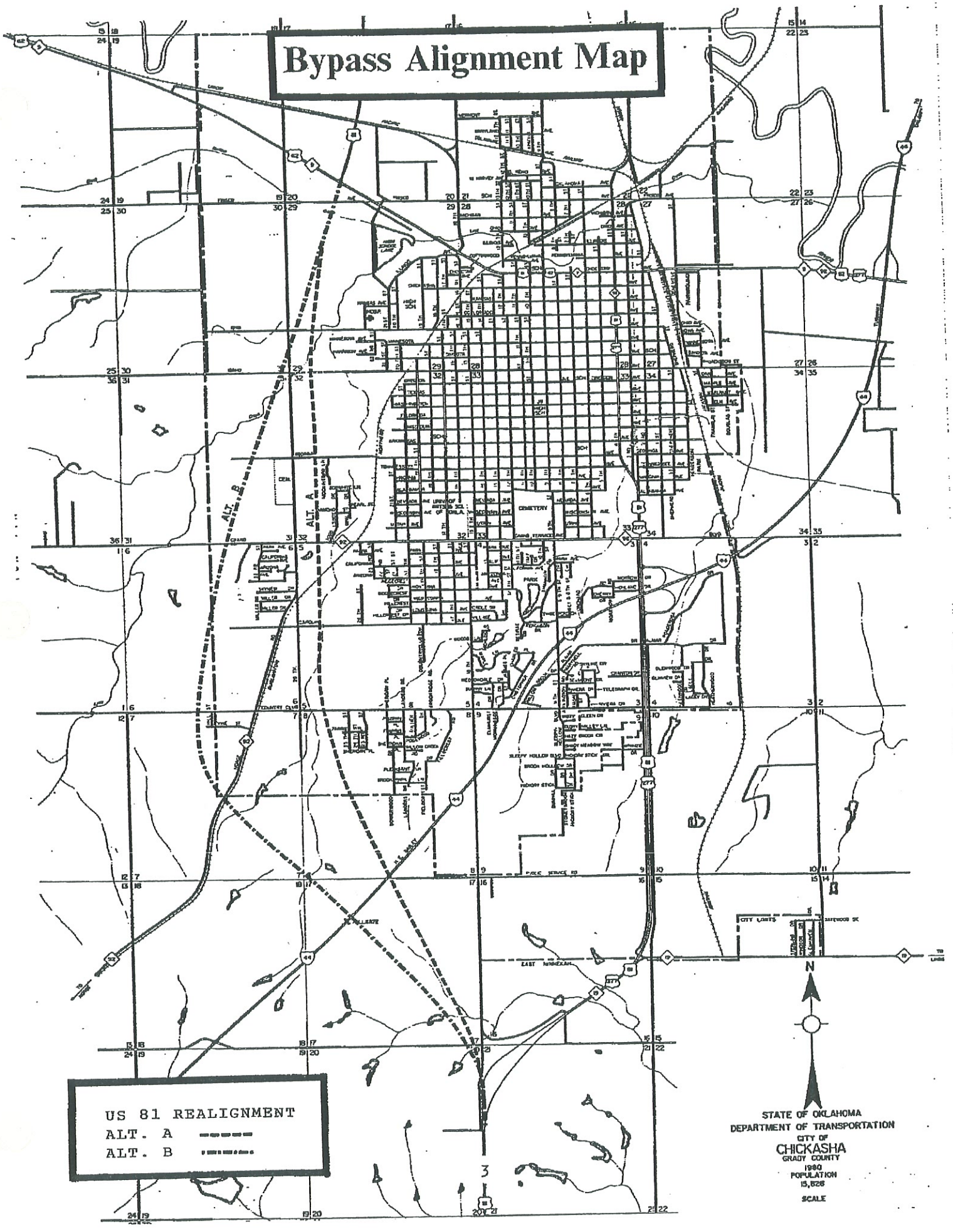
The Chickasha area is served by one Interstate Highway (toll facility) and six state highways as shown on the study area map on page 4. I-44 serves long distance highway oriented trips in a northeast direction to Oklahoma City or southwest to

Lawton. A full interchange exists at US 81 and a partial interchange is provided at US 62 (east of town). US 62 and SH 9 traverse the north side of Chickasha in an east-west direction. US 81 is the city's major business thoroughfare that couples with US 277 in a north-south direction and couples with US 62 at Choctaw Avenue. SH 92 serves local traffic to the southwest and SH 19 serves traffic destined to the southeast.

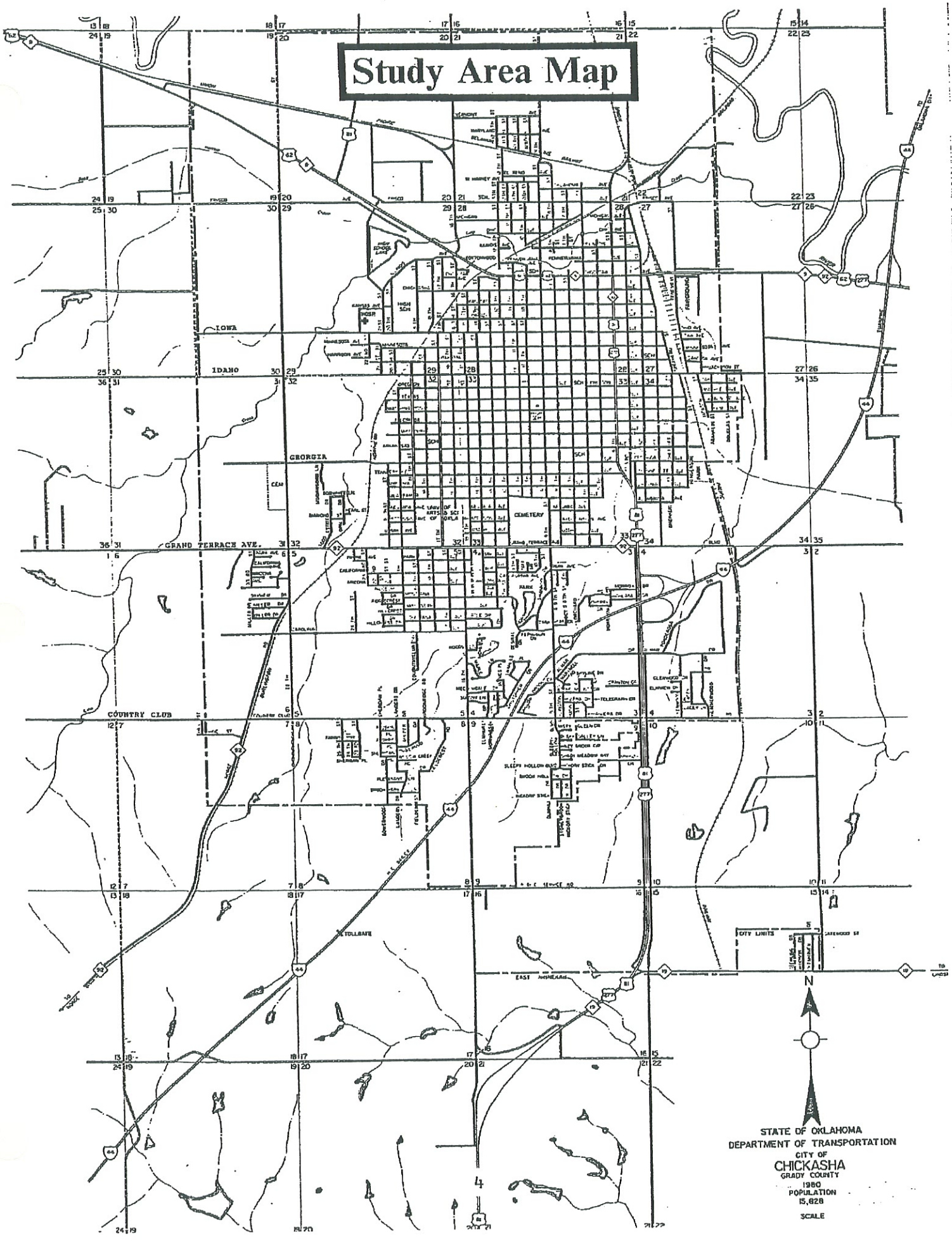
Two major railroads cross Chickasha and have switching yards on the north side of town. The Union Pacific Railroad follows a north-south direction on the east side of town. The Burlington Northern Railroad traverses in a northeast-southwest direction. The city street system is basically a north-south grid system that allows road users easy access to all parts of the city. The central business district (CBD) is bounded by Pennsylvania Avenue, Minnesota Avenue, Fourth Street and Ninth Street. The High School and hospital are located on Iowa Avenue, west of the CBD. Many manufacturing and warehouse type industries such as Delta Faucets are located to the northwest, off US 62. The co-educational University of Science and Arts is located at Grand Terrace Avenue and 17th Street and had an enrollment of 1,451 in 1989. The majority of new residential development has occurred in the southern portion of the city.

In 1978, the Planning Division completed a benefit-to-cost study for providing a four-lane bypass to the west of Chickasha. The conclusion was that the project was infeasible due to low traffic diversions from the 1977 origin and destination study. Since then, traffic has increased and a 1983 origin and destination study has been completed. The 1983 study has been used to determine bypassable trips in the analysis of this report.

Bypass Alignment Map



Study Area Map



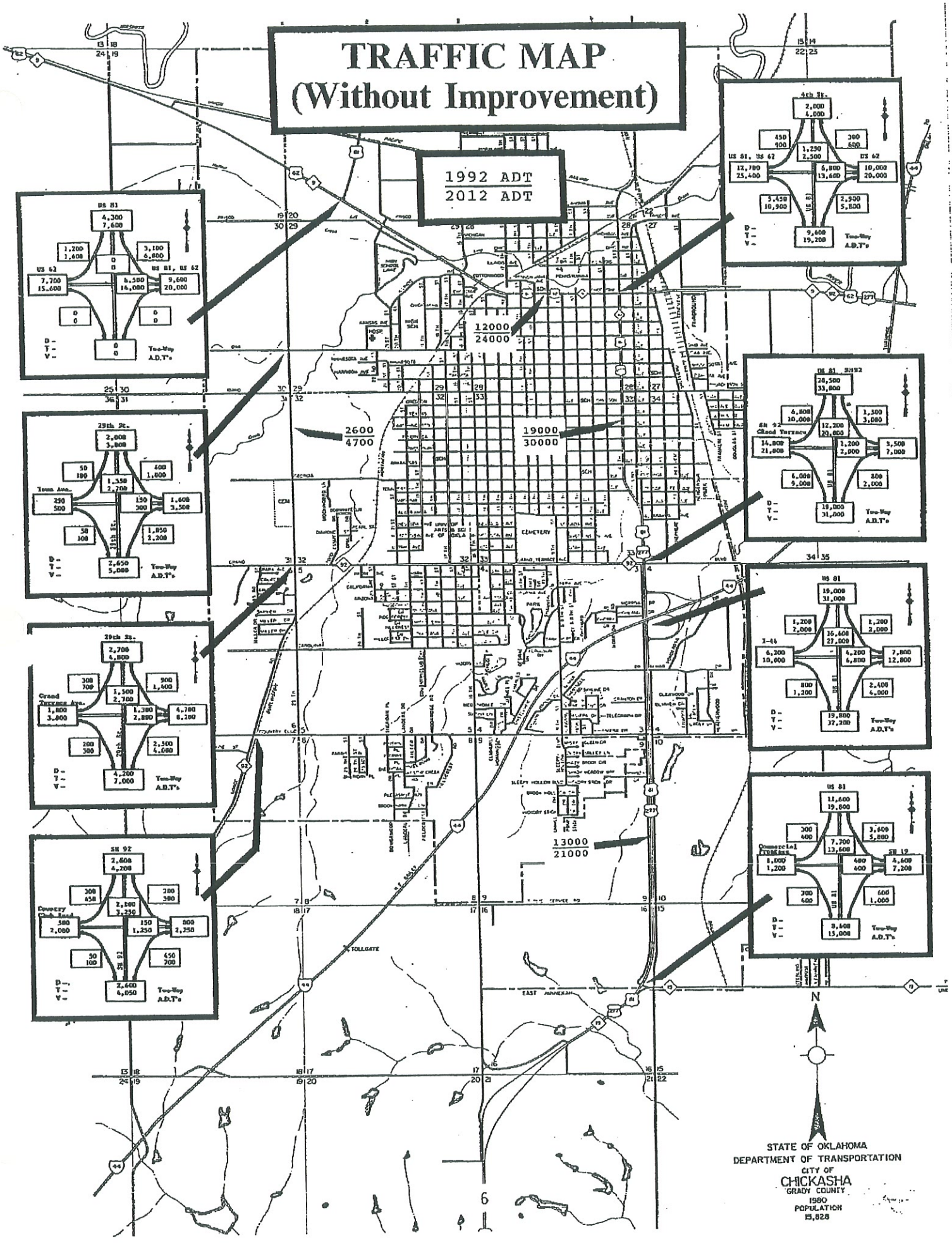
TRAFFIC

The effective treatment of traffic congestion through system improvements is dependent on a historical knowledge of daily volumes, patterns of circulation and characteristics of traffic within the study area. The design of traffic carrying facilities should accommodate the city's present and future development needs. The next three pages display the 1992 present average daily traffic and the forecast 2012 design traffic "with" and "without" the proposed improvements. Items considered in preparing the forecast traffic information are: the 1983 Chickasha Origin and Destination Survey; historical traffic trends; special traffic counts; land use and development potential; present roadway capacity and alternate route diversions on a time delay basis.

US 81 is Chickasha's major north-south business route with the highest traffic and truck volumes. US 81, south of I-44, is a divided four-lane facility with continuous frontage roads to accommodate local commercial and residential traffic circulation. Present traffic flow in this area is stable with little additional capacity available. US 81 north of Grand Terrace Avenue is generally a five-lane curbed roadway with the section between Choctaw and Colorado undivided. The traffic flow in this area is mostly unstable with reduced operating speeds resulting from heavy commercial development on both sides of the roadway, along with frequent traffic signals and a school zone at Idaho Avenue. This area of US 81 is near capacity with no adequate alternate route available for future traffic growth. The intersection of US 81 (4th Street) and US 62 (Choctaw Avenue) is in need of improvement to accommodate present traffic demands. Several legs of this intersection are one lane due to the angle parking for the adjacent buildings.

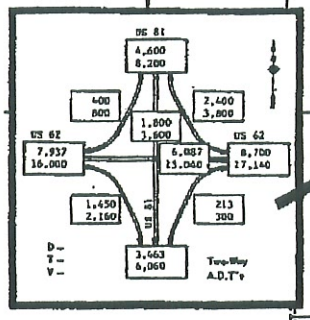
TRAFFIC MAP
(Without Improvement)

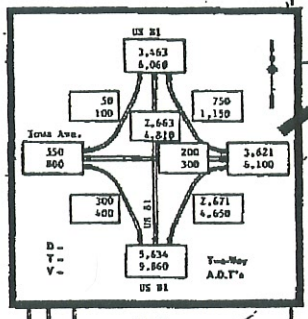
1992 ADT
2012 ADT

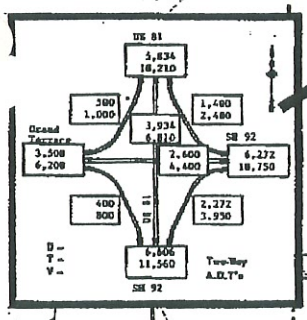


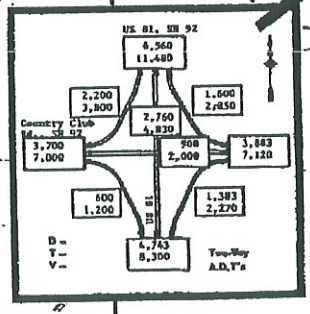
TRAFFIC MAP
(Alternate A)

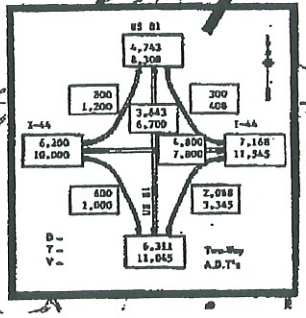
1992 ADT
2012 ADT

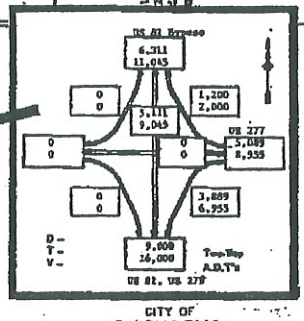












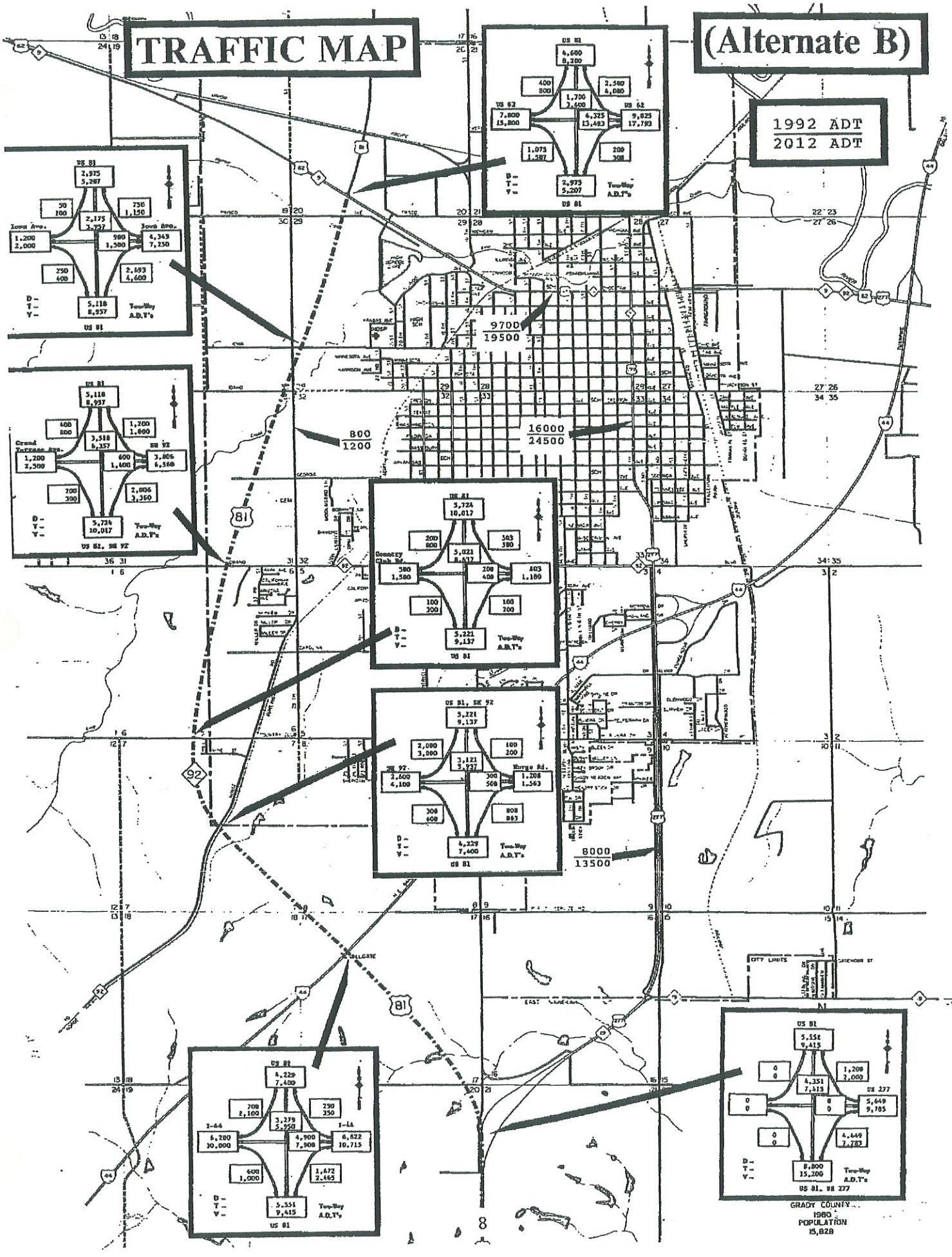
9500
19000

15000
24000

400
600

7000
12000

CITY OF
CHICKASHA
GRADY COUNTY


TRAFFIC MAP
(Alternate B)
1992 ADT
2012 ADT
9700
19500
16000
24500
800
1200
8000
13500
US 81
US 62
US 92
US 81, US 92
US 81, US 277
I-44
Two-Way A.D.T's
GRADY COUNTY
1980
POPULATION
15,828

IMPROVEMENT CONSIDERATIONS

The forecast 2012 ADT on US 81 in Chickasha warrants improvement to a six lane facility that would require a minimum 100 feet of right-of-way. Present development within the CBD restricts further R/W acquisition. An alternate parallel route will be necessary to relieve congestion. Since the northern leg of US 81 approaches Chickasha from the west side, this is the most logical choice for a bypass. This is the shortest available route, which will result in minimizing construction costs and maximizing road user savings. The north-south arterial 29th Street was excluded from consideration as an alternate in order to maintain control of access and retain this route for internal city traffic. Two alternates were chosen, with both having interchanges at US 62, I-44, and US 81 (south) near EW 140. See the alignment map on page 3.

Alternate A is approximately 5.83 miles long and is planned as a four-lane divided facility with a 40 foot median. The proposed alignment is just to the east of 29th Street, with a full interchange planned at the US 62 junction, necessiating that Frisco Avenue be closed. At-grade intersections are planned at Iowa, Idaho, Georgia, Grand Terrace, Carolina Avenue, and Country Club Road. SH 92 is planned to be rerouted east on Country Club Road to the Alternate A at-grade intersection. Then SH 92 traffic can be routed north to Grand Terrace Avenue. This will remove a hazardous "Y" intersection from the highway system at 29th Street and Norge Road (present SH 92). The railroad crossing on the Alternate A route is planned as an at-grade facility since this section of the Burlington Northern Railroad carries only one to three trains per day. The interchange at I-44 is planned to be similiar to the present I-44/US 81 interchange to the northeast. This may

be unacceptable to the turnpike since this planned interchange will open a section of toll free travel on I-44 in Chickasha. The proposed south interchange at county road EW 140 is planned to have no local access since there is presently no access provided. At this location, some realignments of the section line roads are anticipated. Six major drainage structures are planned, two each at Rock Hollow Creek, Line Creek, and Side Creek.

Alternate B is approximately 6.37 miles in length and is also planned as a four-lane divided facility with a 40 foot median. Alternate B is dissimilar from Alternate A in that there is no intersection access at Georgia and Carolina Avenues and Alternate B does cross 29th Street and Norge Road (SH 92). Special design considerations will have to be made at the 29th Street crossing to allow local traffic circulation. The SH 92 crossing will also require special design considerations due to the proximity of the railroad. SH 92 can be rerouted to Alternate B south of Grand Avenue. Alternate B crosses I-44 just north of the tollgate and may require alignment adjustment. All planned improvements are preliminary and the final alignment and interchanges will require approval from the Design Division.

ECONOMIC ANALYSIS

This benefit-to-cost analysis has been prepared to determine if road user savings are adequate to economically justify the cost of constructing and maintaining the improvements. This analysis follows procedures as set in the AASHTO Publication, "A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements - 1977." With this method, the present worth of benefits is divided by the present worth of all costs. The benefit/cost ratio should exceed 1.0 if the project is to be considered feasible from an economic standpoint. An analysis period of twenty years and an interest rate of seven percent will be used.

ROAD USER BENEFITS

The road user costs include fuel costs, auto maintenance costs, depreciation and time costs. Road user costs differ on different roadways (2 or 4 lane) and at different speeds. The road user savings or benefits are found by comparing the road user costs on the present facilities with the costs on the improved route. The point map and road user cost tables are shown in Appendix A. The traffic growth is assumed linear and therefore the growth of benefits is also linear. All benefits are summed to a present worth value through compound interest equations. Present worth benefits are found from the following equation:

PW = A(P/A,I,N) + G(P/G,I,N)

PW = Present Worth Benefits

A = Annual Savings

P/A, P/G = Compounding Factor

I = Interest Rate

N = Number of years in analysis

G = Uniform Gradient of Savings (Annual Increase)

Alt. A, PW = 2,110,549*(10.594) + 95,491*(88.103) = 30,772,200.

Alt. B, PW = 1,291,943*(10.594) + 73,777*(88.103) = 20,186,819.

CONSTRUCTION COSTS

The total estimated construction cost of the improvement is $17,369,035 for Alternate A and $18,105,892 for Alternate B. This cost includes grading and draining work, sodding and erosion control, surfacing, signing and striping, interchange and drainage structures, railroad crossing surface and signals, utility relocations and right-of-way acquisition costs.

MAINTENANCE COSTS

Current maintenance costs for a four-lane rural section with partial control of access is $7,658 per mile. The maintenance cost for the year 2012 is estimated at $8,488 per mile. Using the compound itnerest equations, the present worth maintenance cost for Alternate A is $494,301 and Alternate B is $540,045.

TOTAL IMPROVEMENT COST

The total improvement cost is equal to the sum of the construction and maintenance cost. This present worth value is $17,863,336 for Alternate A and $18,645,937 for Alternate B.

BENEFIT COST RATIO

$$\text{ALTERNATE A, B/C} = \frac{\$30,772,200}{\$17,863,337} = 1.72$$

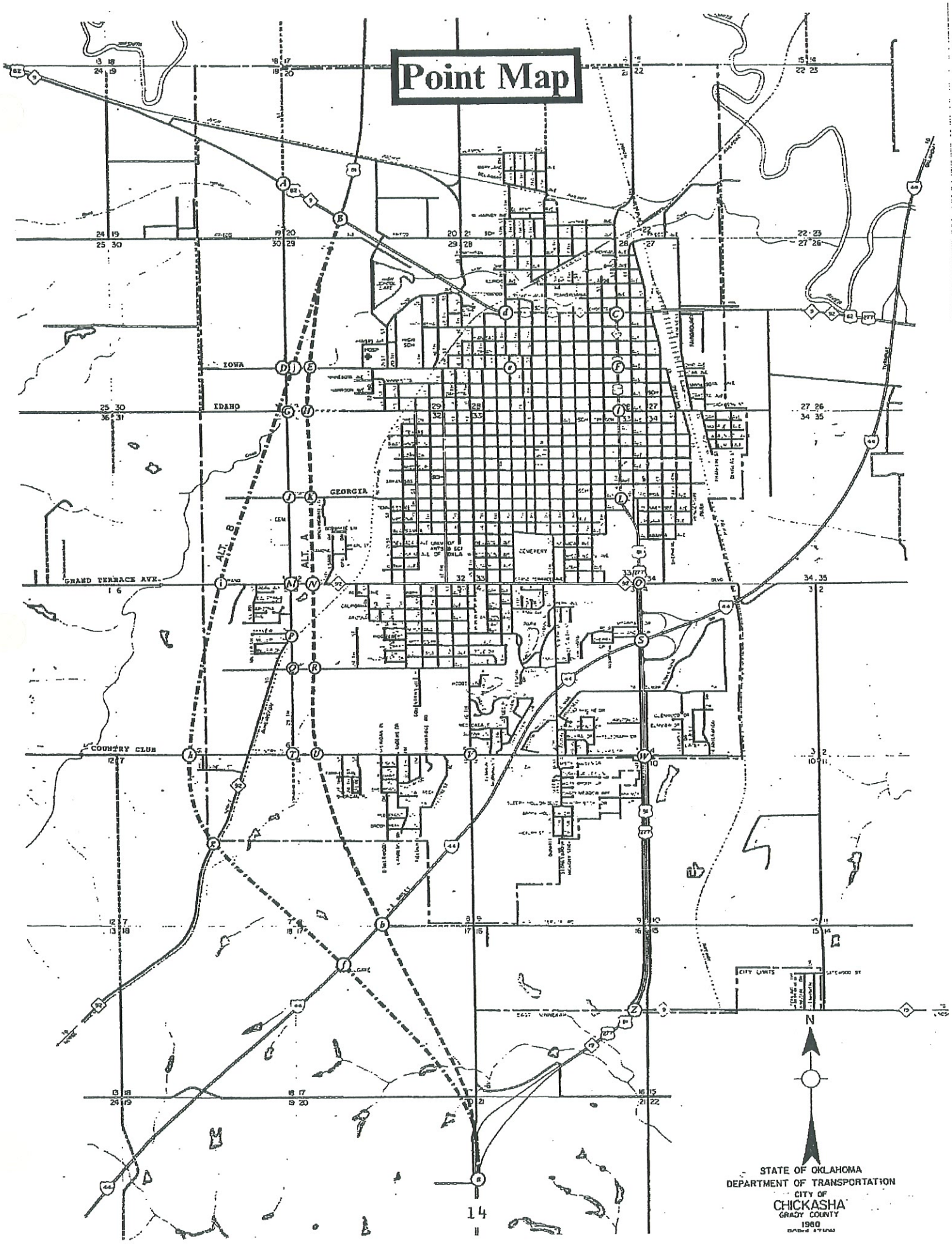
$$\text{ALTERNATE B, B/C} = \frac{\$20,186,819}{\$18,645,937} = 1.08$$

CONCLUSION

Based on the benefit-to-cost ratio, both proposed alternates are feasible expenditures of public funds. Alternate A will accommodate more internal city traffic and therefore has more road user savings. Alternate B will serve more as a bypass route and will open the west side of Chickasha to development. Either alternate will relieve the present US 81 route through the CBD of Chickasha. We recommend either alternate be considered for programming by the Oklahoma Transportation Commission as funding becomes available.

APPENDIX A

Point Map


IOWA
IDAHO
GEORGIA
GRAND TERRACE AVE.
COUNTRY CLUB
ALT. A
ALT. B
CEMETERY
CITY LIMITS
N
STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION
CITY OF
CHICKASHA
GRADY COUNTY
1960

1992 SEGMENT COST W/O BYPASS

ALTERNATE A

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
aZ	0-3	44	4	N	1.40	0.2823	0.3952	1.1292	1.5808
ZW	0-3	40	4	N	1.53	0.2932	0.4486	1.1728	1.7944
WS	0-3	36	4	N	0.67	0.3083	0.2066	1.2332	0.8264
SO	0-3	32	4	R	0.33	0.3353	0.1106	1.3412	0.4424
OL	0-3	32	4	R	0.50	0.3353	0.1676	1.3412	0.6704
LI	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
IF	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
FC	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
Cd	0-3	28	2	R	0.67	0.3638	0.2437	1.4552	0.9748
dB	3-5	48	4	N	1.10	0.2800	0.3080	1.1200	1.2320
AB	0-3	48	4	N	0.40	0.2753	0.1101	1.1012	0.4404
AD	3-5	44	2	N	1.07	0.2983	0.3192	1.1932	1.2768
DG	0-3	40	2	N	0.33	0.2990	0.0987	1.1960	0.3948
GJ	0-3	40	2	N	0.50	0.2990	0.1495	1.1960	0.5980
JM	0-3	40	2	N	0.50	0.2990	0.1495	1.1960	0.5980
MP	0-3	40	2	N	0.30	0.2990	0.0897	1.1960	0.3588
PQ	0-3	44	2	N	0.20	0.2918	0.0584	1.1672	0.2336
QT	0-3	44	2	N	0.50	0.2918	0.1459	1.1672	0.5836
TV	0-3	32	2	N	1.00	0.3318	0.3318	1.3272	1.3272
VW	0-3	32	2	N	1.00	0.3318	0.3318	1.3272	1.3272
Va	0-3	36	2	N	2.47	0.3122	0.7711	1.2488	3.0844
de	0-3	32	2	N	0.33	0.3318	0.1095	1.3272	0.4380
Sb	0-3	56	4	F	2.33	0.2606	0.6072	1.0424	2.4288

2012 SEGMENT COST W/O BYPASS

ALTERNATE A

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
aZ	0-3	40	4	N	1.40	0.2932	0.4105	1.1728	1.6420
ZW	0-3	36	4	N	1.53	0.3083	0.4717	1.2332	1.8868
WS	0-3	32	4	R	0.67	0.3353	0.2247	1.3412	0.8988
SO	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
OL	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
LI	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
IF	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
FC	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
Cd	0-3	28	2	R	0.67	0.3638	0.2437	1.4552	0.9748
dB	3-5	40	4	R	1.10	0.3047	0.3352	1.2188	1.3408
AB	0-3	44	4	N	0.40	0.2823	0.1129	1.1292	0.4516
AD	3-5	40	2	N	1.07	0.3045	0.3258	1.2180	1.3032
DG	0-3	36	2	R	0.33	0.3120	0.1030	1.2480	0.4120
GJ	0-3	36	2	R	0.50	0.3120	0.1560	1.2480	0.6240
JM	0-3	36	2	N	0.50	0.3122	0.1561	1.2488	0.6244
MP	0-3	36	2	N	0.30	0.3122	0.0937	1.2488	0.3748
PQ	0-3	40	2	N	0.20	0.2990	0.0598	1.1960	0.2392
QT	0-3	40	2	N	0.50	0.2990	0.1495	1.1960	0.5980
TV	0-3	28	2	N	1.00	0.3601	0.3601	1.4404	1.4404
VM	0-3	28	2	N	1.00	0.3601	0.3601	1.4404	1.4404
Va	0-3	32	2	N	2.47	0.3318	0.8195	1.3272	3.2780
de	0-3	32	2	M	0.33	0.3318	0.1095	1.3272	0.4380
Sb	0-3	52	4	F	2.33	0.2627	0.6121	1.0508	2.4484

1992 SEGMENT COST WITH BYPASS

ALTERNATE A

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
ab	0-3	44	4	N	1.67	0.2823	0.4714	1.1292	1.8856
bU	0-3	48	4	F	1.07	0.2682	0.2870	1.0728	1.1480
UR	0-3	44	4	N	0.50	0.2823	0.1411	1.1292	0.5644
RN	0-3	44	4	N	0.50	0.2823	0.1411	1.1292	0.5644
NK	0-3	44	4	N	0.50	0.2823	0.1411	1.1292	0.5644
KH	0-3	44	4	N	0.50	0.2823	0.1411	1.1292	0.5644
HE	0-3	44	4	N	0.35	0.2823	0.0988	1.1292	0.3952
EB	0-3	48	4	F	0.87	0.2682	0.2333	1.0728	0.9332

2012 SEGMENT COST WITH BYPASS

ALTERNATE A

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
ab	0-3	40	4	N	1.67	0.2932	0.4896	1.1728	1.9584
bU	0-3	44	4	N	1.07	0.2823	0.3021	1.1292	1.2084
UR	0-3	40	4	N	0.50	0.2932	0.1466	1.1728	0.5864
RN	0-3	40	4	N	0.50	0.2932	0.1466	1.1728	0.5864
NK	0-3	40	4	N	0.50	0.2932	0.1466	1.1728	0.5864
KH	0-3	40	4	N	0.50	0.2932	0.1466	1.1728	0.5864
HE	0-3	40	4	N	0.35	0.2932	0.1026	1.1728	0.4104
EB	0-3	44	4	N	0.87	0.2823	0.2456	1.1292	0.9824

1992 SEGMENT COST W/O BYPASS

ALTERNATE B

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST SEGMENT	TRUCK COST/MILE	TRUCK/COST SEGMENT
aZ	0-3	44	4	N	1.40	0.2823	0.3952	1.1292	1.5808
ZW	0-3	40	4	N	1.53	0.2932	0.4486	1.1728	1.7944
WS	0-3	36	4	N	0.67	0.3083	0.2066	1.2332	0.8264
SO	0-3	32	4	R	0.33	0.3353	0.1106	1.3412	0.4424
OL	0-3	32	4	R	0.50	0.3353	0.1676	1.3412	0.6704
LI	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
IF	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
FC	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
Cd	0-3	28	4	R	0.67	0.3636	0.2436	1.4544	0.9744
dB	0-3	48	4	N	1.10	0.2753	0.3028	1.1012	1.2112
AB	0-3	48	4	N	0.40	0.2753	0.1101	1.1012	0.4404
AD	0-3	44	2	N	1.07	0.2880	0.3082	1.1520	1.2328
DG	0-3	40	2	N	0.33	0.2958	0.0976	1.1832	0.3904
GJ	0-3	40	2	N	0.50	0.2958	0.1479	1.1832	0.5916
JM	0-3	40	2	N	0.50	0.2958	0.1479	1.1832	0.5916
MP	0-3	40	2	N	0.30	0.2958	0.0887	1.1832	0.3548
PQ	0-3	44	2	N	0.20	0.2880	0.0576	1.1520	0.2304
QT	0-3	44	2	N	0.50	0.2880	0.1440	1.1520	0.5760
TV	0-3	32	2	N	1.00	0.3244	0.3244	1.2976	1.2976
VW	0-3	32	2	N	1.00	0.3244	0.3244	1.2976	1.2976
Va	0-3	36	2	N	2.47	0.3094	0.7642	1.2376	3.0568
Sb	0-3	56	2	F	2.33	0.2735	0.6373	1.0940	2.5492
de	0-3	32	2	N	0.33	0.3244	0.1071	1.2976	0.4284

2012 SEGMENT COST W/O BYPASS

ALTERNATE B

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
aZ	0-3	40	4	N	1.40	0.2932	0.4105	1.1728	1.6420
ZW	0-3	36	4	N	1.53	0.3083	0.4717	1.2332	1.8868
WS	0-3	32	4	R	0.67	0.3353	0.2247	1.3412	0.8988
S0	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
OL	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
LI	0-3	28	4	R	0.50	0.3636	0.1818	1.4544	0.7272
IF	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
FC	0-3	28	4	R	0.33	0.3636	0.1200	1.4544	0.4800
Cd	0-3	28	4	R	0.67	0.3636	0.2436	1.4544	0.9744
dB	0-3	40	4	R	1.10	0.3013	0.3314	1.2052	1.3256
AB	0-3	44	4	N	0.40	0.2823	0.1129	1.1292	0.4516
AD	0-3	40	2	N	1.07	0.2958	0.3165	1.1832	1.2660
DG	0-3	36	2	R	0.33	0.3502	0.1156	1.4008	0.4624
GJ	0-3	36	2	R	0.50	0.3502	0.1751	1.4008	0.7004
JM	0-3	36	2	N	0.50	0.3094	0.1547	1.2376	0.6188
MP	0-3	36	2	N	0.30	0.3094	0.0928	1.2376	0.3712
PQ	0-3	40	2	N	0.20	0.2958	0.0592	1.1832	0.2368
QT	0-3	40	2	N	0.50	0.2958	0.1479	1.1832	0.5916
TV	0-3	28	2	N	1.00	0.3578	0.3578	1.4312	1.4312
VW	0-3	28	2	N	1.00	0.3578	0.3578	1.4312	1.4312
Va	0-3	32	2	N	2.47	0.3244	0.8013	1.2976	3.2052
Sb	0-3	52	2	F	2.33	0.2691	0.6270	1.0764	2.5080
de	0-3	32	2	N	0.33	0.3244	0.1071	1.2976	0.4284

1992 SEGMENT COST WITH BYPASS

ALTERNATE B

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
af	0-3	48	4	F	1.48	0.2682	0.3969	1.0728	1.5876
fg	0-3	52	4	F	1.04	0.2627	0.2732	1.0508	1.0928
gh	0-3	48	4	F	0.55	0.2682	0.1475	1.0728	0.5900
hi	0-3	48	4	F	1.02	0.2682	0.2736	1.0728	1.0944
ij	0-3	48	4	F	1.37	0.2682	0.3674	1.0728	1.4696
jB	0-3	52	4	F	0.91	0.2627	0.2391	1.0508	0.9564

2012 SEGMENT COST WITH BYPASS

ALTERNATE B

SEGMENT	GRADE	SPEED	NUMBER OF LANES	OPERATING CONDITIONS	LENGTH	COST/MILE	COST/SEGMENT	TRUCK COST/MILE	TRUCK COST/SEGMENT
af	0-3	44	4	F	1.48	0.2763	0.4089	1.1052	1.6356
fg	0-3	48	4	F	1.04	0.2682	0.2789	1.0728	1.1156
gh	0-3	44	4	F	0.55	0.2763	0.1520	1.1052	0.6080
hi	0-3	44	4	F	1.02	0.2763	0.2818	1.1052	1.1272
ij	0-3	44	4	F	1.37	0.2763	0.3785	1.1052	1.5140
jB	0-3	48	4	F	0.91	0.2682	0.2441	1.0728	0.9764

Road User Cost Table (Alt. A)

1992 Without Bypass				ALT A					
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
aZ	1.400	2,959		0.0377	0.2823	0.4329	1281.0103	467568.75	
			800	0.1508	1.1292	1.7317	1385.3440	505650.56	$973,219.31
ZW	1.530	4,226		0.0308	0.2932	0.4794	2025.9275	739469.54	
			850	0.1232	1.1728	1.9176	1629.9464	594930.44	$1,334,399.97
WS	0.670	4,161		0.0255	0.3083	0.2321	965.6058	352446.12	
			850	0.1020	1.2332	0.9282	789.0074	287987.70	$640,433.83
SO	0.330	2,909		0.0202	0.3353	0.1308	380.6397	138933.51	
			650	0.0808	1.3412	0.5234	340.2074	124175.70	$263,109.21
OL	0.500	2,605		0.0000	0.3353	0.1677	436.7283	159405.81	
			600	0.0000	1.3412	0.6706	402.3600	146861.40	$306,267.21
LI	0.500	2,576		0.0158	0.3636	0.1976	509.0176	185791.42	
			600	0.0632	1.4544	0.7904	474.2400	173097.60	$358,889.02
IF	0.330	2,576		0.0158	0.3636	0.1358	349.7899	127673.31	
			600	0.0632	1.4544	0.5432	325.8912	118950.29	$246,623.60
FC	0.330	1,779		0.0474	0.3636	0.1674	297.7833	108690.89	
			580	0.1896	1.4544	0.6696	388.3402	141744.16	$250,435.05
Cd	0.670	1,694		0.0158	0.3638	0.2595	439.6709	160479.69	
			580	0.0632	1.4552	1.0382	602.1467	219783.55	$380,263.44
dB	1.100	1,894		0.0000	0.2759	0.3028	555.3902	202717.43	
			600	0.0000	1.1012	1.2113	726.7920	265279.08	$467,996.51
BA	0.400	831		0.0000	0.2753	0.1101	91.5097	33401.05	
			300	0.0000	1.1012	0.4405	132.1440	48232.56	$81,633.61
AD	1.070	808		0.0754	0.2880	0.3836	309.9165	113119.52	
			250	0.3016	1.1520	1.5342	383.5600	139999.40	$253,118.92
DG	0.330	2,186		0.0000	0.2958	0.0976	213.3842	77885.23	
			300	0.0000	1.1832	0.3905	117.1368	42754.93	$120,640.17
GJ	0.500	2,249		0.0304	0.2958	0.1763	399.9269	145973.32	
			300	0.1216	1.1832	0.7132	213.9600	78095.40	$224,068.72
JM	0.500	2,301		0.0304	0.2958	0.1789	410.2683	149747.93	
			300	0.1216	1.1832	0.7132	213.9600	78095.40	$227,843.33
MP	0.300	2,718		0.0000	0.2958	0.0887	241.1953	88036.29	
			300	0.0000	1.1832	0.3550	106.4880	38868.12	$126,904.41
PQ	0.200	1,256		0.0377	0.2880	0.0953	119.6968	43689.33	
			150	0.1508	1.1520	0.3812	57.1800	20870.70	$64,560.03
QT	0.500	1,256		0.0377	0.2880	0.1817	228.2152	83298.55	
			150	0.1508	1.1520	0.7268	109.0200	39792.30	$123,090.85
TV	1.000	994		0.0202	0.3244	0.3446	342.5324	125024.33	
			110	0.0808	1.2976	1.3784	151.6240	55342.76	$180,367.09
VW	1.000	487		0.0202	0.3244	0.3446	167.8202	61254.37	
			50	0.0808	1.2976	1.3784	68.9200	25155.80	$86,410.17
Va	2.470	478		0.0255	0.3094	0.7897	377.4852	137782.10	
			60	0.1020	1.2376	3.1589	189.5323	69179.30	$206,961.40
de	0.330	197		0.0202	0.3244	0.1273	25.0686	9150.06	
			20	0.0808	1.2976	0.5090	10.1802	3715.76	$12,865.81
Sb	2.330	799		0.0000	0.2606	0.6072	485.1512	177080.19	
			100	0.0000	1.0424	2.4288	242.8792	88650.91	$265,731.10
							Total 92 W/O =		$7,195,826.74

1992 With Bypass				ALT A					
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
ab	1.570	5,401		0.0000	0.2763	0.4338	2342.9052	$855,160.39	
			910	0.0000	1.1052	1.7352	1578.9992	$576,334.72	$1,431,495.12
bU	1.100	3,993		0.0446	0.2682	0.3396	1356.1027	$494,977.47	
			750	0.1784	1.0728	1.3585	1018.8600	$371,888.90	$866,861.97
UR	0.500	5,660		0.0000	0.2763	0.1382	781.9290	$285,404.09	
			900	0.0000	1.1052	0.5526	497.3400	$181,529.10	$466,933.19
RN	0.500	5,706		0.0377	0.2763	0.1759	1003.4001	$366,241.04	
			900	0.1508	1.1052	0.7034	633.0600	$231,066.90	$597,307.94
NK	0.510	4,934		0.0000	0.2763	0.1409	695.2647	$253,771.63	
			900	0.0000	1.1052	0.5637	507.2868	$185,159.68	$438,931.31
KH	0.510	4,820		0.0000	0.2763	0.1409	679.2007	$247,908.24	
			900	0.0000	1.1052	0.5637	507.2868	$185,159.68	$433,067.92
HE	0.250	4,794		0.0377	0.2763	0.1068	505.4729	$184,497.59	
			900	0.1508	1.1052	0.4271	384.3900	$140,302.35	$324,799.94
EB	0.890	2,613		0.0000	0.2682	0.2387	623.7179	$227,657.02	
			850	0.0000	1.0728	0.9548	811.5732	$296,224.22	$523,881.24
Total length =	5.83								
							Total 92 With =		$5,083,278.03

Road User Cost Table (Alt. A)

2012 Without Bypass								ALT A	
Movement	Length	Cars	Trucks	Stop	Run	Trip	Daily	Annual Cost	Total Cost
aZ	1.400	5,185		0.0308	0.2932	0.4413	2288.0368	$835,133.43	
			1,394	0.1232	1.1728	1.7651	2460.5773	$898,110.71	$1,733,244.14
ZW	1.530	7,401		0.0255	0.3083	0.4972	3679.7698	$1,343,115.98	
			1,482	0.1020	1.2332	1.9888	2947.3957	$1,075,799.42	$2,418,915.40
WS	0.670	7,376		0.0202	0.3359	0.2449	1806.0210	$659,197.66	
			1,394	0.0808	1.3412	0.9794	1365.2892	$498,330.55	$1,157,528.21
SO	0.330	5,346		0.0158	0.3636	0.1358	725.9226	$264,961.77	
			971	0.0632	1.4544	0.5432	527.4006	$192,501.22	$457,462.98
OL	0.500	4,726		0.0000	0.3636	0.1818	859.1868	$313,603.18	
			883	0.0000	1.4544	0.7272	642.1176	$234,372.92	$547,976.11
LI	0.500	4,676		0.0158	0.3636	0.1976	923.9776	$337,251.82	
			883	0.0632	1.4544	0.7904	697.9232	$254,741.97	$591,993.79
IF	0.330	4,676		0.0158	0.3636	0.1358	634.9447	$231,754.81	
			883	0.0632	1.4544	0.5432	479.6032	$175,055.17	$406,809.98
FC	0.330	3,222		0.0474	0.3636	0.1674	539.3241	$196,853.91	
			907	0.1896	1.4544	0.6696	607.2697	$221,658.54	$418,511.85
Cd	0.670	3,072		0.0000	0.3636	0.2437	748.7877	$273,307.51	
			907	0.0000	1.4552	0.9750	884.3105	$322,773.33	$596,080.84
dB	1.100	9,322		0.0308	0.3013	0.3622	1203.3281	$439,214.74	
			937	0.1232	1.2052	1.4489	1357.6980	$495,537.88	$934,752.63
BA	0.400	1,355		0.0000	0.2823	0.1129	153.0066	$55,847.41	
			625	0.0000	1.1292	0.4517	282.3000	$103,039.50	$158,886.91
AD	1.070	1,300		0.0616	0.2958	0.3781	491.5378	$179,411.30	
			551	0.2464	1.1832	1.5124	833.3456	$304,171.15	$483,582.45
DG	0.330	3,659		0.0000	0.3120	0.1030	376.7906	$137,506.68	
			692	0.0000	1.2480	0.4118	284.9933	$104,022.55	$241,529.23
GJ	0.500	3,759		0.0255	0.3120	0.1815	682.2585	$249,024.95	
			692	0.1020	1.2480	0.7260	502.3920	$183,373.08	$432,397.43
JM	0.500	3,859		0.0255	0.3120	0.1815	700.4085	$255,649.10	
			692	0.1020	1.2480	0.7260	502.3920	$183,373.08	$439,022.18
MP	0.300	4,589		0.0000	0.3120	0.0936	429.5304	$156,778.60	
			604	0.0000	1.2480	0.3744	226.1376	$82,540.22	$239,318.82
PQ	0.200	2,092		0.0308	0.2958	0.0900	188.1963	$68,691.66	
			369	0.1232	1.1832	0.3598	132.7810	$48,465.05	$117,156.71
QT	0.500	2,092		0.0308	0.2958	0.1797	373.8404	$136,451.75	
			369	0.1232	1.1832	0.7148	263.7612	$96,272.84	$232,724.58
TV	1.000	1,645		0.0000	0.3578	0.3578	588.5810	$214,832.07	
			287	0.0000	1.4312	1.4312	410.7544	$149,925.36	$364,757.42
VW	1.000	852		0.0000	0.3578	0.3578	304.8456	$111,268.64	
			88	0.0000	1.4312	1.4312	125.9456	$45,970.14	$157,238.79
Va	2.470	793		0.0000	0.3244	0.8013	635.4055	$231,923.02	
			199	0.0000	1.2976	3.2051	637.8093	$232,800.40	$464,723.42
de	0.330	350		0.0000	0.3244	0.1071	37.4682	$13,675.89	
			30	0.0000	1.2976	0.4282	12.8462	$4,688.88	$18,364.77
Sb	2.330	1,337		0.0000	0.2627	0.6121	818.3657	$298,709.47	
			236	0.0000	1.0508	2.4484	577.8139	$210,902.07	$509,605.54
								Total	$13,122,584.18

2012 With Bypass								ALT A	
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
ab	1.570	9,452		0.0000	0.2876	0.4515	4267.8805	$1,557,776.37	
			1,593	0.0000	1.1504	1.8061	2877.1619	$1,050,164.09	$2,607,940.46
bU	1.100	6,987		0.0377	0.2763	0.3416	2386.9688	$871,243.62	
			1,313	0.1508	1.1052	1.3665	1794.2408	$654,897.88	$1,526,141.49
UR	0.500	9,905		0.0000	0.2876	0.1438	1424.9390	$519,869.74	
			1,575	0.0000	1.1504	0.5752	905.9400	$330,668.10	$850,551.84
RN	0.500	9,985		0.0308	0.2876	0.1746	1743.3810	$636,334.07	
			1,575	0.1232	1.1504	0.6984	1099.9800	$401,492.70	$1,037,826.77
NK	0.510	8,635		0.0000	0.2876	0.1467	1266.5473	$462,289.75	
			1,575	0.0000	1.1504	0.5867	924.0588	$337,281.46	$799,571.21
KH	0.510	8,435		0.0000	0.2876	0.1467	1237.2121	$451,582.40	
			1,575	0.0000	1.1504	0.5867	924.0588	$337,281.46	$788,863.86
HE	0.250	8,285		0.0308	0.2876	0.1027	850.8695	$310,567.37	
			1,575	0.1232	1.1504	0.4108	647.0100	$236,158.65	$546,726.02
EB	0.890	4,572		0.0000	0.2763	0.2459	1124.2868	$410,364.68	
			1,488	0.0000	1.1052	0.9836	1463.6985	$534,228.04	$944,592.72
Total length =	5.83							Total 2012 With =	$9,102,214.37

Road User Cost Table (Alt. B)

1992 Without Bypass				ALT B					
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
aZ	1.400	2,964		0.0377	0.2823	0.4329	1029.4229	378549.35	
			750	0.1506	1.1292	1.7317	1298.7600	474047.40	$847,596.75
ZW	1.530	3,257		0.0308	0.2932	0.4794	1561.3928	569908.36	
			800	0.1232	1.1728	1.9176	1534.0672	559934.53	$1,129,842.89
WS	0.670	3,363		0.0255	0.3083	0.2321	780.4211	284853.72	
			800	0.1020	1.2332	0.9282	742.5952	271047.25	$555,900.97
SO	0.330	2,613		0.0202	0.3953	0.1308	341.9084	124796.58	
			518	0.0808	1.3412	0.5234	271.1191	98958.48	$223,755.06
OL	0.500	2,271		0.0000	0.3353	0.1677	380.7332	138967.60	
			518	0.0000	1.3412	0.6706	347.3708	126790.34	$265,757.94
LI	0.500	2,271		0.0158	0.3636	0.1976	448.7496	163793.60	
			518	0.0632	1.4544	0.7904	409.4272	149440.93	$313,234.53
IF	0.330	2,271		0.0158	0.3636	0.1358	308.3745	112556.71	
			518	0.0632	1.4544	0.5432	281.3527	102699.75	$215,250.46
FC	0.330	1,591		0.0474	0.3636	0.1674	266.3143	97204.72	
			500	0.1896	1.4544	0.6696	934.7760	122193.24	$219,397.96
Cd	0.670	1,557		0.0158	0.3638	0.2595	404.1131	147501.29	
			500	0.0632	1.4552	1.0382	519.0920	189468.58	$336,969.87
dB	1.100	1,589		0.0000	0.2753	0.3028	479.3799	174973.66	
			520	0.0000	1.1012	1.2113	629.8864	229908.54	$404,882.20
BA	0.400	727		0.0000	0.2753	0.1101	80.0572	29220.89	
			260	0.0000	1.1012	0.4405	123.3344	45017.06	$74,237.95
AD	1.070	677		0.0754	0.2880	0.3836	259.6701	94779.59	
			230	0.3016	1.1520	1.5342	352.8752	128799.45	$223,579.04
DG	0.330	2,062		0.0000	0.2958	0.0976	201.2801	73467.22	
			268	0.0000	1.1832	0.3905	104.6422	38194.41	$111,661.63
GJ	0.500	2,062		0.0304	0.2958	0.1783	367.6546	134193.99	
			268	0.1216	1.1832	0.7132	191.1976	69765.22	$203,959.15
JM	0.500	2,062		0.0304	0.2958	0.1783	367.6546	134193.99	
			268	0.1216	1.1832	0.7132	191.1976	69765.22	$203,959.15
MP	0.300	2,325		0.0000	0.2958	0.0887	206.3205	75306.98	
			268	0.0000	1.1832	0.3550	95.1293	34722.19	$110,029.17
PQ	0.200	936		0.0377	0.2880	0.0953	89.2008	32558.29	
			130	0.1508	1.1520	0.3812	49.5560	18087.94	$50,646.23
QT	0.500	936		0.0377	0.2880	0.1817	170.0712	62075.99	
			130	0.1508	1.1520	0.7268	94.4840	34486.66	$96,562.65
TV	1.000	827		0.0202	0.3244	0.3446	284.9842	104019.23	
			90	0.0808	1.2976	1.3784	124.0560	45280.44	$149,299.67
VW	1.000	321		0.0202	0.3244	0.3446	110.6166	40375.06	
			30	0.0808	1.2976	1.3784	41.3520	15093.48	$55,468.54
Va	2.470	506		0.0255	0.9094	0.7897	399.5973	145853.02	
			60	0.1020	1.2376	3.1589	189.5323	69179.30	$215,032.31
de	0.330	180		0.0202	0.3244	0.1273	22.9054	8360.46	
			20	0.0808	1.2976	0.5090	10.1802	3715.76	$12,076.21
Sb	2.330	679		0.0000	0.2606	0.6072	412.2874	150484.92	
			90	0.0000	1.0424	2.4288	218.5919	79785.82	$230,270.73
							Total 92 W/O =		$6,249,371.08

1992 With Bypass				ALT B					
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
af	1.480	4,711		0.0000	0.2682	0.3969	1869.9655	$682,537.41	
			840	0.0000	1.0728	1.5877	1339.7050	$486,802.31	$1,169,339.72
fg	1.040	3,560		0.0520	0.2627	0.3252	1157.7405	$422,575.28	
			669	0.2080	1.0508	1.3008	870.2566	$317,643.66	$740,218.94
gh	0.550	4,435		0.0446	0.2682	0.1921	852.0079	$310,982.87	
			786	0.1784	1.0728	0.7684	603.9938	$220,457.75	$531,440.62
hi	1.020	4,998		0.0446	0.2682	0.3182	1571.0938	$573,449.25	
			786	0.1784	1.0728	1.2727	1000.3076	$365,112.28	$938,561.53
ij	1.370	4,332		0.0446	0.2682	0.4120	1784.9313	$651,499.92	
			786	0.1784	1.0728	1.6481	1295.4949	$472,833.74	$1,124,333.66
jB	0.910	2,232		0.0000	0.2627	0.2991	533.5752	$194,754.96	
			743	0.0000	1.0508	0.9562	710.4774	$259,324.25	$454,079.21
Total length =	6.97								
							Total 92 With =		$4,957,973.67

Road User Cost Table (Alt. B)

2012 Without Bypass					ALT B				
Movement	Length	Cars	Trucks	Stop	Run	Trip	Daily	Annual Cost	Total Cost
aZ	1.400	4,490		0.0308	0.2992	0.4419	1981.3472	$723,191.79	
			1,260	0.1232	1.1728	1.7651	2224.0512	$811,778.69	$1,534,970.42
ZW	1.530	6,080		0.0255	0.3083	0.4972	3022.9699	$1,103,364.62	
			1,320	0.1020	1.2332	1.9888	2625.2107	$958,201.91	$2,061,585.99
WS	0.670	6,325		0.0202	0.3353	0.2449	1548.6826	$565,269.14	
			1,260	0.0808	1.3412	0.9794	1234.0490	$450,427.90	$1,015,697.04
SO	0.330	4,709		0.0158	0.3636	0.1358	639.4257	$233,390.38	
			771	0.0632	1.4544	0.5432	418.7702	$152,851.12	$386,241.50
OL	0.500	4,109		0.0000	0.3636	0.1818	747.0162	$272,660.91	
			771	0.0000	1.4544	0.7272	560.6712	$204,644.99	$477,305.90
LI	0.500	4,109		0.0158	0.3636	0.1976	811.9984	$296,357.52	
			771	0.0632	1.4544	0.7904	609.3984	$222,430.42	$518,787.93
IF	0.330	4,109		0.0158	0.3636	0.1358	557.9529	$203,652.81	
			771	0.0632	1.4544	0.5432	418.7702	$152,851.12	$356,503.93
FC	0.330	2,889		0.0474	0.3636	0.1674	483.5839	$176,508.14	
			771	0.1896	1.4544	0.6696	516.2246	$188,421.98	$364,930.11
Cd	0.670	2,833		0.0000	0.3636	0.2437	690.5324	$252,044.33	
			767	0.0000	1.4552	0.9750	747.8127	$272,951.65	$524,995.98
dB	1.100	2,883		0.0308	0.3013	0.3622	1044.3091	$381,172.82	
			797	0.1232	1.2052	1.4489	1154.7892	$421,498.07	$802,670.89
BA	0.400	1,206		0.0000	0.2823	0.1129	136.1815	$49,706.25	
			556	0.0000	1.1292	0.4517	251.1341	$91,663.94	$141,370.19
AD	1.070	1,084		0.0616	0.2958	0.3781	409.8669	$149,601.42	
			503	0.2464	1.1832	1.5124	760.7493	$277,673.48	$427,274.90
DG	0.990	3,473		0.0000	0.3120	0.1030	357.5801	$130,516.73	
			604	0.0000	1.2480	0.4118	248.7514	$90,794.25	$221,310.98
GJ	0.500	3,473		0.0255	0.3120	0.1815	630.3495	$230,077.57	
			604	0.1020	1.2480	0.7260	438.5040	$160,053.96	$390,131.53
JM	0.500	3,473		0.0255	0.3120	0.1815	630.3495	$230,077.57	
			604	0.1020	1.2480	0.7260	438.5040	$160,053.96	$390,131.53
MP	0.300	3,933		0.0000	0.3120	0.0936	368.1288	$134,367.01	
			604	0.0000	1.2480	0.3744	226.1376	$82,540.22	$216,907.24
PQ	0.200	1,591		0.0308	0.2958	0.0900	137.7288	$50,271.00	
			394	0.1232	1.1832	0.3598	120.1866	$43,868.09	$94,139.09
QT	0.500	1,591		0.0308	0.2958	0.1787	273.5897	$99,860.24	
			394	0.1232	1.1832	0.7148	298.7432	$87,141.27	$187,001.51
TV	1.000	1,355		0.0000	0.3576	0.3579	484.8190	$176,958.94	
			250	0.0000	1.4312	1.4312	357.8000	$130,597.00	$307,555.94
VW	1.000	555		0.0000	0.3576	0.3579	198.5790	$72,481.34	
			60	0.0000	1.4312	1.4312	85.8720	$31,343.28	$103,824.62
Va	2.470	800		0.0000	0.3244	0.8013	641.0144	$233,970.26	
			190	0.0000	1.2976	3.2051	608.9637	$222,271.74	$456,242.00
de	0.330	320		0.0000	0.3244	0.1071	34.2566	$12,503.67	
			30	0.0000	1.2976	0.4282	12.8462	$4,688.88	$17,192.55
Sb	2.330	1,345		0.0000	0.2627	0.6121	823.2624	$300,490.77	
			200	0.0000	1.0508	2.4484	489.6728	$178,790.57	$479,281.35
								Total 2012 w/o	$11,475,999.04

2012 With Bypass					ALT B				
				Stop		Total			
Movement	Length	Cars	Trucks	Cost	Cost/mile	Trip	Daily	Annual Cost	Total Cost
af	1.480	7,965		0.0000	0.2763	0.4089	3257.0797	$1,188,834.08	
			1,450	0.0000	1.1052	1.6357	2371.7592	$865,692.11	$2,054,526.18
fg	1.040	6,230		0.0446	0.2682	0.3235	2015.5794	$735,686.50	
			1,170	0.1784	1.0728	1.2941	1514.1110	$552,650.53	$1,288,337.03
gh	0.550	7,762		0.0377	0.2763	0.1897	1472.1797	$537,345.60	
			1,375	0.1508	1.1052	0.7587	1043.1575	$380,752.49	$918,098.09
hi	1.020	8,642		0.0377	0.2763	0.3195	2761.3437	$1,007,890.45	
			1,375	0.1508	1.1052	1.2781	1757.3930	$641,448.45	$1,649,338.89
ij	1.370	7,582		0.0377	0.2763	0.4162	3155.8634	$1,151,890.16	
			1,375	0.1508	1.1052	1.6649	2289.2705	$835,589.73	$1,987,479.89
jB	0.910	9,907		0.0000	0.2682	0.2441	953.5502	$348,045.84	
			1,300	0.0000	1.0728	0.9762	1269.1224	$463,229.68	$811,275.51
Total length =	6.97							Total 2012 With =	$8,709,049.59