

A TRAFFIC CIRCULATION PLAN FOR THE WEST BEND CENTRAL BUSINESS DISTRICT

CITY OF WEST BEND
WASHINGTON COUNTY
WISCONSIN

**SOUTHEASTERN WISCONSIN REGIONAL
PLANNING COMMISSION MEMBERS**

KENOSHA COUNTY

Leon T. Dreger
Donald E. Mayew
Francis J. Pitts

RACINE COUNTY

Raymond J. Moyer
Earl G. Skagen
Michael W. Wells

MILWAUKEE COUNTY

Irene M. Brown
Richard W. Cutler,
Secretary
Harout O. Sanasarian,
Vice-Chairman

WALWORTH COUNTY

John D. Ames
Anthony F. Balestrieri
Harold H. Kolb

OZAUKEE COUNTY

Allen F. Bruederle
Thomas H. Buestrin
Alfred G. Raetz,
Chairman

WASHINGTON COUNTY

Harold F. Ryan
Thomas J. Sackett
Frank F. Uttech

WAUKESHA COUNTY

Robert F. Hamilton
William D. Rogan,
Treasurer
Paul Vrakas

CITY OF WEST BEND OFFICIALS

Mayor
Donald L. Gonring

City Aldermen

Jed M. Dolnick
Arden S. Fierek
Ronald M. Kocher
Michael R. Miller

Michael J. Quigley
Norman D. Riesen
June K. Schuppel
Ronald D. Teofilo

Administrator
John J. Meyer

City Engineer
Mark E. Fuge

Police Chief
James W. Skidmore

**SOUTHEASTERN WISCONSIN REGIONAL
PLANNING COMMISSION STAFF**

Kurt W. Bauer, P.E. Executive Director
Philip C. Evenson Assistant Director
John W. Ernst. Data Processing Manager
Leland H. Kreblin Chief Planning Illustrator
Donald R. Martinson Chief Transportation Engineer
Frederick J. Patrie Administrative Officer
Thomas D. Patterson Chief of Planning Research
Bruce P. Rubin Chief Land Use Planner
Roland O. Tonn Chief Community Assistance Planner
Lyman F. Wible, P.E. Chief Environmental Engineer
Kenneth R. Yunker, P.E. Chief Special Projects Engineer

Special acknowledgement is due Mr. Kenneth H. Voigt, Principal Engineer, for his contribution to the preparation of this report.

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 62

A TRAFFIC CIRCULATION PLAN FOR THE
WEST BEND CENTRAL BUSINESS DISTRICT

City of West Bend
Washington County, Wisconsin

Prepared by the
Southeastern Wisconsin Regional Planning Commission
P.O. Box 769
Old Courthouse
916 N. East Avenue
Waukesha, Wisconsin 53187-1607

With the Assistance of the
West Bend Department of Public Works

The preparation of this report was financed in part through a highway safety grant from the U.S. Department of Transportation, Federal Highway Administration, through the Wisconsin Department of Transportation, Office for Highway Safety.

August 1981

(This page intentionally left blank)

TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
STUDY AREA.....	1
EXISTING TRAFFIC CONDITIONS.....	4
TRAFFIC PATTERNS.....	13
TRAFFIC IMPACT OF PROPOSED ARTERIAL STREET AND HIGHWAY SYSTEM IMPROVEMENTS.....	26
ANALYSIS OF ALTERNATIVE ARTERIAL STREET SYSTEMS.....	29
Existing Conditions.....	34
Alternative Plan 1.....	34
Alternative Plan 2.....	37
Alternative Plan 3.....	38
Alternative Plan 4.....	39
Alternative Plan 5.....	40
Alternative Plan 6.....	41
CONCLUSION AND RECOMMENDATIONS.....	41

(This page intentionally left blank)

A TRAFFIC CIRCULATION PLAN FOR THE WEST BEND CENTRAL BUSINESS DISTRICT

INTRODUCTION

Over the past several years local elected officials, businessmen, and residents of the City of West Bend have been actively planning for the development of a downtown mall on a portion of Main Street (USH 45) located immediately south of Washington Street (STH 33). The proposal to develop this mall was incorporated into a tax incremental financing (TIF) plan for the redevelopment of the West Bend central business district (CBD). The development of the mall envisions restricting the use of Main Street by through traffic. The Wisconsin Department of Transportation has approved the diversion of such traffic and has agreed to reroute USH 45 from its present location on Main Street through the City's central business district to a newly relocated and reconstructed Island Avenue which extends parallel to Main Street along the east side of the Milwaukee River from Walnut Street to Washington Street. A principal concern of officials and businessmen of the City of West Bend is the identification of the changes in traffic patterns, volumes, operating characteristics and congestion levels, and motor vehicle accident potential which may be expected to result from restricting the movement of through traffic on Main Street, and the design of a safe and efficient arterial street system to accommodate these anticipated changes in traffic conditions. Accordingly, city officials requested the Southeastern Wisconsin Regional Planning Commission to undertake a study of alternative arterial street systems for the central business district that would accommodate the changes in traffic conditions which could be expected from implementation of the downtown mall. This report presents the findings and recommendations of that study.

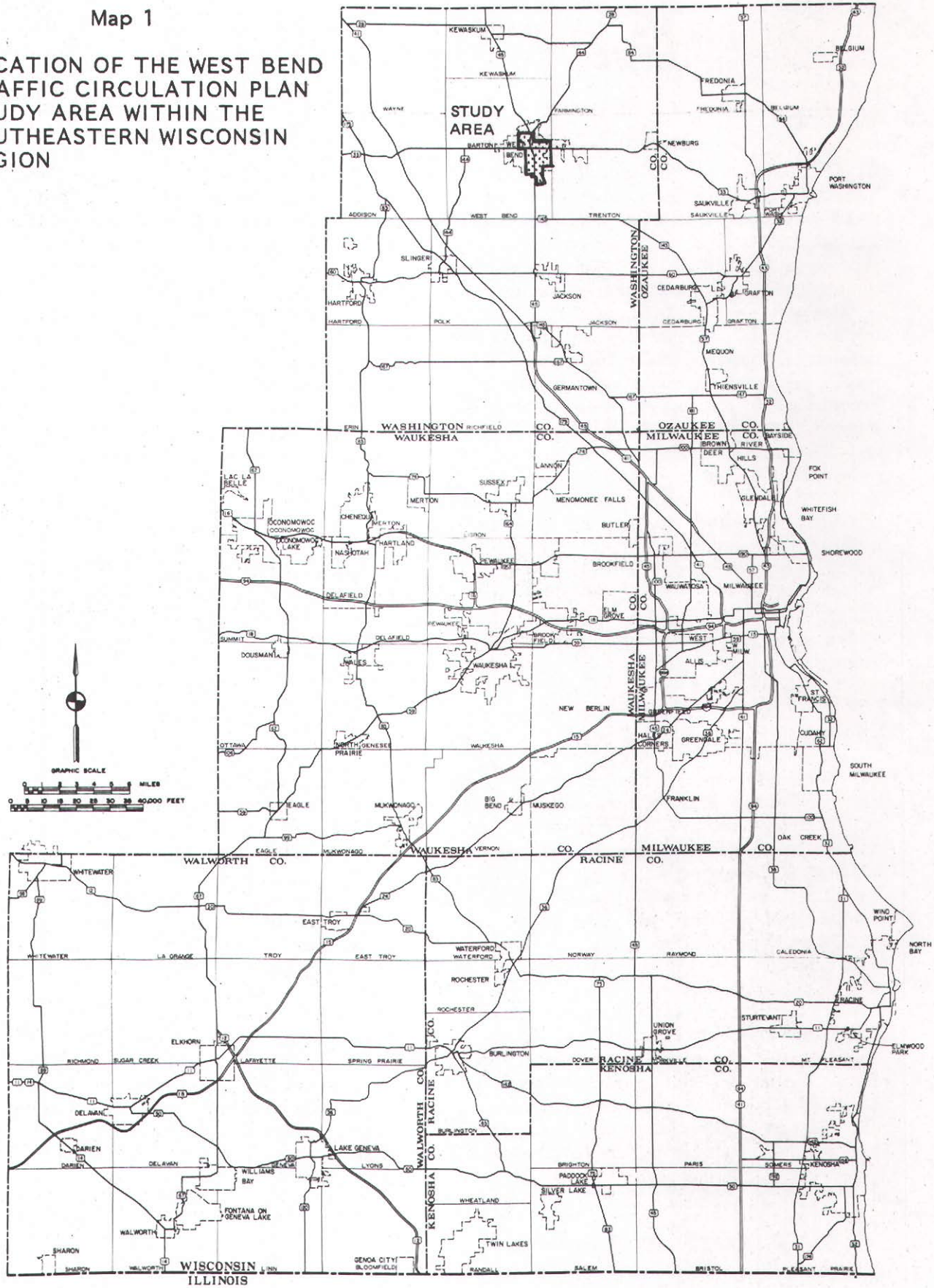
STUDY AREA

As shown on Map 1, the City of West Bend, Wisconsin, is located in northern Washington County approximately 11 miles north of the northern limits of the Milwaukee urbanized area. The City had a 1980 population of 21,484 residents. As shown on Map 2, the geographic area covered by this study includes approximately 46 percent of the 8.2-square-mile area within the corporate limits of the City of West Bend. The limits of the study area were delineated so as to include the West Bend central business district and adjacent urban development while at the same time aligning with the Commission's traffic analysis zone system to permit ready use of the origin-destination travel data available in the Commission's files.

The two principal arterial streets within the City of West Bend are Main Street (USH 45) which traverses the center of the West Bend central business district in a north-south direction, and Washington Street (STH 33) which extends in an east-west direction along the northerly limits of the central business district, as shown on Map 2. These two highways are the principal north-south and east-west arterial routes traversing the City and, as such, serve a major proportion of the through, as well as local, traffic in the West Bend area.

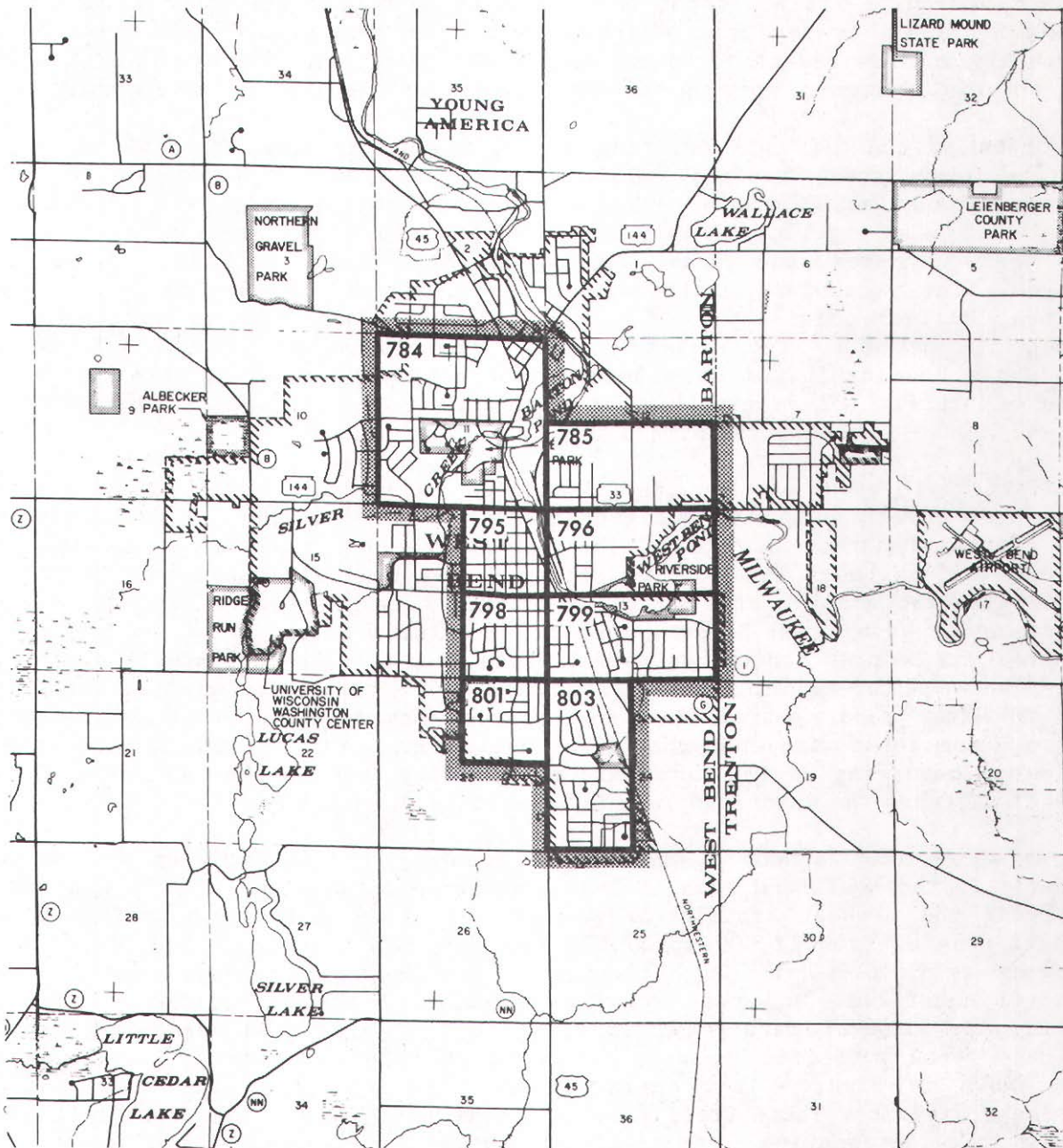
Map 1

LOCATION OF THE WEST BEND
TRAFFIC CIRCULATION PLAN
STUDY AREA WITHIN THE
SOUTHEASTERN WISCONSIN
REGION





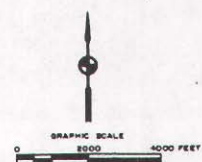
Map 2

WEST BEND TRAFFIC CIRCULATION PLAN STUDY AREA



LEGEND

-  Study Area Boundary
-  Traffic Analysis Zone Boundary
- 784 Traffic Analysis Zone Number



EXISTING TRAFFIC CONDITIONS

Among the more important data used to quantify the existing demand on a community's transportation system are vehicular traffic counts on that system. Analysis of vehicular traffic count data taken on an hourly and daily basis can provide important insights into the characteristics of the demand for travel within a community and are essential to any determination of the effectiveness of the existing arterial system in meeting the vehicular travel demands of the community.

In order to quantify the existing travel demand on the arterial street system in the study area, traffic volume counts taken by the Wisconsin Department of Transportation (WisDOT) were analyzed by the Commission staff. Traffic volume counts taken on a periodic basis by the WisDOT since 1971 are summarized in Table 1 for the study area, the latest such counts being taken in 1980. As indicated in Table 1, the vehicular traffic volumes on the arterial streets in the West Bend central business district have been increasing since 1971 at an annual rate of about 3.2 percent. The highest rate of traffic volume growth, 4.5 percent per year, has been exhibited on Washington Street, east of Main Street. The lowest rate of traffic volume growth, 1.0 percent per year, has been exhibited on Seventh Avenue, south of Washington Street.

Traffic growth rates on the arterial streets and highways entering the greater West Bend area have been somewhat higher than such rates on the same arterials entering the central business district. The annual traffic growth rates on the arterial streets and highways entering the greater West Bend area have been about 3.8 percent. Traffic growth rates on these arterials ranged from a high of 9.0 percent per year on Washington Street, west of University Drive, to a low of 0.2 percent per year on Decorah Street, east of Indiana Avenue. The variance in traffic growth rates between the arterial streets and highways entering the greater West Bend area and the West Bend central business district may be attributed to the growth in travel associated with the urban land development, both residential and commercial, which is occurring on the periphery of the City and to the attendant changes in travel patterns, as described in a later section of this report.

Map 3 shows the 24-hour average annual weekday traffic volumes on the arterial streets in the West Bend area in 1980. As shown on the map, STH 33 and USH 45 are carrying the highest traffic volumes in the study area, with traffic volumes on STH 33 ranging from 12,000 to 17,000 vehicles per average weekday, and on USH 45 ranging from 15,000 to 20,000 vehicles per average weekday. Based upon these traffic count data and peak morning and evening traffic volume counts obtained during the week of March 22, 1981, by City of West Bend personnel, the 24-hour average weekday traffic volumes estimated for 1981, including turning movements, are shown in Figure 1 for the arterial street system in the West Bend central business district. These traffic volumes were used in the analyses conducted under the study of alternative arterial street systems for the central business district.

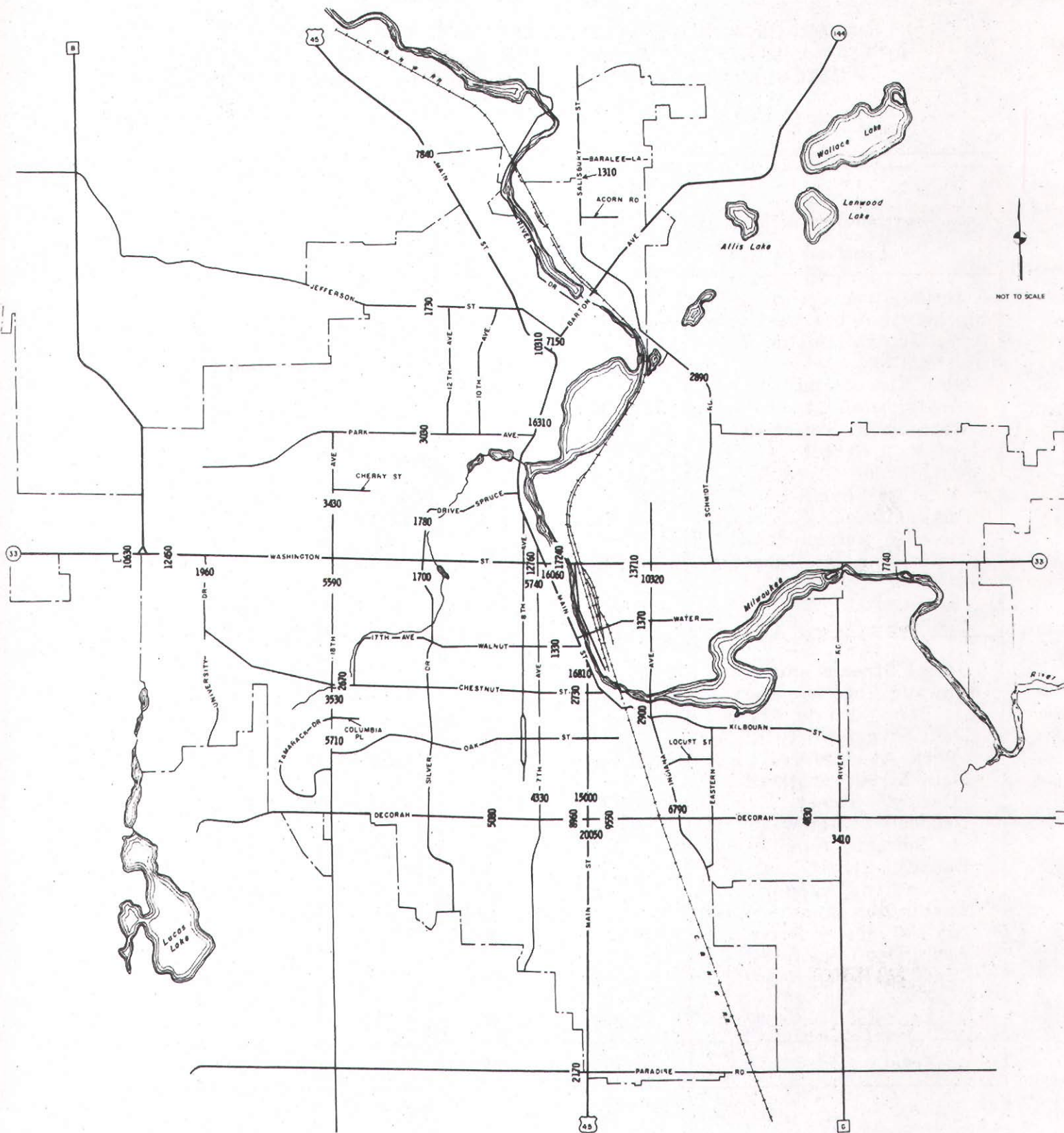
Hourly traffic volumes obtained in 1980 and 1981 in the West Bend study area indicate that the morning peak-hour traffic volumes generally occur between 7:15 a.m. and 8:15 a.m., with traffic volumes steadily increasing throughout the day, reaching a high value during the evening peak hour which generally occurs between 4:00 p.m. and 5:00 p.m., as shown in Figure 2. Figure 2 indicates that the morning peak hour comprises approximately 4.5 percent of the average annual weekday traffic volume, while the evening peak hour comprises approximately 7.5 percent of that volume. The configuration of the curve in Figure 2 is not typical of vehicular

Table 1

**AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUMES ON THE
ARTERIAL STREETS AND HIGHWAYS IN THE WEST BEND TRAFFIC
CIRCULATION PLAN STUDY AREA: 1971 THROUGH 1980**

Location	Year				Annual Growth Rate (percent)
	1971	1974	1977	1980	
Arterial Streets and Highways in the West Bend Central Business District:					
Main Street-South of Washington Street	13,330	13,690	16,820	16,060	2.1
Washington Street-East of Main Street.....	11,550	11,220	14,120	17,240	4.5
Washington Street- West of Seventh Avenue.....	8,770	10,180	12,950	12,760	4.3
Seventh Avenue-South of Washington Street ...	5,310	5,710	4,160	5,740	1.0
Subtotal	38,960	40,800	48,050	51,800	3.2
Arterial Streets and Highways Entering the West Bend Study Area:					
Main Street-North of Park Avenue	13,470	14,610	18,120	16,310	2.2
Main Street-South of Decorah Street	14,990	18,690	18,360	20,050	3.3
Decorah Street-West of Seventh Avenue	2,710	3,850	4,290	5,080	7.3
Decorah Street-East of Indiana Avenue.....	4,770	6,640	5,030	4,830	0.2
Washington Avenue-West of University Drive.....	5,740	9,150	11,530	12,450	9.0
Washington Avenue- East of River Road	5,990	6,840	7,000	7,740	3.0
Subtotal	47,670	59,780	64,330	66,460	3.8
Total	86,630	100,580	112,380	118,260	3.5

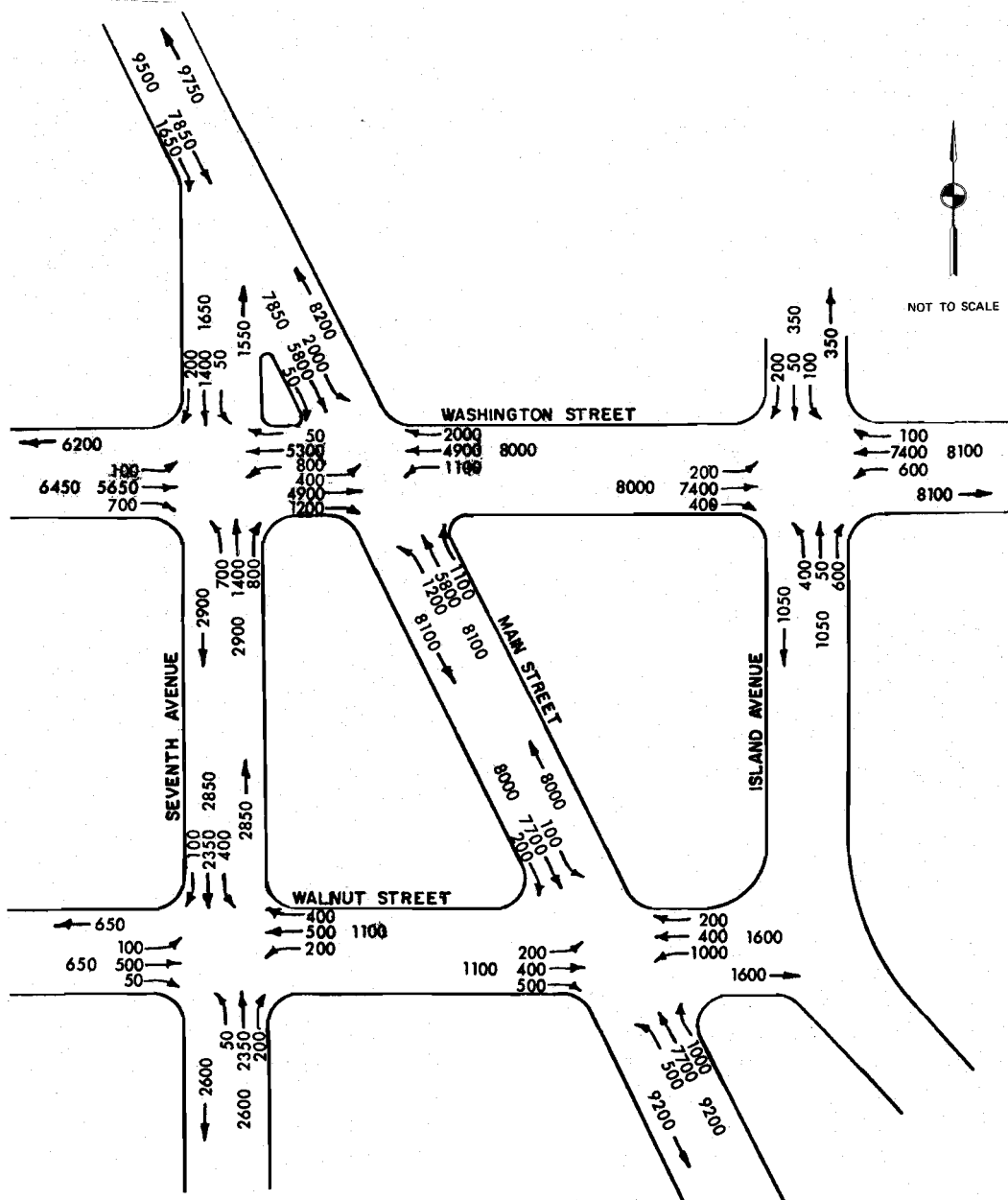
AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUME ON
THE ARTERIAL AND COLLECTOR STREET SYSTEM IN
THE WEST BEND TRAFFIC CIRCULATION PLAN STUDY AREA: 1980



Source: Wisconsin Department of Transportation.

Figure 1

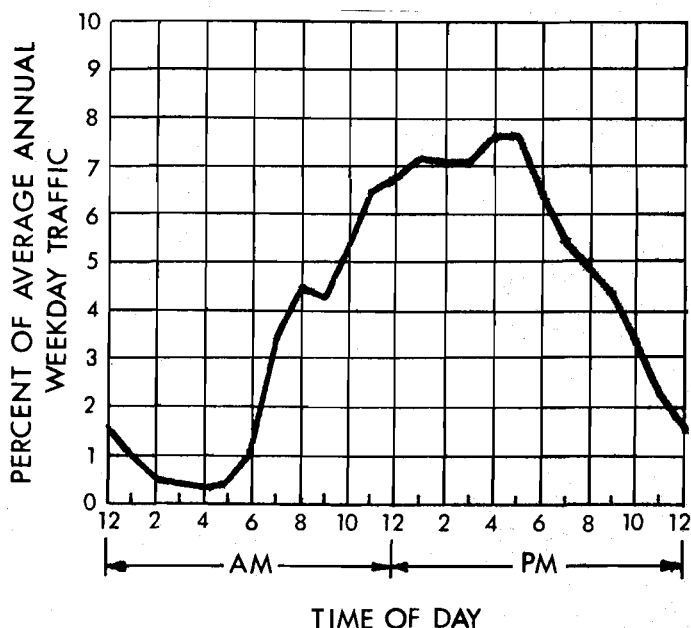
24-HOUR WEEKDAY TRAFFIC VOLUME TURNING MOVEMENTS
ON THE ARTERIAL STREET AND HIGHWAY SYSTEM
IN THE WEST BEND CENTRAL BUSINESS DISTRICT: 1981



traffic flow in urban areas and reflects the complexity of the many travel patterns which occur in the West Bend study area.. A typical urban hourly traffic volume curve exhibits two distinct peaks of about 7 and 8.5 percent for the morning and evening peak hours, respectively, with mid-day travel slightly depressed when compared to the morning and evening peak periods. The morning and evening peaks represent primarily work-related trips, and the mid-day travel between the peaks represents primarily business, shopping, and social-recreational-related trips.

Figure 2

HOURLY VARIATION IN ANNUAL
WEEKDAY TRAFFIC IN THE
WEST BEND CENTRAL BUSINESS
DISTRICT: 1981



The time of morning and evening peak hours in the study area was substantiated by manual intersection counts taken by City of West Bend personnel at selected intersections in the traffic study area. The 1981 peak-hour traffic volumes for the 7:15 a.m. to 8:15 a.m. and 4:00 p.m. to 5:00 p.m. time periods on the arterial street system in the study area are shown in Figure 3 and in Table 2. From the traffic count data given in Table 2, it can be seen that left and right turns average 18 and 21 percent, respectively, of the traffic flow during both the morning and evening peak hours. This is somewhat higher than the 10 percent left- and right-turn distribution typically found in urban areas, and reflects the complexity of the many travel patterns which are occurring in the West Bend area. Trucks and buses comprise an average of 4 percent of the morning peak-hour traffic volumes, and 2 percent of the evening peak-hour traffic volumes. Also indicated in Table 2 is the directional distribution of traffic flow on the arterial streets in the study area. The directional distribution, which indicates the percentage of traffic flowing in opposing directions on a specific segment of roadway, was found to

average 60 percent in the peak direction and 40 percent in the nonpeak direction during the morning peak hour, and 57 percent in the peak direction and 43 percent in the nonpeak direction during the evening peak hour. These values are typical of the directional distribution of peak-hour vehicular traffic on arterial streets in urban areas.

Also indicated in Table 2 are the intersection approach peak-hour factors required for roadway capacity calculations. The peak-hour factor is a measure of the uniformity of the traffic flow rate. It is defined as the ratio of the number of vehicles arriving at an intersection during the peak-hour to four times the number of vehicles arriving during the busiest consecutive 15-minute period during that hour. As the peak-hour factor approaches a value of 1.00, the traffic flow throughout the hour becomes increasingly uniform, without marked peaks. The peak-hour factors shown in Table 2 range from a high of 0.97 to a low of 0.34, with an average 7:15 a.m. to 8:15 a.m. peak-hour factor of 0.75, and an average 4:00 p.m. to 5:00 p.m. peak-hour factor of 0.85. This difference between the morning and evening average peak-hour factors is typical of urban traffic, and indicative of increased evening traffic volumes resulting from the coincidence of work to home trips with social, recreational, medical/dental, and shopping trips which normally are not made during the morning peak-hour period.

Additional traffic counts were taken by Commission staff, at the request of city officials, at the intersection of Washington Street and Service Drive and at the First National Bank of West Bend drive-in banking and parking lot driveway entrances located on Washington Street immediately west of Service Drive. These additional counts were taken from 3:30 p.m. to 7:00 p.m. on June 26, 1981, the last Friday in June, to document the higher-than-average weekday traffic volumes associated with a peak monthly banking activity day and to identify the perceived operational traffic conflict between through traffic on Washington Street and those vehicles utilizing the bank driveways and the public off-street parking facilities located along Service Drive south of Washington Street.

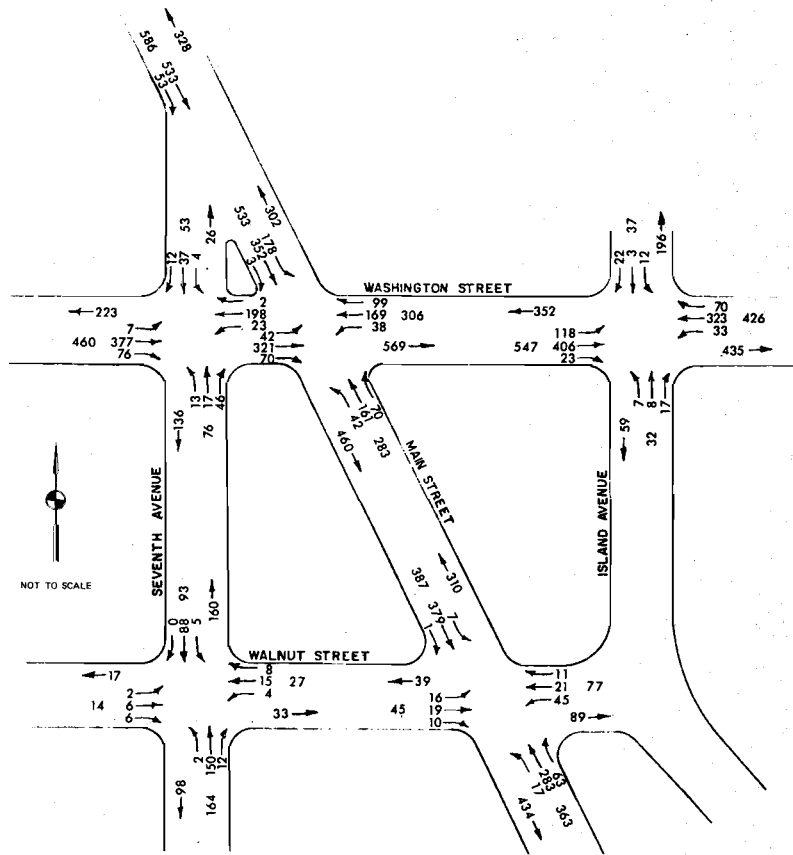
As indicated in Figure 4, the peak-hour traffic volumes in the vicinity of the intersection of Washington Street and Service Drive occur between 4:15 p.m. and 5:15 p.m., with a peak volume of 1,502 vehicles on Washington Street east of Service Drive. This is an increase of 235 vehicles per hour, or about 18 percent, over the average weekday peak-hour traffic volumes shown in Figure 3. This increased traffic volume is attributed to the increase in travel demand which normally occurs on Friday evenings and the additional vehicular traffic attracted to the First National Bank during the last Friday of the month. For these reasons, the hourly traffic volumes in the vicinity of the intersection of Washington Street and Service Drive remain at a high level throughout the 3:30 p.m. to 7:00 p.m. time period, with hourly traffic entering the bank driveways remaining relatively constant--ranging from a low of 186 vehicles from 5:15 to 6:15 p.m. to a high of 210 vehicles from 4:15 to 5:15 p.m. These higher-than-average Friday traffic volumes over an extended time period serve to increase significantly the number of traffic conflicts at this location.

Accordingly, a special traffic engineering analysis was made by Commission staff to identify the severity of the increased traffic conflicts along that segment of Washington Street in the vicinity of Service Drive and the driveway entrances of the First National Bank of West Bend. Because of the proximity of the bank drive-in and parking lot driveways, they have been combined for analysis purposes in Figure 4. Of the 1,502 vehicles indicated in Figure 4 as traveling on Washington Street during the 4:15 p.m. to 5:15 p.m. time period, 910 vehicles, or about 60

Figure 3

PEAK-HOUR WEEKDAY TRAFFIC VOLUME TURNING MOVEMENTS
ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN
THE WEST BEND CENTRAL BUSINESS DISTRICT: 1981

7:15 a.m. to 8:15 a.m.



4:00 p.m. to 5:00 p.m.

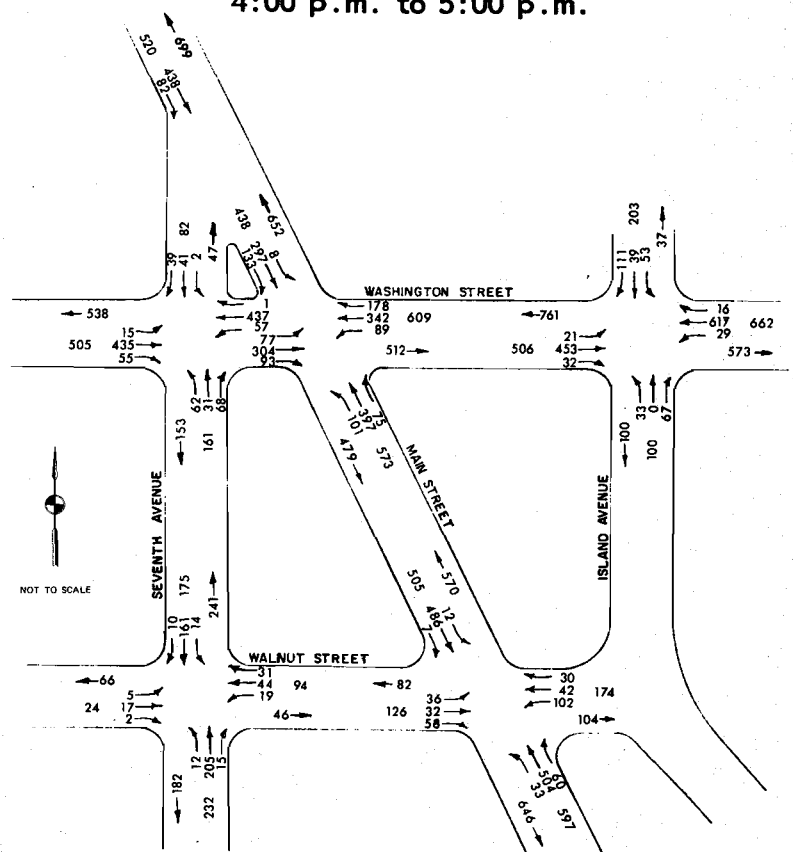


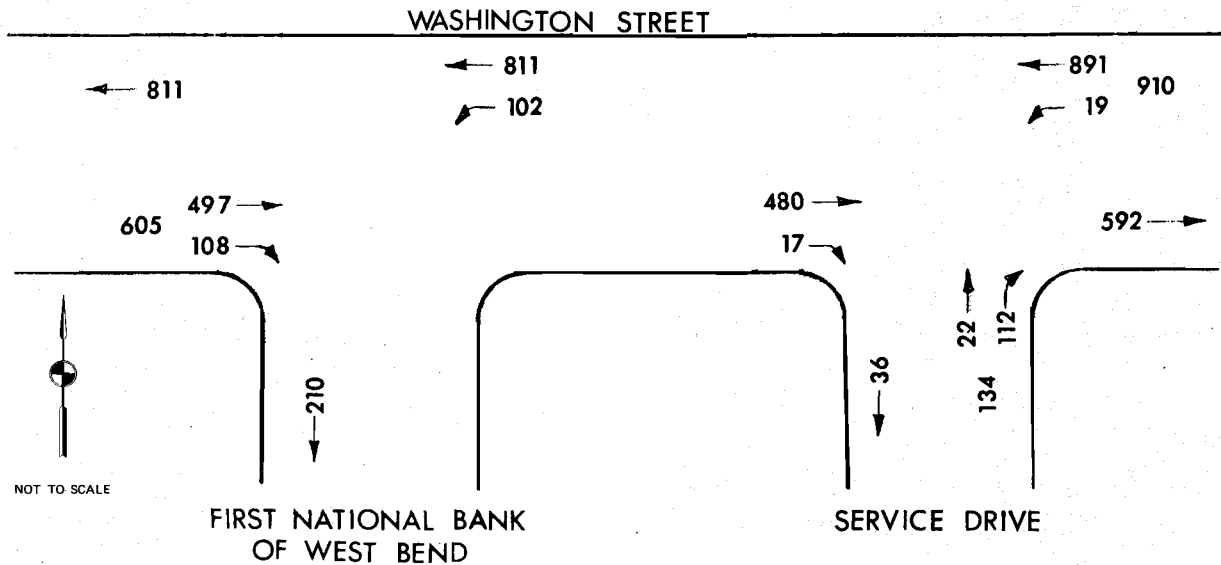
Table 2

**SUMMARY OF PEAK-HOUR TURN MOVEMENTS, TRUCKS AND BUSES, DIRECTIONAL
DISTRIBUTION, AND PEAK-HOUR FACTORS OF AVERAGE WEEKDAY TRAFFIC AT
SELECTED INTERSECTIONS IN THE WEST BEND CENTRAL BUSINESS DISTRICT: 1981**

Intersection	Approach Direction	7:15 to 8:15 a.m.						4:00 to 5:00 p.m.					
		Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Directional Distribution	Peak- Hour Factor	Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Directional Distribution	Peak Hour Factor
			Percent Left	Percent Right					Percent Left	Percent Right			
Seventh Avenue and Washington Street	Southbound	53	8	23	6	67-33	0.83	82	2	48	2	64-36	0.80
	Northbound	76	17	60	--	36-64	0.79	161	38	42	--	51-49	0.96
	Westbound	223	10	1	8	34-66	0.81	495	12	--	2	51-49	0.92
	Eastbound	460	2	16	3	67-33	0.72	505	3	11	2	48-52	0.88
Main Street and Washington Street	Southbound	533	33	1	2	64-36	0.91	438	30	2	1	40-60	0.97
	Northbound	283	15	25	5	38-62	0.69	573	18	13	1	54-46	0.91
	Westbound	306	12	32	6	35-65	0.79	609	15	29	1	54-46	0.82
	Eastbound	433	10	16	3	66-34	0.72	474	16	20	2	49-51	0.85
Island Avenue and Washington Street	Southbound	37	59	32	22	16-84	0.84	203	26	55	1	85-15	0.34
	Northbound	32	22	53	3	35-65	0.67	100	33	67	--	50-50	0.92
	Westbound	426	8	16	3	49-51	0.70	662	4	2	2	54-46	0.83
	Eastbound	546	22	4	1	61-39	0.72	506	4	6	1	40-60	0.92
Main Street and Walnut Street	Southbound	387	2	--	5	55-45	0.78	505	2	1	2	47-53	0.81
	Northbound	363	5	17	3	46-54	0.80	597	6	10	3	48-52	0.90
	Westbound	77	58	14	6	46-54	0.80	174	59	17	--	62-38	0.67
	Eastbound	45	36	22	--	54-46	0.63	126	28	46	--	60-40	0.81
Seventh Avenue and Walnut Street	Southbound	93	5	--	2	37-63	0.73	175	8	6	--	42-58	0.82
	Northbound	164	1	7	2	62-38	0.62	232	5	6	--	56-44	0.86
	Westbound	27	15	30	--	45-55	0.88	94	20	33	--	67-33	0.88
	Eastbound	14	14	43	--	45-55	0.75	24	21	8	--	27-73	0.67
Average	--	--	18	21	4	60-40	0.75	--	18	21	2	57-43	0.85

Figure 4

PEAK-HOUR TRAFFIC VOLUME TURNING MOVEMENTS
IN THE VICINITY OF THE INTERSECTION OF
WASHINGTON STREET AND SERVICE DRIVE ON
FRIDAY, JUNE 26, 1981: 4:15 p.m. to 5:15 p.m.



percent, were traveling in the westbound direction, with 19 and 102 vehicles, or about 2 and 11 percent, turning left onto Service Drive and the driveway entrances to the First National Bank, respectively. The total of 102 left turns during a one-hour time period is approximately two turns per minute. Based upon typical traffic flow characteristics, which have been identified as occurring at this location from the special June 6, 1981 traffic count taken by Commission personnel, a maximum of four left turns per minute would be expected to enter the bank driveway entrances from Washington Street. This is not an excessively high number of turning vehicles and can be readily accommodated provided that gaps in the eastbound through traffic stream are available. The proposed reconstruction of the intersection of Main Street and Washington Street, which is detailed in a later section of this report as Alternative Plan 1 to accommodate the proposed downtown shopping mall, should, along with improved traffic progression along Washington Street, serve to provide sufficient gaps in the traffic stream to accommodate the peak demand for left turns desiring to use Service Drive and/or the driveway entrances to the First National Bank. The demand for left turns from Washington Street into the bank driveway entrances is further facilitated by the existing operation of those driveways as entrances only, thereby eliminating a conflict between left turns from Washington Street and potential left turns onto Washington Street from the bank driveways. It is the Commission staff conclusion that additional traffic management measures are currently not warranted at this location, and, provided that the traffic signals at the intersections of Washington Street with Island Avenue and Seventh Avenue are interconnected to maintain sufficient gaps in the traffic stream on Washington Avenue, the proposed alternative street system plans analyzed in the following portions of the report should not adversely impact vehicles desiring to enter or exit Service Drive and/or the driveway entrance of the First National Bank of West Bend on Washington Street.

TRAFFIC PATTERNS

In order to properly analyze vehicular traffic conditions in the study area, it is essential to determine the pattern and type of traffic entering and/or passing through the study area. This is of particular concern in a community like West Bend which consists of a highly developed urban area surrounded by essentially rural development. An understanding of the existing traffic patterns imposed upon a community's transportation system is important to any analysis of the performance of alternative arterial street systems designed to serve those travel patterns. The origin-destination travel data collected by the Commission in 1972 and forecast for the year 2000 were analyzed to determine current travel patterns by trip purpose in the study area. As indicated in Table 3, an estimated 39,600 person trips were made on an average weekday in 1981 within the study area.

Table 3
AVERAGE WEEKDAY DISTRIBUTION OF
TOTAL PERSON TRIPS WITHIN THE
WEST BEND TRAFFIC CIRCULATION
AREA: 1981

Trip Purpose	Person Trips	Percent of Total	Regional Percentage
Home-Based Work	10,500	26.5	23.7
Home-Based Shopping	5,900	14.9	15.1
Home-Based Other	14,100	35.6	34.3
Nonhome Based	7,700	19.5	17.5
School	1,400	3.5	9.4
Total	39,600	100.0	100.0

Person trips may be separated into the following classifications by trip purpose: home-based work; home-based shopping; home-based other, which includes those trips made for personal business, medical/dental, and social/recreational purposes; nonhome based--that is, trips which neither begin nor end at home; and school trips. Of the total person trips made in the study area on an average weekday in 1981, approximately 26 percent were home-based work trips, as compared to 24 percent for the Region as a whole; 15 percent were home-based shopping trips, the same as for the Region; and 4 percent were school trips, compared to 9 percent for the Region. Another 55 percent was classified as home-based other and nonhome-based trips. Table 3 indicates that the tripmaking pattern for the study area very closely resembles the tripmaking pattern for the Region as a whole.

A separate analysis was made of those shopping trips attracted to the SEWRPC traffic analysis zone number 795, which approximates the West Bend central business district (see Map 2).

Table 4 indicates that a total of approximately 1,700 shopping trips were attracted to the West Bend central business district on an average weekday in 1972. This total increased by about 1,800 person shopping trips in 1981 to a total of 3,500 trips. If the adopted regional land use plan--which includes forecasts of increased urban development in the West Bend area and, more specifically, of increased commercial/retail land use development in the West Bend central business district and along STH 33 and USH 45 west and south of the study area, respectively--is implemented, this total may be expected to increase to about 6,400 shopping trips by the year 2000, almost double the 1981 level. A high percentage of these trips may be expected to have destinations at commercial establishments located along the proposed downtown mall. Based upon an average vehicle occupancy rate of 1.4 persons per vehicle for shopping trips, it is anticipated that a downtown mall restricted to through traffic would attract about 2,500 vehicles on an average weekday in 1981.

Table 4

**AVERAGE WEEKDAY HOME-BASED
SHOPPING TRIPS ATTRACTED TO
SEWRPC TRAFFIC ANALYSIS ZONE
795: 1972, 1981, AND 2000**

From Zone	Person Trips		
	1972	1981	2000
784	180	380	790
785	--	40	120
795	140	210	360
796	100	140	230
798	70	80	90
799	--	70	210
803	30	30	30
804	340	250	60
All Other Zones	830	2,300	4,510
Total	1,690	3,500	6,400

An analysis was also made, based upon the 1972 origin-destination travel data, of the vehicle trip types which occur in the study area. Vehicle trip types may be classified as internal trips--those trips with both the origin and the destination within the study area; internal/external trips--those trips with either the origin or destination, but not both, within the study area; and through trips--those trips which pass through the study area and which originate and are destined for areas outside the study area. As indicated in Table 5, a total of 56,540 vehicle trips were made in the study area on an average weekday in 1972. Of this total, approximately 22,300, or about 39 percent, were internal vehicle trips; 29,800, or 53 percent, were internal/external vehicle trips; and the remaining 4,400, or 8 percent, were through vehicle trips. Therefore, about 92 percent of the vehicular traffic using the arterial street and highway system in the study area on an average weekday in 1972 either originated within or was destined to the study area.

Table 5

**24-HOUR AVERAGE WEEKDAY ORIGIN/DESTINATION VEHICLE
TRIP SUMMARY FOR THE WEST BEND TRAFFIC CIRCULATION
PLAN STUDY AREA: 1972, 1981, AND 2000**

Year	Trip Type			Total
	Internal	Internal/External	Through	
1972 Trips Percent of Total	22,340 39	29,770 53	4,430 8	56,540 100
1981 Trips Percent of Total Percent Change 1972-1981	19,000 32 15	35,000 58 17	6,000 10 36	60,000 100 6
2000 Trips Percent of Total Percent Change 1972-2000	14,470 21 -38	51,070 73 72	4,320 6 -2	69,870 100 24

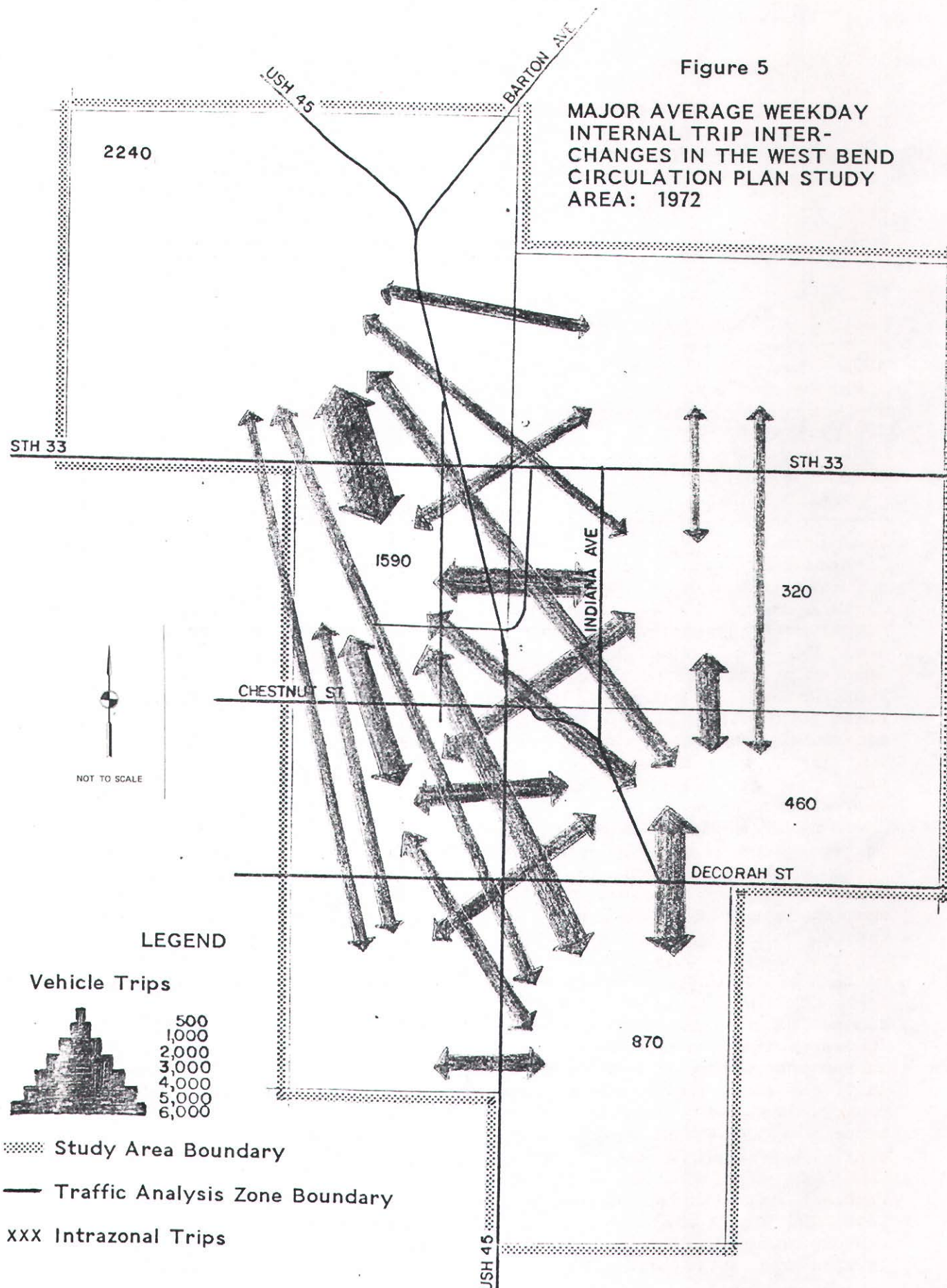
Based upon the traffic growth rates established in the study area and land development patterns in and around the study area, the number of vehicle trips is estimated to have increased to about 60,000 on an average weekday in 1981, an increase of approximately 6 percent since 1972. Of this total, approximately 19,000, or 32 percent, were internal vehicle trips, 35,000, or 58 percent were internal/external vehicle trips; and 6,000, or 10 percent, were through vehicle trips. This represents a decrease of about 3,300, or 15 percent, in internal vehicle trips; an increase of about 5,200, or 17 percent, in internal/external vehicle trips; and an increase of 1,600, or 36 percent, in through vehicle trips since 1972. In total, about 90 percent of the vehicular traffic using the arterial street and highway system in the study area on an average weekday in 1981 either originated within or was destined to the study area.

The 1981 vehicle trip information is not sufficiently detailed to identify the trip pattern within and through the study area. Therefore, the following description of the 1972 average weekday vehicle trip pattern is presented to provide a general indication of vehicle trip movements which occur in the study area. Figure 5 indicates the pattern of movement of about 21,400, or 96 percent, of the total of 22,340 internal vehicle trips made within the study area on an average weekday in 1972. Of these 21,400 vehicle trips, about 1,680, or 8 percent, passed through the central business district in a north-south direction, while about 6,570 vehicle trips, or 29 percent, either originated in or were destined for the West Bend central business district.

Figure 6 indicates the pattern of movement of about 25,900, or 87 percent, of the total 29,770 internal/external vehicle trips made in the study area on an average weekday in 1972. Of these 25,900 vehicle trips, about 9,900, or about 33 percent, entered the study area from the south on USH 45. About 2,400 of these 9,900

Figure 5

MAJOR AVERAGE WEEKDAY
INTERNAL TRIP INTER-
CHANGES IN THE WEST BEND
CIRCULATION PLAN STUDY
AREA: 1972



trips, or 24 percent, were destined to areas to the north of the central business district and 2,000 of the 9,900 trips, or 22 percent, were destined for the West Bend central business district. Another 6,900 vehicle trips, or about 23 percent, entered the study area from the north on USH 45. About 1,200 of these 6,900 vehicle trips, or 17 percent, were destined to areas to the south of the central business district, and another 1,400 of the 6,900 trips, or 20 percent, were destined for the central business district. Of the 16,800 internal/external vehicle trips on an average weekday in 1972 which entered north and south of the study area on USH 45, approximately 7,000, or 42 percent, were destined to or passed through the central business district on USH 45.

Figure 7 indicates the pattern of movement of about 4,000, or 90 percent, of the total 4,400 vehicle trips made through the study area on an average weekday in 1972. As indicated in the figure, the major vehicular through trip pattern across the study area in 1972 was from USH 45 north of the study area to USH 45 south of the study area and to STH 33 west of the study area. These two traffic movements accounted for about 2,000, or 45 percent, of the total through traffic moving across the study area.

In total, approximately 8,260, or 35 percent, of the internal vehicle trips within the study area were attracted to the West Bend central business district and 6,200, or 21 percent, of the internal/external vehicle trips were attracted to the central business district. Thus, 14,400, or 25 percent, of the total weekday vehicle trips made within the study area were destined to the central business district. In addition to the 14,400 trips destined to the central business district, another 1,700, or 8 percent, of the internal vehicle trips; 5,900, or 20 percent, of the internal/external vehicle trips; and 1,800, or 40 percent, of the through vehicle trips--for a total of 9,400, or 17 percent, of the total weekday vehicle trips made within the study area--had to pass through the central business district. In summary, a total of 23,800, or 42 percent, of the vehicle trips made in the study area were either destined to or had to pass through the West Bend CBD because of the limited number of direct arterial routes available to serve the desired lines of these trips.

Based upon the adopted year 2000 land use and transportation system plans for the Southeastern Wisconsin Region, vehicle trips in the West Bend study area, as shown in Table 5, are forecast to increase from 56,540 in 1972 to 69,870 in the year 2000, or about 24 percent on an average weekday. This increase in vehicle trips results in a redistribution of the trip types which occur in the study area. Internal vehicle trips decrease from 22,340 in 1972 to 14,470 in the year 2000, or by about 35 percent, internal/external vehicle trips increase from 29,770 in 1972 to 51,070 in the year 2000, or by about 72 percent, and through vehicle trips decrease slightly from 4,430 in 1972 to 4,320 in the year 2000, or by about 2 percent. This increase in total vehicle tripmaking and the resultant changes in the distribution of vehicle trip types, most notably the decrease in internal trips and increase in internal/external trips, are attributed to the increased land development and the associated tripmaking characteristics in the area immediately surrounding the study area. As summarized in Table 6, and shown in Figure 8, total vehicle trip origins and destinations in the study area comprised 72 percent of the origins and destinations in the larger area immediately surrounding and including the study area. While vehicle trip activity is estimated to increase slightly within the study area from 74,440 in 1972 to 80,000 origins and destinations in the year 2000, or about 7 percent, total vehicle trip activity in the area surrounding and including the study area is estimated to increase from 103,370 in 1972 to 157,600 origins and destinations in the year 2000, or about 52 percent. By the

Figure 6

MAJOR AVERAGE WEEKDAY
INTERNAL/EXTERNAL TRIP
INTERCHANGES IN THE
WEST BEND TRAFFIC
CIRCULATION PLAN STUDY
AREA: 1972

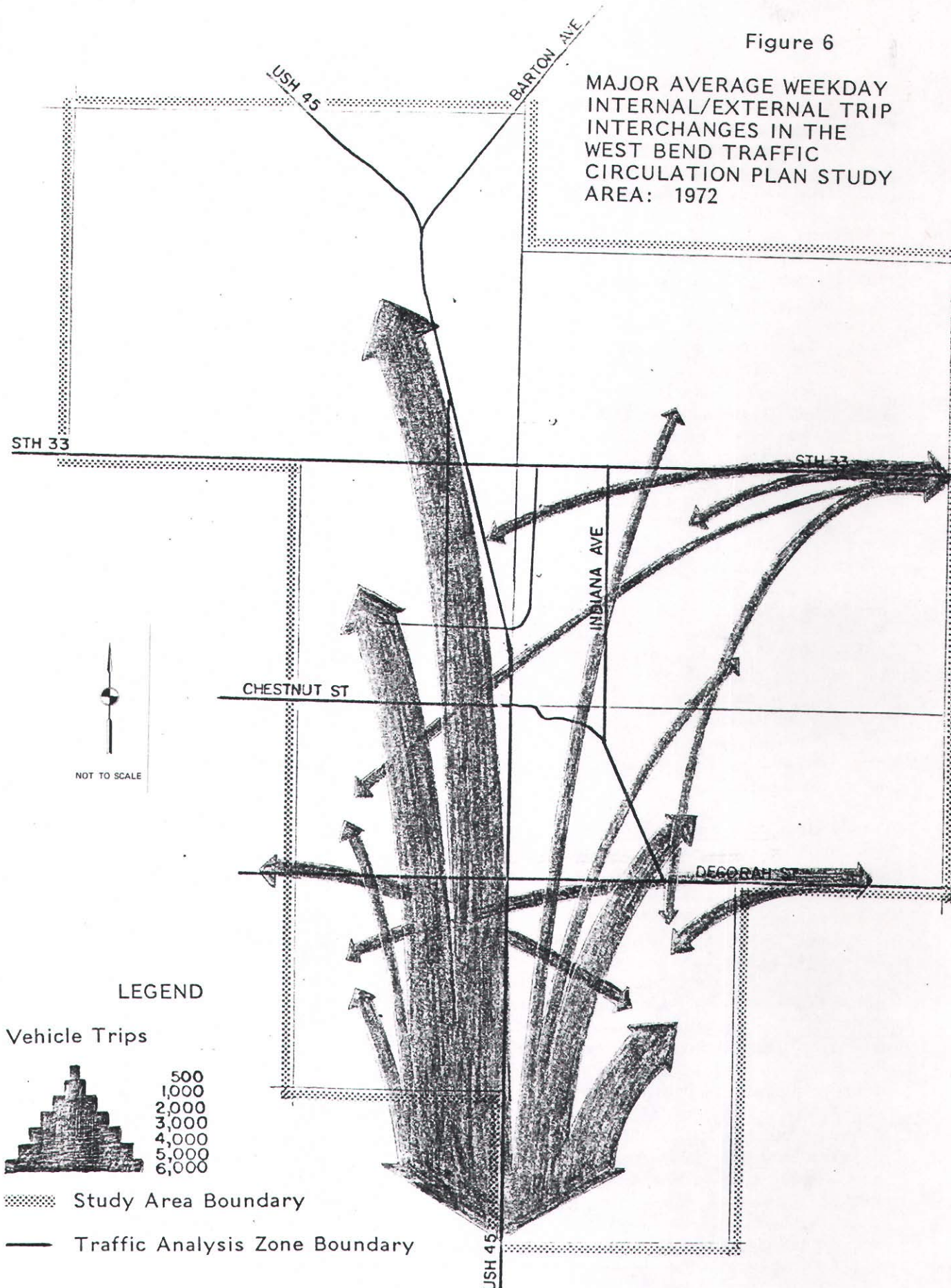


Figure 6 (continued)

MAJOR AVERAGE WEEKDAY
INTERNAL/EXTERNAL TRIP
INTERCHANGES IN THE WEST
BEND TRAFFIC CIRCULATION
PLAN STUDY AREA: 1972

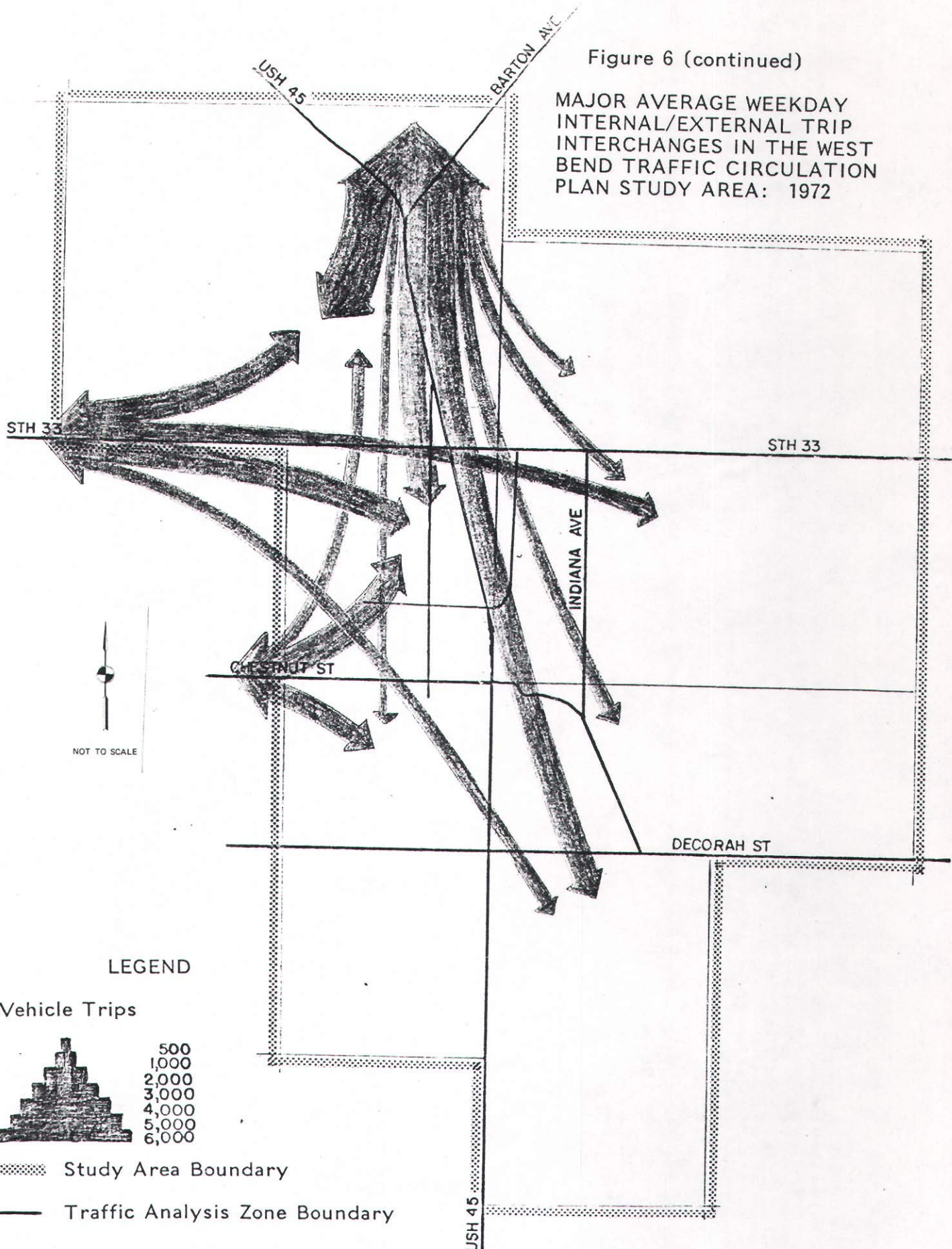
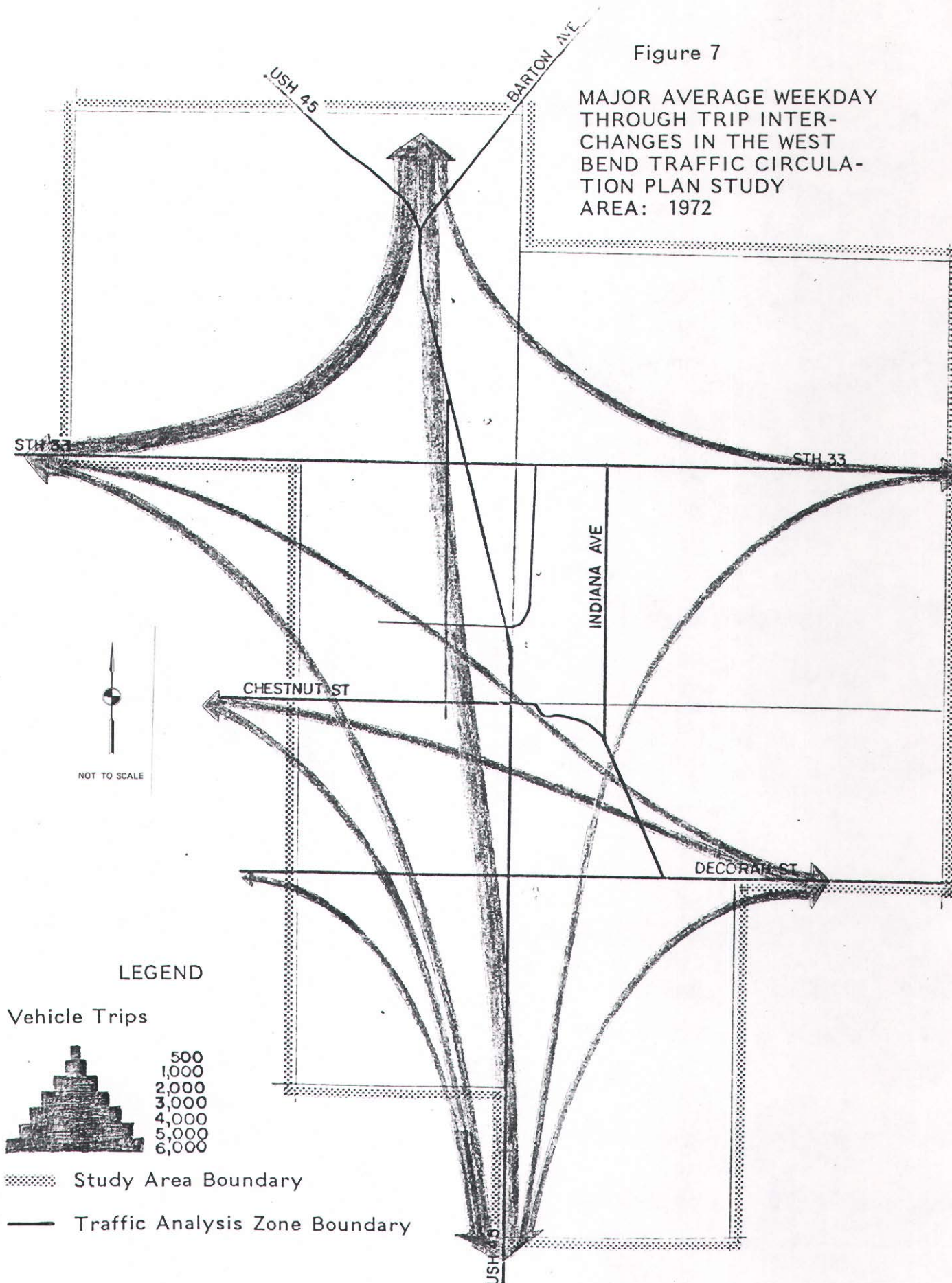


Figure 7

MAJOR AVERAGE WEEKDAY
THROUGH TRIP INTER-
CHANGES IN THE WEST
BEND TRAFFIC CIRCULA-
TION PLAN STUDY
AREA: 1972



year 2000, therefore, total vehicle trip origins and destinations in the study area are estimated to comprise 51 percent, as compared to 78 percent in 1972, of the origins and destinations in the larger area immediately surrounding and including the study area.

Table 6

**AVERAGE WEEKDAY VEHICLE TRIP END (ORIGINS AND DESTINATIONS)
SUMMARY FOR THE WEST BEND TRAFFIC CIRCULATION PLAN
STUDY AREA AND SURROUNDING LAND DEVELOPMENT: 1972-2000**

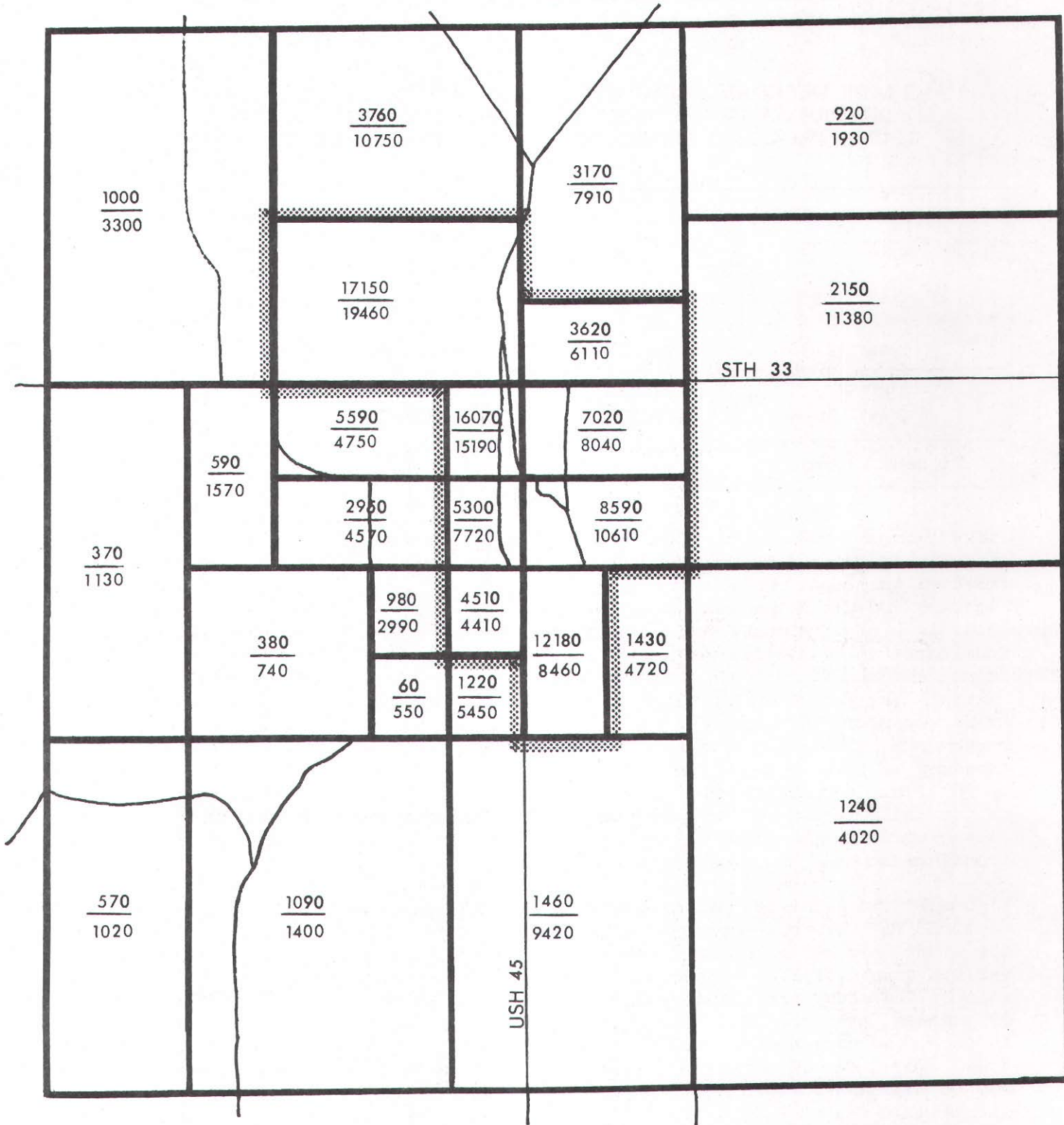
Year	Vehicle Trips		
	Study Area	Study Area Plus Surrounding Land Development	Percent Trips in Study Area
1972	74,440	103,370	72.0
2000	80,000	157,600	50.8
Percent Change	7.5	52.5	--

These changes in vehicle tripmaking activity expected to be associated with an increase in urban land development in the West Bend area to the year 2000 may be expected to result in a shift in the previously described 1972 travel patterns. Figure 9 indicates the pattern of movement of about 11,900, or 82 percent, of the total of 14,470 internal vehicle trips which may be expected to be made within the study area on an average weekday in the year 2000. Of this total of 11,900 vehicle trips, approximately 1,000, or about 7 percent, may be expected to pass through the central business district in a north-south direction, while about 4,700 vehicle trips, or about 32 percent, will either originate in or be destined for the West Bend central business district. The 4,700 internal vehicle trips which may be expected to have destinations in the central business district is a decrease of 1,870 trips, or 28 percent, from the 1972 level. This reduction in internal trip-making follows regional trends resulting from changes in average family size and decreased land densities within urban areas, and is normally offset by increased trends in internal/external tripmaking.

Figure 10 indicates the pattern of movement of about 47,500, or 93 percent, of the total 51,070 internal/external vehicle trips which may be expected to be made in the study area on an average weekday in the year 2000. Of this total of 47,500 vehicle trips, 13,200, or about 26 percent, may be expected to enter from the south side of the study area on USH 45. This is an increase of 3,300 vehicle trips, or 33 percent, over the 1972 level. Approximately 4,800 vehicle trips may be expected to enter the east side of the study area on STH 33. This is an increase of about 3,000 vehicles, or more than double the 1972 level. Another 5,100 vehicle trips may be expected to enter the east side of the study area on Decorah Street, an increase of about 4,200, or almost fivefold, over the 1972 level. The largest increase in internal/external vehicle trip patterns may be expected to occur on the west side of the study area, where the number of vehicles entering the study area on an average weekday may be expected to increase from 3,300 in 1972 to 14,300, or

Figure 8

AVERAGE WEEKDAY VEHICLE TRIP ENDS (ORIGINS/DESTINATIONS)
FOR THE WEST BEND TRAFFIC CIRCULATION PLAN STUDY
AREA AND SURROUNDING LAND DEVELOPMENT: 1972-2000



NOT TO SCALE

Figure 9

MAJOR AVERAGE WEEKDAY
INTERNAL TRIP INTER-
CHANGES IN THE WEST BEND
TRAFFIC CIRCULATION PLAN
STUDY AREA: 2000

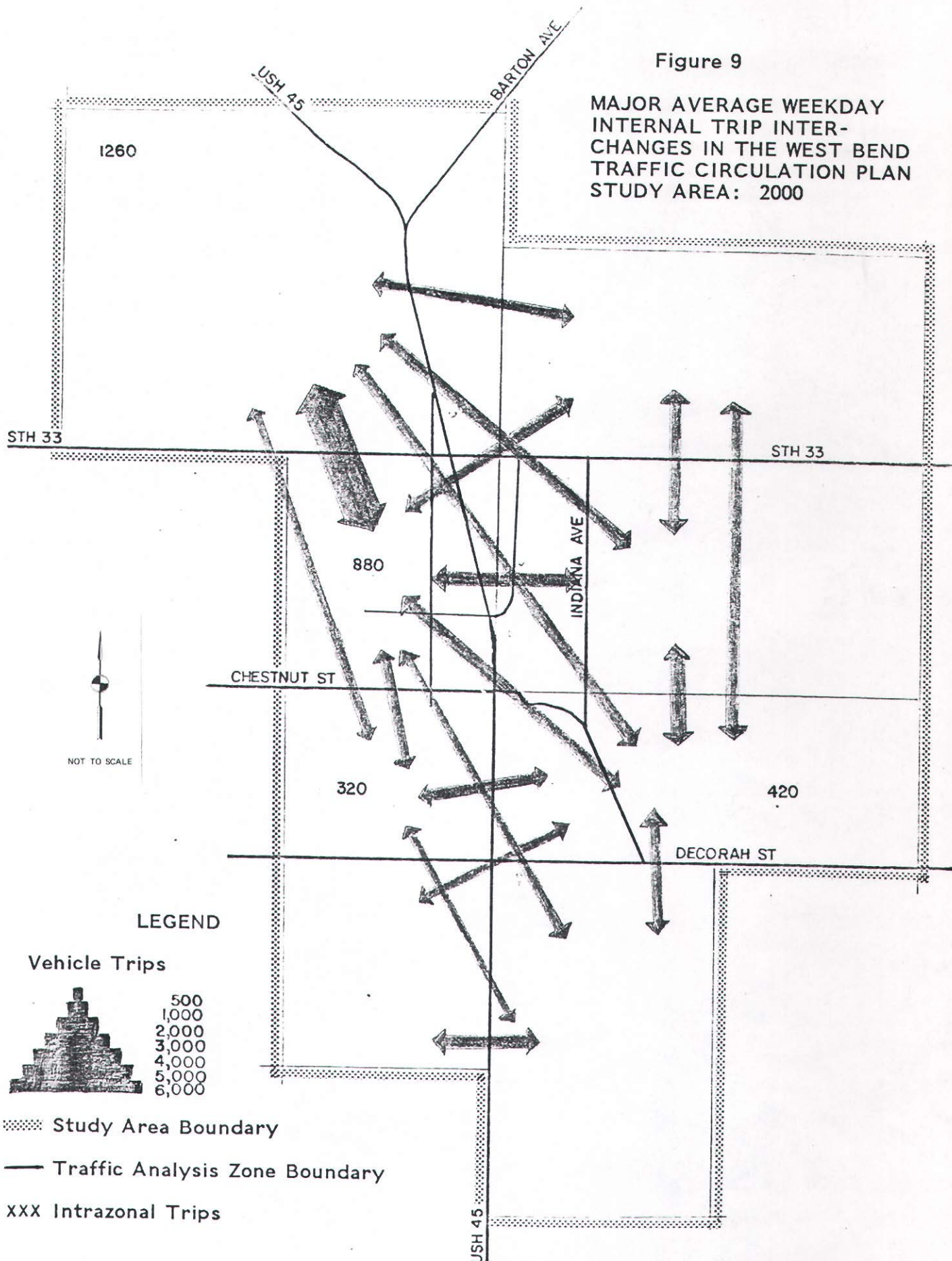


Figure 10

MAJOR AVERAGE WEEKDAY
INTERNAL/EXTERNAL
TRIP INTERCHANGES IN
THE WEST BEND TRAFFIC
CIRCULATION PLAN
STUDY AREA: 2000

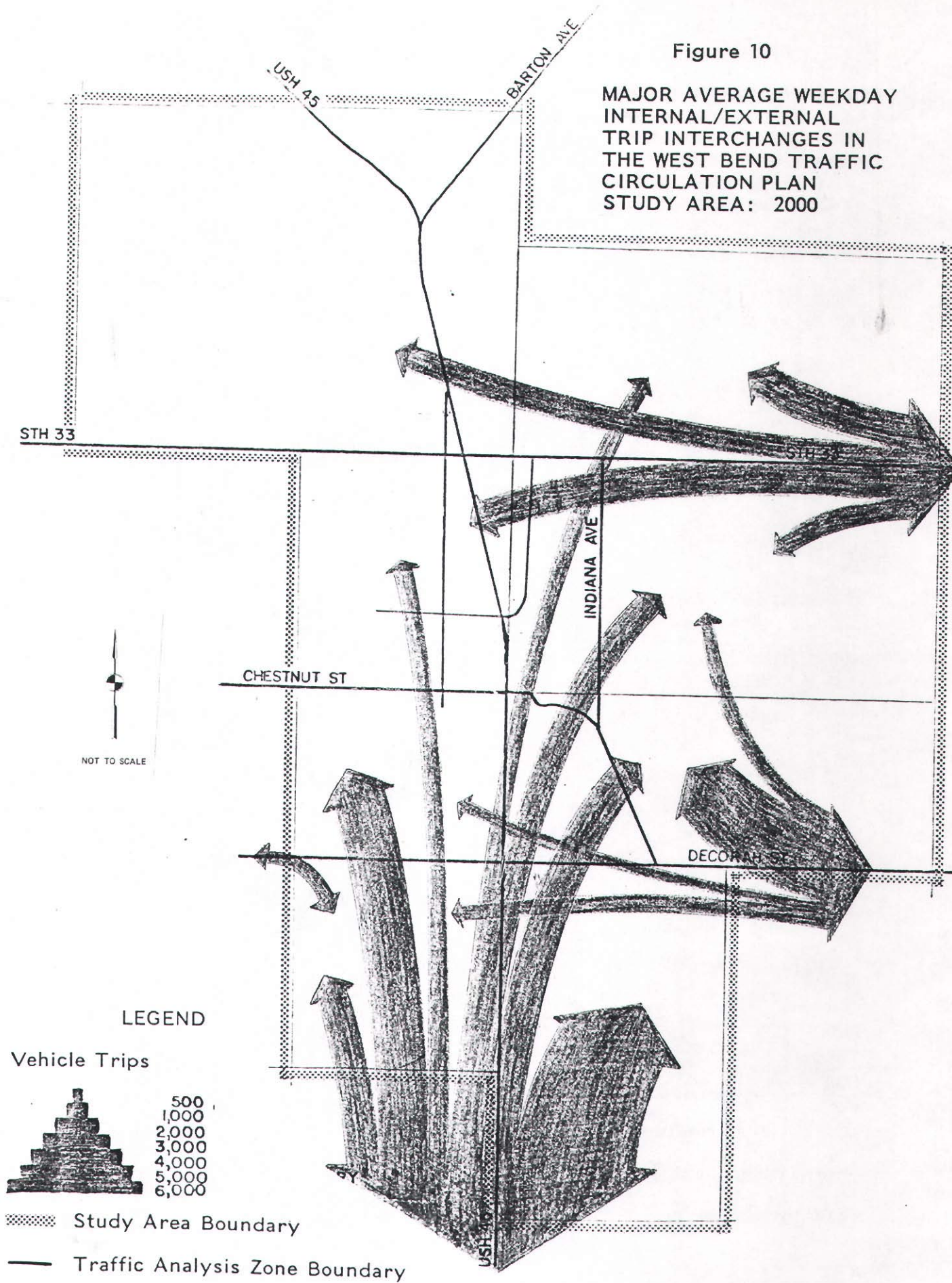
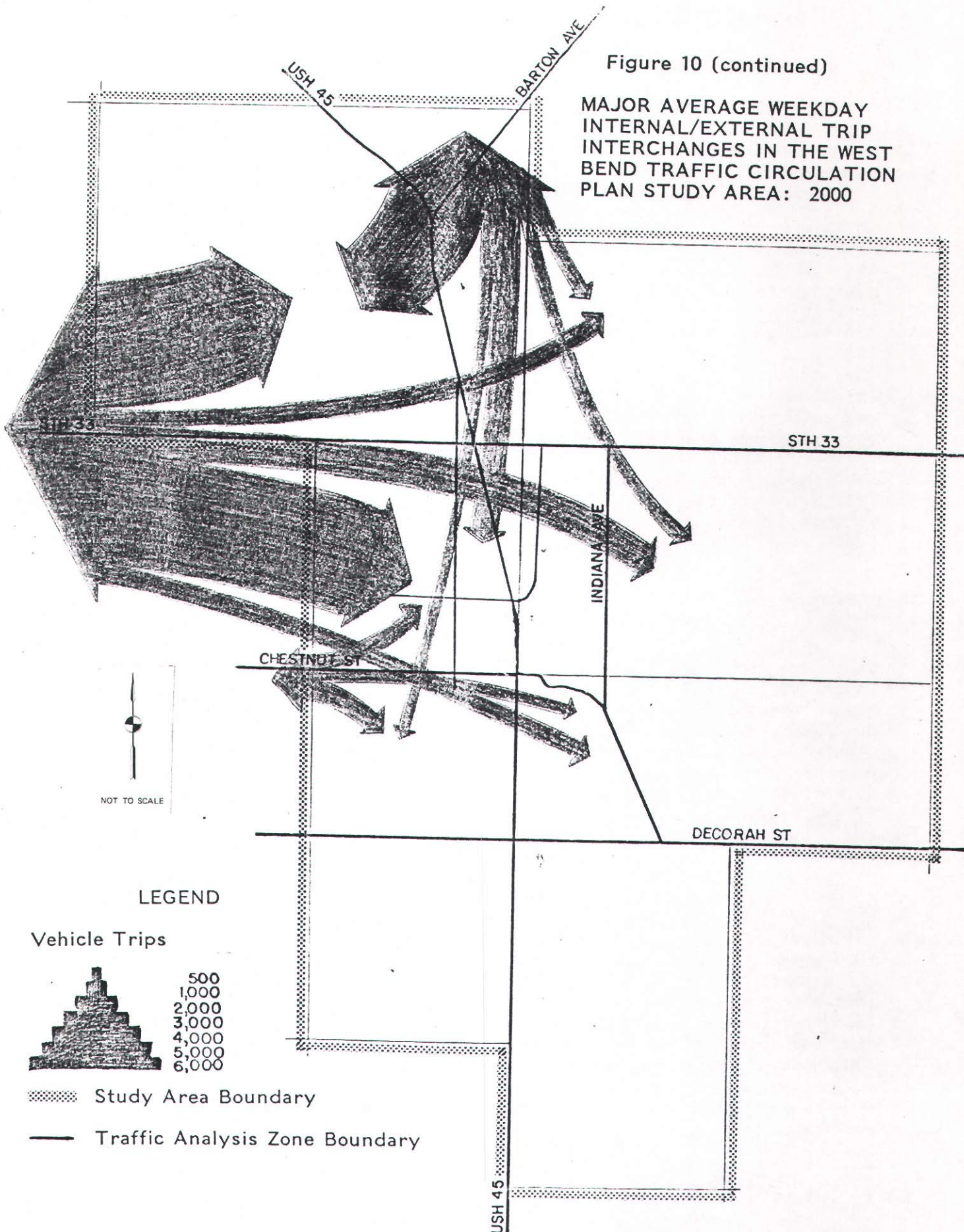


Figure 10 (continued)

MAJOR AVERAGE WEEKDAY
INTERNAL/EXTERNAL TRIP
INTERCHANGES IN THE WEST
BEND TRAFFIC CIRCULATION
PLAN STUDY AREA: 2000



by over fourfold, in the year 2000. Of the 51,070 total internal/external vehicle trips, 9,050, or about 18 percent, may be expected to have destinations within the central business district, an increase of 6,200 trips or, 46 percent, over the 1972 level.

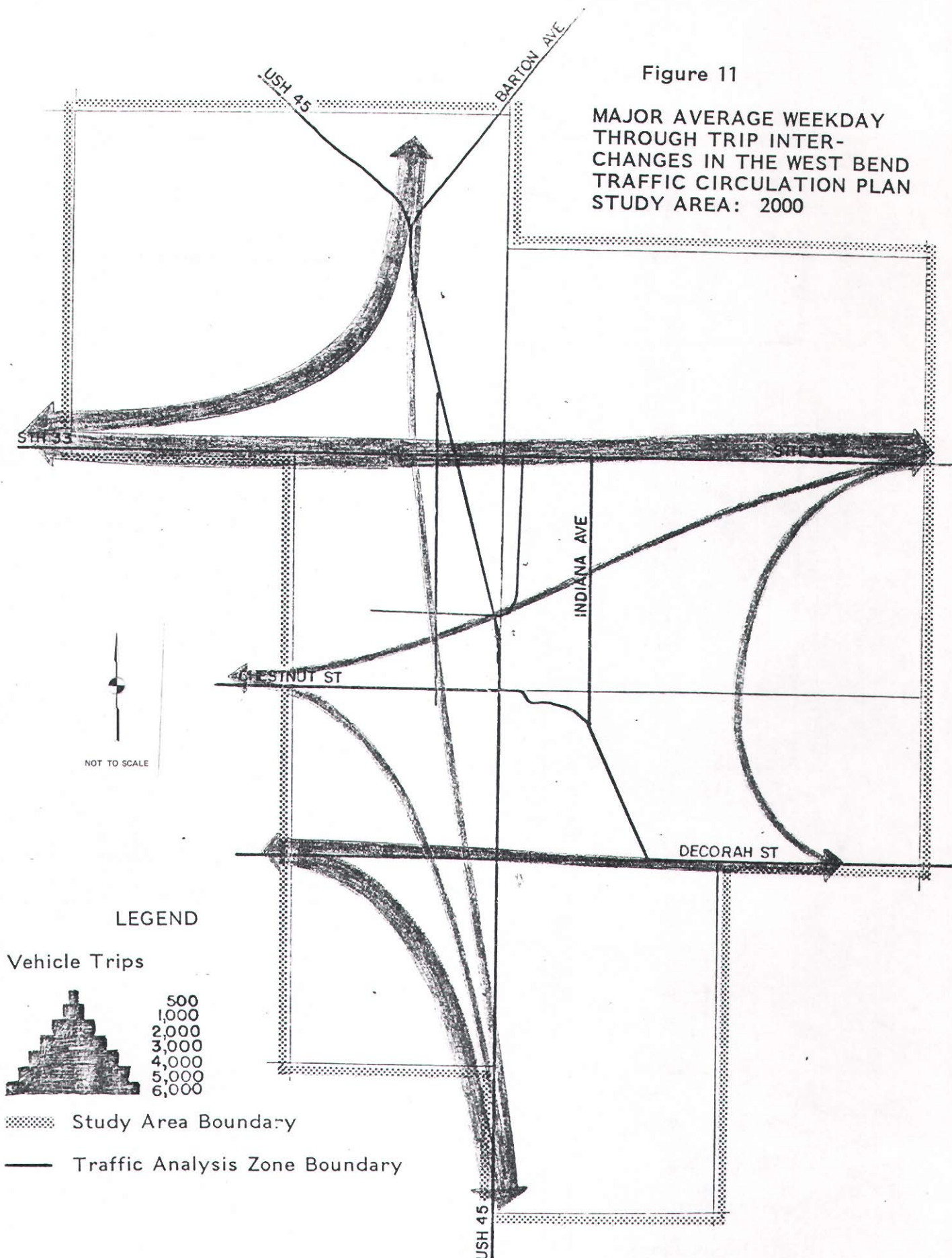
Figure 11 indicates the pattern of movement of about 4,100, or 96 percent, of the total 4,300 vehicle trips which may be expected to be made through the study area on an average weekday in the year 2000. The north-to-west through movement may be expected to remain at about 850 vehicles, or 20 percent, of the total through trips, while the predominant north-south through trip movement may be expected to decrease from 1,100 in 1972 to 300 by the year 2000, or by 73 percent. The east-to-west through trip movement may be expected to increase from less than 150 vehicles per average weekday in 1972 to 1,300 in the year 2000. In addition to the 13,750 trips destined for the central business district, 1,000, or 7 percent, of the internal vehicle trips; 2,100, or 4 percent, of the internal/external vehicle trips; and 500, or 12 percent, of the through trips--for a total of 3,600, or 5 percent, of the total 69,870 vehicle trips which may be expected to be made in the study area on an average weekday in the year 2000--may be expected to pass through the central business district. In summary, total average weekday vehicle trips destined for the West Bend central business district may be expected to remain relatively unchanged between 1972 and the year 2000, while vehicle trips which have to pass through the central business district may be expected to decrease from 9,400 in 1972 to 3,600 by the year 2000.

TRAFFIC IMPACT OF PROPOSED ARTERIAL STREET AND HIGHWAY SYSTEM IMPROVEMENTS

There are two arterial street and highway improvements recommended in the adopted year 2000 regional transportation system plan which may be expected to directly impact the vehicular traffic conditions in the West Bend study area. Data in the Commission's year 2000 traffic assignment and travel data files indicate that the planned construction of the West Bend Freeway and the extension of CTH G from its present location at Decorah Street to STH 33, as shown on Map 4--which depicts the Commission's long-range transportation plan for the study area--may be expected to divert vehicular traffic from the central business district. More specifically, the proposed construction of the West Bend Freeway should serve to reduce traffic volumes in the study area by approximately 6,000 vehicles per average weekday in the year 2000, and the proposed extension of CTH G should serve to reduce traffic volumes in the study area by approximately 2,000 vehicles per average weekday in the year 2000. The construction of these two proposed arterial facilities should not directly impact the internal trip patterns within the study area, but should reduce the demand for north-south internal/external and through vehicle trips into and across the West Bend central business district by providing additional arterial routes for vehicular traffic. This will encourage the desirable separation of local and through traffic by providing a bypass route around the central business district. In addition to reducing arterial traffic volumes in the study area, the construction of these two proposed arterial facilities should reduce traffic volumes on other arterial routes outside the study area by improving vehicular accessibility and reducing the unnecessary circuitiveness of travel in northern Washington County.

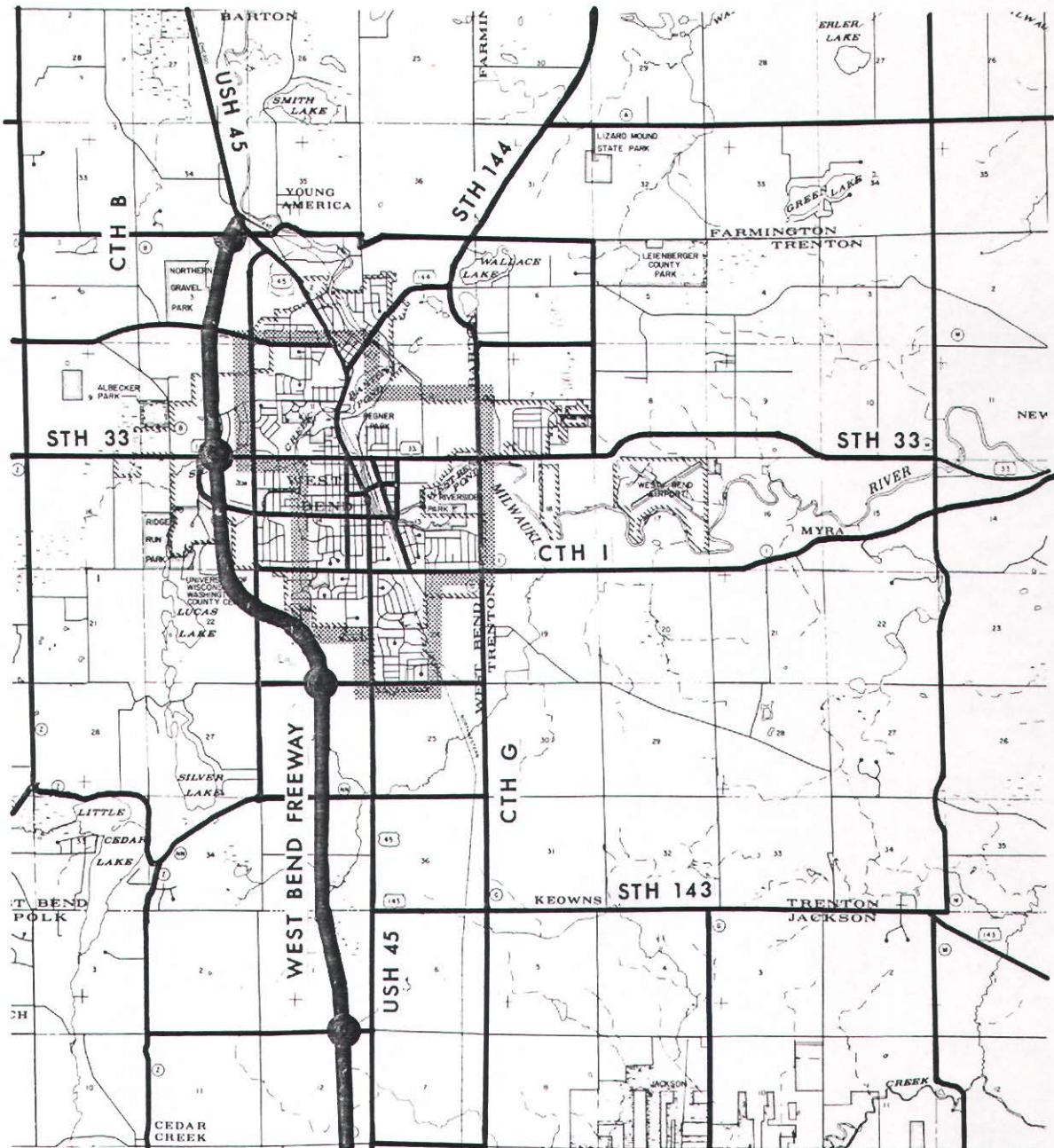
Figure 11

MAJOR AVERAGE WEEKDAY
THROUGH TRIP INTER-
CHANGES IN THE WEST BEND
TRAFFIC CIRCULATION PLAN
STUDY AREA: 2000







Map 4

SEWRPC TRANSPORTATION SYSTEM PLAN IN THE VICINITY OF THE
WEST BEND TRAFFIC CIRCULATION PLAN STUDY AREA: 2000



LEGEND

-  Study Area Boundary
-  Freeway
-  Arterial
-  Interchange



ANALYSIS OF ALTERNATIVE ARTERIAL STREET SYSTEMS

A set of six alternative arterial street systems were designed to accommodate the changes in vehicular traffic patterns which may be expected to be brought about by the proposed development of a downtown mall on Main Street. The remaining portion of this report describes and analyzes these alternative systems, and compares the traffic-carrying efficiency and operating characteristics of the alternative systems to each other and to the traffic-carrying efficiency and operating characteristics of the existing arterial street system. Each alternative arterial street system is analyzed and compared on the basis of such accepted traffic engineering standards as roadway volume-to-capacity ratios, average vehicular travel speed, and vehicle miles of travel.

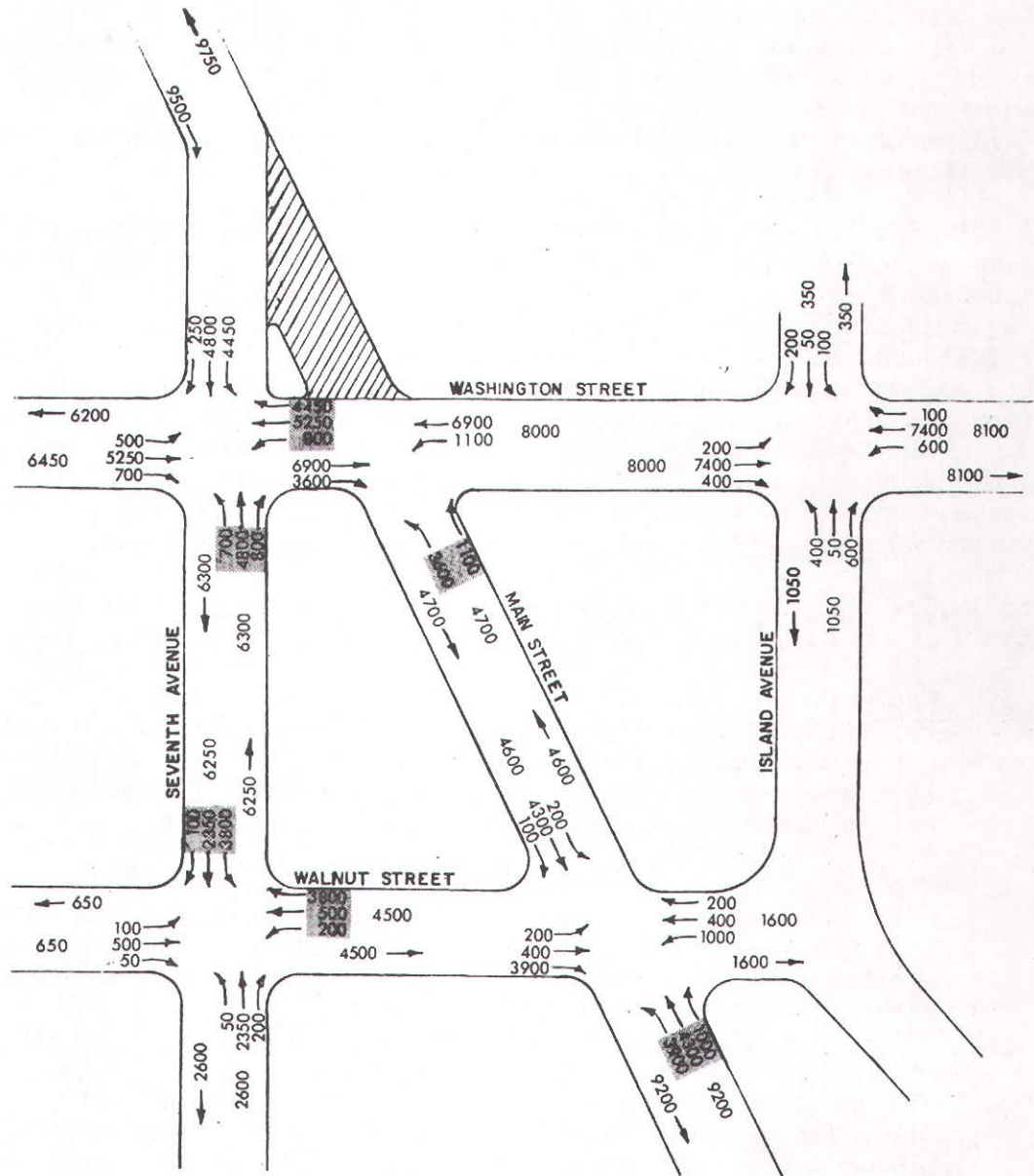
Volume-to-capacity ratios and level-of-service operating conditions were determined in accordance with the procedures set forth in the 1965 Highway Capacity Manual, published as Special Report 87 of the Transportation Research Board of the National Academy of Sciences. Each alternative was also analyzed to determine its impact on motor fuel consumption and vehicular air quality emissions in the study area. The impacts of the existing and alternative arterial street systems on motor fuel consumption and vehicular emissions were determined using the procedures set forth in the National Cooperative Highway Research Program Report III entitled, Running Costs of Motor Vehicles as Affected by Road Design and Traffic, 1971, and the procedures set forth by the U. S. Environmental Protection Agency and documented in the report entitled, Mobile Source Emission Factors--Final Document, March 1978.

The following alternative arterial street systems were designed in cooperation with officials of the City of West Bend for analysis under the study:

1. The existing arterial street system, which includes Main Street, Washington Street, Seventh Avenue, Walnut Street, and Island Avenue, with that segment of Main Street extending from Washington Street north to Seventh Avenue closed to through vehicular traffic and reconstructed as an off-street parking facility to accommodate about 20 vehicles (see Figure 12);
2. The existing arterial street system as described under Alternative 1, with that segment of Main Street from Walnut Street northward to Washington Street reconstructed as a shopping mall, with the restriction of vehicular through traffic and one-way northbound operation, and with the provision of a right-turn-lane exit from Main Street onto Washington Street (see Figure 13);
3. The arterial street system as described under Alternative 2, with the operation of that segment of Seventh Avenue between Washington Street and Walnut Street as a one-way southbound facility (see Figure 14);
4. The existing arterial street system, with that segment of Main Street from Walnut Street northward to Sixth Avenue reconstructed as a shopping mall, with the restriction of vehicular through traffic and one-way northbound operation, and with the operation of Sixth Street as a one-way southbound arterial street facility (see Figure 15);
5. The alternative street system as described under Alternative 2, but with two-way vehicular traffic operation permitted on that segment of Main Street reconstructed as a shopping mall from Walnut Street northward to

Figure 12

ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 1
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981



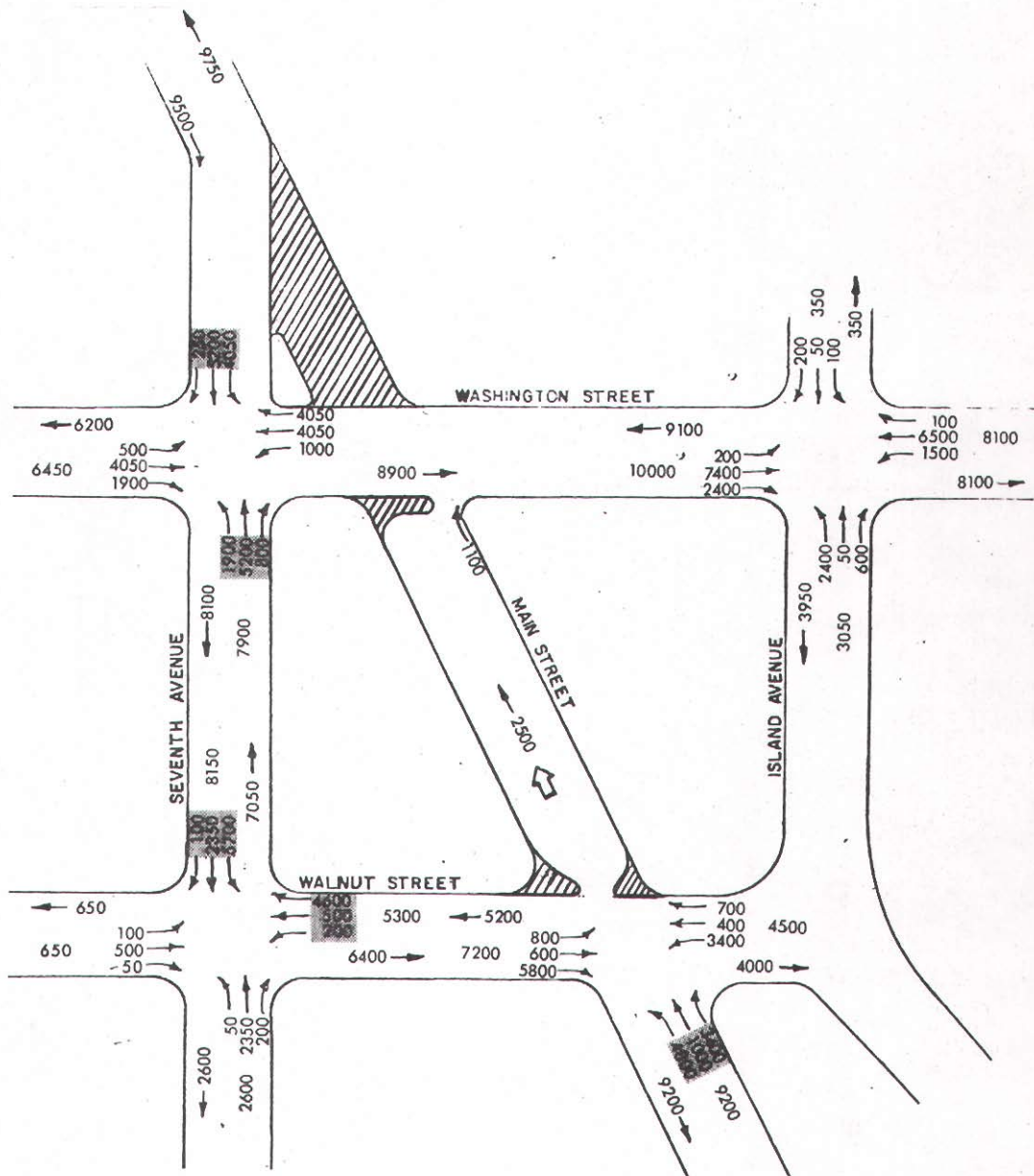
LEGEND

- ← xxx Average Daily Traffic Movement
- xxx Approach Operating at Level-of-Service D or E
- ▨ Roadway Pavement to be Removed



Figure 13

**ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 2
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981**



LEGEND

← xxx Average Daily Traffic Movement

→ xxx Approach Operating at Level-of-Service D or E

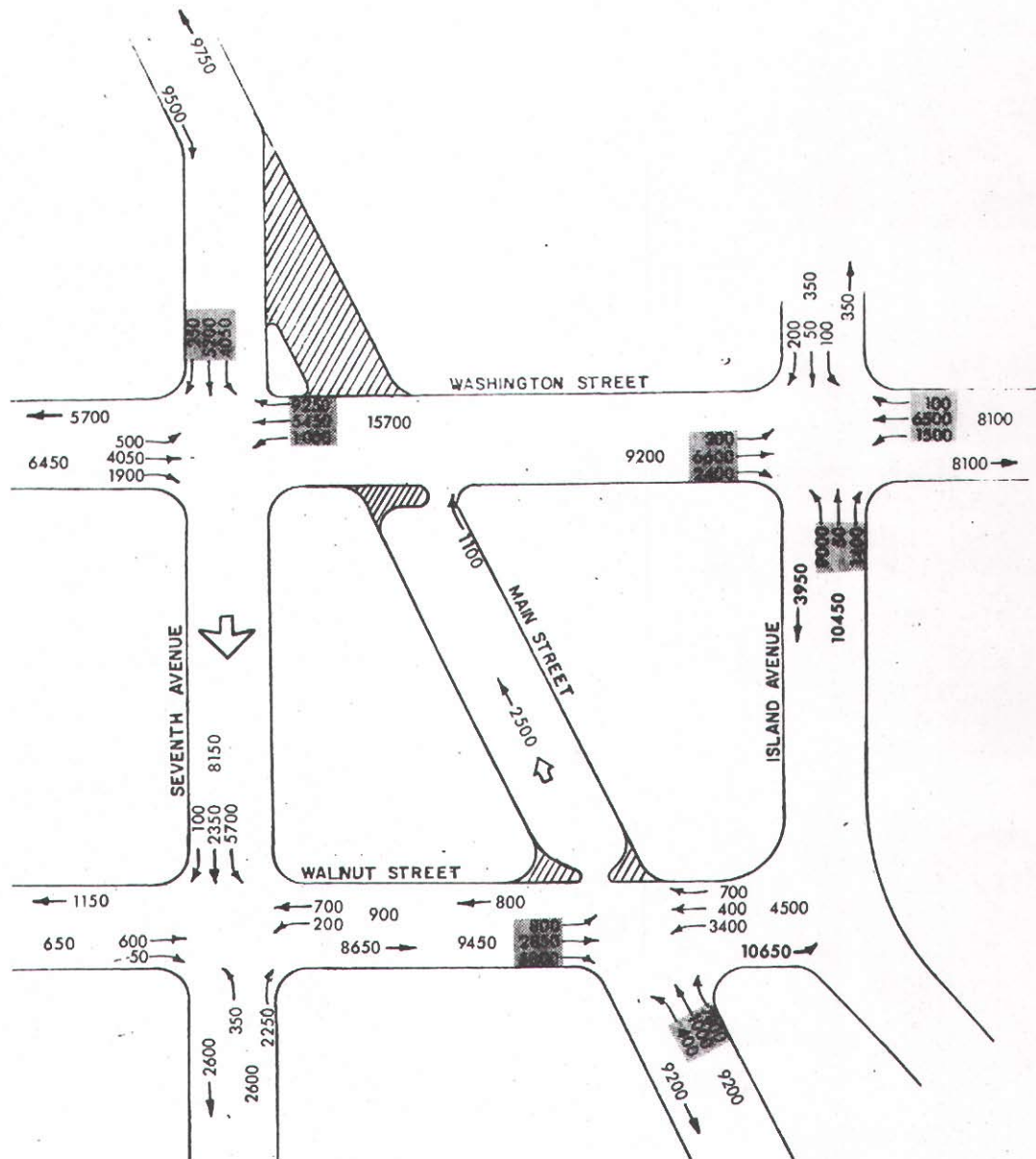
▨ Roadway Pavement to be Removed



NOT TO SCALE

Figure 14

ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 3
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981



LEGEND

← xxx Average Daily Traffic Movement

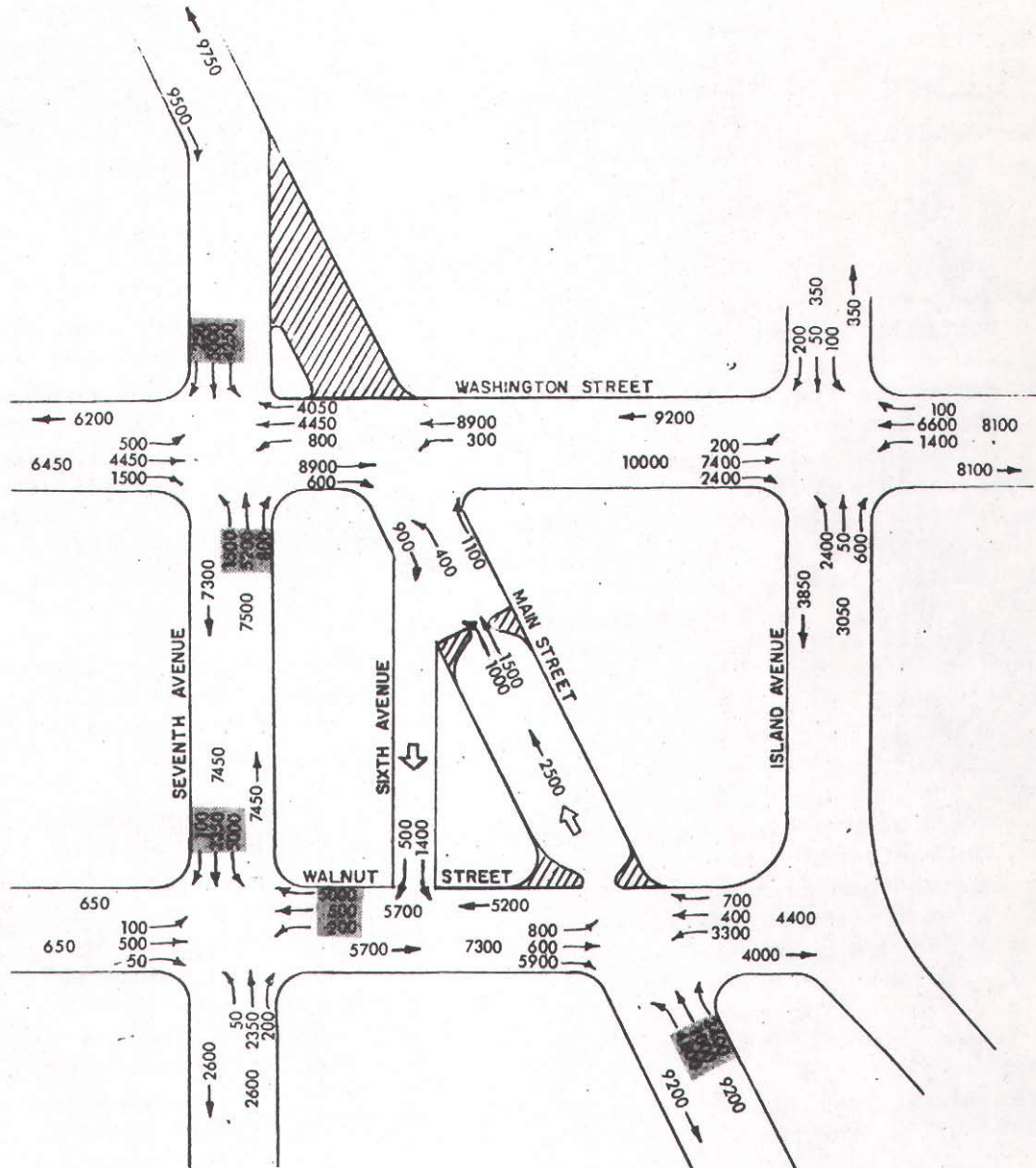
xxx Approach Operating at Level-of-Service D or E

/// Roadway Pavement to be Removed

NOT TO SCALE

Figure 15

**ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 4
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981**



LEGEND

← xxx Average Daily Traffic Movement

← xxx Approach Operating at Level-of-Service D or E

/// Roadway Pavement to be Removed



Washington Street and with equal emphasis placed on Island Avenue and Walnut Street/ Seventh Avenue as downtown bypass routes. However, Island Avenue would be officially signed as USH 45 (see Figure 16); and

6. The existing arterial system, with that segment of Main Street from Walnut Street northward to Washington Street reconstructed as a shopping mall with two-way vehicular traffic permitted, with the provision, however, of a right-turn-lane exit from Main Street onto Washington Street, and emphasis placed on the utilization of Island Avenue as a downtown bypass route through use of preferential traffic progression, signalization, signing, and exclusive turn lanes (see Figure 17).

Existing Conditions

The following description of the existing arterial street and highway system in the central business district, as shown in Figure 1, is provided to permit a comparison of the traffic-carrying efficiency and operating conditions of the existing system to the traffic-carrying efficiency and operating conditions of the six alternative arterial street systems described above. In 1981 average weekday traffic volumes on Main Street through the central business district ranged from a high of approximately 19,250 vehicles north of its intersection with Seventh Avenue to a low of 16,000 vehicles north of its intersection with Walnut Street. From 71 to 83 percent of the average weekday traffic on Main Street travels straight ahead through the intersections with Walnut Street and Washington Street. Washington Street exhibits the next highest traffic volumes of the arterial facilities in the central business district, ranging from a high of 16,200 vehicles east of Island Avenue to a low of 12,650 vehicles west of Seventh Avenue. Seventh Avenue, Walnut Street, and Island Avenue carry lower traffic volumes of about 5,800, 2,200, and 2,100 vehicles per average weekday, respectively.

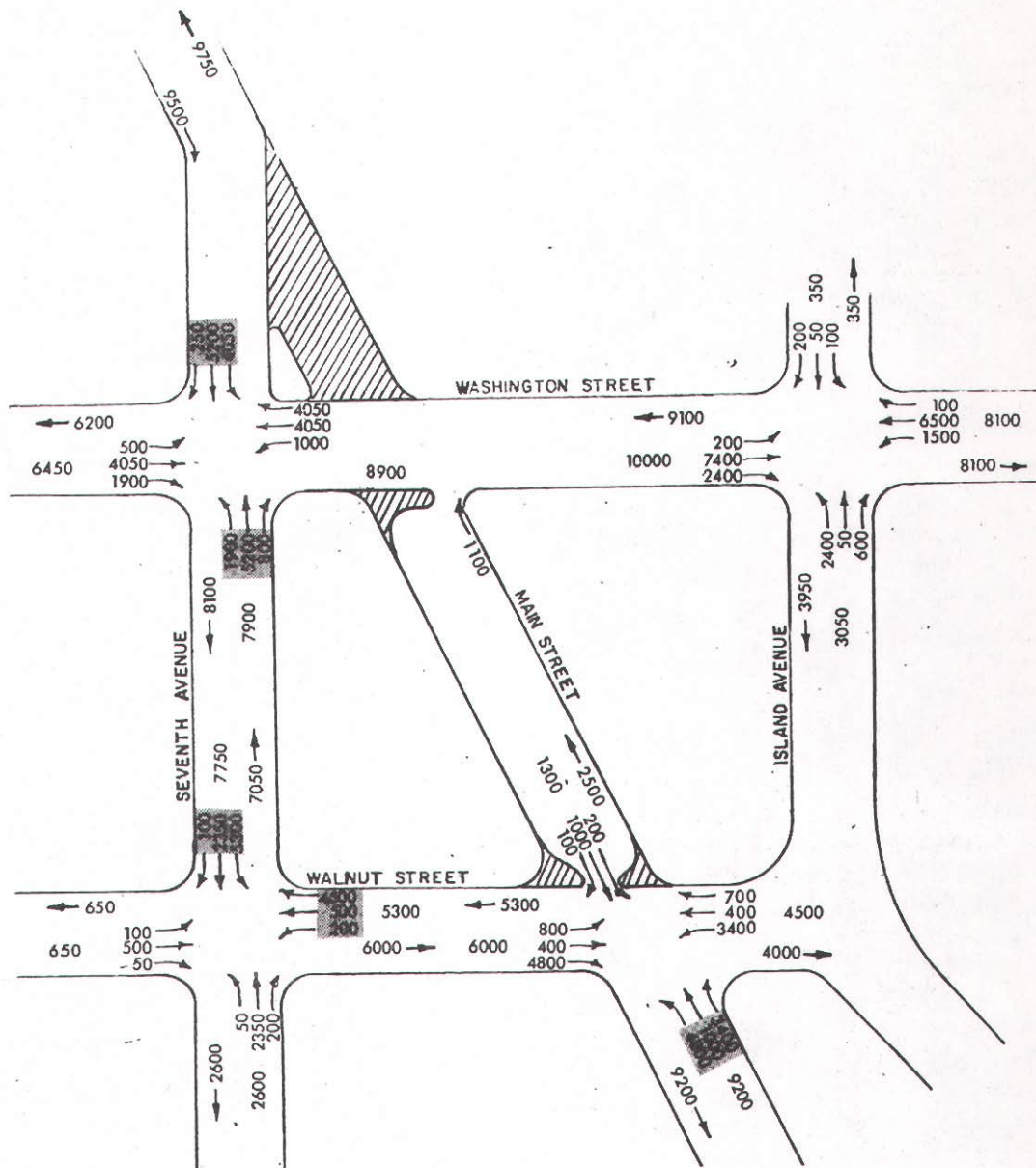
The northbound approach of Main Street to its intersection with Washington Street near the northern limits of the central business district exhibits traffic congestion approximating level-of-service E conditions during the evening peak hour. Level-of-service E operating conditions, as defined in the 1965 Highway Capacity Manual, occur when traffic volumes approach the traffic-carrying capacity of a roadway and are marked by unstable flow conditions, intolerable delays at principal intersections, and average travel speeds of approximately 15 miles per hour (mph). Vehicular travel on the existing arterial system totaled about 4.0 million vehicle miles per year in 1981 at an average weekday operating speed of 19.3 mph. It is estimated that, in 1981, the vehicles traveling over the existing arterial street system shown in Figure 1 consumed about 210,000 gallons of motor fuel per year and emitted about 256 tons of carbon monoxide and 19.4 tons of hydrocarbon pollutants per year.

Alternative Plan 1

The first alternative arterial street system plan--which is considered to serve as a preliminary phase to the implementation of one of the following five alternative arterial street system plans designed to accommodate the changes in traffic patterns which may be expected to accompany the implementation of the West Bend downtown redevelopment plan--basically entails closing off that segment of Main Street between Seventh Avenue and Washington Street to eliminate the short intersection spacing problem at the triangular intersection of Main Street with Washington Street and Seventh Avenue, as shown in Figure 12, and reconstructing that portion of Main Street as a 20-stall off-street parking facility. Implementation of this alternative would result in the rerouting of additional traffic onto that segment

Figure 16

ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 5
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981



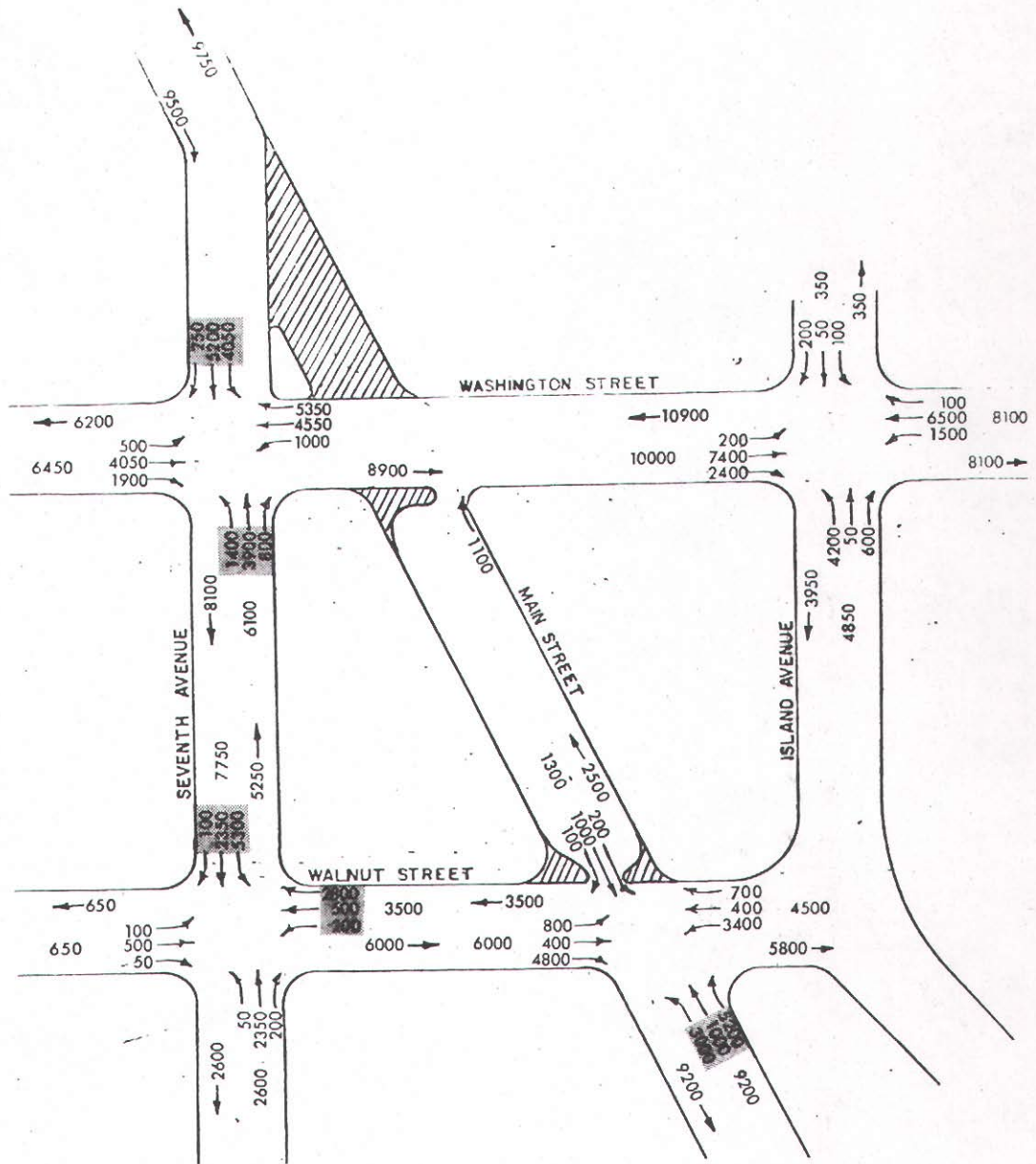
LEGEND

- ← xxx Average Daily Traffic Movement
- ← xxx Approach Operating at Level-of-Service D or E
- ▨ Roadway Pavement to be Removed



Figure 17

**ALTERNATIVE ARTERIAL STREET SYSTEM PLAN 6
TO ACCOMMODATE THE TRAFFIC CHANGES WHICH MAY BE
EXPECTED TO ACCOMPANY IMPLEMENTATION OF THE
WEST BEND DOWNTOWN REDEVELOPMENT PLAN: 1981**



LEGEND

← xxx Average Daily Traffic Movement

xxx Approach Operating at Level-
of-Service D or E

▨ Roadway Pavement to be Removed



of Seventh Avenue immediately north of Washington Street. This alternative should result in reducing the current average weekday traffic volumes on that segment of Main Street between Washington Street and Walnut Street from the existing 16,200 to 9,400 vehicles, or by about 42 percent. The 6,800 vehicle decrease on Main Street would result in an increase in traffic volumes on Seventh Avenue between Washington Street and Seventh Avenue of from 5,800 to 12,600 vehicles per average weekday, or of 117 percent. It would also increase traffic volumes on that segment of Walnut Street between Seventh Avenue and Main Street from the existing 2,200 to 9,000 vehicles per day, after which the diverted traffic would rejoin Main Street south of Walnut Street. The remaining arterial streets in the central business district should not experience a substantial change in traffic volume as a result of the implementation of this alternative.

Under this alternative system plan, the westbound approach of Walnut Street to Seventh Avenue and the southbound approach of Seventh Avenue to Walnut Street may be expected to exhibit traffic congestion, with level-of-service E operating conditions during the peak travel periods of an average weekday, while the northbound approach of Seventh Avenue to Washington Street, the westbound approach of Washington Street to Seventh Avenue, and the northbound approach of Main Street to Washington Street and to Walnut Street may be expected to exhibit traffic congestion at level-of-service D operating conditions during the peak travel periods of an average weekday. Level-of-service D operating conditions occur when traffic volumes exceed the design capacity of a roadway and are associated with unstable flow conditions, tolerable delays at principal intersections, and average operating speeds between 15 and 19 mph.

The implementation of this alternative arterial street system plan would result in an increase in vehicular travel on the existing arterial street system in the central business district--from 4.0 to 4.3 million vehicle miles per year in 1981--accompanied by a decrease in average vehicle operating speed of from 19.3 to 18.9 mph. Vehicles traveling on the alternative street system would consume about 233,000 gallons of motor fuel per year, an increase of about 23,000 gallons, or 11 percent, over the amount consumed on the existing system, and would emit about 282 tons of carbon monoxide and 21.5 tons of hydrocarbons per year in 1981, increases of 26 tons of carbon monoxide and 2.1 tons of hydrocarbons, or of 10 and 11 percent, respectively, over the levels emitted on the existing system.

Alternative Plan 2

The second alternative arterial street system plan designed to accommodate the changes in traffic patterns which may be expected to accompany the implementation of the West Bend downtown redevelopment plans consists of the closure of that segment of Main Street between Seventh Avenue and Washington Street--reconstructing that segment of Main Street as a 20-stall off-street parking facility as described under the first alternative--plus the closure of that segment of Main Street from Walnut Street to Washington Street and the reconstruction of that segment as a shopping mall with the restriction of vehicular through traffic, one-way northbound operation, and the provision of a northbound right-turn-lane exit from Main Street onto Washington Street, as shown in Figure 13. This alternative system plan would reroute vehicular traffic from the segment of Main Street between Walnut Street and Washington Street to Seventh Avenue and Island Avenue. Without traffic engineering actions to encourage vehicular traffic to use Island Avenue, 1981 traffic volumes on Seventh Avenue may be anticipated to increase from the existing 5,800 vehicles per average weekday to 16,000 vehicles per average weekday, or by about 176 percent, while traffic volumes on Island Avenue may be expected to increase from 2,100 to 7,000 vehicles per average weekday, or by 233 percent. This alternative system

may also be expected to increase traffic volumes on Washington Street from 16,000 to 19,100 vehicles, or by 19 percent, and on Walnut Street from 2,200 to 12,400 vehicles, or by 464 percent.

Under this alternative system plan, the westbound approach of Walnut Street to Seventh Avenue, the southbound and northbound approaches of Seventh Avenue to Washington Street, and the southbound approach of Seventh Avenue and Walnut Street may be expected to exhibit traffic congestion at level-of-service E operating conditions, while the northbound approach of Main Street at Walnut Street may exhibit traffic congestion at level-of-service D operating conditions during the peak travel periods of an average weekday. The remaining arterial street intersections in the central business district should operate at or above design capacity levels throughout the day.

Implementation of this alternative arterial street system plan would result in an increase in annual vehicular travel on the arterial street system in the central business district--from 4.0 to 4.7 million vehicle miles per year--accompanied by a decrease in average vehicle operating speed of from 19.3 to 17.5 mph. Vehicles traveling on this alternative arterial street system may be expected to consume about 265,000 gallons of motor fuel per year, an increase of 55,000 gallons, or 26 percent, over the amount consumed on the existing system and would emit about 326 tons of carbon monoxide and 24.9 tons of hydrocarbon pollutants per year in 1981, increases of 70 tons of carbon monoxide and 5.5 tons of hydrocarbons, or of 27 and 28 percent, respectively, over the levels emitted on the existing system.

Alternative Plan 3

The third alternative arterial street system plan designed to accommodate the changes in traffic patterns which may be expected to accompany the implementation of the West Bend downtown redevelopment plan consists of the closure of that segment of Main Street between Seventh Avenue and Washington Street as described under the first alternative, plus the closure of that segment of Main Street from Walnut Street to Washington Street and the reconstruction of that segment as a shopping mall, with the restriction of vehicular through traffic and one-way northbound operation, the provision of a northbound right-turn-lane exit from Main Street onto Washington Street, and the operation of Seventh Avenue as a one-way southbound arterial facility, as shown in Figure 14. This alternative system plan would result in the rerouting of vehicular traffic from the segment of Main Street between Walnut Street and Washington Street to Seventh Avenue and Island Avenue. It is anticipated that 1981 traffic volumes on Seventh Avenue would increase from the existing two-way volume of 5,800 vehicles to a one-way volume of 8,150 vehicles per average weekday, or by about 40 percent, while traffic volumes on Island Avenue would increase from 2,100 to 14,400 vehicles per average weekday, or by 585 percent. In addition, this alternative system would be expected to increase traffic volumes on Washington Street by from 16,000 to 24,900 vehicles, or by 56 percent, and on Walnut Street by from 2,200 to 10,250 vehicles, or by 365 percent. Because of the one-way southbound operation of Seventh Avenue, approximately 500 of the 2,900 vehicles per average weekday that would have traversed Seventh Avenue in a northbound direction may be expected to proceed westward on Walnut Street to Eighth Avenue, and northward on Eighth Avenue to Washington Street, where they would enter the traffic stream on Washington Street and resume their previous travel patterns. The remaining 2,400 vehicles that traversed Seventh Avenue would be expected to travel northbound on Island Avenue to Washington Street and then westbound on Washington Street to Seventh Avenue, where they would also resume their previous travel patterns.

Under this alternative system plan, the northbound approach of Island Avenue at Washington Street, the southbound approach of Seventh Avenue at Washington Street, the westbound approach of Washington Street at Seventh Avenue, the eastbound approach of Washington Street at Island Avenue, and the northbound approach of Main Street at Walnut Street may be expected to exhibit traffic congestion at level-of-service E operating conditions, while the eastbound approach of Walnut Street at Main Street and the westbound approach of Washington Street at Island Avenue would exhibit traffic congestion at level-of-service D operating conditions during the peak travel periods of an average weekday. The remaining arterial street intersections in the central business district may be expected to operate at or above design capacity levels throughout the day.

The implementation of this alternative arterial street system plan would result in an increase in annual vehicular travel on the arterial street system in the central business district--from 4.0 to 4.8 million vehicle miles per year in 1981--accompanied by a decrease in average vehicle operating speed of from 19.3 to 18.4 mph. Vehicles traveling on this alternative arterial street system may be expected to consume about 266,000 gallons of motor fuel per year, an increase of 56,000 gallons, or 27 percent, over the amount consumed on the existing system, and would emit about 324 tons of carbon monoxide and 24.8 tons of hydrocarbon pollutants per year in 1981, increases of 65 tons of carbon monoxide and 5.4 tons of hydrocarbons, or 26 and 28 percent, respectively, over the levels emitted on the existing system.

Alternative Plan 4

The fourth alternative arterial street system plan designed to accommodate the changes in traffic patterns which may be expected to accompany the implementation of the West Bend downtown redevelopment plan consists of the closure of that segment of Main Street between Seventh Avenue and Washington Street as described in the first alternative, plus the closure of that segment of Main Street from Walnut Street to Sixth Avenue and the reconstruction of that segment of Main Street as a shopping mall, with the restriction of vehicular through and one-way northbound operation. The northern segment of Main Street between Sixth Avenue and Washington Street would continue to operate as a two-way arterial facility, with the segment of Sixth Avenue between Walnut Street and Main Street designated as a one-way southbound arterial facility, as shown in Figure 15. This alternative system plan would result in the rerouting of vehicular traffic on the segment of Main Street designated as a shopping mall to Seventh Avenue, Sixth Avenue, and Island Avenue. Without traffic engineering measures designed to encourage vehicular traffic to travel on Island Avenue, it is anticipated that 1981 traffic volumes on Seventh Avenue would increase from the existing 5,800 to 15,100 vehicles per average weekday, or by about 160 percent; traffic volumes on Island Avenue would increase from 2,100 to 6,900 vehicles per average weekday, or by 228 percent; and traffic volumes on the segment of Main Street between Sixth Avenue and Washington Street would decrease from 16,200 to 2,400 vehicles per average weekday, or by about 85 percent. Traffic on Sixth Avenue between Main Street and Walnut Street would approximate 1,900 vehicles per average weekday. In addition, this alternative system may be expected to increase traffic volumes on Washington Street by from 16,000 to 19,200 vehicles, or by 20 percent, and on Walnut Street by from 2,200 to 12,500 vehicles, or by 468 percent.

Under this alternative system plan, the westbound approach of Walnut Street at Seventh Avenue and the southbound approaches of Seventh Avenue at Walnut Street and Washington Street may be expected to exhibit level-of-service E operating conditions, while the northbound approach of Seventh Avenue at Washington Street and the northbound approach of Main Street at Walnut Street may be expected to exhibit

level-of-service D operating conditions during the peak travel periods on an average weekday. The remaining arterial street intersections in the central business district should operate at or above design capacity levels throughout the day.

The implementation of this alternative arterial street system plan would result in an increase in annual vehicular travel on the arterial system in the central business district--from 4.0 to 4.8 million vehicle miles per year in 1981--accompanied by a decrease in average vehicle operating speed of from 19.3 to 18.3 mph. Vehicles traveling on this alternative arterial street system may be expected to consume about 265,000 gallons of motor fuel per year, an increase of 55,000 gallons, or 26 percent, over the amount consumed on the existing system, and would emit about 324 tons of carbon monoxide and 24.7 tons of hydrocarbon pollutants per year in 1981, increases of 68 tons of carbon monoxide and 5.3 tons of hydrocarbons, or of 26 and of 27 percent, respectively, over the levels emitted on the existing system.

Alternative Plan 5

The fifth alternative arterial street system plan designed to accommodate the changes in traffic patterns which may be expected to accompany implementation of the West Bend downtown redevelopment plan consists of the closure of that segment of Main Street between Seventh Avenue and Washington Avenue as described in the first alternative, plus the closure of that segment of Main Street from Walnut Street to Washington Street and the reconstruction of that segment as a shopping mall with two-way vehicular traffic permitted, the restriction of vehicular through traffic, and the provision of a northbound right-turn-lane exit from Main Street onto Washington Street, as shown in Figure 16. This alternative system plan is basically similar to Alternative 2 except that the proposed downtown mall on Main Street would be operated as a two-way facility. As in Alternative 2, implementation of this alternative would result in rerouting vehicular traffic on that segment of Main Street between Walnut Street and Washington Street to Seventh Avenue and Island Avenue. Without traffic engineering measures to encourage vehicular traffic to travel on Island Avenue, it is anticipated that 1981 traffic volumes on Seventh Avenue would increase from the existing 5,800 to 16,000 vehicles per average weekday, or by about 176 percent, while traffic volumes on Island Avenue would increase from 2,100 to 7,000 vehicles per average weekday, or by 233 percent. In addition, this alternative system may be expected to increase traffic volumes on Washington Street by from 16,000 to 19,100 vehicles, or by 19 percent, and on Walnut Street by from 2,200 to 11,300 vehicles, or by 414 percent.

Under this alternative system plan, the westbound approach of Walnut Street at Seventh Avenue, the northbound and southbound approaches of Seventh Avenue at Washington Street, the southbound approach of Seventh Avenue at Walnut Street, and the northbound approach of Main Street at Walnut Street may be expected to exhibit traffic congestion at level-of-service E operating conditions during the peak travel periods of an average weekday. The remaining arterial street intersections in the central business district should operate at or above design capacity levels throughout the day.

The implementation of this alternative arterial street system plan would result in an increase in annual vehicular travel on the arterial street system in the central business district--from 4.0 to 4.7 million vehicle miles per year in 1981--accompanied by a decrease in average vehicle operating speed of from 19.3 to 17.9 mph. Vehicles traveling on this alternative arterial street system may be expected to consume about 249,000 gallons of motor fuel per year, an increase of 39,000 gallons, or 19 percent, over the level consumed on the existing system, and would emit

about 321 tons of carbon monoxide and 24.5 tons of hydrocarbon pollutants per year in 1981, increases of 65 tons of carbon monoxide and 5.1 tons of hydrocarbons, or of 26 and 26 percent, respectively, over the levels emitted on the existing system.

Alternative Plan 6

The sixth alternative arterial street system plan designed to accommodate changes in traffic patterns which may be expected to accompany implementation of the West Bend downtown redevelopment plan consists of the closure of that segment of Main Street between Seventh Avenue and Washington Street as described in the first alternative, plus the closure of that segment of Main Street from Walnut Street to Washington Street, and the reconstruction of that segment as a shopping mall with two-way vehicular traffic permitted, and with the provision of a northbound right-turn-lane exit from Main Street onto Washington Avenue, as shown in Figure 17. The principal difference between this alternative and Alternative 5 is that traffic engineering measures would be used to encourage vehicular traffic diverted from Main Street to use Island Avenue. It is anticipated that 1981 traffic volumes on Island Avenue would increase from the existing 2,200 to 8,800 vehicles per average weekday, or by about 300 percent, while traffic volumes on Island Avenue would increase from 5,800 to 14,200 vehicles per average weekday, or by 245 percent. In addition, this alternative system may be expected to increase traffic volumes on Washington Street by from 16,000 to 20,900 vehicles, or by 30 percent, and on Walnut Street by from 2,200 to 9,500 vehicles, or by 330 percent.

Under this alternative system plan, the westbound approach of Walnut Street at Seventh Avenue, the southbound approaches of Seventh Street at Walnut Street and Washington Street, and the northbound approach of Main Street at Walnut Street may be expected to exhibit traffic congestion at level-of-service E operating conditions, and the northbound approach of Seventh Avenue at Washington Street may be expected to exhibit traffic congestion at level-of-service D operating conditions during peak travel periods on an average weekday.

The implementation of this alternative arterial street system plan would result in an increase in annual vehicular travel on the arterial street system in the central business district--from 4.0 to 4.7 million vehicle miles per year in 1981--accompanied by a decrease in average vehicle operating speed of from 19.3 to 18.3 mph. Vehicles traveling on this alternative arterial street system may be expected to consume about 246,000 gallons of motor fuel per year, an increase of 36,000 gallons, or 17 percent, over the amount consumed on the existing system, and would emit about 315 tons of carbon monoxide and 24.1 tons of hydrocarbon pollutants in 1981, increases of 59 tons of carbon monoxide and 4.7 tons of hydrocarbons, or of 23 and 24 percent, respectively, over levels emitted on the existing system.

CONCLUSION AND RECOMMENDATIONS

As indicated in Table 7, the comparative evaluation of the existing arterial street system and of six alternative arterial street system plans designed to accommodate the changes which may be expected to accompany implementation of the West Bend downtown redevelopment plan indicated that the existing arterial street system is the most efficient system, having the lowest overall annual vehicle miles of travel--4.0 million; the highest average vehicle operating speed--19.3 mph; the least number of congested intersection approaches, with only the northbound approach of Main Street to Washington Street exhibiting level-of-service E operating conditions during the peak travel periods of the day; the lowest annual motor fuel

Table 7

**IMPACT OF EXISTING AND ALTERNATIVE ARTERIAL STREET SYSTEM PLANS
ON VEHICULAR TRAFFIC OPERATING CONDITIONS, MOTOR FUEL CONSUMPTION,
AND AIR QUALITY IN THE WEST BEND CENTRAL BUSINESS DISTRICT: 1981**

Arterial Street Systems	Annual Vehicle Miles Traveled (millions)	Average Weekday Operating Speed (mph)	Number of Congested Intersection Approaches			Motor Fuel Consumption (gallons per year)	Emissions (tons per year)	
			Level of Service D	Level of Service E	Total		Carbon Monoxide	Hydrocarbons
Existing System	4.0	19.3	--	1	1	210,000	256	19.4
Alternative Plan 1	4.3	18.9	4	2	6	233,000	282	21.5
Alternative Plan 2	4.7	17.5	1	4	5	265,000	326	24.9
Alternative Plan 3	4.8	18.4	2	5	7	266,000	324	24.8
Alternative Plan 4	4.8	18.3	2	3	5	265,000	324	24.7
Alternative Plan 5	4.7	17.9	0	5	5	249,000	321	24.5
Alternative Plan 6	4.7	18.3	1	4	5	246,000	315	24.1

consumption--210,000 gallons per year; and the lowest air pollutant emissions--256 and 19.4 tons per year of carbon monoxide and hydrocarbons, respectively.

Table 6 indicates that Alternative Plans 2 through 6 all may be expected to increase the vehicle miles of travel on the arterial street system of the central business district, the increase ranging from a high of 800,000 vehicle miles for Alternatives 3 and 4 to a low of 300,000 vehicle miles for Alternative 2, or increases of from about 8 to 20 percent. Alternative Plans 2 through 6 may also be expected to reduce operating speeds on the arterial street system serving the central business district by from 0.4 to 1.8 mph, or by from 2 to 9 percent; to increase the total number of intersection approaches operating under congested capacity conditions by from four to six approaches; to increase annual motor fuel consumption by from 36,000 to 56,000 gallons per year, or by from 16 to 27 percent; to increase carbon monoxide emissions by from 59 to 70 tons per year, or by from 23 to 27 percent; and to increase hydrocarbon emissions by from 4.7 to 5.5 tons per year, or by from 24 to 28 percent.

It is apparent from the data summarized in Table 7 that Alternative Plan 1 is the most efficient system outside of the existing system. In order to accommodate the development of a downtown mall, the construction of Alternative Plan 1 has been initiated by the City of West Bend. This plan proposes the closing of that segment of Main Street between Washington Street and Seventh Avenue, utilizing that segment as a 20-space off-street parking facility. Without the implementation of any other alternative system plans, the implementation of this plan should serve to reduce existing traffic volumes on Main Street through the proposed downtown shopping mall between Walnut Street and Washington Street from the 1981 level of 16,000 vehicles per average weekday to 9,400, a 41 percent reduction. This reduction in traffic volume will, however, be accompanied by a 300,000-vehicle-mile increase in vehicle miles per year. This increase is due to the necessary diversion of traffic from Main Street to Seventh Avenue and Walnut Street. Implementation of this plan may also be expected to increase existing traffic congestion from one intersection approach to six intersection approaches operating at level-of-service D or E; increase motor fuel consumption from 210,000 gallons per year to 233,000 gallons per year, an increase of 23,000 gallons per year; and increase air pollution emissions from 256 to 282 tons of carbon monoxide per year, and from 19.4 to 21.5 tons of hydrocarbons per year. Average vehicular travel speeds may be expected to be reduced from 19.3 mph to 18.9 mph on the arterial system of the West Bend central business district.

The implementation of Alternative Plan 1 alone will not, however, accommodate the desired downtown shopping mall. Accordingly, it is recommended that upon construction of the proposed shopping mall on a segment of Main Street in the West Bend central business district, Alternative 6 be implemented. Alternative 6 includes the implementation of Alternative 1--the closure of that segment of Main Street between Washington Street and Seventh Avenue and its attendant reconstruction as an off-street parking facility--plus the closure of Main Street from Walnut Street to Washington Street and the reconstruction of that segment as a shopping mall with two-way operation permitted, the restriction of vehicular through traffic, the provision of a northbound right-turn-lane exit from Main Street onto Washington Street, and the implementation of such traffic engineering measures as signing, preferential traffic progression, exclusive turn lanes, and signalization to encourage those vehicles diverted from Main Street to use Island Avenue.

Of Alternative Plans 2 through 6, Alternative 6 is expected to exhibit the lowest increases in annual motor fuel consumption and vehicular air pollutant emissions,

and in annual vehicle miles of travel and number of congested intersections. Alternative 6 is also expected to have the second highest average vehicle operating speed of Alternatives 2 through 6. Clearly, implementation of Alternative 6--which includes Alternative 1--must be justified on the basis of community benefits other than improved traffic flow, benefits that are largely intangible such as the support of the preservation, enhancement, and revitalization of the land uses comprising the central business district of the City. Upon the reconstruction of Main Street as a shopping mall and the implementation of Alternative 6 to accommodate the changes in traffic patterns which may be expected to accompany the West Bend downtown redevelopment plan, it is recommended that a transportation system management plan be prepared for the arterial street and highway system in the West Bend area. Such a study would include an analysis of the arterial street system in the central business district and recommendations on how to improve vehicular operating conditions and reduce traffic congestion levels which may be expected to occur as a result of the creation of the downtown mall. The Regional Planning Commission would be willing to assist the City, on request, in the conduct of such a study of low-cost traffic engineering improvements after traffic pattern changes from implementation of the downtown redevelopment plans have had an opportunity to stabilize and redistribute themselves on the arterial street system in the West Bend central business district.