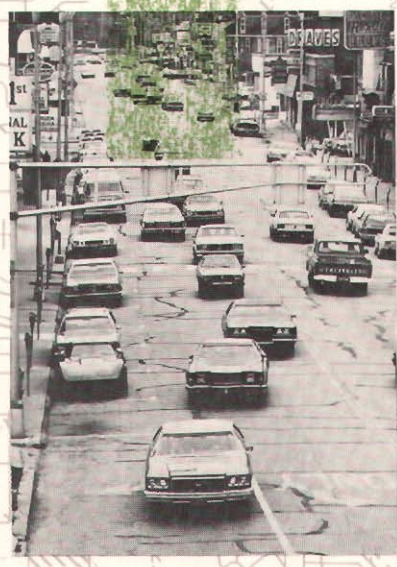
COMMUNITY ASSISTANCE
PLANNING REPORT NO. 28

OCONOMOWOC AREA TRAFFIC MANAGEMENT PLAN



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Special acknowledgement is due Mr. Donald H. Jorgensen, District Traffic Engineer, Wisconsin Department of Transportation, District 2, and Dr. Donald S. Berry, Professor Emeritus, Northwestern University, Department of Civil Engineering, for their contributions to the conduct of this study.

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 28

OCONOMOWOC AREA TRAFFIC MANAGEMENT PLAN

CITY OF OCONOMOWOC
WAUKESHA COUNTY, WISCONSIN

Prepared by the

Southeastern Wisconsin Regional Planning Commission
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December 1979

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SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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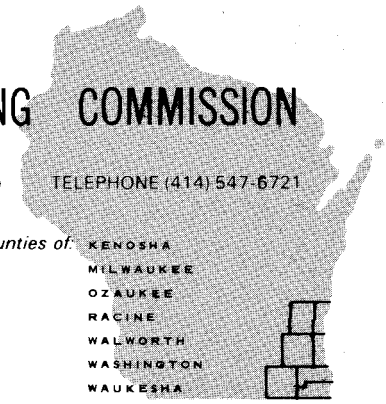

December 28, 1979

The Honorable Florence G. Whalen, Mayor
and Members of the Common Council
of the City of Oconomowoc
City Hall
174 E. Wisconsin Avenue
Oconomowoc, Wisconsin 53066

Ladies and Gentlemen:

In October 1978 the Common Council of the City of Oconomowoc requested the Regional Planning Commission to assist the City in the conduct of a study looking to the abatement of the traffic congestion and safety problems existing in the City. A Citizens and Technical Advisory Committee was created to work with the Commission staff in the development of the desired solutions to these problems, which were to emphasize short-range, low-cost improvements to increase the operating efficiency and safety of the community's arterial street and highway system.

The Committee and Commission staff have now completed and are pleased to transmit herewith this report setting forth a traffic management plan for the Oconomowoc area. The plan is based upon a careful inventory of the existing transportation system operating conditions; an analysis of those conditions to identify the location and severity of existing traffic congestion, arterial service, parking, and traffic accident problems in the Oconomowoc area; the preparation of alternative low-cost traffic engineering, regulatory, and traffic management actions to solve or mitigate the identified problems; the identification and recommendation for adoption of the best measures from among the alternatives considered; and a determination of the level and agency of government which should assume responsibility for implementing each recommended action, together with an identification of any eligible federal aids for the recommended actions.

The findings and recommendations contained in this report are the result of more than a year of intensive study by the Advisory Committee, which unanimously recommends the adoption and implementation of the plan presented in this report. Such adoption and implementation would, in the Committee's opinion, abate traffic congestion, reduce travel time and costs, improve air quality, conserve motor fuel, and reduce accident exposure in the Oconomowoc area.

The recommendations contained in this traffic management plan, while designed to effect significant improvements in the operation of the existing arterial street and highway system, should not be expected to eliminate the ultimate need for the construction of certain new transportation facilities in the Oconomowoc area as recommended in the adopted long-range regional transportation system plan. Traffic volumes may be expected to continue to increase in the City of Oconomowoc as population and economic activity in the area continue to grow; and in light of this increase, the type of traffic management actions recommended in this report cannot serve as long-term substitutes for the provision of the additional traffic capacity ultimately required. It is, therefore, also recommended that the City act to adopt the regional transportation system plan for the year 2000 as a guide to future transportation system improvement in the Oconomowoc area, and act to reserve the right-of-way required for the improvements envisioned in that plan.

This report and plan are respectfully submitted on behalf of the Committee for your careful consideration and action. The Committee and the Commission staff stand ready to meet with the Common Council, should the Council so desire, to discuss the findings and recommendations of the study and, should the plan be adopted as recommended, to assist the City in its implementation of the plan over time.

Respectfully submitted,

Kurt W. Bauer
Executive Director

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Chapter I

INTRODUCTION

A traffic management plan may be defined as a series of recommended traffic engineering actions which are intended to provide for the safer and more efficient operation of a community's existing transportation system. A traffic management plan is intended to focus on short-range solutions to existing traffic-related problems through the application of operational traffic engineering techniques such as intersection control devices, traffic routing, and traffic regulations. A traffic management plan is intended to resolve existing traffic problems without resorting to major capital investments in new transportation facilities or major improvements to existing facilities. A traffic management plan should be set within the context of an ongoing traffic engineering process that can assess traffic problems as they occur and as existing traffic conditions and travel patterns change. The plan should periodically be revised to reflect changing conditions so that the safety and efficiency of the existing transportation system will be maintained at the highest possible level.

A traffic management plan should also be set within the context of a long-range transportation system plan for the area concerned. The long-range transportation system plan provides recommendations for the development of the existing transportation system to meet probable future, as opposed to existing, transportation needs. The capacity that can be effectively obtained from an existing system through transportation system management has a definite limit. Similarly, the attenuation of travel demand that can be obtained from such management has a definite limit. When the increased travel attendant to the continued development of an area exceeds these limits, a major expansion of the capacity of the transportation system will become necessary, requiring significant capital investment in the construction of new facilities or in the reconstruction of existing facilities. Accordingly, the improvements set forth in a traffic management plan should serve to facilitate the ultimate implementation of the long-range transportation system plan. Importantly, the actions recommended in the traffic management plan should not foreclose implementation of the recommendations contained in the area's long-range transportation system plan when the practical limits of traffic management are reached and such implementation becomes necessary.

BACKGROUND

Over the past several years, local elected officials, businessmen, and residents of the City of Oconomowoc have become increasingly concerned with the level of traffic congestion within the City. This congestion is reported to be most noticeable during the weekday morning and evening peak travel periods, and on Friday and Sunday evenings during the summer recreational travel season. The problems associated with this congestion are considered by these community representatives to occur along much of the length of both Wisconsin Avenue (STH 16) and Summit Avenue (STH 67). These two highways are the principal east-west and north-south arterial routes traversing the City and, as such, serve a major proportion of through, as well as local, traffic in the City.

Based upon this perceived traffic congestion a committee of city officials and community representatives decided to seek traffic engineering assistance for the development of a comprehensive traffic management plan to ameliorate existing traffic problems. (The members of this committee are listed in Appendix A.) On August 11, 1978, this committee met with staff representatives of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) to discuss the perceived traffic-related problems currently affecting the City, and to request the Commission's assistance in undertaking a study to improve traffic operations. On September 22, 1978, a second meeting between the committee and the Commission staff was held. During this meeting, the Commission staff conveyed the Commission's willingness to assist the City of Oconomowoc in a traffic management planning study and presented a suggested study format for the committee's review.

Following this second meeting, a resolution dated October 3, 1978, was adopted by the City of Oconomowoc Common Council, formally requesting the Commission to assist the City in the

conduct of a traffic management planning study (see Appendix B). This report presents the findings and recommendations resulting from that study.

STUDY PURPOSE

This traffic management planning study has five interrelated purposes. These purposes are:

1. To establish a set of objectives, supporting principles, and planning standards through which existing traffic problems can be identified and alternative solutions evaluated;

2. To identify the location and the severity of existing traffic problems in the City of Oconomowoc;

3. To determine the causes of these traffic problems;

4. To develop a plan of recommended low-cost traffic engineering, management, regulatory, and operational improvements that could be made to the existing transportation system, thereby improving the safety and efficiency of the system; and

5. To provide a framework within which a continuing program of traffic management could be conducted by the City.

It should be noted that implementation of the traffic management measures recommended herein, while abating existing problems, should not be expected to eliminate the ultimate need for capital investments in the construction of new or the major reconstruction of existing transportation facilities as recommended for the Oconomowoc area in the adopted transportation system plan for the Southeastern Wisconsin Region. Traffic volumes may be expected to continue to increase in the City of Oconomowoc area as the area grows. In light of this increase, the traffic management actions recommended in this planning report cannot serve as long-term substitutes for providing the additional traffic capacity ultimately required. The traffic management plan provides a series of recommended improvements that are intended to make the most efficient use practicable of the traffic capacity available on the City's existing street and highway system, until such time as additional warranted capacity can be provided through capital-intensive construction or reconstruction projects. As future changes in traffic conditions may dictate, the data upon which the improvements recommended in this planning report are based should be reviewed and any modifications necessary should be made in the recommended traffic management actions that comprise this plan.

STUDY AREA

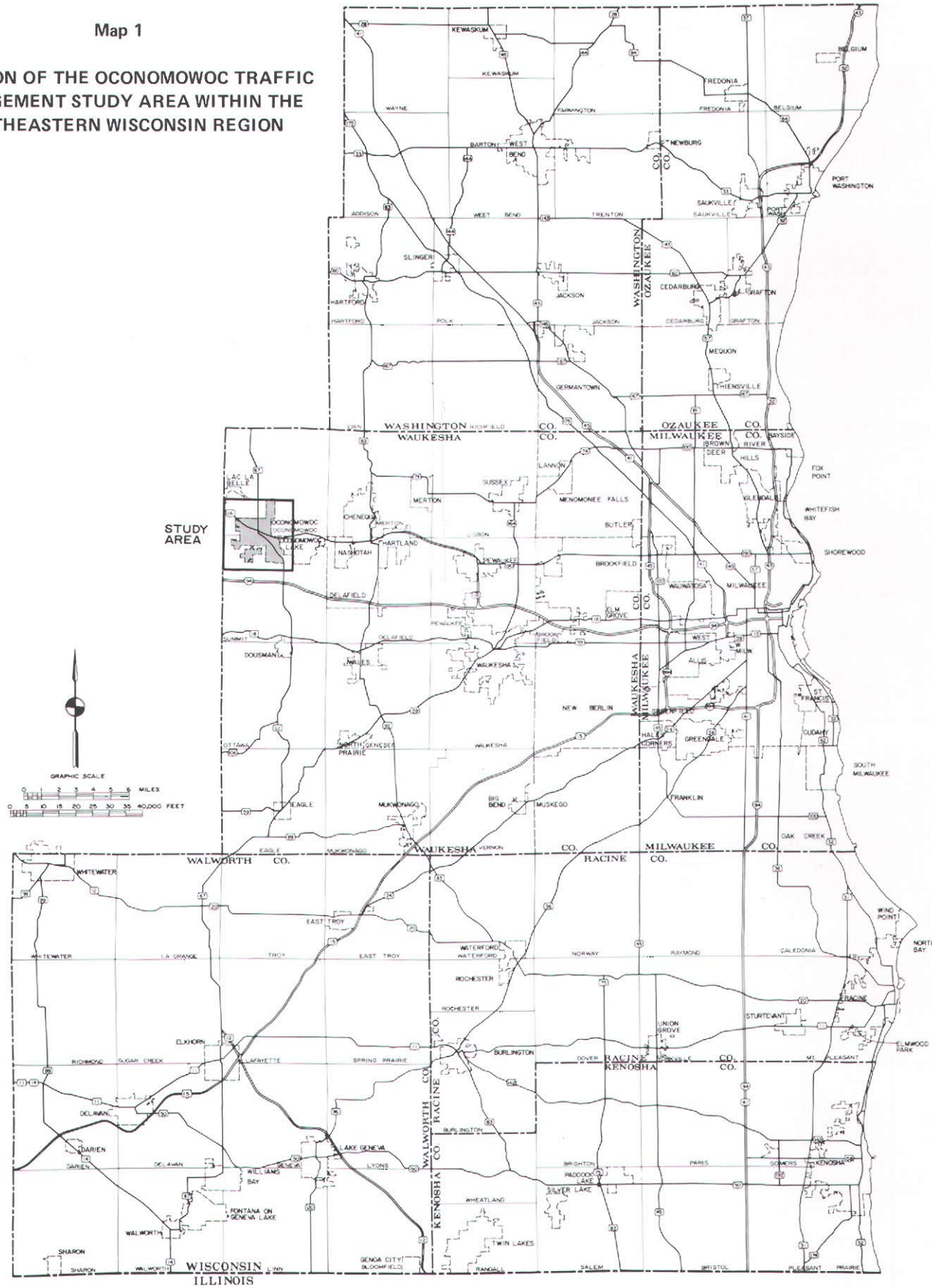
The City of Oconomowoc and the Oconomowoc Traffic Management Study area are located in northwestern Waukesha County (see Map 1) approximately 12 miles west of the western edge of the Milwaukee urbanized area. The geographic area covered in this study includes all of the 5.49-square-mile area within the corporate boundaries of the City of Oconomowoc and, in addition, the immediate environs (see Map 2). The central business district of the City is situated immediately adjacent to Lac La Belle and Fowler Lake, with STH 67, one of the principal arterial facilities serving the City, leading from the City's central business district area northerly across the narrow isthmus between the two lakes.

In 1978 the resident population of the City of Oconomowoc was estimated at 10,800 persons, an increase of about 2,000 persons, or about 23 percent, over the 1970 population level. Waukesha County, and particularly the area of the County within which the City of Oconomowoc is located, is experiencing rapid population growth and urbanization. This growth and urbanization is evidenced by the rapid increase in the number of motor vehicles registered in the City of Oconomowoc. In 1978 there were about 8,200 motor vehicles registered within the City of Oconomowoc, an increase of about 2,900 vehicles, or about 55 percent, over the number registered in 1970.

The City of Oconomowoc's existing transportation system, as of January 1, 1978, consisted of 42.30 miles of streets, of which 9.78 miles, or about 23 percent, were arterial streets; 2.69 miles, or about 7 percent, were collector streets; and 29.83 miles, or about 70 percent, were land access streets. In addition to the street and highway system, the City of Oconomowoc is served by the Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road), which is located along the south side of the City's central business district, which provides rail freight service to the industries located in the City, and over which passenger trains of the National Railroad Passenger Corporation (AMTRAK) are routed; Wisconsin Coach Lines—

Map 1

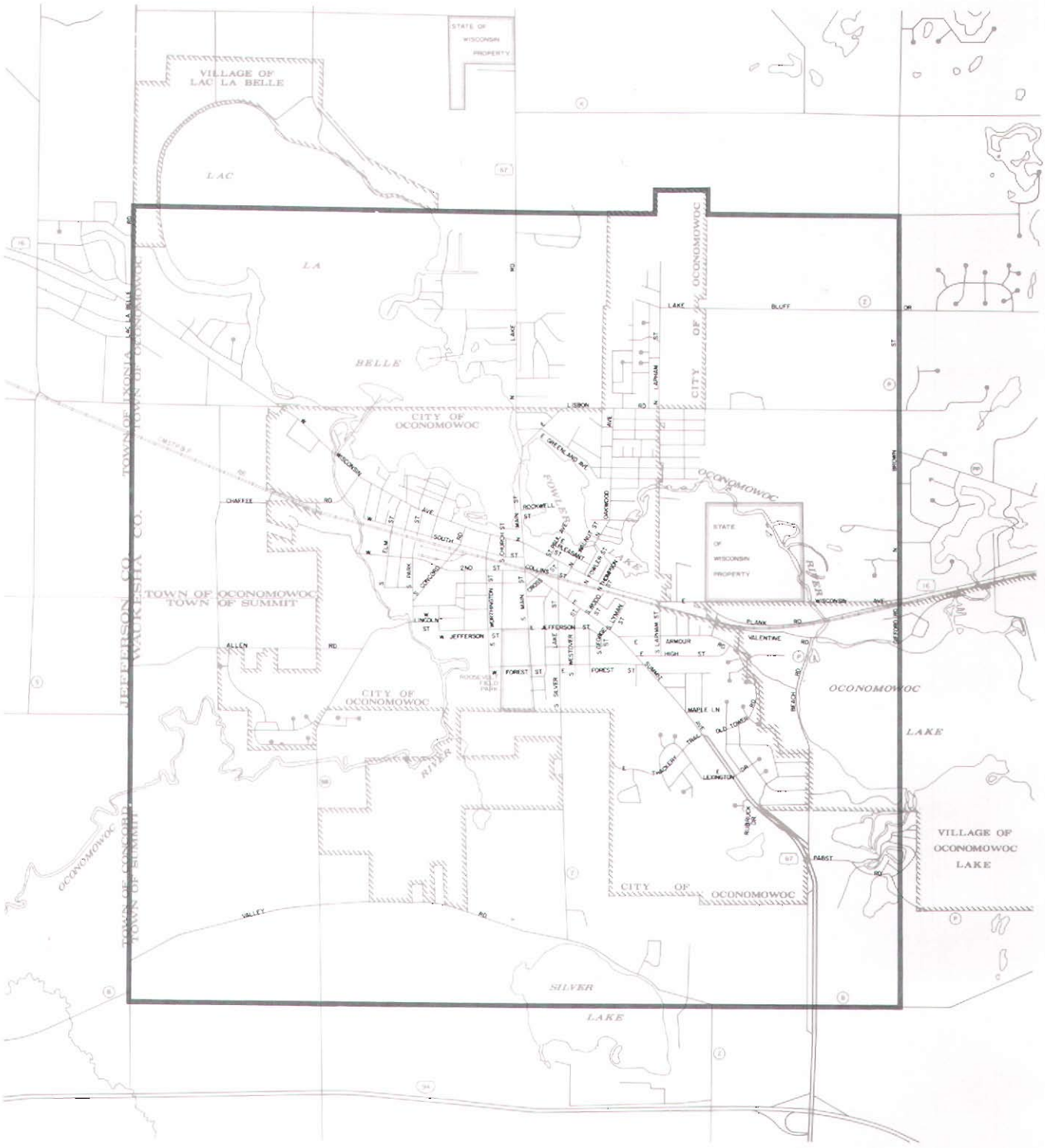
LOCATION OF THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA WITHIN THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Map 2

OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA



Source: SEWRPC.

Waukesha, Inc., which provides commuter mass transit service to the Milwaukee urbanized area; and Greyhound Bus Lines, Inc., which provides intercity bus service to Watertown and Madison.

STUDY ORGANIZATION

This study was conducted by the Commission staff with the assistance of the staff of the Wisconsin Department of Transportation, District 2, Traffic Section. Assisting the staff in the conduct of the study was a 24-member joint citizen and technical advisory committee created by the Mayor of the City of Oconomowoc. This committee was charged with the responsibility of directing the course of the study and reviewing and approving the information and recommendations contained in this report. A listing of committee members is provided in Appendix C.

FORMAT OF REPORT PRESENTATION

This planning report consists of eight chapters. Chapter I, "Introduction," briefly discusses the actions that led to the conduct of the City of Oconomowoc traffic management study, the intended purpose of the study, the geographic area covered by the study, and the organization for the study. Chapter II, "Existing Street and Highway System," presents a description of the street and highway system as it currently exists in the study area. This chapter also includes a description of the major traffic generators in the study area, which influence the quantity and pattern of traffic; the location, function, and physical characteristics of the existing street and highway system; and the current system of traffic control devices. Chapter III, "Existing Traffic Conditions," provides a description of the operational characteristics of the street and highway system in the study area. This chapter also includes an analysis of traffic origins and destinations, an analysis of existing traffic volumes and movement, and data on average vehicle speeds and street intersection delays. Chapter IV, "Objectives, Principles, and Standards," sets forth a set of objectives along with the supporting principles and standards to be used to identify existing traffic problems in the Oconomowoc study area and evaluate recommended traffic management actions to be applied to the existing transportation system. Chapter V, "Existing Traffic Problems," identifies and describes the various traffic problems affecting the study area. Chapter VI, "Analysis and Recommendations," provides an analysis of the causes of the traffic problems and recommends a series of traffic management actions to improve traffic operations on the existing street and highway system. Chapter VII, "Implementation," sets forth the procedures, responsible agencies, and potential funding sources for implementing the traffic management actions recommended in Chapter VI. Finally, Chapter VIII, "Summary," provides a summary of the significant findings and recommendations of the transportation system management study.

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Chapter II

EXISTING STREET AND HIGHWAY SYSTEM

INTRODUCTION

Reliable, basic engineering data, collected on a uniform, areawide basis, are essential to the analysis and formulation of sound traffic management plans. Consequently, a definitive inventory of the existing street and highway system becomes the first operational step in the traffic management planning process. Information concerning the existing system is required, both for the identification of existing traffic problems and for the design and evaluation of alternative traffic management actions to solve or mitigate the identified problems. The sound formulation of a traffic management plan requires that data be obtained about the location, configuration, and capacity of the existing street and highway system and about those factors which directly affect the operation of that system. These factors include land use, topography, street and highway classification systems, and the physical characteristics of each of the arterial facilities comprising the total system, as well as traffic control measures which affect the flow and traffic-carrying capacity of that system.

EXISTING LAND USE AND TOPOGRAPHY INFLUENCING THE STREET AND HIGHWAY SYSTEM

Generalized Land Use

Traffic generation and traffic patterns are, in part, a function of land use. The type, intensity, and location of land use in a community determine, to a considerable extent, the number of trips generated in and attracted to the various subareas of the community. An inventory of existing land use is required to understand the relationships between land use and existing travel demand. For planning purposes, land uses can be classified under urban and rural categories. Urban land uses include residential uses, including areas under development for such uses; commercial uses; industrial uses, including manufacturing, wholesaling, and storage; transportation uses, including streets and highways and off-street parking areas of more than 10 spaces; communication and utility uses; governmental and institutional uses; and recreational uses. Rural uses include agricultural uses and open lands, including woodlands, wetlands, and surface water.

Map 3 shows the land use identified in the Oconomowoc study area under the Commission's 1975 land use inventory. The land area of the Oconomowoc study area totals 8,900 acres, or about 14 square miles. An additional 1,500 acres, or about two square miles, of lakes, rivers, and streams are also included in the study area. Urban land uses account for 5.5 square miles, or about 34 percent (see Table 1), of the total study area. Of this 5.5 square miles, residential land uses comprise the major portion, accounting for approximately three square miles, or about 52 percent, of the total urban land uses, and about 18 percent of the total study area. When combined, commercial, industrial, and governmental and institutional uses comprise 0.5 square mile, or about 10 percent, of the total urban land uses, and about 3 percent of the total study area. The rural land uses within the study area constitute approximately 10.5 square miles, or about 66 percent, of the total study area.

Table 1

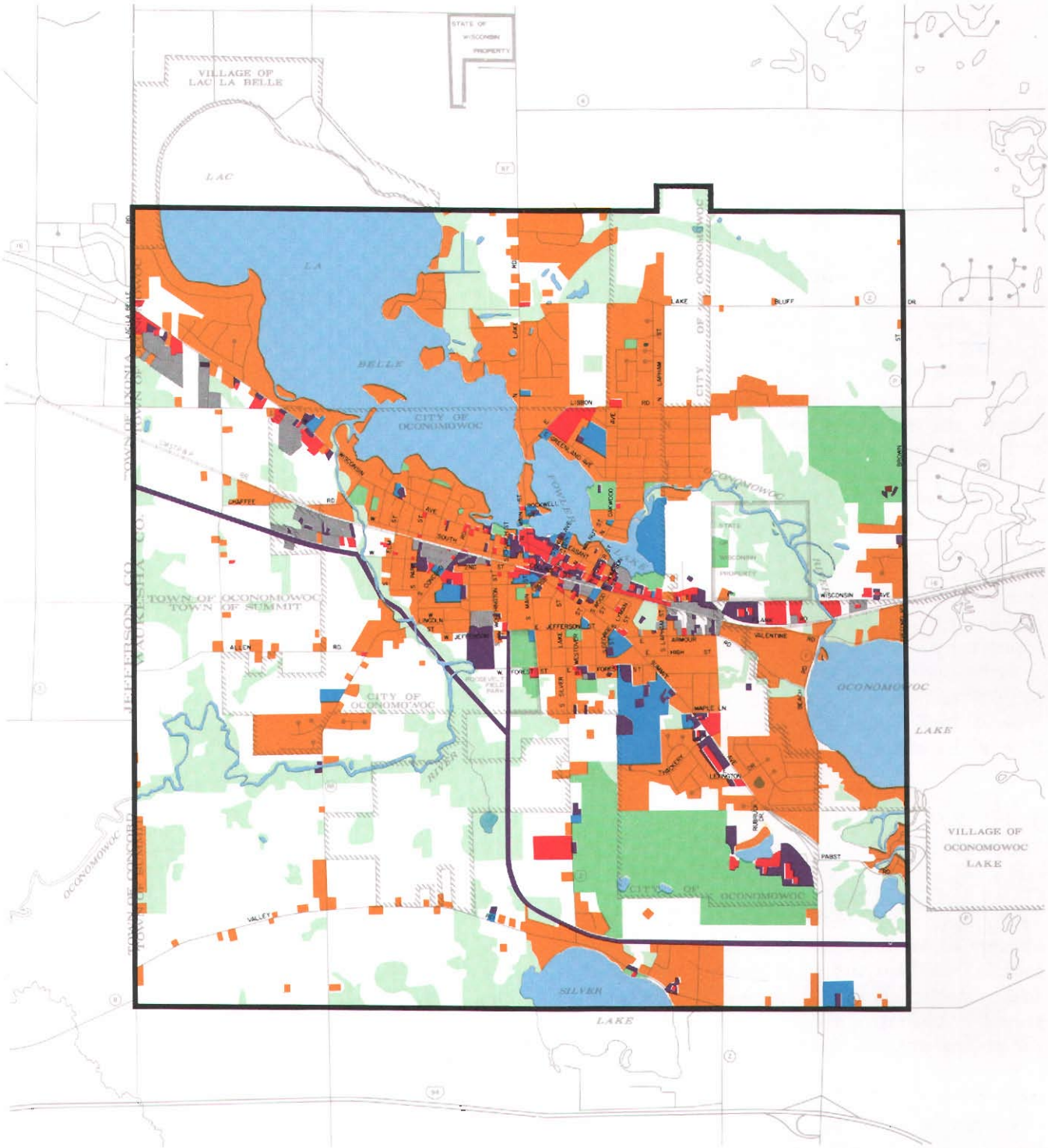
DISTRIBUTION OF LAND USE IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1975

Major Land Use Category	Acres	Percent	
		Land Use Category	Total Study Area
Urban			
Residential	1,817	51.7	17.5
Commercial	127	3.6	1.2
Industrial	82	2.3	0.8
Governmental/Institutional	139	4.0	1.3
Transportation	793	22.6	7.7
Recreational	554	15.8	5.3
Subtotal	3,512	100.0	33.8
Rural			
Agricultural and Open Lands	3,718	54.2	35.8
Woodlands and Wetlands	1,682	24.5	16.2
Surface Water	1,461	21.3	14.1
Subtotal	6,861	100.0	66.2
Total	10,373	--	100.0

Source: SEWRPC.

Map 3

LAND USE IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1975



Source: SEWRPC.

Several important observations concerning the study area's character and development can be drawn from the land use data. First, residential, commercial, and industrial development in the study area is concentrated in the City of Oconomowoc. Secondly, the City is surrounded by agricultural and open lands which are relatively free of urban development. Since the majority of the study area's urban land use and its associated concentrated traffic movements are located within the City of Oconomowoc, the traffic management plan should concentrate on the existing traffic problems identified within this more densely developed area and on the major traffic generators in this area.

Major Traffic Generators: The major trip generators in the Oconomowoc area may be identified as concentrations of commercial, governmental and institutional, and industrial land uses, which together account for 348 acres, or 10 percent, of the total developed urban land in the Oconomowoc study area. Table 2 lists, and Map 4 shows, the location of the major public and private employment centers and of the elementary, junior, and senior high schools in the study area. (Table 2 includes the names of the employer or school, the total number of employees or students at the facility, and the work or school starting and dismissal times.) For the purpose of this study, a major public or private employment center is defined as one which provides 100 jobs or more. The entire area encompassed by the central business district of the City of Oconomowoc is classified as a major traffic generator based on the types and intensity of land use in this area. Therefore, no attempt was made to identify each separate employer in the central business district. As shown on Map 4, in addition to the Oconomowoc central business district and the elementary, junior, and senior high schools, there are eight major public or private employment centers in the Oconomowoc study area.

Off-Street Public Parking: Another land use which directly affects the operation of the existing street and highway system is off-street parking. The location and capacity of such terminal facilities directly affect the traffic volumes on, and the operational flow characteristics of, the arterial street and highway system.

The City of Oconomowoc has four off-street public parking lot facilities. All of these lots serve the downtown central business district. A total of 422 off-street parking spaces are provided in these lots. Map 5 shows the location, number of spaces, and parking restrictions for each of the off-street public parking lot facilities.

Topography

Natural Features: The existing street and highway system in the Oconomowoc study area has been noticeably influenced by the presence of Lac La Belle and Fowler Lake on the north side of the City. It is readily apparent, as shown on Map 6, that these two lakes have had a major influence on the number, location, and "directness" of north-south traffic routes within the City of Oconomowoc. Only two traffic routes, STH 67 and Oakwood Avenue, cross these two lakes in a north-south direction, with the major east-west route, STH 16, passing along the southern edge of the two lakes directly through the central business district of the City. Two other lakes are also located in the study area, as shown on Map 6—Oconomowoc Lake to the east of the City and Silver Lake to the south of the City. Although these two lakes influenced the location of STH 16 and STH 67, they do not directly affect the location of the existing street and highway system within the central area of the City of Oconomowoc.

It does not appear that the Oconomowoc River on the east and west sides of the City of Oconomowoc has significantly affected the development of the street and highway system in the study area. Aside from the lakes, there are no other features of the landscape such as wetlands or areas of rough topography which have influenced the development of the street and highway system in the City of Oconomowoc.

Railroads: The Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) has influenced the number, location, and "directness" of the north-south traffic routes. This railroad operates over a double-track main line which bisects the study area in a generally east-west direction and which passes along the central business district of the City immediately south of, and parallel to, STH 16. These tracks, as shown on Map 6, are crossed by 11 north-south streets in the study area.

EXISTING STREET AND HIGHWAY SYSTEM CLASSIFICATION

For planning and administrative purposes, the existing street and highway system can be divided into subsystems on the basis of function and jurisdiction.

Table 2

MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTERS AND SCHOOLS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Land Use Type	Map 4 Identification Number	Employer/School	Number of Employees/ Students	Operation Schedule
Industrial	1	City of Oconomowoc Industrial Park		
		Lange Enterprises[a]	12	8:00 a.m. to 4:30 p.m.
		R. E. Neumann Company	3	8:00 a.m. to 4:30 p.m.
		Precision Chucking Products, Inc.	10	7:00 a.m. to 4:30 p.m.
		Plastocon—Division of Will Ross, Inc.[b]	41	7:00 a.m. to 3:00 p.m.
		Moraine Industries, Inc.	28	8:00 a.m. to 5:00 p.m.
		Custom Label & Design	5	7:00 a.m. to 5:00 p.m.
		Mercier Research & Development Company	28	8:00 a.m. to 5:00 p.m.
		C. W. Brown Printing Company—Plant 2[c]	14	7:00 a.m. to 4:30 p.m.
		Foremost Metal Products, Inc.[d]	8	7:00 a.m. to 3:30 p.m.
		Total Employment	126	--
	2	Cluster of Industrial Employers		
		Carnation Company		
		Instant Division[e]		
		- General Office	25	8:00 a.m. to 5:00 p.m.
		- Plant	80	6:00 a.m. to 2:00 p.m.
		Can Division[f]		
		- General Office	26	8:00 a.m. to 5:00 p.m.
		- Plant and Machine Shop	110	6:00 a.m. to 2: 30 p.m.
		Oconomowoc Lumber & Supply Company	12	7:30 a.m. to 5:30 p.m.
		Total Employment	253	--
	3	Cluster of Industrial Employers		
		Hartmann Oil Company	4	7:00 a.m. to 4:30 p.m.
		Mobile Oil Corporation—Bulk Plant	1	8:00 a.m. to 4:00 p.m.
		Lyons Oil Company	4	7:30 a.m. to 4:00 p.m.
		Fiberesin Industries, Inc.[g]	80	7:00 a.m. to 3:00 p.m.
		Mirro Aluminum Company[h]	51	6:00 a.m. to 2:00 p.m.
		Hystro Products, Inc.[i]	10	7:00 a.m. to 3:00 p.m.
		Sentry Equipment Corporation	35	7:30 a.m. to 3:30 p.m.
			30	8:00 a.m. to 5:00 p.m.
		Kinkead Plastics Division[j]	14	6:00 a.m. to 3:00 p.m.
		Oconomowoc Transport Company	20	6:30 a.m. to 8:30 a.m. 2:30 p.m. to 5:00 p.m.
		Total Employment	249	--
	4	La Belle Industries, Inc.	200	7:30 a.m. to 3:30 p.m.
	5	Musebeck Shoe Company	140	7:00 a.m. to 3:30 p.m.
			45	7:30 a.m. to 4:30 p.m.
		Total Employment	185	--
Retail and Services	6	Olympia Resort Hotel & Spa	75	7:00 a.m. to 3:30 p.m.
			225	8:00 a.m. to 4:30 p.m.
		Total Employment	300	--
	7	Oconomowoc Central Business District	--	--
		Total Employment	--	--

Table 2 (continued)

Land Use Type	Map 4 Identification Number	Employer/School	Number of Employees/ Students	Operation Schedule
Governmental/ Institutional	8	Oconomowoc Memorial Hospital[k]	173 71	7:00 a.m. to 3:30 p.m. 8:00 a.m. to 5:00 p.m.
		Total Employment	244	--
	9	Shorehaven Nursing Home[l]	85	7:00 a.m. to 3:00 p.m.
		Total Employment	85	--
	10	Greenland Elementary School[m]	48 staff/ 487 students	8:40 a.m. to 3:15 p.m.
	11	Park Lawn Elementary School[n]	42 staff/ 534 students	8:30 a.m. to 3:10 p.m.
	12	St. Jerome Elementary School[o]	18 staff/ 381 students	8:15 a.m. to 3:00 p.m.
	13	St. Matthew's Elementary School[p]	10 staff/ 139 students	8:30 a.m. to 3:10 p.m.
	14	St. Paul's Lutheran School[q]	14 staff/ 210 students	8:30 a.m. to 3:10 p.m.
	15	Summit Elementary School[r]	54 staff/ 598 students	8:35 a.m. to 3:15 p.m.
	16	Oconomowoc Junior High School[s]	91 staff/ 1,068 students	Arrive—7:30 a.m. to 8:00 a.m. Depart—3:30 p.m. to 4:30 p.m.
	17	Oconomowoc Senior High School[s]	129 staff/ 1,600 students	Arrive—7:30 a.m. to 8:00 a.m. Depart—3:30 p.m. to 4:30 p.m.
		Total Staff/Students	406 staff/ 5,017 students	--

[a] *Four employees from October through April; 10-15 employees from May to September (seasonal employment).*

[b] *Second shift—3:00 p.m. to 11 p.m., 41 employees. Third shift—11:00 p.m. to 7:00 a.m., 25 employees.*

[c] *Seven full-time employees, seven part-time employees.*

[d] *Second shift—3:30 p.m. to midnight, four employees.*

[e] *Second shift—2:00 p.m. to 10:00 p.m., 55 employees. Third shift—10:00 p.m. to 6:00 a.m., 50 employees.*

[f] *Second shift—2:30 p.m. to 11:00 p.m., 90 employees. Third shift—11:00 p.m. to 7:30 a.m., 26 employees.*

[g] *Second shift—3:00 p.m. to 11:00 p.m., 60 employees. Third shift—11:00 p.m. to 7:00 a.m., 25 employees.*

[h] *Second shift—2:00 p.m. to 11:00 p.m., 11 employees.*

[i] *Second shift—3:00 p.m. to 11:00 p.m., six employees.*

[j] *Third shift—11:00 p.m. to 7:00 a.m., six employees.*

[k] *Second shift—3:00 p.m. to 11:30 p.m., 93 employees. Third shift—11:00 p.m. to 7:00 a.m., 40 employees.*

[l] *Second shift—3:00 p.m. to 11:00 p.m., 30 employees. Third shift—11:00 p.m. to 7:00 a.m., 15 employees.*

[m] *Three school buses serving Greenland Elementary School are in the vicinity of the school between 8:00 and 8:15 a.m. and 3:00 and 3:15 p.m.*

Table 2 (continued)

[n] *Seven school buses serving Park Lawn Elementary School are in the vicinity of the school between 8:10 and 8:20 a.m. and 3:15 and 3:30 p.m.*

[o] *Six school buses serving St. Jerome Elementary School are in the vicinity of the school between 8:15 and 8:30 a.m. and 3:00 and 3:15 p.m.*

[p] *Four school buses serving St. Matthew's Elementary School are in the vicinity of the school between 8:20 and 8:30 a.m. and 3:00 and 3:10 p.m.*

[q] *Four school buses serving St. Paul's Lutheran School are in the vicinity of the school between 8:20 and 8:30 a.m. and 3:05 and 3:15 p.m.*

[r] *Seven school buses serving Summit Elementary School are in the vicinity of the school between 8:15 and 8:30 a.m. and 3:15 and 3:40 p.m.*

[s] *Twenty-two school buses serving both Oconomowoc Junior High School and Senior High School and four school buses serving elementary school students living in the area of the junior and senior high schools are in the vicinity of the junior and senior high schools between 7:30 and 8:00 a.m. and 3:30 and 4:00 p.m.*

Source: SEWRPC.

Functional Classification

Functional classification means grouping streets and highways into classes according to the principal function served, ranging from a high degree of travel mobility and limited access to adjacent land uses to a very low degree of travel mobility and high access to adjacent land uses. In urban areas, streets and highways are usually classified into three functional groups: 1) arterial streets, 2) collector streets, and 3) land access streets. Arterials may be further subdivided into principal and minor arterials. Two types of criteria are used to determine the functional classification of an urban street or highway—basic and supplemental. Basic criteria include system continuity, land use service, trip length, and existing average daily traffic volume. Supplemental criteria may include spacing, bus route location, truck route designation, and traffic signal location.

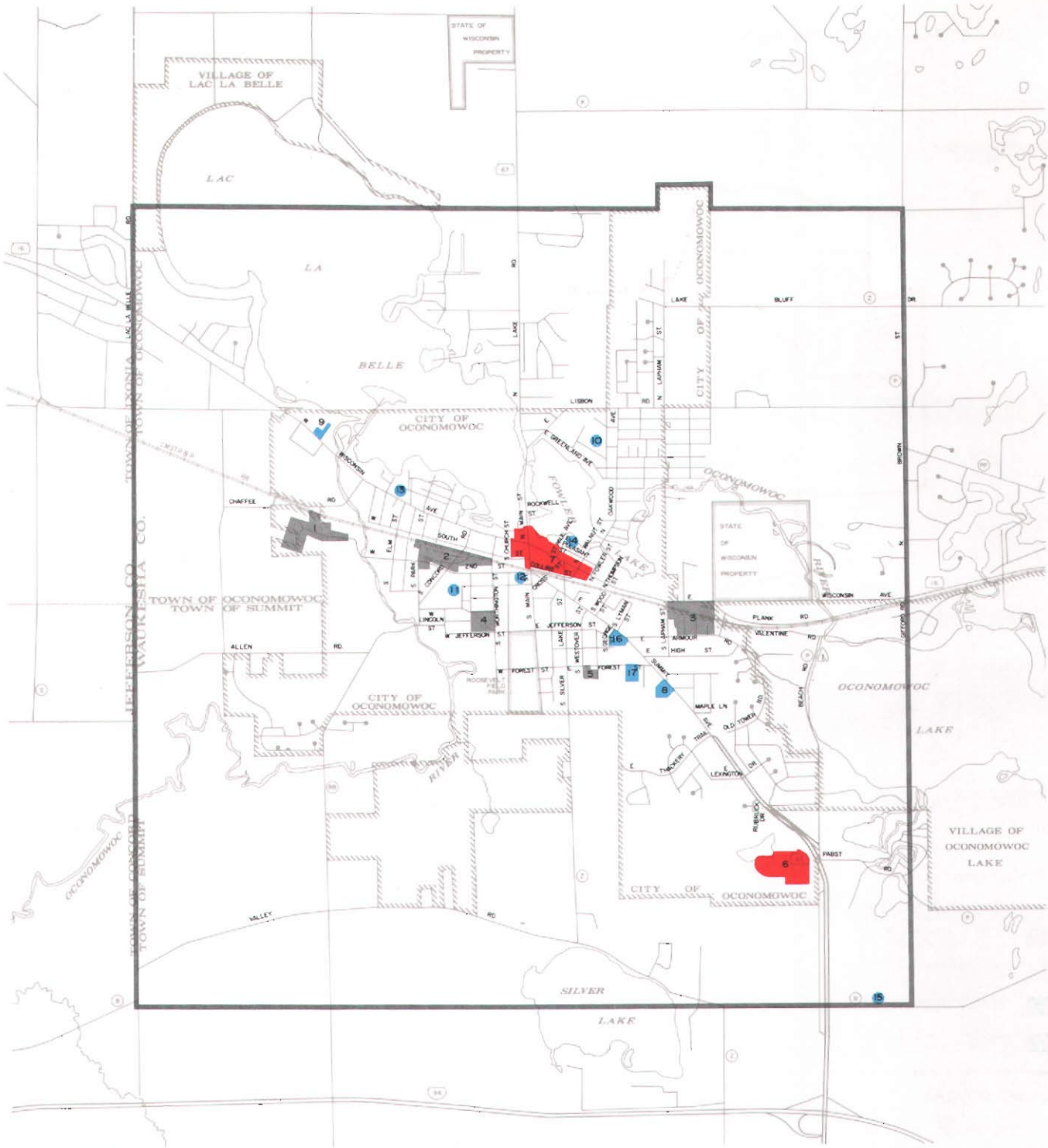
In 1977 the Wisconsin Department of Transportation, pursuant to Section 86.301(3) of the Wisconsin Statutes, developed and approved a functional classification system for all streets and highways within the State of Wisconsin. Chapter 29, "Laws of 1977," requires local transportation aids to be paid on the basis of the functional classification of public streets and highways. Table 3 shows the distribution of the street and highway system mileage by functional classification for each municipality within the study area. As indicated in Table 3, there are 78.64 miles of existing streets and highways in the Oconomowoc study area, of which 42.30 miles, or 54 percent, are in the City of Oconomowoc. Of the total, 9.31 miles, or 12 percent, are principal arterials; 16.42 miles, or 21 percent, are minor arterials; 3.01 miles, or 4 percent, are collector streets; and the remaining 49.90 miles, or 63 percent, are land access streets. Map 7 shows the existing street and highway system serving the City of Oconomowoc and the functional classification of each roadway comprising the system within the study area.

Jurisdictional Classification

The jurisdictional classification of a particular segment of roadway indicates which level and agency of government (state, county, or local) has primary responsibility for the planning, design, construction, operation, and/or maintenance of the facility. For the purposes of establishing jurisdictional responsibilities, and thereby participatory funding responsibilities, over the existing street and highway system in urban areas, arterial facilities within the corporate limits of a community are considered to be one of three types: Type I—state trunk highways; Type II—county trunk highways; or Type III—local trunk highways. A subcategory of state trunk highways is the "connecting highway." Connecting highways are the marked and signed routes of state trunk highways leading into and through an urban area which "connect" the ends of a state trunk highway on opposite sides of a community. The local community involved has, historically, been responsible for maintenance of the connecting highway.

Map 4

MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTERS AND SCHOOLS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

EMPLOYMENT CENTERS

- INDUSTRIAL
- RETAIL AND SERVICE
- GOVERNMENTAL AND INSTITUTIONAL

5 SEE TABLE 2 FOR EMPLOYER NUMBER AND NAME

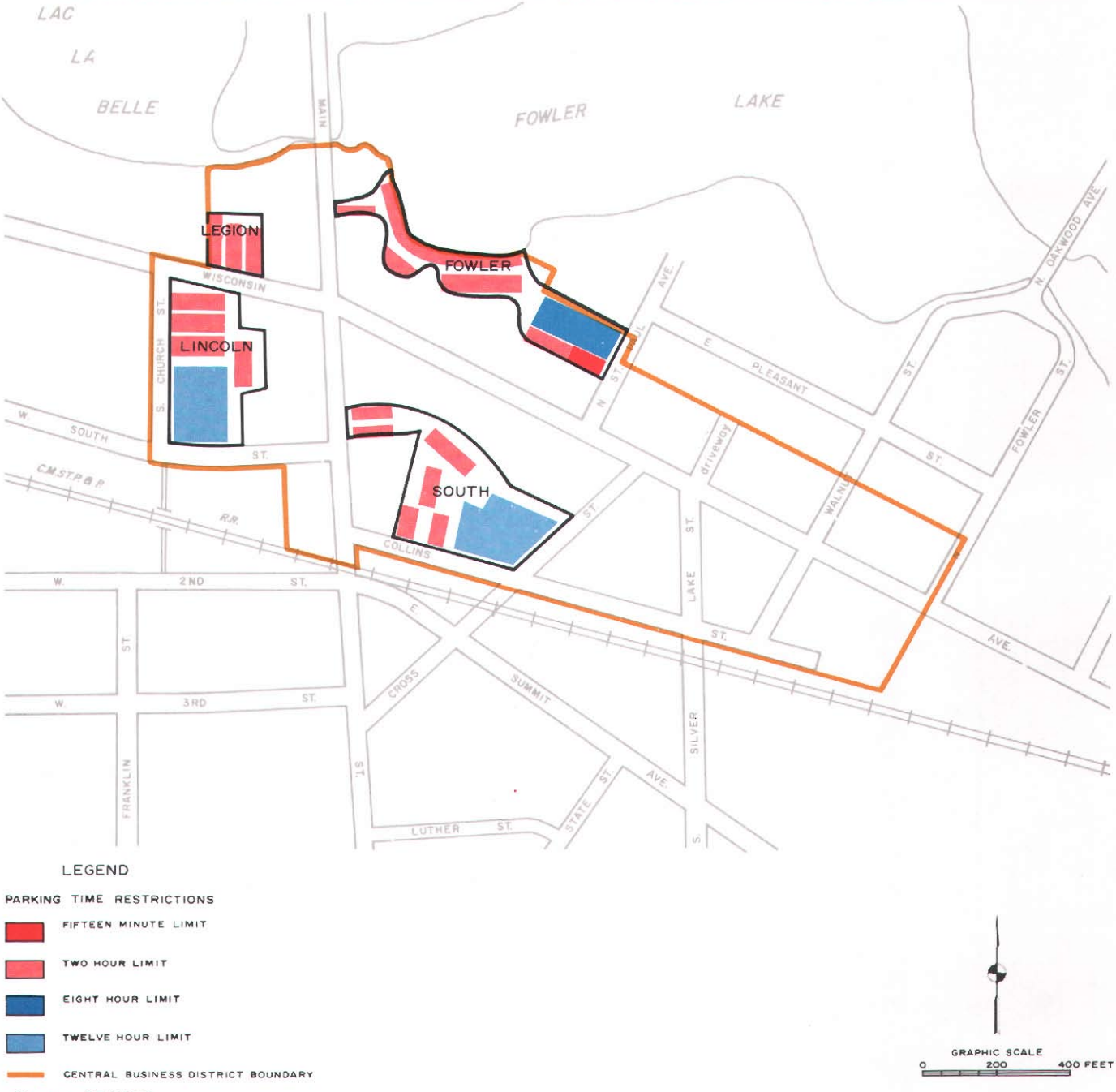
STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/2 1 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Map 5

OFF-STREET PUBLIC PARKING FACILITIES IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979

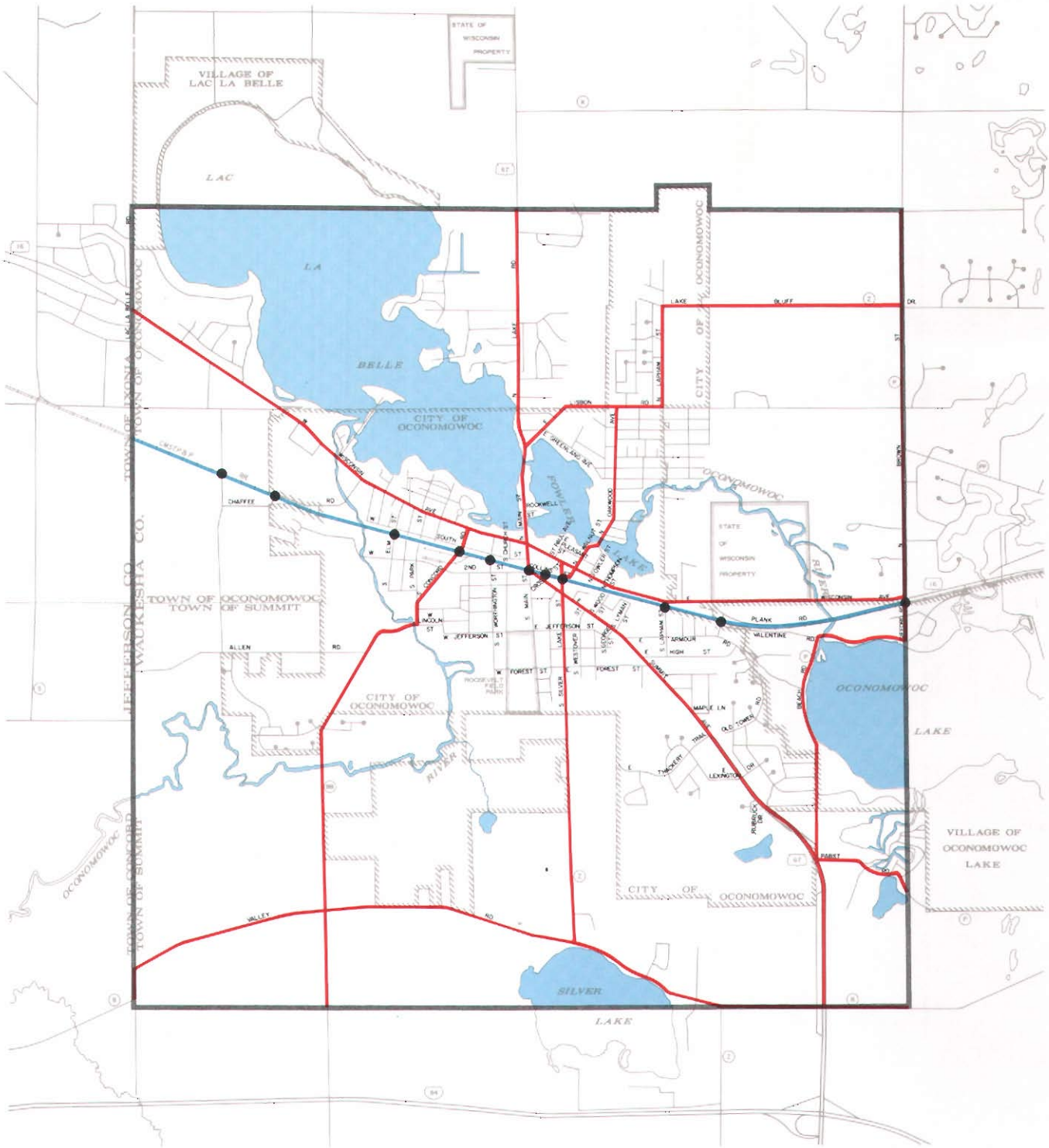


Source: SEWRPC.

Map 8 shows the jurisdictional classification of the streets and highways in the Oconomowoc study area. Table 4, which shows the distribution of street and highways system mileage by jurisdictional classification in the Oconomowoc study area, indicates that 5.14 miles, or 6 percent, of the total 78.64 miles of streets and highways are classified as state trunk highways; 3.95 miles, or 5 percent, are classified as connecting highways; 11.10 miles, or 14 percent, are classified as county trunk highways; and the remaining 58.45 miles, or 75 percent, are classified as local trunk highways. Underlying these state, county, and local trunk highway systems is a system of federal aid

Map 6

NATURAL AND CULTURAL FEATURES INFLUENCING THE STREET AND HIGHWAY SYSTEM IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

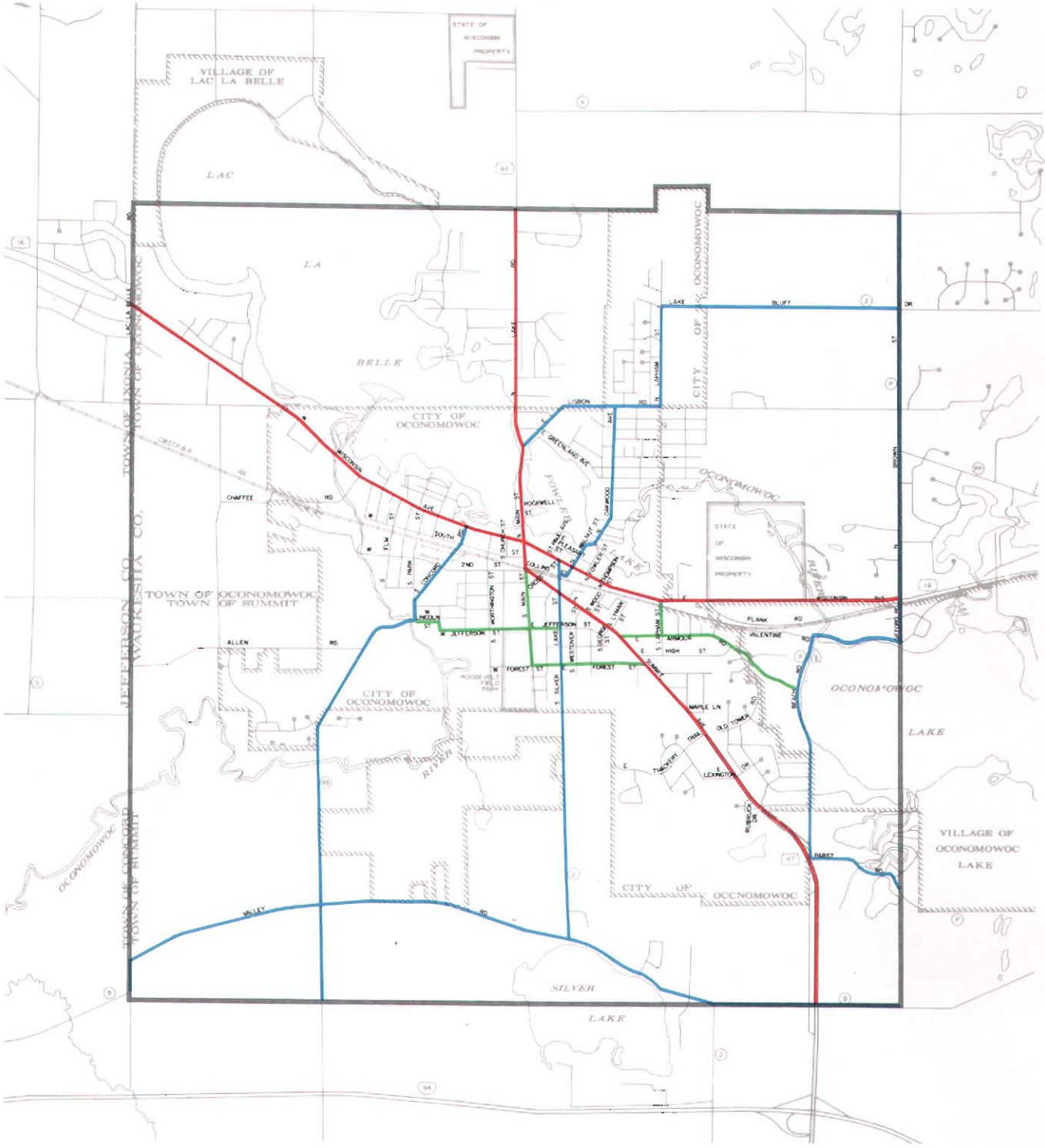
- ARTERIAL STREET OR HIGHWAY
- RAILROAD
- RAILROAD STREET CROSSING
- WATER
- STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/2 1 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Map 7

CLASSIFICATION OF FUNCTIONAL STREETS AND HIGHWAYS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978



LEGEND

- PRINCIPAL ARTERIAL STREET
- MINOR ARTERIAL STREET
- COLLECTOR STREET
- LOCAL STREET
- STUDY AREA BOUNDARY

Source: Wisconsin Department of Transportation and SEWRPC.

Table 3

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY FUNCTIONAL CLASSIFICATION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978

Municipality	Functional Classification				Total (miles)
	Arterial		Collector (miles)	Land Access (miles)	
	Principal (miles)	Minor (miles)			
City of Oconomowoc	5.42	4.36	2.69	29.83	42.30
Village of Oconomowoc Lake	--	1.43	0.32	1.43	3.18
Town of Oconomowoc	3.16[a]	2.96[a]	--	14.21	20.33
Town of Summit	0.73[a]	7.67[a]	--	4.43	12.83
Total	9.31	16.42	3.01	49.90	78.64

[a] *The Wisconsin Department of Transportation, for the distribution of motor vehicle tax revenues, uses a system of nomenclature which identifies sections of these facilities as rural collectors and arterials.*

Source: SEWRPC.

highway routes that has important implications for the administration and financing of traffic management and highway improvement measures.

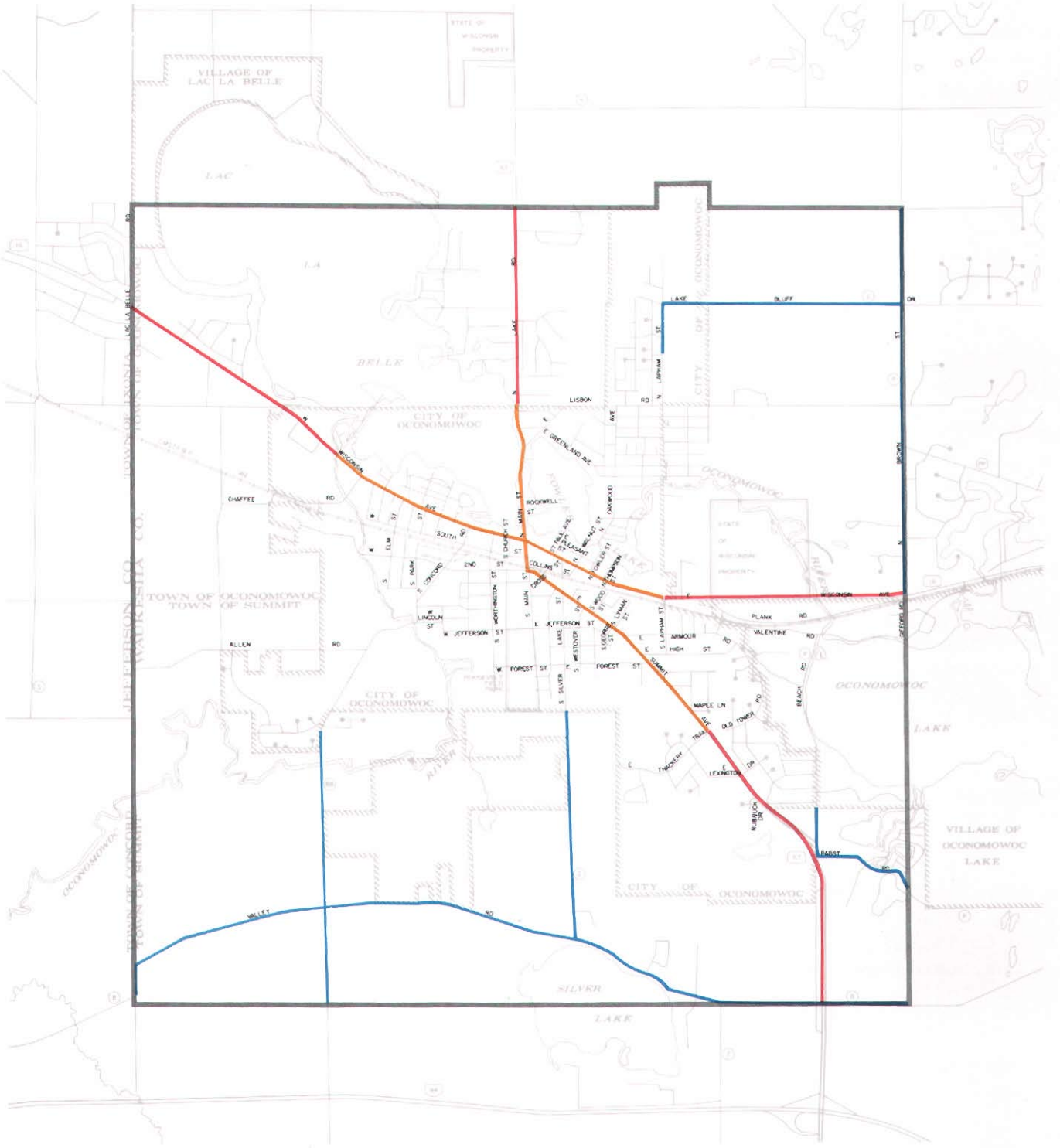
Of the 78.64 miles of streets and highways in the study area, 42.30 miles, or 54 percent, are within the corporate limits of the City of Oconomowoc. The City has primary jurisdictional responsibility over all local trunk highways and connecting highways within its corporate limits. Together, these represent 83 percent of the existing arterial street and highway system, and 96 percent of the total street and highways system in the City. However, since the connecting highways are intended to provide continuity on the state trunk highway system, the State provides financial aids to the City for use in maintaining and operating these facilities in a manner that is consistent with its functional classification as a major arterial street. Therefore, while the City has primary jurisdictional responsibility over the connecting highways, the City must cooperate with the Wisconsin Department of Transportation and obtain its approval before proceeding with any action which could substantially alter the use or capacity of a connecting highway. This would include performing such traffic management actions as installing traffic control devices (signals and signing), designating a facility as a one-way street, prohibiting turning movements, restricting truck traffic, and changing intersection geometrics. Of the remaining 4 percent of the street and highway system in the City, 0.47 mile, or 1 percent, is under the jurisdiction of Waukesha County, and 1.25 miles, or 3 percent, are under the jurisdiction of the State of Wisconsin.

Federal Aid System

The federal aid system consists of a network of streets and highways which have been designated as eligible for federal funds to offset all or part of the cost of transportation-related projects impacting the facilities concerned. As related to the City of Oconomowoc, the federal aid system is composed of a federal aid primary system, including the extension of primary aid routes into urban areas, a federal aid secondary system, and a federal aid urban system. Generally, only those streets and highways which are part of one of these federal aid systems are eligible to receive federal funds. Certain exceptions to this rule exist which permit federal funds to be spent for improvement of facilities which are not on the federal aid system. These improvements include, but are not limited to, replacement of bridges, elimination of high hazard locations and roadside obstacles, safety improvements, and roadway beautification. The level of federal funding participation in an eligible project depends on the type of federal aid system concerned, the type of project, and the total amount of federal and state monies available. Those streets and highways included on the federal aid system in the Oconomowoc study area are shown on Map 9.

Map 8

JURISDICTIONAL CLASSIFICATION OF STREETS AND HIGHWAYS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

- STATE TRUNK HIGHWAY
- STATE TRUNK CONNECTING HIGHWAY
- COUNTY TRUNK HIGHWAY
- LOCAL STREET
- STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/4 1/2 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Table 4

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY JURISDICTIONAL CLASSIFICATION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978

Municipality	Jurisdictional Classification				Total (miles)
	State Trunk (miles)	Connecting Highway (miles)	County Trunk (miles)	Local Trunk (miles)	
City of Oconomowoc	1.25	3.95	0.47	36.63	42.30
Village of Oconomowoc Lake	--	--	--	3.18	3.18
Town of Oconomowoc	3.16	--	2.96	14.21	20.33
Town of Summit	0.73	--	7.67	4.43	12.83
Total	5.14	3.95	11.10	58.45	78.64

Source: SEWRPC.

Table 5 shows the distribution of the street and highway system mileage by federal aid system category in the Oconomowoc study area. As indicated in the table, 1.60 miles, or 2 percent, of the total 78.64 miles of streets and highways are on the federal aid primary system; 3.88 miles, or 5 percent of the total, are on the federal aid secondary system; 10.58 miles, or 13 percent of the total, are on the federal aid urban system; and the remaining 62.58 miles, or 80 percent of the total, are not on a federal aid system. Furthermore, Table 5 shows that of the total 42.30 miles of streets and highways within the City of Oconomowoc, 0.87 mile, or 2 percent, is on the federal aid primary system; 8.75 miles, or 21 percent, are on the fedeal aid urban system; and the remaining 32.68 miles, or 77 percent, are not on a federal aid system.

PHYSICAL CHARACTERISTICS OF THE EXISTING STREET AND HIGHWAY SYSTEM

The physical characteristics of the existing street and highway system affect the volume of traffic a facility can efficiently accommodate and, thus, are of great importance in the development of a traffic management plan. These characteristics include right-of-way width, pavement width, on-street parking conditions, and operation as a one- or two-way street.

Table 6 shows the rights-of-way widths and total pavement widths for each section of arterial and collector street or highway within the Oconomowoc study area. Minor reconstruction of these rights-of-way such as special intersection channelization or realignment may be considered as alternative traffic management actions.

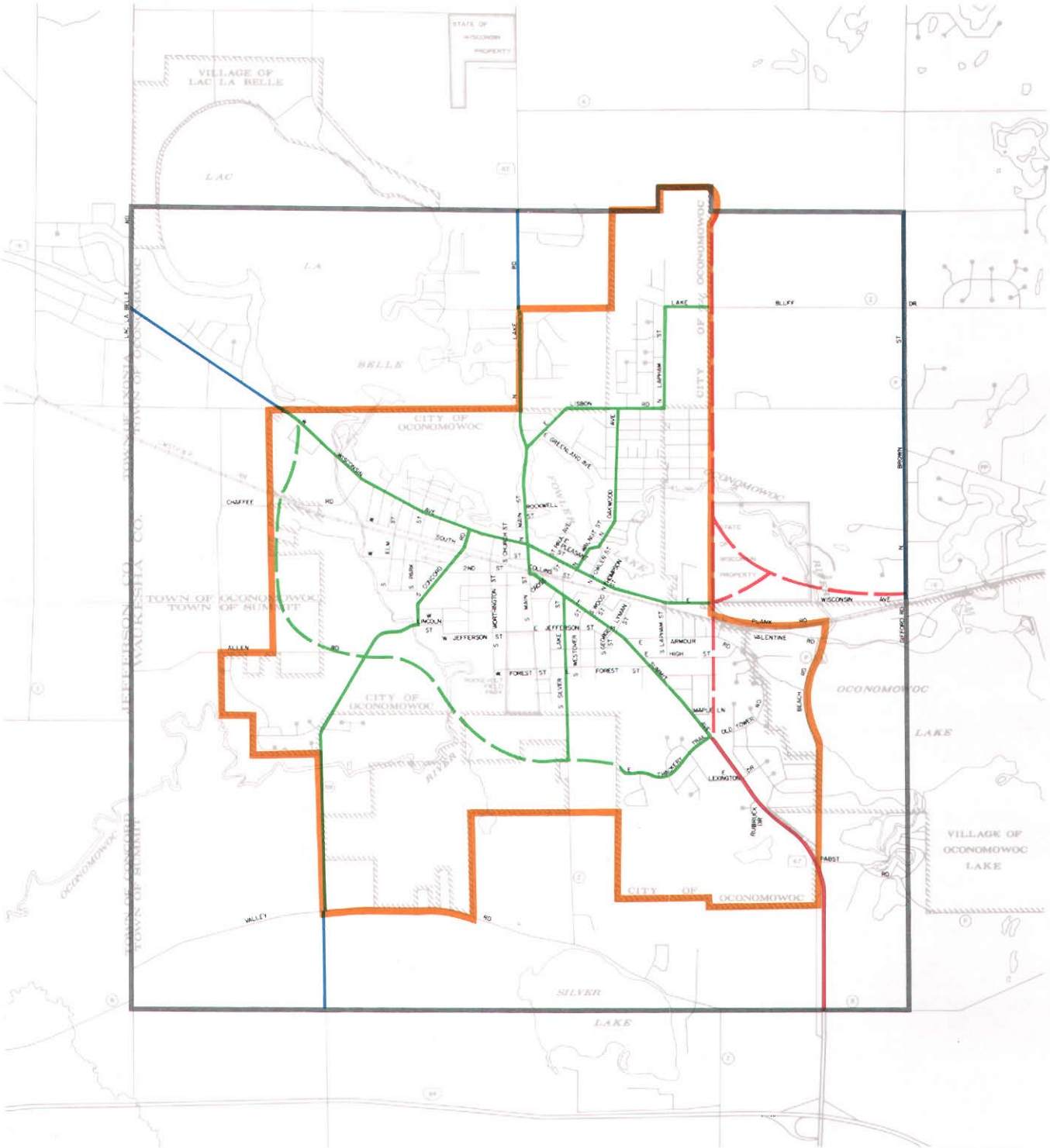
In urban areas such as the City of Oconomowoc, the vehicular capacity of a roadway segment is normally a function of the maximum number of vehicles that can pass through intersections with other roadways. Therefore, when collecting information on the physical characteristics of the existing street and highway system in general, it is important to obtain detailed geometric information on the approaches within 250 feet of arterial and collector street intersections within the City. Map 10 shows the location of those intersections for which detailed geometric information is included in Appendix D.

On-street curb parking is permitted on almost all streets and highways in the Oconomowoc study area. Map 11 indicates the location and type of on-street curb parking restrictions presently enforced in the City of Oconomowoc. The majority of on-street curb parking restrictions are located in the central business district of Oconomowoc, where roadway capacity is limited and parking turnover is encouraged to support the commercial establishments in that area.

One-way street operation has a direct impact on facility capacity and adjacent land use accessibility. The only one-way street in the City at the present time is N. Fowler Street, between E. Wisconsin Avenue and N. Walnut Street, as shown on Map 11.

Map 9

FEDERAL AID HIGHWAY SYSTEM IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978



LEGEND

FEDERAL AID CLASSIFICATION

PRIMARY

EXISTING

PROPOSED

SECONDARY

EXISTING

PROPOSED (NONE)

URBAN

EXISTING

PROPOSED

FEDERAL AID URBAN AREA BOUNDARY

STUDY AREA BOUNDARY

GRAPHIC SCALE

0 1/2 1 MILE

0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Table 5

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY FEDERAL AID CATEGORY IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978

Municipality	Jurisdictional Classification	Federal Aid System			Not on Federal Aid System (miles)	Total (miles)
		Primary (miles)	Secondary (miles)	Urban (miles)		
City of Oconomowoc	State Trunk Highway	0.87	--	0.38	--	1.25
	Connecting Highway	--	--	3.95	--	3.95
	County Trunk Highway	--	--	0.47	--	0.47
	Local Trunk Highway	--	--	3.95	32.68	36.63
Subtotal		0.87	--	8.75	32.68	42.30
Village of Oconomowoc Lake	State Trunk Highway	--	--	--	--	--
	Connecting Highway	--	--	--	--	--
	County Trunk Highway	--	--	--	--	--
	Local Trunk Highway	--	--	--	3.18	3.18
Subtotal		--	--	--	3.18	3.18
Town of Oconomowoc	State Trunk Highway	--	1.46	0.70	1.00	3.16
	Connecting Highway	--	--	--	--	--
	County Trunk Highway	--	1.93	--	1.03	2.96
	Local Trunk Highway	--	--	--	14.21	14.21
Subtotal		--	3.39	0.70	16.24	20.33
Town of Summit	State Trunk Highway	0.73	--	--	--	0.73
	Connecting Highway	--	--	--	--	--
	County Trunk Highway	--	0.49	1.12	6.06	7.67
	Local Trunk Highway	--	--	--	4.43	4.43
Subtotal	--	0.73	0.49	1.12	10.49	12.83
Total	--	1.60	3.88	10.58	62.58	78.64

Source: SEWRPC.

TRAFFIC CONTROL MEASURES ON THE EXISTING STREET AND HIGHWAY SYSTEM

Traffic control measures have a direct effect on the capacity, operating characteristics, and safety of a roadway facility. The principal traffic control measures inventoried as a part of any traffic management planning effort include traffic signals and signs, railroad and school crossing protection devices, and posted speed limit restrictions.

Signals

The City of Oconomowoc has four pretimed non-interconnected traffic signals in operation. The Wisconsin Department of Transportation has one semi-traffic-activated traffic signal in operation in this study area. Table 7 indicates the location, phasing, timing, and total cycle length for each of these signals. The Wisconsin Department of at the intersection of STH 67 and Thackery Trail. In addition to these signals, the City makes extensive use of stop signs. At 11 locations within the City of Oconomowoc, flashing lights are used as school crossing and pedestrian protection devices, and as reduced highway speed limit warning devices. Map 12 shows the location of the one proposed and five existing traffic signals, the 11 flashing lights, and all stop signs in the Oconomowoc study area.

Railroad Crossing Protection

As previously noted, the main line of the Chicago, Milwaukee, St. Paul & Pacific Railroad, over which trains of the National Railroad Passenger Corporation (AMTRAK) are operated, traverses the City at-grade. Consequently, 11 streets intersect and cross the tracks in the Oconomowoc study area. As indicated on Map 13, vehicular and pedestrian

Table 6

RIGHT-OF-WAY AND PAVEMENT WIDTHS FOR THE ARTERIAL AND COLLECTOR STREET AND HIGHWAY SYSTEM IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

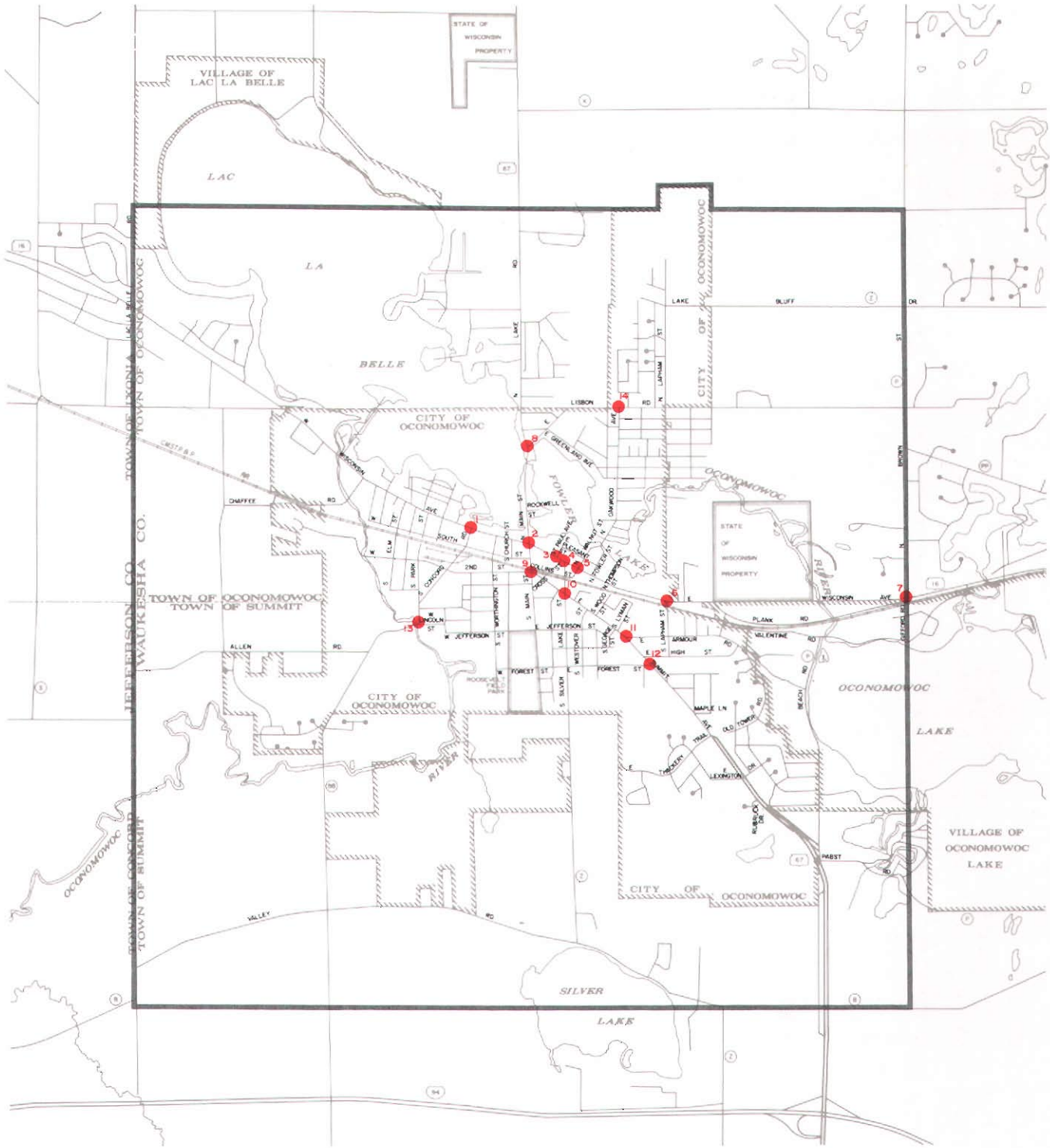
Facility	Termini	Pavement Width (feet)	Right-of-Way Width (feet)
E. Summit Avenue, Main Street and Lake Road (STH 67)	CTH B - Robruck Drive	48[a]	240
	Robruck Drive - Maple Lane	48[a]	From 66 to 240
	Maple Lane - E. Armour Road	44	66
	E. Armour Road - S. Main Street	30	66
	E. Summit Avenue - Lake Road	46	50
	Lake Road - Rockwell Street	36	50
	Rockwell Street - Pine Street	32	50
	Pine Street - N. City Limits	46	50
	N. City Limits - N. Ridge Court	24	93
	N. Ridge Court - CTH K	24	120
Wisconsin Avenue (STH 16)	CTH P - Plank Road	24	From 66 to 200
	Plank Road - Main Street	48	
	Main Street - W. City Limits	44	66
	W. City Limits - Jefferson County Line	24	100
S. Concord Road (CTH BB)	2600' South of CTH B - W. Lincoln Street	24	66
	W. Lincoln Street - W. South Street	28	50
	W. South Street - W. Wisconsin Avenue	28	50
S. Silver Lake Street (CTH Z)	CTH B - Bolson Drive	24	66
	Bolson Drive - E. Oak Street	20	66
	E. Oak Street - E. Summit Avenue	30	66
	E. Summit Avenue - E. Wisconsin Avenue	42	66
Collins Street	S. Silver Lake Street - S. Walnut Street	28	40
N. Walnut Street and N. Oakwood Avenue	Collins Street - E. Lisbon Road	36	66
E. Lisbon Road	Lake Road - 1500' Northeast of Lake Road	42	66
	1500' Northeast of Lake Road - N. Roosevelt Avenue	24	66
	N. Roosevelt Avenue - N. Lapham Street	40	66
N. Lapham Street	E. Lisbon Road - Lake Bluff Drive	24	66
CTH Z	N. Lapham Street - CTH P	24	66
Beach Road and CTH P	2600' East of STH 67 - Beach Road		
	E. Summit Avenue (STH 67) - E. Wisconsin Avenue (STH 16)	22	66
	E. Wisconsin Avenue (STH 16) - CTH K	24	100
CTH B	2500' East of STH 67 - Jefferson County Line	24	66
W. Lincoln Street	S. Concord Road - S. Pearl Street	36	66
S. Pearl Street	W. Lincoln Street - W. Jefferson Street	36	66
W. Jefferson Street	S. Pearl Street - S. Silver Lake Street	40	66
S. Main Street	E. Forest Street - E. Jefferson Street	40	66
	E. Jefferson Street - E. Summit Avenue	30	66
E. Forest Street	S. Main Street - E. Summit Avenue	40	66
E. Armour Road	E. Summit Avenue - S. Lapham Street	48	66
	S. Lapham Street - 1300' East of Lapham Street	30	66
	1300' East of Lapham Street - Kozlowski Lane	28	66
	Kozlowski Lane - Beach Road	20	66
S. Lapham Street	E. Armour Road - E. Wisconsin Avenue	20	66

[a] *Divided highway.*

Source: City of Oconomowoc, Waukesha County, and SEWRPC.

Map 10

LOCATION OF INTERSECTIONS FOR WHICH DETAILED GEOMETRICS ARE INCLUDED IN APPENDIX D



LEGEND

STUDY AREA BOUNDARY

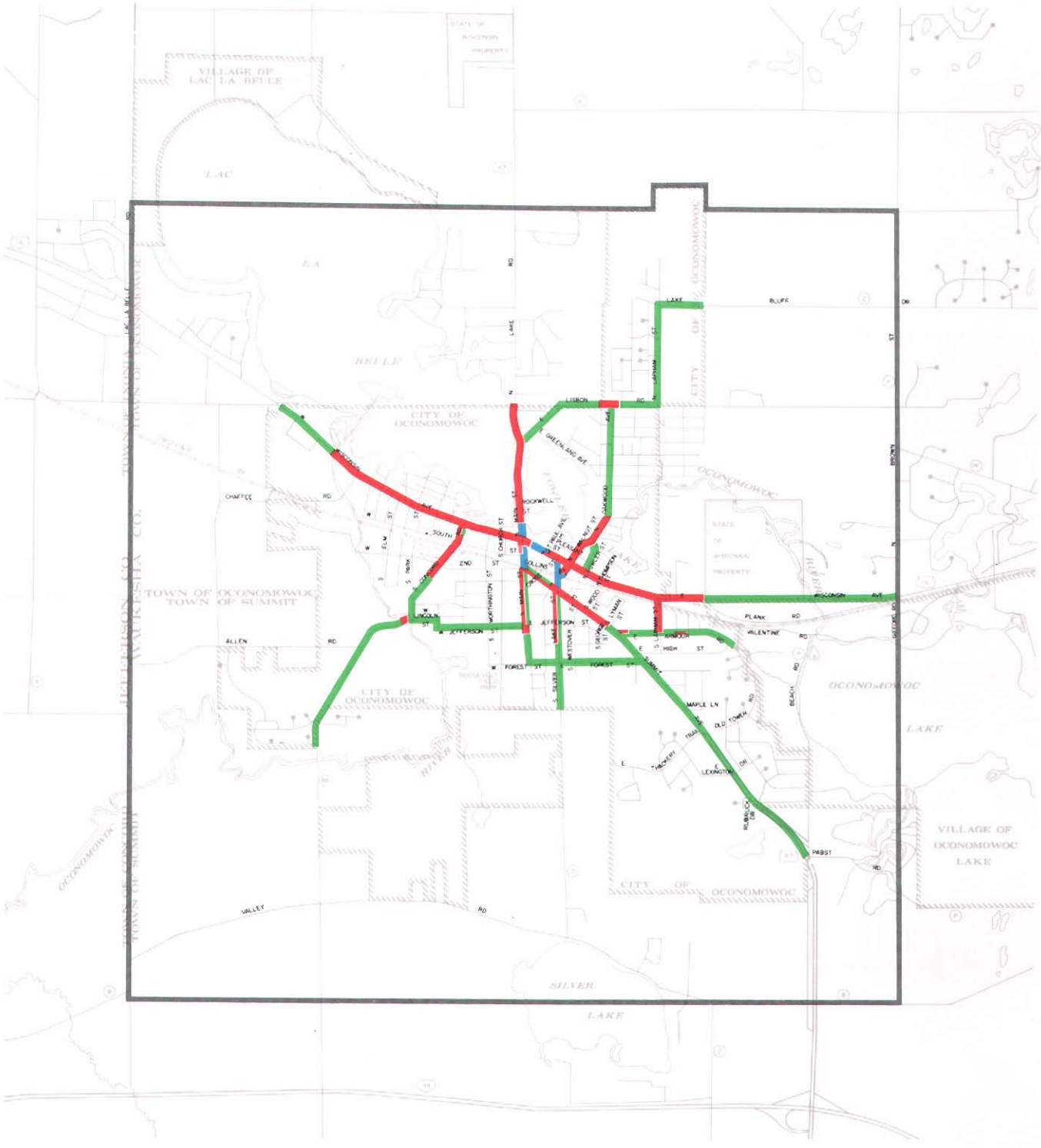
^{2} DETAILED GEOMETRICS AND INTERSECTION FIGURE NUMBER (SEE APPENDIX D)

GRAPHIC SCALE
0 1/4 1/2 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Map 11

ON-STREET CURB PARKING RESTRICTIONS FOR SELECTED STREETS AND HIGHWAYS IN THE CITY OF OCONOMOWOC: 1979



LEGEND

- NO PARKING ANYTIME
- ONE HOUR PARKING
- FIFTEEN MINUTE PARKING
- NO RESTRICTIONS ON PARKING
- STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/2 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Table 7

TRAFFIC SIGNAL OPERATION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979[a]

Phase	Intersection	
	Wisconsin Avenue	Main Street
Green	24 seconds	21 seconds
Yellow	3 seconds	3 seconds
Red	25 seconds	36 seconds
Westbound Green with Left Turn Arrow	8 seconds	--
Total Cycle	60 seconds	60 seconds
	E. Summit Avenue	S. Silver Lake Street
Green	26 seconds	26 seconds
Yellow	4 seconds	4 seconds
Red	30 seconds	30 seconds
Total Cycle	60 seconds	60 seconds
	S. Silver Lake Street	E. Wisconsin Avenue
Green	18 seconds	28 seconds
Yellow	4 seconds	4 seconds
Red	38 seconds	22 seconds
Westbound Green with Left Turn Arrow	--	6 seconds
Total Cycle	60 seconds	60 seconds
	N. Walnut Avenue	E. Wisconsin Avenue
Green	18 seconds	28 seconds
Yellow	4 seconds	4 seconds
Red	38 seconds	22 seconds
Eastbound Green with Left Turn Arrow	--	6 seconds
Total Cycle	60 seconds	60 seconds

[a] *A temporary traffic actuated signal is also located at the intersection of Wisconsin Avenue (STH 16) and CTH P on the eastern boundary of the study area. This signal has a total cycle length of 90 seconds, with a maximum green time of 50 seconds for traffic on Wisconsin Avenue and 30 seconds for traffic on CTH P.*

Source: SEWRPC.

traffic is protected at each street intersection with the tracks by either a grade separation, operating crossing gates, flashing signals, and/or stop signs. It should be noted there are seven crossings that have stop signs in addition to automatic gates and flashing lights, an unusual practice not in conformance with the State "Uniform Manual on Traffic Control Devices." There are currently two railroad grade-separated crossings in the study area—on Valentine Road and Chaffee Road. Both facilities cannot be fully utilized for their intended purpose because of the load limits imposed as a result of their deteriorated structural condition.

School Crossing Protection

Table 8 and Map 13 identify the elementary, junior, and senior high schools in the Oconomowoc study area. There are eight locations within the

Map 12

TRAFFIC SIGNAL AND STOP SIGN LOCATIONS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN CONTROLLED INTERSECTION APPROACH
- FLASHING LIGHT
- STUDY AREA BOUNDARY

Source: City of Oconomowoc and SEWRPC.

Table 8

ELEMENTARY, JUNIOR, AND SENIOR HIGH SCHOOLS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Map 13 Identification Number	School Name
1	Greenland Elementary School
2	Park Lawn Elementary School
3	St. Jerome Elementary School
4	St. Matthew's Elementary School
5	St. Paul's Lutheran Elementary School
6	Summit Elementary School
7	Oconomowoc Junior High School
8	Oconomowoc Senior High School

Source: SEWRPC.

area where some form of school crossing protection is provided. Map 13 shows the location and type of school crossing protection provided in the study area. Most of these crossings are guarded by students, adults, or police officers. However, there are three locations in the study area where traffic control signals are currently utilized for school crossing protection.

Speed Limits

Except for relatively short stretches of the arterial streets and highways entering and leaving the City of Oconomowoc, the existing arterial street and highway system in the City is restricted for a 25-mile-per-hour (mph) speed limit. Map 14 shows the current speed limits on the street and highway system in the study area. As shown on Map 13, reduced 15-mph speed restrictions are in effect on all roadways adjacent to the public and private schools in the study area. These 15-mph restrictions are in effect only during the hours when children are present and serve to supplement existing school crossing protection measures.

SUMMARY

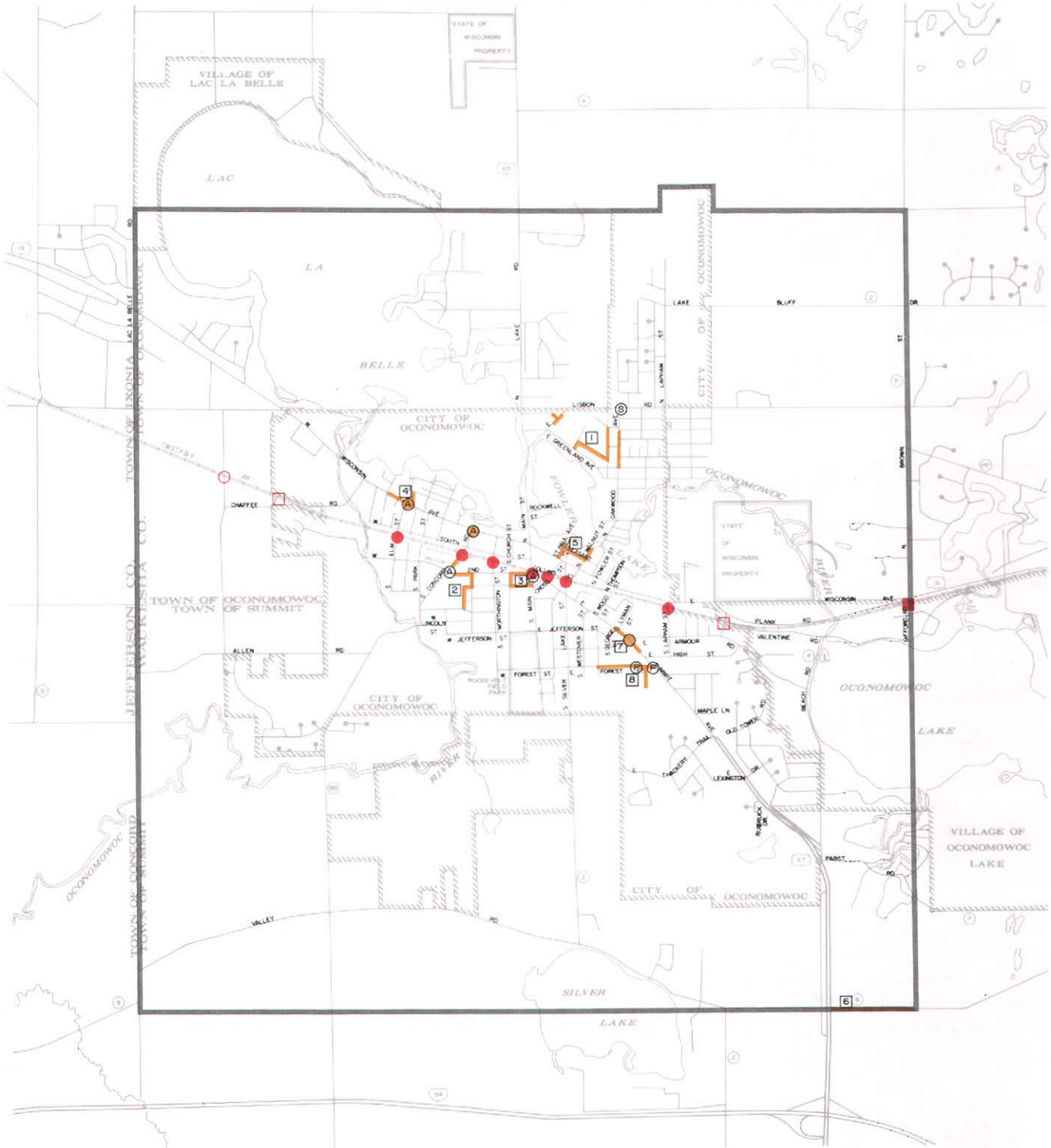
This chapter has presented information on the existing street and highway system in the Oconomowoc traffic management study area and on those factors which directly affect the location, design, and operation of that system. The available existing land use data indicate that the major concentrations of residential and commercial development are centered in the City of Oconomowoc, emanating outward from the intersection of STH 16 and STH 67. Of a total 8,900 acres of land in the study area, about 21 percent are occupied by residential, commercial, industrial, and governmental and institutional development. Since these urban land uses generate and attract relatively intense vehicular trip activity, all major employers in the study area have been identified and located. The effect of these land uses and their associated trip making activity will be analyzed in subsequent chapters.

A total of 78.64 miles of streets and highways are located within the Oconomowoc study area, of which 42.30 miles, or 54 percent, are within the corporate limits of the City of Oconomowoc. These streets and highways have been classified according to function and jurisdiction. Of the total street and highway mileage in the study area, 25.73 miles, or 33 percent, are functionally classified as arterials; 3.01 miles, or 4 percent, as collectors; and the remaining 49.90 miles, or 63 percent, as land access streets. With respect to jurisdiction, the City of Oconomowoc has maintenance responsibility for its 3.95 miles of connecting highways and 36.63 miles of local trunk highways, a total of 40.58 miles, or 52 percent of the total mileage of existing streets and highways in the study area. These 40.58 miles comprise 96 percent of the total street and highway mileage within the City of Oconomowoc. Of the remaining 4 percent, 0.47 mile, or 1 percent, is under Waukesha County's jurisdiction, and 1.25 miles, or 3 percent, are under the State of Wisconsin's jurisdiction. Furthermore, of the total street and highway mileage in the study area, 16.06 miles, or 20 percent, are on the federal aid highway system. Of these 16.06 miles, 9.62 miles, or 23 percent of the total street and highway mileage, are within the corporate limits of the City of Oconomowoc.

A detailed description of the right-of-way and pavement widths of the streets and highways within the study area and of the traffic control measures currently utilized in the area has been documented in this chapter. It is only through the complete identification of the existing street and highway system that alternative actions can be designed and evaluated to determine the most effective traffic engineering improvements to that system.

Map 13

RAILROAD AND SCHOOL CROSSING PROTECTION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

RAILROAD CROSSING PROTECTION

- CROSSBUCK SIGNS
- AUTOMATIC GATES AND FLASHING LIGHTS
- AUTOMATIC GATES, FLASHING LIGHTS, AND STOP SIGNS
- GRADE SEPARATED
- SCHOOL (SEE TABLE 8 FOR SCHOOL NUMBER AND NAME)

SCHOOL CROSSING PROTECTION

- FLASHING YELLOW LIGHT
- (A) ADULT CROSSING GUARD
- (P) UNIFORMED POLICE OFFICER
- (S) STUDENT CROSSING GUARD
- 15-MPH SPEED LIMIT WHEN CHILDREN CHILDREN ARE PRESENT

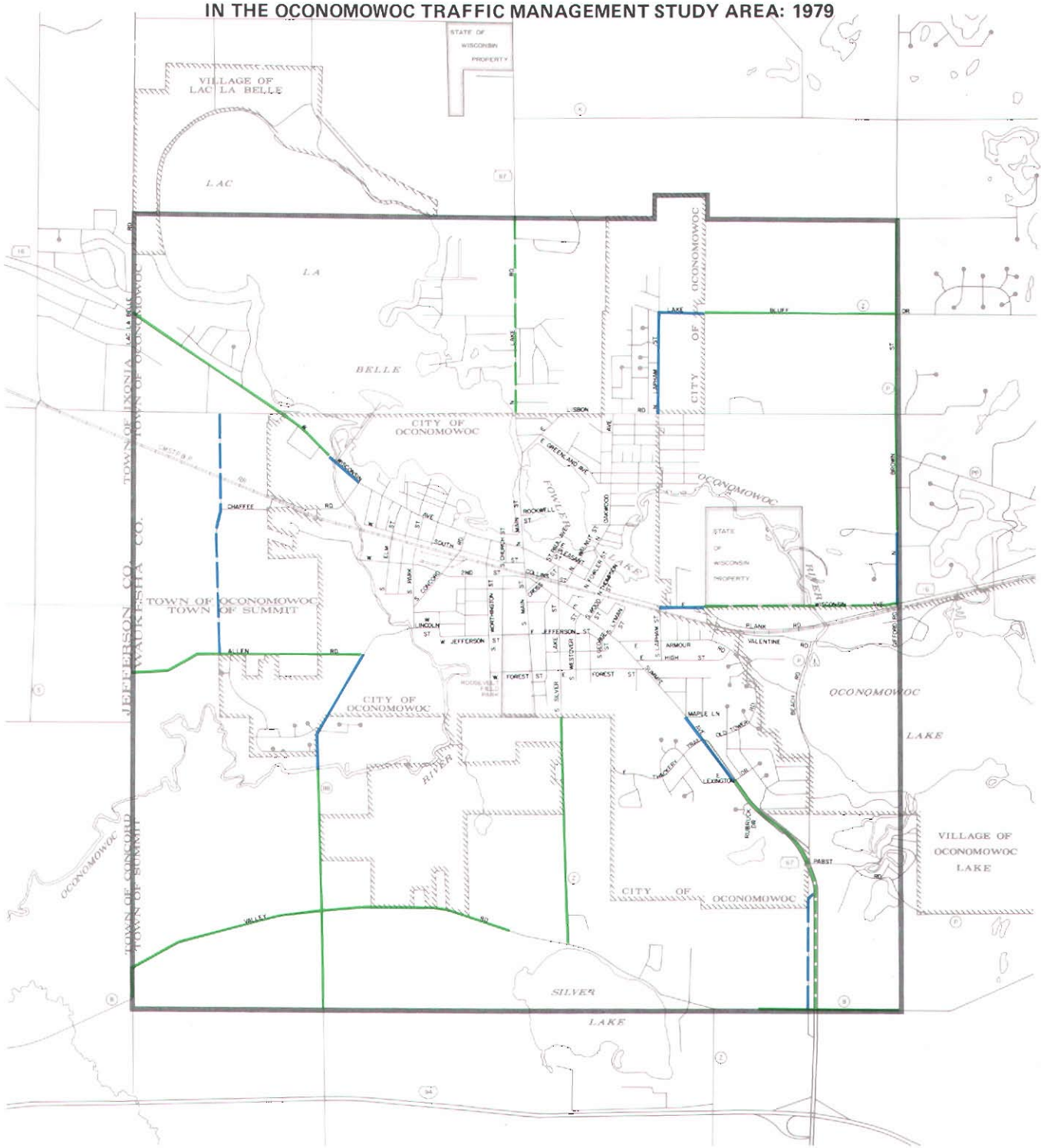
STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/2 1 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Map 14

POSTED SPEED LIMITS ON THE STREET AND HIGHWAY SYSTEM IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

SPEED LIMIT

- 25 MPH
- 35 MPH
- 40 MPH
- 45 MPH
- 50 MPH
- 55 MPH

STUDY AREA BOUNDARY

GRAPHIC SCALE

0 ½ 1 MILE

0 1000 2000 3000 4000 FEET

Source: City of Oconomowoc and SEWRPC.

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Chapter III

EXISTING TRAFFIC CONDITIONS

INTRODUCTION

A complete and accurate assessment of the performance of the existing transportation system is essential to the identification of traffic problems and to the formulation of traffic management actions necessary to solve or mitigate the identified problems. A comprehensive assessment of the operating conditions of an existing transportation system requires the collection and analysis of definitive data on: 1) traffic volumes and composition; 2) traffic operating conditions; and 3) travel patterns and trip purposes. The measurement of vehicular traffic volumes and of the characteristics of those volumes, such as the proportion of trucks and buses in the traffic stream and the variation of the traffic flow throughout the hours of the day, serves to quantify the demand on the existing transportation system. The ability of the existing transportation system to accommodate the existing demand is defined in terms of certain traffic operating conditions. Such conditions include volume to capacity ratios; traffic signal load factors; average vehicle speeds and average hourly intersection vehicle delays; public parking facility turnover and occupancy rates; and motor vehicle accident histories. The identification of existing travel patterns and trip purposes within a community is required to understand the basic factors underlying the existing traffic volumes and conditions and to identify the causes as well as the existence of traffic problems and to formulate sound solutions to those problems.

The data on existing traffic conditions presented herein, together with the data presented in Chapter II on the physical characteristics of the existing arterial street and highway system, provide the basic information necessary to identify deficiencies in the transportation system and to formulate traffic management actions to mitigate those deficiencies. The deficiencies of the existing transportation system of the Oconomowoc area are described in Chapter V of this report through a comparison of the existing traffic conditions as described in this chapter against the desired conditions as defined by the traffic management objectives and standards set forth in Chapter IV.

TRAFFIC VOLUMES

Among the more important data used to quantify the existing demand on a community transportation system are vehicular traffic counts on that system. Current traffic counts provide a measure of the utilization of the arterial street and highway system within a community. Analyses of vehicular traffic count data on an hourly, daily, and monthly basis can provide important insights on the demand for travel within a community and are essential to a determination of the effectiveness of the existing arterial street and highway system in meeting the community demand for vehicular travel.

In order to quantify the existing demand on the arterial street and highway system in the study area, average weekday traffic volumes were obtained for each roadway segment comprising the total system. Traffic volume counts on the entire arterial system have been taken by the Regional Planning Commission and the Wisconsin Department of Transportation (WisDOT) on a periodic basis since 1965, the latest such systemwide counts being taken by the WisDOT in 1976. These counts were updated to 1979 by the application of factors derived from special traffic counts taken by the WisDOT at selected locations specifically for the traffic management study. The historic growth trends exhibited by traffic on the arterial streets and highways in the study area since 1965 are shown in Table 9.

As indicated in Table 9, the vehicular traffic volumes on the arterial streets and highways entering the study area have been increasing since 1965 at an average annual rate of about 5.2 percent per year. The highest rate of traffic volume growth, 8.5 percent per year, has been exhibited by STH 67, E. Summit Avenue, north of Thackery Trail. The lowest rate of growth has been exhibited by S. Concord Road, north of Allen Road—2.2 percent per year. Traffic growth rates on the arterial streets and highways entering the City of Oconomowoc central business district (CBD) have been somewhat lower than such rates on the same arterials as they enter the study area. The annual traffic growth rates on the arterial

Table 9

AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUME ON THE ARTERIAL STREETS AND HIGHWAYS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1965 THROUGH 1979

Location	Year						Annual Growth Rate (percent)
	1965	1968	1970	1973	1975	1979	
Arterial Streets and Highways Entering the Oconomowoc Study Area							
STH 16—East of S. Lapham Street	8,500	10,870	11,360	9,350	16,540	16,000	4.6
STH 16—West of S. Blain Street	7,150	8,900	8,560	11,200	11,760	13,000	4.4
STH 67—North of E. Thackery Trail	4,500	6,180	7,320	11,880	14,240	14,000	8.5
STH 67—North of E. Lisbon Road	3,850	3,900	3,680	4,550	6,270	7,000	4.4
S. Silver Lake Street—South of E. Forest Street	1,400	1,710	1,780	1,890	2,520	3,000	5.6
S. Concord Road—North of W. Allen Road	1,850	1,730	1,880	1,840	2,320	2,500	2.2
E. Lisbon Road—West of N. Lapham Street	1,170	1,480	1,350	1,980	1,980	2,500	5.5
Subtotal	28,420	34,770	35,930	42,690	55,630	58,000	5.2
Arterial Streets and Highways Entering the Oconomowoc Central Business District							
STH 16—West of Main Street	9,290	12,260	9,910	12,010	13,470	14,500	3.2
STH 16—West of N. Walnut Street	11,370	13,010	12,510	15,890	16,840	15,500	2.2
STH 67—East of S. Silver Lake Street	6,200	7,550	9,620	11,940	12,860	14,200	6.1
S. Silver Lake Street—South of STH 67	2,830	2,860	3,200	3,660	3,560	3,600	1.8
S. Main Street—South of STH 67	1,790	1,290	1,560	1,830	2,940	3,000	3.7
S. Main Street—North of STH 16	6,590	7,870	6,960	8,380	7,950	9,000	2.3
Subtotal	38,070	44,840	43,760	53,710	57,620	59,800	3.3
Total	66,490	79,610	79,690	96,400	113,250	117,800	4.2

Source: Wisconsin Department of Transportation and SEWRPC.

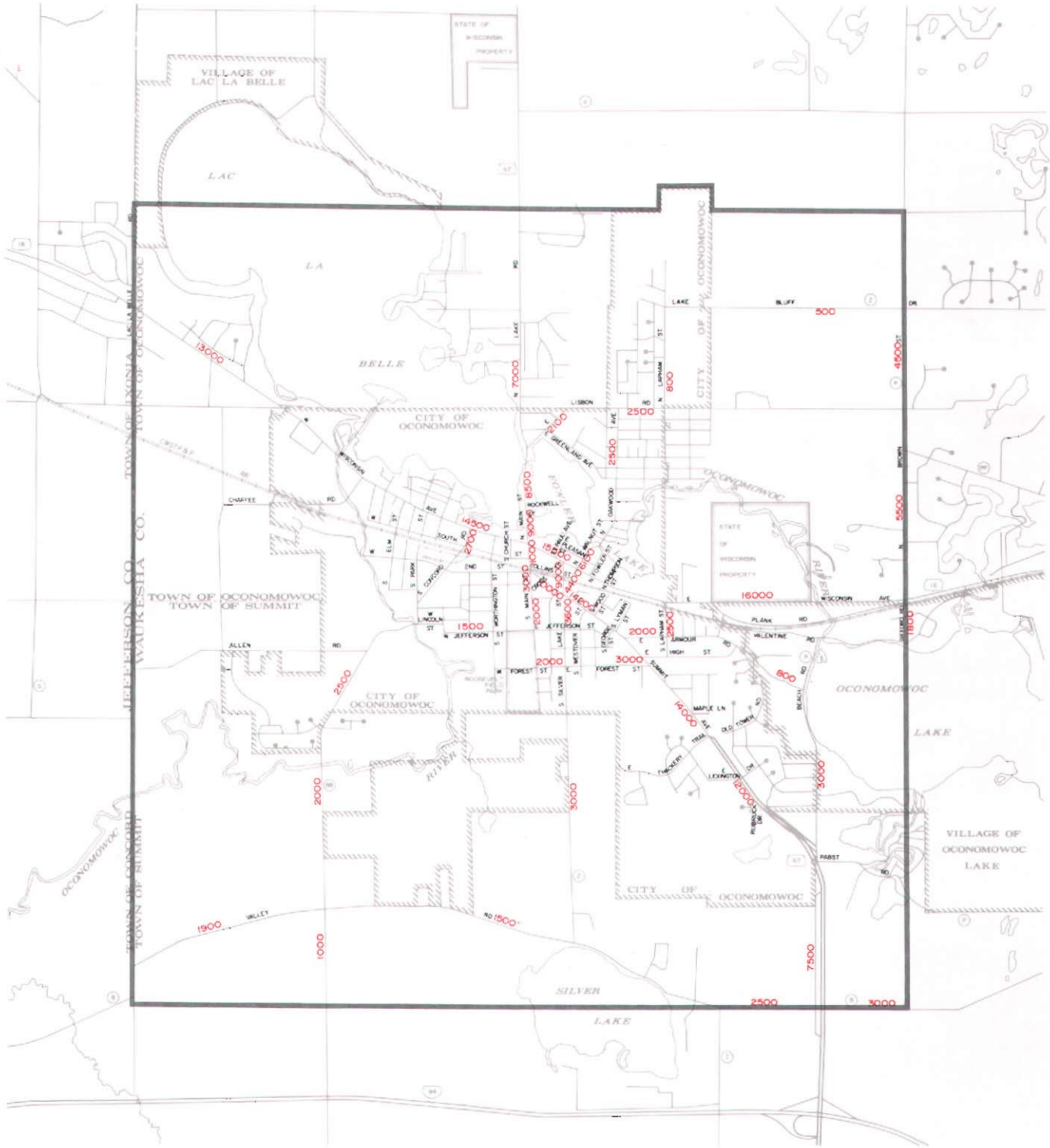
streets and highways entering the CBD have approximated 3.3 percent per year. Traffic growth rates on these arterials have ranged from a high of 6.1 percent on STH 67, E. Summit Avenue, east of S. Silver Lake Street to a low of 1.8 percent on S. Silver Lake Street south of STH 67. The variance in traffic growth rates between the arterial streets and highways entering the study area and those entering the central business district can 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 resulting change in travel patterns attendant to this new land development, as described in a later section of this chapter.

Map 15 shows the estimated 1979 24-hour average annual weekday traffic volumes on the arterial and collector streets in the Oconomowoc study area. As shown on the map, STH 16 and STH 67 are carrying the highest traffic volumes in the study area, with traffic volumes on STH 16 ranging from 13,000 to 16,000 vehicles per average weekday, and on STH 67 ranging from 4,500 to 14,000 vehicles per average weekday. The remaining arterial and collector streets in the study area have volumes ranging from 500 to 5,500 vehicles per average weekday, with the majority of these facilities carrying approximately 3,000 vehicles per average weekday.

The traffic volumes shown in Table 9 and on Map 15 represent average annual weekday conditions such as would be approximated in the spring or fall of any given year. The WisDOT also counts traffic volumes on a monthly basis at selected locations to determine seasonal variations in traffic volumes. Such counts are taken at three locations in or near the study area. These locations are STH 16 west of the City of Ocono-

Map 15

AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUME ON THE ARTERIAL AND COLLECTOR STREET SYSTEM IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

STUDY AREA BOUNDARY

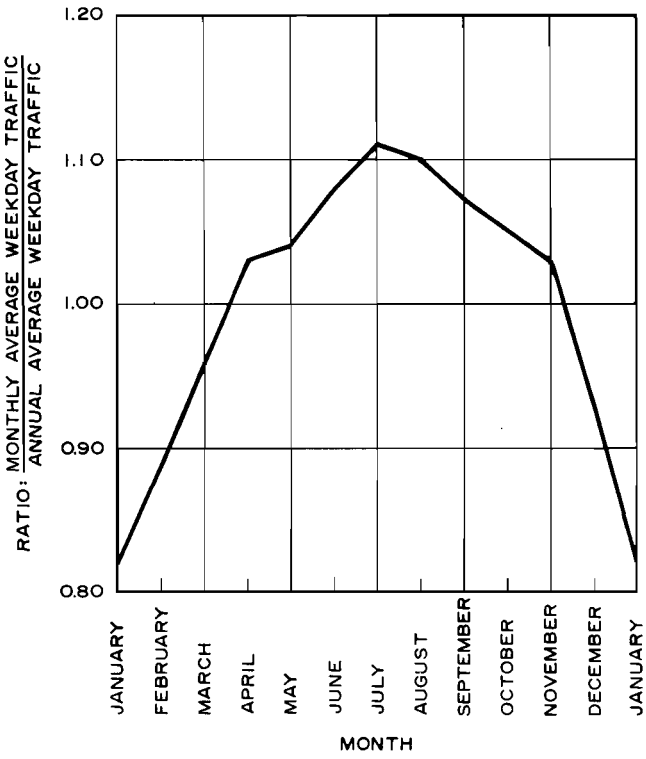
Source: Wisconsin Department of Transportation and SEWRPC.

mowoc at the Jefferson County Line, STH 16 east of the City of Oconomowoc at Sawyer Road, and STH 67 south of the City of Oconomowoc between CTH B and IH 94. As shown in Figure 1, the traffic volumes at these three locations range from a high of 111 percent of the average annual volume in July to a low of 82 percent of the average annual volume in January, with the months of March-April and November-December approximating average annual weekday traffic volumes.

In addition to monitoring the seasonal variations in traffic, the WisDOT monitors weekend traffic volumes in urban areas on Saturday and Sunday to determine changes in the weekend travel demand. As indicated in Table 10, weekend traffic volumes in the study area range from a high of 116 percent to a low of 72 percent of the average annual weekday traffic volumes. For the months of April through November, Saturday traffic volumes average 108 percent of the average annual weekday traffic volumes and Sunday traffic volumes average 95 percent of the average annual weekday traffic volumes.

Figure 1

AVERAGE MONTHLY VARIATION IN WEEKDAY TRAFFIC VOLUMES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



Source: Wisconsin Department of Transportation and SEWRPC.

As indicated in Table 10, STH 16 west of S. Blain Street, located at the western edge of the study area, exhibited the highest Saturday and Sunday percentage of the average annual weekday traffic volumes—108 and 105 percent, respectively. The percent difference between Saturday and average annual weekday traffic volumes was very consistent on all three arterial highways monitored by the WisDOT, with an average range of 107 to 108 percent. This indicates that 24-hour traffic volumes on Saturdays are basically of the same magnitude as weekday traffic volumes. However, the percent differences between Sunday and average annual weekday traffic volumes for these same routes ranged from 89 to 105 percent, with only STH 16, west of S. Blain Street, having a ratio greater than 100 percent. This implies that vehicular traffic volumes on STH 16 west of the study area are quite uniform throughout the week and do not decrease significantly on Saturdays or Sundays. In contrast, vehicular traffic volumes on STH 67 south of the study area and on STH 16 east of the study area are uniform throughout the week except for Sundays, on which traffic volumes range from 89 to 93 percent of the average annual weekday volumes.

PEAK-HOUR TRAFFIC VOLUMES

Hourly traffic volumes were obtained in 1979 for selected locations on the arterial street and highway system of the Oconomowoc study area. This hourly traffic count information indicates that the morning peak-hour traffic volume occurs between 7:30 a.m. and 8:30 a.m. and that the evening peak-hour volume 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 6.7 percent of the average annual weekday traffic volume, while the evening peak hour comprises approximately 8.6 percent of the volume. The configuration of the curve in Figure 2 is typical of vehicular traffic volume variation in urban areas, with the morning and evening peak times representing primarily work-related trips and midday travel between the peaks representing primarily business, shopping, and social-recreation-related trips. For traffic management analysis purposes, these noted peak-hour periods are of primary concern, since it is at these times that the traffic demand normally approaches the capacity of the arterial facilities.

The determination of the period within which the peak hour occurs in the study area was substantiated by manual intersection counts taken by the

Table 10

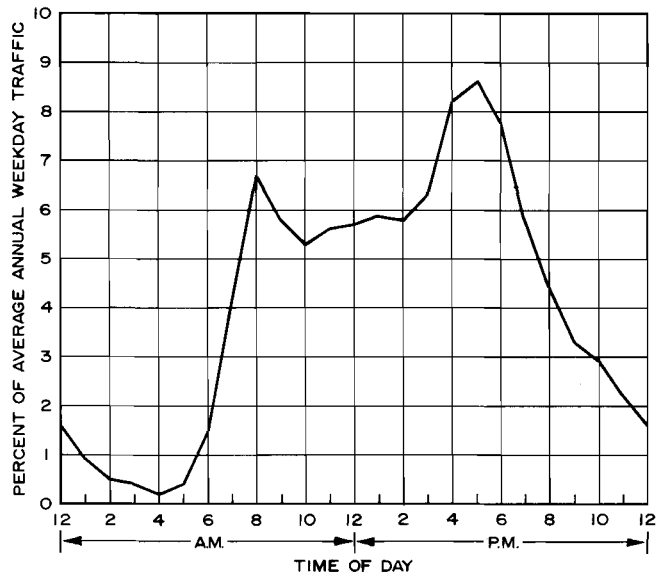
COMPARISON OF WEEKEND TO AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUMES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Month	Saturday (percent of weekday)				Sunday (percent of weekday)			
	STH 16 (west of E. Blain Street)	STH 67 (north of CTH B)	STH 16 (east of CTH P)	Average	STH 16 (west of E. Blain Street)	STH 67 (north of CTH B)	STH 16 (east of CTH P)	Average
April	110	109	98	106	91	89	79	86
May.	112	100	108	107	110	85	87	94
June	107	109	110	109	116	96	99	104
July.	101	110	114	108	106	101	101	103
August	114	109	113	112	116	96	110	107
September . . .	111	108	109	109	114	93	80	96
October	113	109	104	109	102	89	72	88
November . . .	95	--	99	97	88	--	81	84
Average	108	108	107	108	105	93	89	95

Source: Wisconsin Department of Transportation and SEWRPC.

Figure 2

HOURLY VARIATION IN ANNUAL AVERAGE WEEKDAY TRAFFIC IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



Source: SEWRPC.

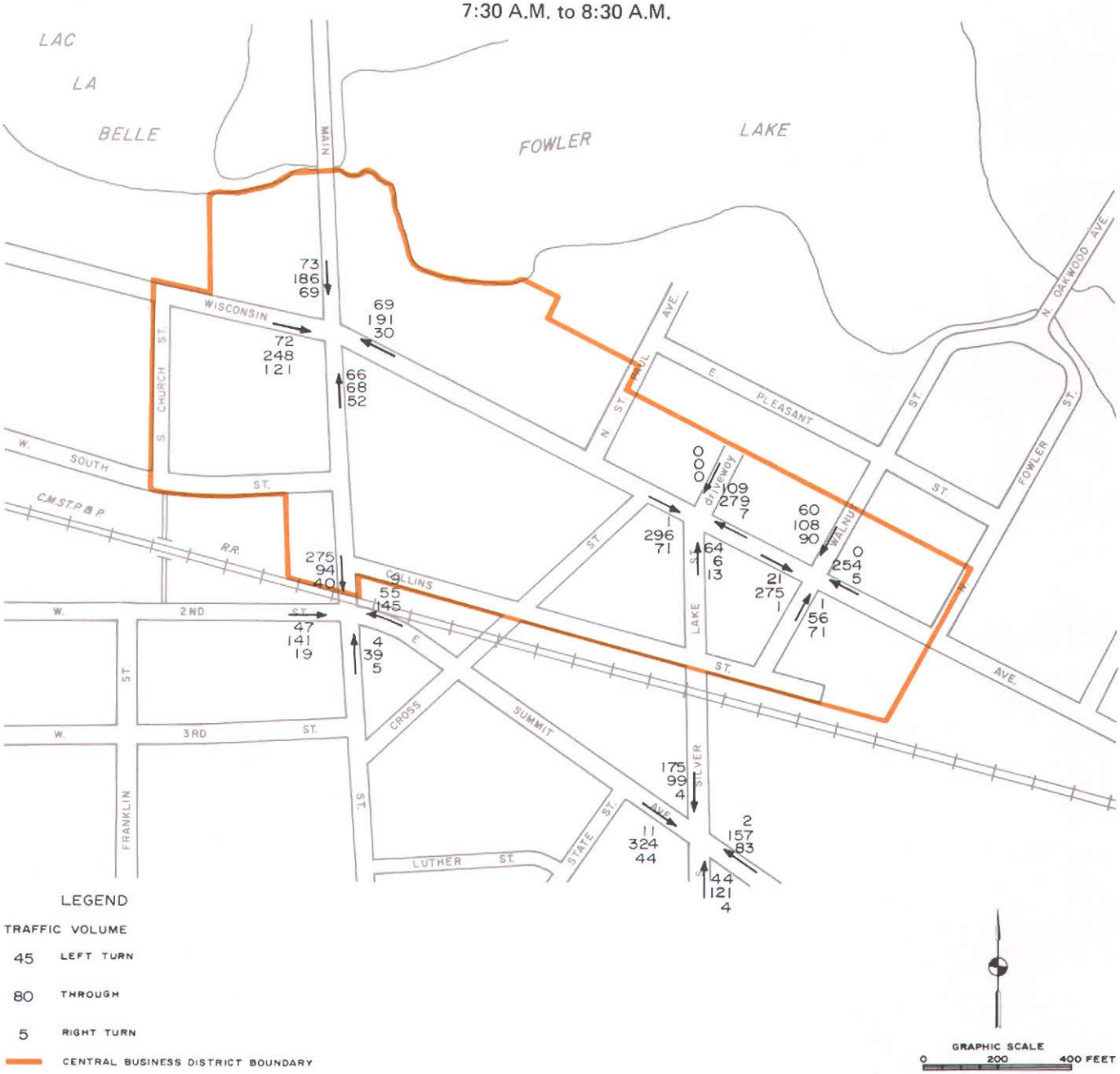
Commission staff at the four signalized intersections in the Oconomowoc central business district between the hours of 7:00 a.m. and 9:00 a.m. and 3:00 p.m. and 6:00 p.m. These manual intersection counts indicated that on some arterials, the traffic volumes between 3:30 p.m. and 4:30 p.m. was equal to or exceeded the volume between 4:00 p.m. and 5:00 p.m. Such a shift in the evening peak hour was exhibited on some of the intersection approaches at the intersections of E. Summit Avenue and S. Silver Lake Street and Main Street and Wisconsin Avenue. The 3:30 p.m. to 4:30 p.m. volume, however, was only slightly higher than the 4:00 p.m. to 5:00 p.m. volume on some of the intersection approaches at these two intersections, with the total traffic volume still peaking during the 4:00 p.m. to 5:00 p.m. period except at the intersection of E. Summit Avenue with S. Silver Lake Street, where the total intersection volume between 3:30 p.m. and 4:30 p.m. was approximately 8 percent greater than the 4:00 p.m. to 5:00 p.m. volume. This indicates that instead of a one-hour evening peak hour, there is an extended hour and a half of peak traffic demand on some of the arterial streets and highways in the Oconomowoc central business district.

The 1979 peak-hour traffic volumes for the 7:30 a.m. to 8:30 a.m. and 4:00 p.m. to 5:00 p.m. time periods on the arterial street and highway system in the Oconomowoc central business district are shown on Map 16 and in Table 11. Table 11 also shows the 3:30 p.m. to 4:30 p.m. traffic volumes at the Main Street and Wisconsin Avenue and S. Silver Lake Street and E. Summit Avenue intersections. Hourly traffic count data were not available at this time for peak weekend hours of vehicular traffic. However, it is reasonable to assume, based on the variance in weekend daily traffic volumes, that the weekend peak-hour volumes are equal to or less than the peak weekday volumes except on the

Map 16

PEAK-HOUR TRAFFIC VOLUMES ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979

7:30 A.M. to 8:30 A.M.



LEGEND

TRAFFIC VOLUME

45 LEFT TURN

80 THROUGH

5 RIGHT TURN

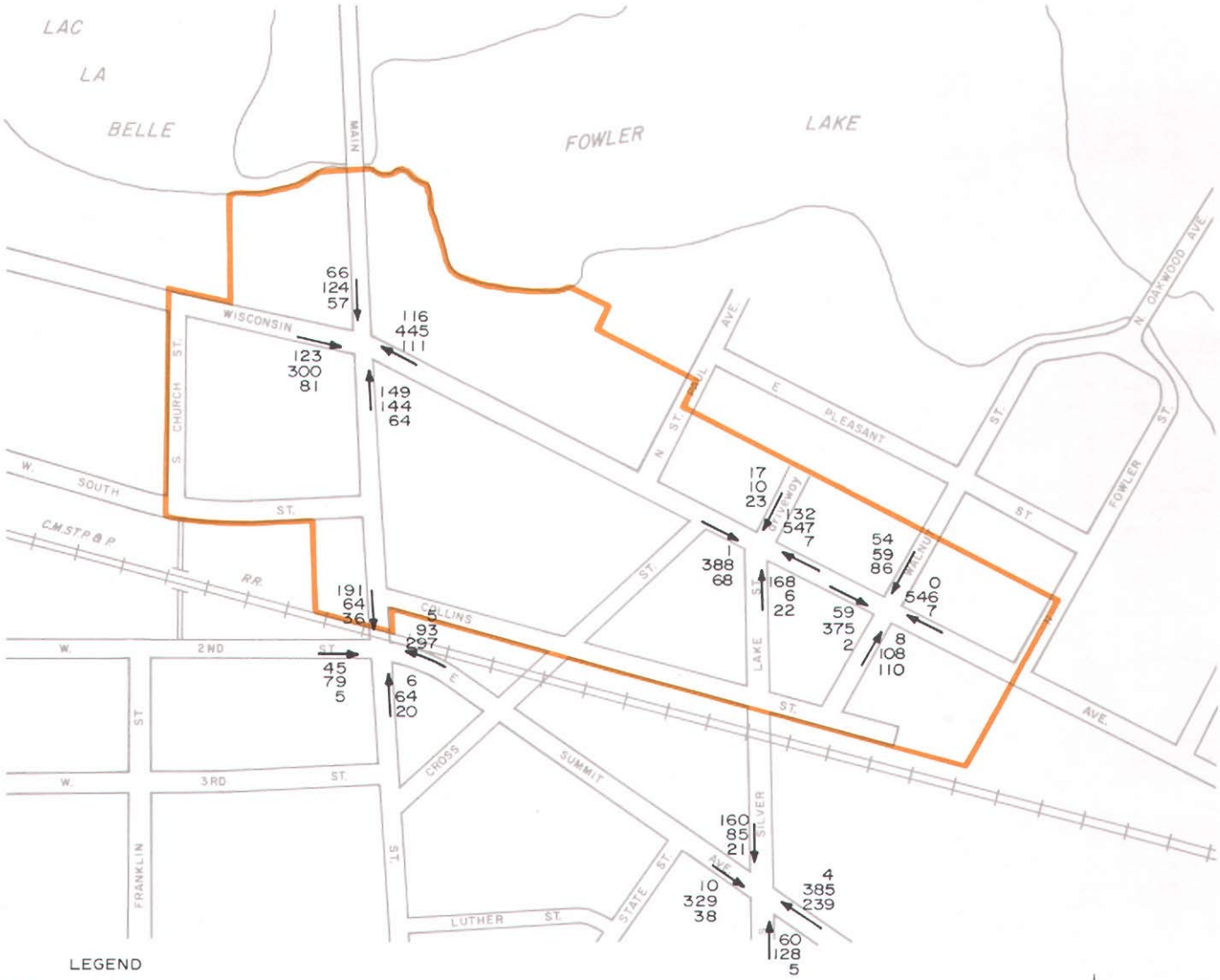
CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE 0 200 400 FEET

Source: SEWRPC.

Map 16 (continued)

4:00 P.M. to 5:00 P.M.



LEGEND

TRAFFIC VOLUME

45 LEFT TURN

80 THROUGH

5 RIGHT TURN

CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE

0 200 400 FEET

Source: SEWRPC.

Table 11

DISTRIBUTION OF PEAK-HOUR TURN MOVEMENTS, TRUCKS AND BUSES, AND PEAK-HOUR FACTORS AT SELECTED LOCATIONS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Intersection	Approach Direction	7:30 a.m. to 8:30 a.m.					4:00 p.m. to 5:00 p.m./3:30 p.m. to 4:30 p.m.				
		Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Peak-Hour Factor	Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Peak-Hour Factor
			Percent Left	Percent Right				Percent Left	Percent Right		
Main Street and Wisconsin Avenue[a]	Southbound	328	22	21	2	0.68	247/243	26/23	23/30	3/4	0.81/0.83
	Northbound	186	35	28	7	0.88	357/360	42/36	18/19	4/4	0.89/0.90
	Westbound	290	24	10	9	0.82	672/610	17/16	16/18	2/2	0.79/0.82
	Eastbound	441	16	27	5	0.83	504/501	24/21	16/19	3/5	0.89/0.93
S. Silver Lake Street and E. Summit Avenue[a]	Southbound	278	63	1	2	0.64	266/303	60/56	8/8	2/2	0.88/0.86
	Northbound	169	26	2	6	0.65	193/303	31/32	2/2	1/3	0.86/0.63
	Westbound	242	1	34	6	0.81	628/599	1/1	38/38	4/3	0.95/0.94
	Eastbound	379	3	12	7	0.75	377/377	3/3	12/9	6/6	0.84/0.85
N. Walnut Street and E. Wisconsin Avenue	Southbound	268	22	34	1	0.64	199	27	43	1	0.92
	Northbound	128	1	55	2	0.76	226	4	49	2	0.82
	Westbound	259	--[b]	2	6	0.91	553	--[b]	1	1	0.91
	Eastbound	297	7	1	4	0.87	436	14	1	3	0.86
S. Silver Lake Street and E. Wisconsin Avenue	Southbound[c]	--	--	--	--	--	50	34	46	--	0.78
	Northbound	83	77	16	6	0.69	195	86	11	4	0.84
	Westbound	395	28	2	8	0.84	680	19	--	2	0.94
	Eastbound	368	--	19	5	0.84	457	--	15	3	0.94
E. Wisconsin Avenue[d] and CTH P	Southbound	239	43	40	3	0.82	169	34	40	4	0.70
	Northbound	31	3	29	--	0.60	53	20	8	3	0.74
	Westbound	292	6	13	8	0.88	571	4	21	2	0.88
	Eastbound	308	10	1	7	0.77	490	30	2	2	0.90
S. Main Street and E. Summit Avenue[a]	Southbound	409	67	10	9	0.77	291	66	12	3	0.79
	Northbound	48	9	11	2	0.72	90	7	22	--	0.75
	Westbound	209	4	69	6	0.82	395	1	76	3	0.84
	Eastbound	207	23	9	6	0.78	129	35	4	5	0.87
E. Forest Street and E. Summit Avenue	Southbound	611	--	34	6	N/A	613	--	13	9	N/A
	Northbound	402	34	--	7	N/A	717	14	--	5	N/A
	Eastbound	132	24	76	2	N/A	228	34	66	4	N/A

NOTE: N/A indicates data not available.

[a] *Peak-hour traffic volumes at the intersections of Main Street and Wisconsin Avenue and S. Silver Lake Street and E. Summit Avenue occur between the 3:30 p.m. to 4:30 p.m. and 4:00 p.m. to 5:00 p.m. time period, depending upon the intersection approach direction.*

[b] *Left turn prohibited for westbound traffic on E. Wisconsin Avenue at N. Walnut Street.*

[c] *The southbound approach of S. Silver Lake Street at E. Wisconsin Avenue is a driveway to a private parking lot and had zero vehicles during the 7:30 a.m. to 8:30 a.m. time period.*

[d] *Peak-hour traffic volumes at the intersection of E. Wisconsin Avenue and CTH P occur between 7:30 a.m. and 8:30 a.m. and 4:30 p.m. and 5:30 p.m.*

[e] *Peak-hour traffic volumes at the intersection of E. Forest Street and E. Summit Avenue occur between 7:30 a.m. and 8:30 a.m. and 3:00 p.m. and 4:00 p.m., which coincides with the Oconomowoc Senior High School's start and dismissal times.*

Source: SEWRPC.

major summer holiday weekends. Such volumes are not normally used for system design or evaluation purposes.

VOLUME TO CAPACITY RATIOS

The relationship between the average annual weekday traffic volume on particular segments of the arterial system and the capacity of those segments is referred to as the volume to capacity (V/C) ratio. The volume to capacity ratio is used to measure the degree of traffic congestion on arterial streets and highways. This relationship, when determined for the entire arterial system, is useful in identifying routes where traffic management actions should be considered to improve system operating conditions.

The design hourly capacity, defined as that capacity which would provide a level of service "C," given the physical and operating characteristics of the roadway, was calculated for each arterial and collector street segment in the Oconomowoc study area according to the procedures set forth in the Highway Capacity Manual—1965."[1] In urban areas the capacity of a roadway segment is normally determined by the maximum number of vehicles that can pass through intersections with other roadways. There are seven basic factors that control intersection capacity: 1) approach pavement width; 2) parking within 250 feet of the intersection; 3) type of traffic control measures; 4) community population size and the character of land development; 5) the distribution of the right and left turns; 6) the percent of trucks or buses in the traffic stream; and 7) the peak-hour factor, which is a measure of the variation in traffic flow rate during the peak hour.

The first four factors together comprise the existing physical conditions affecting roadway capacity and have been described for the study area in Chapter II of this report. The last three factors together comprise the flow characteristics of the vehicular traffic using the arterial system and are described below for the arterial streets and collectors of the Oconomowoc study area. Table 11 indicates the peak-hour distribution of right- and left-turning vehicles and the percentage of trucks and buses in the traffic stream at the four signalized arterial intersections and two nonsignalized arterial intersections in the City of Oconomowoc. Midday traffic counts were taken at the intersection of Main Street and Wisconsin Avenue to determine the percentage of trucks and buses in the traffic stream during the peak truck traffic activity period—from 11:00 a.m. to 12:00 p.m. and 1:00 p.m. to 2:00 p.m. During this midday period, trucks were found to comprise from 6 to 10 percent of the total traffic volume, averaging about 8 percent. This is higher than the average peak-hour truck percentage of about 3 percent, and the average annual weekday truck percentage of about 6 percent. This variance in peak-hour and midday truck percentages is typical of traffic on urban arterial streets and does not indicate an abnormally high number of trucks in the traffic stream. The peak-hour percentages for right- and left-turning vehicles and for trucks or buses in the traffic stream were used in the calculation of peak-hour design capacities at the five signalized intersections and two nonsignalized intersections contained in Table 11. For all other arterial intersections in the study area for which roadway capacities were calculated, it was assumed that the intersection was operating under typical urban traffic conditions of 10 percent right turns, 10 percent left turns, and 5 percent trucks and buses.

Also indicated in Table 11 are the intersection approach peak-hour factors used in the 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 during the peak-hour to four times the highest number of vehicles arriving during a consecutive 15-minute period during that hour. The peak-hour factor cannot exceed a value of 1.00, and as the peak-hour factor approaches 1.00 the traffic flow throughout the hour becomes uniform, without marked peaks. The peak-hour factors indicated in Table 11 range from a low of 0.63 to a high of 0.95, with an average 7:30 a.m. to 8:30 a.m. peak-hour factor of 0.77 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 is representative of increased evening traffic volumes resulting from the coincidence of work to home trips with other social, recreational, medical/dental, and shopping trips which normally are not made during the morning peak-hour period. A peak-hour factor of 0.85, which is typical of normal peak-hour traffic demand in urban areas, was assumed for all other arterial intersections in the study area.

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[1] *Transportation Research Board Special Report 87, Highway Capacity Manual—1965, National Academy of Sciences, National Research Council, Washington, D.C.*

Based on the previously described traffic flow characteristics, the average weekday traffic volume to design capacity ratio was calculated for each segment of the arterial and collector street system in the study area. The "design" capacity was calculated under level of service, or "C," conditions equal to 0.80 of maximum capacity.

Facilities operating at or under this design capacity were assumed to provide an adequate level of service. Under level of service "C" conditions, drivers may occasionally have to wait through more than one red signal cycle, and queues may develop behind turning vehicles. Most drivers feel somewhat restricted but not objectionably so. Facilities operating over design capacity experience congestion with long queues of vehicles waiting upstream of intersections. Drivers may have to wait through several signal cycles. The backup of vehicles may, in turn, restrict or prevent the movement of vehicles from cross streets and driveways. Map 17 identifies those arterial and collector streets in the study area which are currently operating below, at, and over design capacity.

As shown on Map 17, two arterial streets in the Oconomowoc study area are currently operating at design capacity: E. Wisconsin Avenue from N. Main Street to S. Silver Lake Street and E. Summit Avenue from S. Main Street to S. Silver Lake Street. There are also two arterial streets in the Oconomowoc study area operating over design capacity: W. Wisconsin Avenue from approximately S. Concord Road to N. Main Street, and E. Summit Avenue from S. Silver Lake Street to approximately E. Armour Road. All of the arterial streets operating at or over capacity are located within or enter the Oconomowoc central business district. Of the total of 28.74 miles of arterial and collector streets in the study area, 27.64 miles, or about 96.1 percent, were found to be operating under design capacity; 0.42 mile, or about 1.5 percent, was found to be operating at design capacity; and 0.68 mile, or about 2.4 percent, were found to be operating over design capacity.

SIGNALIZED INTERSECTION LOAD FACTORS

The intersection load factor is a measure of the degree of utilization of an approach roadway to a signalized intersection. This factor provides a second measure of roadway congestion. It is defined as the ratio of the number of green phases of the traffic signal cycle that are fully utilized (loaded) during a one-hour period to the total number of green phases of that signal during an hour. A load factor value approaching 1.00 is an indication that vehicular traffic entering the intersection cannot travel through the intersection without stopping and waiting for at least a second green signal phase before proceeding through the intersection. Table 12 indicates the load factors for each roadway approach to the five signalized intersections in the study area during the morning and evening peak hours. As shown in the table, almost all of the approaches to the signalized intersections are operating with a load factor of zero. Only two intersection approaches in the study area exceed a load factor of 0.30: the westbound approach of E. Summit Avenue at S. Silver Lake Street, which has a load factor of 0.56 from 3:30 p.m. to 4:30 p.m., and the eastbound approach of W. Wisconsin Avenue at Main Street, which has a load factor of 0.44 from 4:00 p.m. to 5:00 p.m.

ARTERIAL SYSTEM OPERATING SPEEDS

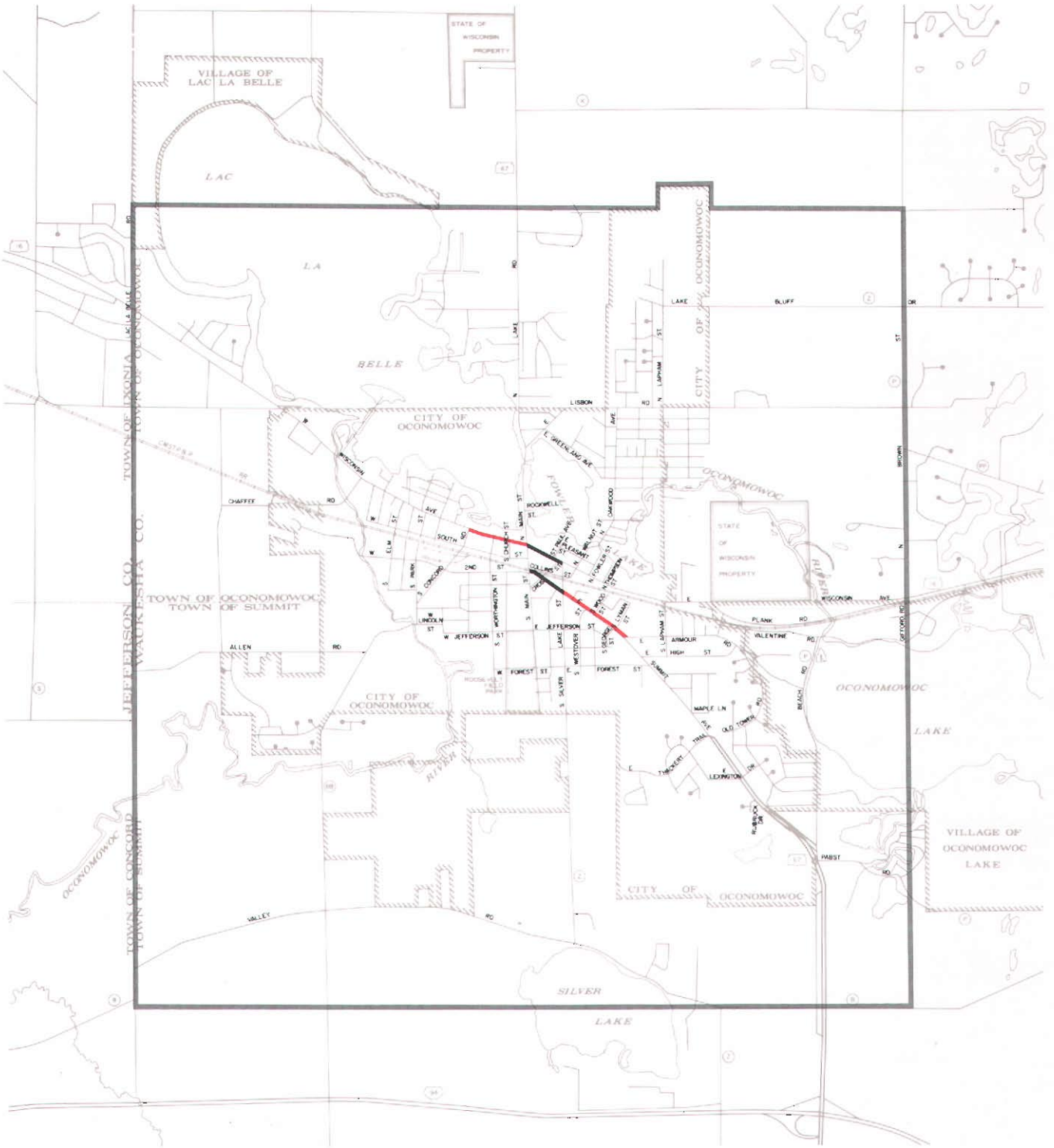
Travel time and delay information on an arterial street system are useful indicators of arterial system operating efficiency. Intersection delay information can be used to identify traffic congestion and the need for traffic management actions to improve arterial intersection operations. In addition to intersection delay information, average vehicle operating speeds, which are directly related to arterial system travel times, can be used to quantify the relative efficiency of vehicular traffic flow on the arterial system. Average vehicle operating speeds that are substantially above or below the posted speed limits or which vary significantly between peak and off-peak periods for a specific roadway segment generally indicate that the area warrants consideration for the application of traffic management actions to produce a more uniform speed consistent with posted speed limits.

Average Vehicle Operating Speeds

Average vehicle operating speeds were measured during both off-peak and peak periods of traffic demand on STH 16 and STH 67 in the City of Oconomowoc. These speeds were determined by the "floating car" method, which utilizes a test car that is driven at the average speed of the other vehicles in the traffic stream over measured segments of the roadway. In conducting the average vehicle operating speed study, STH 16 was divided into four segments and STH 67 into five segments as shown on Map 17. Over a period of several weeks in March and April 1979, eight travel time runs were made in each direction on these arte-

Map 17

ARTERIAL AND COLLECTOR STREETS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA OPERATING BELOW, AT, AND OVER DESIGN CAPACITY: 1979



Source: Wisconsin Department of Transportation and SEWRPC.

Table 12

VEHICLE DELAY AND LOAD FACTORS AT THE SIGNALIZED INTERSECTIONS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Intersection	Approach Direction	7:30 a.m. to 8:30 a.m.			4:00 p.m. to 5:00 p.m./ 3:30 p.m. to 4:30 p.m.		
		Average Delay per Approach Vehicle (seconds)	Percent Vehicles Stopped	Load Factor	Average Delay per Approach Vehicle (seconds)	Percent Vehicles Stopped	Load Factor
Main Street and Wisconsin Avenue	Southbound	13.1	63	0.00	13.6	60.0	0.00
	Northbound	8.7[a]	49[a]	0.00	19.9	70.0	0.00
	Westbound	10.2	50	0.00	14.3[b]	63.0[b]	0.00
	Eastbound	20.6	66	0.25	55.9	94.0	0.44
S. Silver Lake Street and E. Summit Avenue[c]	Southbound	16.7	66	0.00	9.9/9.4	43/69	0.00/0.13
	Northbound	9.3[a]	52[a]	0.00	10.4[b]/8.5	58[b]/52	0.00/0.00
	Westbound	7.5	48	0.00	16.8/37.7	72/83	0.38/0.56
	Eastbound	8.0	47	0.06	6.4/11.1	34/67	0.06/0.00
N. Walnut Street and E. Wisconsin Avenue	Southbound	12.6	66	0.00	16.7	80.0	0.00
	Northbound	7.3	48	0.00	12.6	64.0	0.00
	Westbound	7.1	51	0.00	9.4	59.0	0.00
	Eastbound	0.2	1	0.00	4.4	26.0	0.00
S. Silver Lake Street and E. Wisconsin Avenue	Southbound	--	--	--	--	--	--
	Northbound	16.8	80	0.00	9.9	48.0	0.00
	Westbound	0.9	6	0.00	2.8	17.0	0.00
	Eastbound	7.7	44	0.00	9.3	51.0	0.10
E. Wisconsin Avenue and CTH P	Southbound	15.0	77.2	0.00	17.6	68.1	0.00
	Northbound	15.0	62.5	0.00	12.6	60.0	0.00
	Westbound	4.0	23.4	0.00	5.3	30.0	0.00
	Eastbound	5.1	26.5	0.00	6.4	29.0	0.00

[a] *Morning delay values represent the time period from 8:00 to 9:00 a.m. since they exceeded the 7:30 to 8:30 a.m. values.*

[b] *Evening delay values represent the time period from 5:00 to 6:00 p.m. since they exceeded the 4:00 to 5:00 p.m. values.*

[c] *Evening delay and load factor values vary at the S. Silver Lake Street and E. Summit Avenue intersection by approach direction between 3:30 p.m. and 5:00 p.m.*

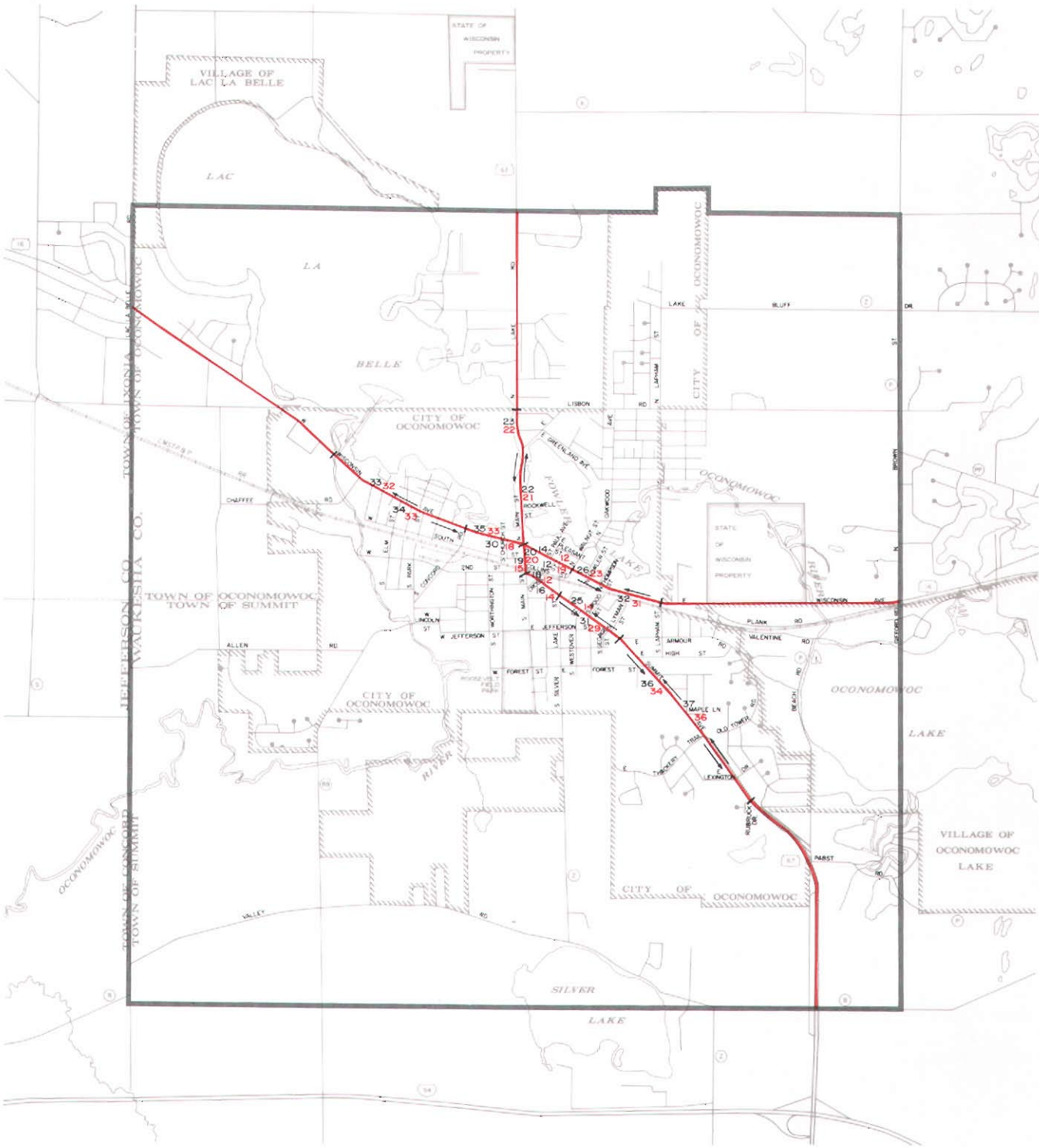
[d] *Evening delay and load factor values represent the time period from 4:30 p.m. to 5:30 p.m.*

Source: SEWRPC.

rials during off-peak periods of traffic demand, and 10 runs were made in each direction during afternoon peak periods of traffic demand from 3:30 p.m. to 5:00 p.m. Map 18 shows the off-peak-period and peak-period average operating speed on each of the roadway segments surveyed. As indicated in Table 13, the average travel time on STH 16 from the Oconomowoc River on the west side of the City to S. Lapham Street, a distance of 1.88 miles, is approximately 4.2 minutes in either direction of travel during off-peak traffic demand periods, and increases to approximately 5.1 minutes traveling eastbound and 4.7 minutes traveling westbound during the evening peak-hour traffic demand period. This results in an average vehicle travel speed during the off-peak period of 27 miles per hour (mph) in the eastbound and westbound directions, as compared to evening peak-hour speeds of 22 mph in the eastbound direction and 24 mph in the westbound direction.

Map 18

AVERAGE OFF-PEAK AND PEAK PERIOD VEHICLE OPERATING SPEEDS ON STH 16 AND STH 67 IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

AVERAGE VEHICLE OPERATING SPEED

33 OFF-PEAK PERIOD

32 PEAK PERIOD

→ DIRECTION OF TRAFFIC

STUDY AREA BOUNDARY

GRAPHIC SCALE

0 1/2 1 MILE

0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Table 13

AVERAGE OFF-PEAK-HOUR AND PEAK-HOUR WEEKDAY TRAVEL TIMES AND OPERATING SPEEDS ON STH 16 AND STH 67 IN THE CITY OF OCONOMOWOC: 1979

Facility	Termini	Distance (miles)	Posted Speed Limit (mph)	Average Travel Time and Speed[a]			
				Off-Peak		Peak	
				Time (minutes)	Speed (mph)	Time (minutes)	Speed (mph)
STH 16 Eastbound	The Oconomowoc River-S. Concord Road. . .	0.80	35-25	1.42	34	1.43	33
	S. Concord Road-Main Street	0.35	25	0.67	32	1.15	18
	Main Street-N. Walnut Street	0.23	25	1.17	12	1.55	9
	N. Walnut Street-S. Lapham Street	0.50	25	0.95	32	0.98	31
	Total	1.88	--	4.21	27	5.11	22
STH 16 Westbound	S. Lapham Street-N. Walnut Street	0.50	25	1.13	26	1.33	23
	N. Walnut Street-Main Street	0.23	25	1.02	14	1.20	12
	Main Street-S. Concord Road	0.35	25	0.60	35	0.63	33
	S. Concord Road-the Oconomowoc River . . .	0.80	25-35	1.47	33	1.50	32
	Total	1.88	--	4.22	27	4.66	24
STH 67 Northbound	Robruck Drive-E. Armour Road	1.03	45-25	1.68	37	1.73	36
	E. Armour Road-S. Silver Lake Street	0.40	25	0.95	25	1.70	14
	S. Silver Lake Street-E. Summit Avenue	0.20	25	0.68	18	1.00	12
	E. Summit Avenue-Wisconsin Avenue	0.18	25	0.55	20	0.55	20
	Wisconsin Avenue-Pine Street	0.68	25	1.87	22	1.97	21
	Total	2.49	--	5.73	26	6.95	21
STH 67 Southbound	Pine Street-Wisconsin Avenue	0.68	25	1.75	23	1.85	22
	Wisconsin Avenue-E. Summit Avenue	0.18	25	0.58	19	0.73	15
	E. Summit Avenue-S. Silver Lake Street	0.20	25	0.77	16	0.85	14
	S. Silver Lake Street-E. Armour Road	0.40	25	0.78	31	0.82	29
	E. Armour Road-Robruck Drive	1.03	25-45	1.73	36	1.82	34
	Total	2.49	--	5.61	27	6.07	25
STH 16 Eastbound to STH 67 Southbound	The Oconomowoc River-S. Concord Road. . .	0.80	35-25	1.42	34	1.43	33
	S. Concord Road-Main Street	0.35	25	1.07	20	1.20	18
	Wisconsin Avenue-E. Summit Avenue	0.18	25	0.63	17	0.58	18
	S. Main Street-S. Silver Lake Street.	0.20	25	0.70	17	0.65	18
	S. Silver Lake Street-E. Armour Road	0.40	25	0.83	29	0.87	28
	E. Armour Road-Robruck Drive	1.03	25-45	1.73	36	1.82	34
	Total	2.96	--	6.38	28	6.55	27
STH 67 Northbound to STH 16 Eastbound	Robruck Drive-E. Armour Road	1.03	45-25	1.68	37	1.73	36
	E. Armour Road-S. Silver Lake Street	0.40	25	0.93	26	1.58	15
	S. Silver Lake Street-S. Main Street.	0.20	25	0.60	20	0.78	15
	E. Summit Avenue-Wisconsin Avenue	0.18	25	0.77	14	1.05	10
	S. Main Street-S. Concord Road.	0.35	25	0.70	30	0.72	29
	S. Concord Road-the Oconomowoc River . . .	0.80	25-35	1.47	33	1.50	32
	Total	2.96	--	6.15	29	7.36	24

[a] *Off-peak-hour travel times and operating speeds were surveyed between the hours of 9:00 a.m. and 3:30 p.m. and peak-hour travel times were surveyed between the hours of 3:30 p.m. and 5:00 p.m.*

Source: SEWRPC.

As STH 16 enters the central business district (CBD) of the City of Oconomowoc, average vehicle operating speeds in the eastbound direction are reduced to approximately 12 mph during the off-peak periods and 9 mph during the evening peak hour. This reduction in average vehicle speeds in the CBD occurs primarily because of the delays caused by the signalized intersections and by interference from the marginal traffic activity generated by the land uses located within the CBD.

A similar pattern of travel time and average vehicle operating speeds was found to exist on STH 67. Travel times on STH 67 during off-peak travel demand periods average about 5.67 minutes from Robruck Drive to Pine Street, a distance of 2.49 miles. The peak-hour travel times increase to 6.95 minutes in the northbound direction and 6.07 minutes in the southbound direction for the same 2.49-mile segment of STH 67. Vehicle operating speeds thus average 27 mph during off-peak periods and about 21 mph in the northbound direction and 25 mph in the southbound direction during the evening peak-hour period. STH 67 also experiences reduced average vehicle operating speeds as it enters the Oconomowoc CBD area, with speeds averaging 17 and 13 mph, respectively, during the off-peak and evening peak-hour periods.

Vehicle operating speed measurements were also taken on the arterial route combination of STH 16 from the Oconomowoc River on the west side of the study area to its intersection with STH 67, and then on STH 67 at its intersection with STH 16 to Robruck Drive, a total distance of 2.96 miles. As indicated in Table 13, this route exhibited an off-peak average travel speed of 28 mph eastbound and 29 mph westbound, and a peak-hour average travel speed of 27 mph eastbound and 24 mph westbound. Travel on this route through the Oconomowoc CBD averaged 17 mph and 15 mph during the off-peak and peak periods, respectively.

Signalized Intersection Delays

Signalized intersection delay is a measure of the amount of time vehicular traffic must stop and wait prior to proceeding through a signalized intersection. This measure of delay is used to indicate the efficiency of traffic signal timing plans in accommodating the traffic using the intersection. The percentage of vehicles stopped at the intersection is another useful indicator of needed changes in traffic signal timing at the intersection.

Signalized intersection delay information was obtained for the five signalized intersections in the study area for the 7:00 a.m. to 9:00 a.m. and 3:30 p.m. to 6:00 p.m. time periods. The longest vehicle delays were found to occur between 7:30 a.m. and 8:30 a.m. and 4:00 p.m. and 5:00 p.m. As shown in Table 12, the average delay per vehicle approaching these intersections during these periods ranged from a low of 0.2 second between 7:30 and 8:30 a.m. for vehicles eastbound on E. Wisconsin Avenue at the intersection with N. Walnut Street to a high of 55.9 seconds between 4:00 and 5:00 p.m. for vehicles eastbound on W. Wisconsin Avenue at the intersection with Main Street. Of the 19 approaches to the five signalized intersections in the study area, 15 exhibited an average delay of less than 15 seconds per vehicle during the 7:30 a.m. to 8:30 a.m. peak hour and 13 approaches exhibited an average delay of less than 15 seconds per vehicle during the 4:00 p.m. to 5:00 p.m. peak hour. The average delay per vehicle for all intersection approaches was 9.8 seconds and 13.4 seconds during the morning and evening peak hours, respectively. These data are corroborated by the hourly traffic count information, shown in Figure 2, which shows the 4:00 to 5:00 p.m. peak-hour volumes to be higher than the 7:30 to 8:30 a.m. peak-hour volumes.

The percent of vehicles stopped during the peak hour at each approach to the five signalized intersections in the Oconomowoc study area ranges from a low of 1 percent between 7:30 and 8:30 a.m. for the eastbound approach of E. Wisconsin Avenue at its intersection with N. Walnut Street, to a high of 94 percent between 3:30 and 5:00 p.m. for the eastbound approach of W. Wisconsin Avenue at its intersection with Main Street (see Table 12). For the peak hour at all five signalized intersections, an average of approximately 44 percent of all vehicles was stopped during the morning peak period and 54 percent was stopped in the evening peak period. These peak-period percentages are considered normal based on an assumed random arrival of vehicles at the traffic signals, which are in a red, or stop, phase about 50 percent of the time.

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 the City of Oconomowoc, which is a relatively small, urban area surrounded by essentially suburban and rural development, and which is located approximately 29 miles from the center of the Milwaukee urbanized area, the major social and economic center in the Southeastern Wisconsin Region.

An understanding of the existing traffic patterns imposed on a community's transportation system is important to the development of sound traffic management actions, which should be designed to more efficiently serve those patterns. The origin-destination travel data collected by the Commission in 1972 were analyzed and extrapolated to determine trip purposes in the study area. As indicated in Table 14, an estimated 108,800 person trips were made on an average weekday in 1979 within the study area.

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 1979, approximately 20 percent was classified as home-based work, compared to 24 percent for the Region; 12 percent as home-based shopping trips, compared to 15 percent for the Region; and 7 percent as school trips, compared to 9 percent for the Region. Another 61 percent was classified as home-based other and nonhome-based trips, compared to an average of 52 percent for the Region. The comparisons to the average regional trip purpose percentages indicate that the study area experiences a higher number of trips which do not originate at home, but which are made after the initial trip from home has been completed.

An analysis was also made, based on the 1972 origin-destination travel data, of the total 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 the 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 that area. As indicated in Table 15, a total of 45,200 vehicle trips were made in the study area on an average weekday in 1972. Of this total, approximately 17,100, or 38 percent, were internal trips; 23,300, or 52 percent, were internal/external trips; and the remaining 4,800, or 10 percent, were through trips. Therefore, about 90 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.

Based upon the traffic growth rates established in the study area, the number of vehicle trips is estimated to have increased to about 56,900 on an average weekday in 1979, an increase of approximately 26 percent, or 3.7 percent per year, since

Table 14

DISTRIBUTION OF TOTAL PERSON TRIPS WITHIN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA ON AN AVERAGE WEEKDAY: 1979

Trip Purpose	Person Trips	Percent of Total	Percent of Region
Home-Based Work	21,400	19.7	23.7
Home-Based Shopping	13,100	12.0	15.1
Home-Based Other	35,000	32.2	34.3
Nonhome-Based	31,200	28.7	17.5
School	8,100	7.4	9.4
Total	108,800	100.0	100.0

Source: SEWRPC.

Table 15

DISTRIBUTION OF TOTAL VEHICLE TRIPS OCCURRING IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA ON AN AVERAGE WEEKDAY: 1972 AND 1979

Trip Type	1972		1979	
	Vehicle Trips	Percent of Total	Vehicle Trips	Percent of Total
Internal	17,100	37.8	20,900	36.7
Internal/External	23,300	51.6	29,300	51.5
Through	4,800	10.6	6,700	11.8
Total	45,200	100.0	56,900	100.0

Source: SEWRPC.

1972. Of this total, approximately 20,900, or 37 percent, were internal vehicle trips; 29,300, or 52 percent, were internal/external vehicle trips; and 6,700, or 12 percent, were through trips. This represents an increase of about 3,800, or 22 percent, in internal vehicle trips; 6,000, or 26 percent, in internal/external trips; and 1,900, or 40 percent, in through vehicle trips since 1972. In total, about 88 percent of the vehicular traffic using the arterial street and highway system in the study area on an average weekday in 1979 either originated within or was destined to the study area.

The 1979 vehicle trip information is not sufficiently detailed to identify the movement of vehicle trip patterns within and through the study area. Therefore, the following description of 1972 average weekday vehicle trip patterns is presented to indicate the general relationship of vehicle trip movements which occurred in the study area. Figure 3 indicates the pattern of movement of about 16,750, or 98 percent, of the total 17,100 internal vehicle trips made within the study area on an average weekday in 1972. Of this total, 7,450 vehicle trips, or about 44 percent, passed through the CBD area in a north-south direction. An additional 2,000 vehicle trips, or 12 percent, passed through the CBD area in an east-west direction.

Figure 4 indicates the pattern of movement of about 21,100, or 91 percent, of the total 23,300 internal/external trips made in the study area on an average weekday in 1972. Of this total, 3,550 vehicle trips, or about 15 percent, entered the west side of the study area on STH 16. About 2,500 trips, or about 70 percent, ended within the Oconomowoc CBD or in areas to the east of that district. Another 7,300 vehicle trips, or about 31 percent, entered the study area from the east on STH 16. About 4,850 of these 7,300 vehicle trips, or about 66 percent, ended in the Oconomowoc CBD or in areas to the north or west of that district.

Figure 5 indicates the pattern of movement of about 4,500, or 94 percent, of the total 4,800 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 STH 16 west of the study area to STH 16 and STH 67 east and south of the study area. Of the 11,200 vehicles on STH 16 crossing the western boundary of the study area in 1972, 4,250 vehicles, or about 38 percent, did not stop in the study area, but originated and were destined for areas outside the study area. Approximately 2,950, or 75 percent, used STH 67 at the southern boundary of the study area, with the remaining 1,300 through trips, or 25 percent, using STH 16 at the eastern boundary of the study area. Figure 5 also indicates that of the 3,200 through vehicle trips which used STH 67 on an average weekday at the southern boundary of the study area in 1972, only 250, or about 8 percent, traversed the study area in a north-south direction and also used STH 67 at the northern boundary of the study area.

Thus, approximately 9,450, or 55 percent, of the 17,100 internal vehicle trips; 7,350, or 32 percent, of the 23,300 internal/external vehicle trips; and all of the 4,800 through vehicle trips—21,600 vehicle trips, or 48 percent of the total of 45,200 vehicle trips made within the study area on an average weekday in 1972—had to pass through the Oconomowoc CBD because of the limited number of direct arterial routes available to serve the desired lines of these trips.

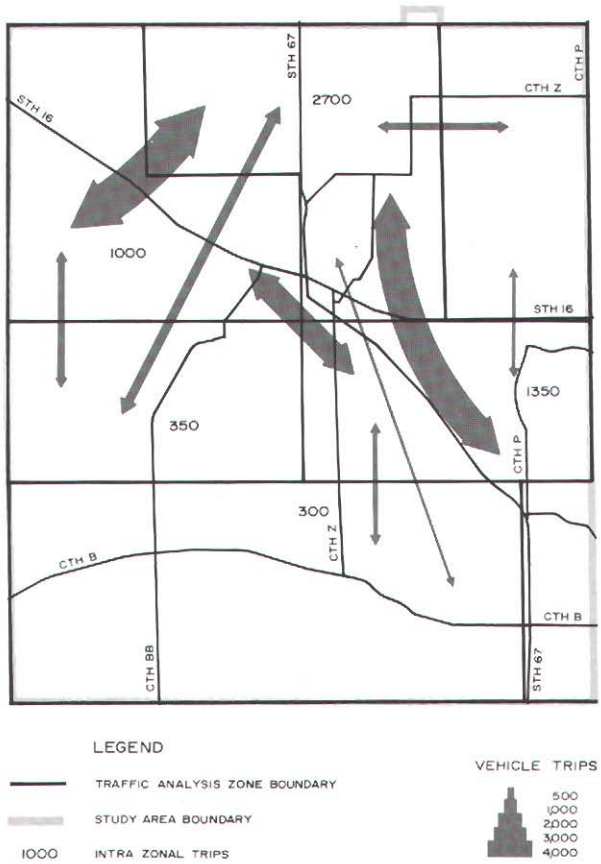
CENTRAL BUSINESS DISTRICT PUBLIC PARKING DEMAND AND UTILIZATION

Public parking facilities are an essential element of a community's transportation system. Public parking facilities are comprised of on-street curb parking spaces and off-street lot or garage parking spaces. An inadequate supply of public parking either in terms of the number of spaces provided, the time restrictions applied, or the parking facility location manifests itself in the form of: 1) traffic flow disruption and congestion as vehicles stop in moving traffic lanes to wait for and maneuver into available parking spaces; 2) motor vehicle accidents caused by parked vehicles that enter and leave the traffic stream; 3) an eventual reduction in vehicle trips and a possible loss of commercial business in those areas where parking is a problem; and 4) air and noise pollution and excessive fuel consumption as vehicles circulate on the local street system in search of available parking spaces.

Two measures of the adequacy and operation of public parking facilities are the parking occupancy rate and the parking stall turnover rate. The parking occupancy rate is defined as the ratio of the number of vehicles parked during a specified time period to the total number of on-street or off-street parking stalls available, expressed as a percentage. A low occupancy rate indicates a surplus of parking stalls. The parking stall

Figure 3

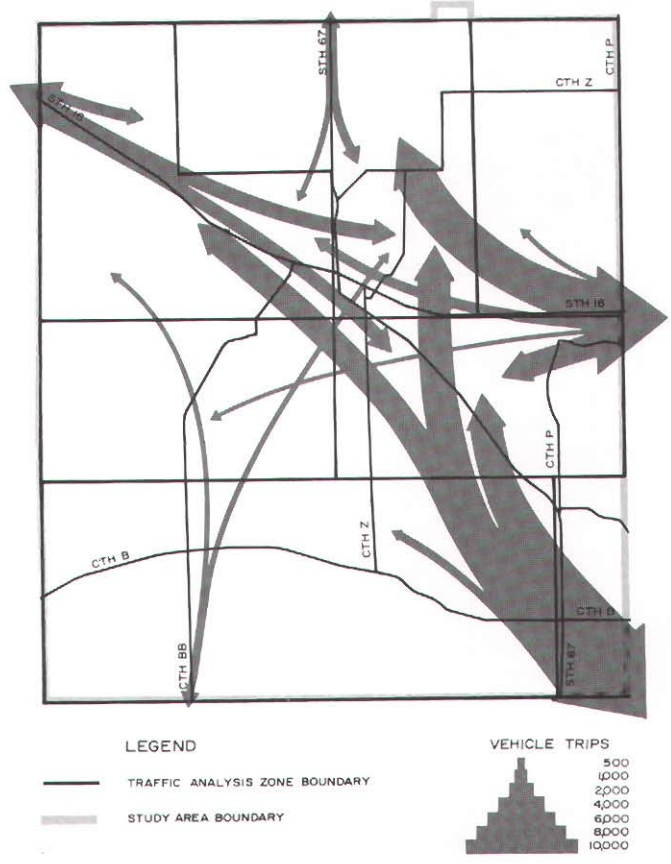
MAJOR AVERAGE WEEKDAY INTERNAL TRIP INTERCHANGES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1972



Source: SEWRPC.

Figure 4

MAJOR AVERAGE WEEKDAY INTERNAL/EXTERNAL TRIP INTERCHANGES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1972



Source: SEWRPC.

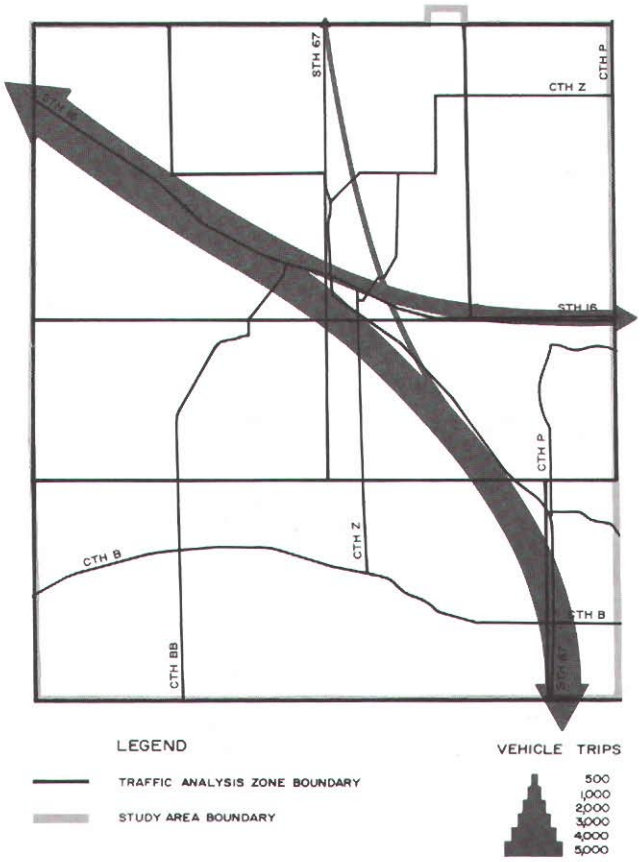
turnover rate is defined as the ratio of the total number of different vehicles parked during a specified time period to the total number of parking stalls available. A high turnover rate indicates the use of the stalls for short-term parking, while a low turnover rate indicates the use of stalls for long-term or all day parking.

Public parking occupancy rates were determined by field survey for the on-street curb parking areas and the four off-street public parking lots in the Oconomowoc CBD in order to determine the adequacy of the public parking facilities. The parking survey was conducted by Commission personnel between the hours of 10:00 a.m. and 3:00 p.m. on Thursday, March 12, 1979. The time period chosen for the survey was based on the findings of a parking study conducted by the Greater Oconomowoc Area Chamber of Commerce during June 1977, wherein the period from 10:00 a.m. to 3:00 p.m. on a Thursday was found to represent the period of maximum weekly utilization of public parking facilities in the Oconomowoc CBD.

The locations of the public on-street curb parking facilities and the off-street parking lots surveyed are shown on Map 19. As shown on the map and in Table 16, the public parking occupancy rates averaged 40 percent for the on-street facilities and 76 percent for the four off-street lots. The parking occupancy rates ranged from 85 percent to 97 percent along those streets nearest the geographic center of the CBD, with the exception of E. Wisconsin Avenue, which exhibited a 71 percent occupancy rate.

Figure 5

MAJOR AVERAGE WEEKDAY THROUGH TRIP INTERCHANGES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1972



Source: SEWRPC.

The two public parking lots within the CBD, the South lot and the Fowler lot, also exceeded an occupancy rate of 80 percent, with the South lot having an occupancy rate of 83 percent and the Fowler lot having an occupancy rate of 87 percent. The other two public parking lots, Lincoln and Legion—located adjacent to the western boundary of the CBD—exhibited an average occupancy rate of approximately 64 percent. Occupancy rates for the off-street lots appear to be only slightly higher than those set forth in the Chamber of Commerce's report for 1977, with an average occupancy rate of 76 percent compared to the Chamber of Commerce's average occupancy rate of 74 percent. This indicates that utilization of public parking facilities in the CBD has not changed significantly since 1977.

In addition to the parking stall occupancy rates, parking stall turnover rates were obtained for the on-street public parking facilities in the Oconomowoc CBD based on a one-hour time interval. As shown on Map 20 and in Table 17, the turnover rates for the public on-street parking facilities in the CBD averaged 1.2 vehicles per stall. As may be expected, the turnover rates in the CBD are affected by the time restrictions imposed upon the parking facilities concerned. The one-hour parking restrictions along Main Street and E. Wisconsin Avenue result in turnover rates ranging from 1.7 to 3.4 vehicles per stall, compared to the unlimited parking restrictions in the area of E. Pleasant Street which result in turnover rates ranging between zero to 0.4 vehicle per stall. Parking turnover rates were not obtained for the off-street public parking facilities in the Oconomowoc CBD.

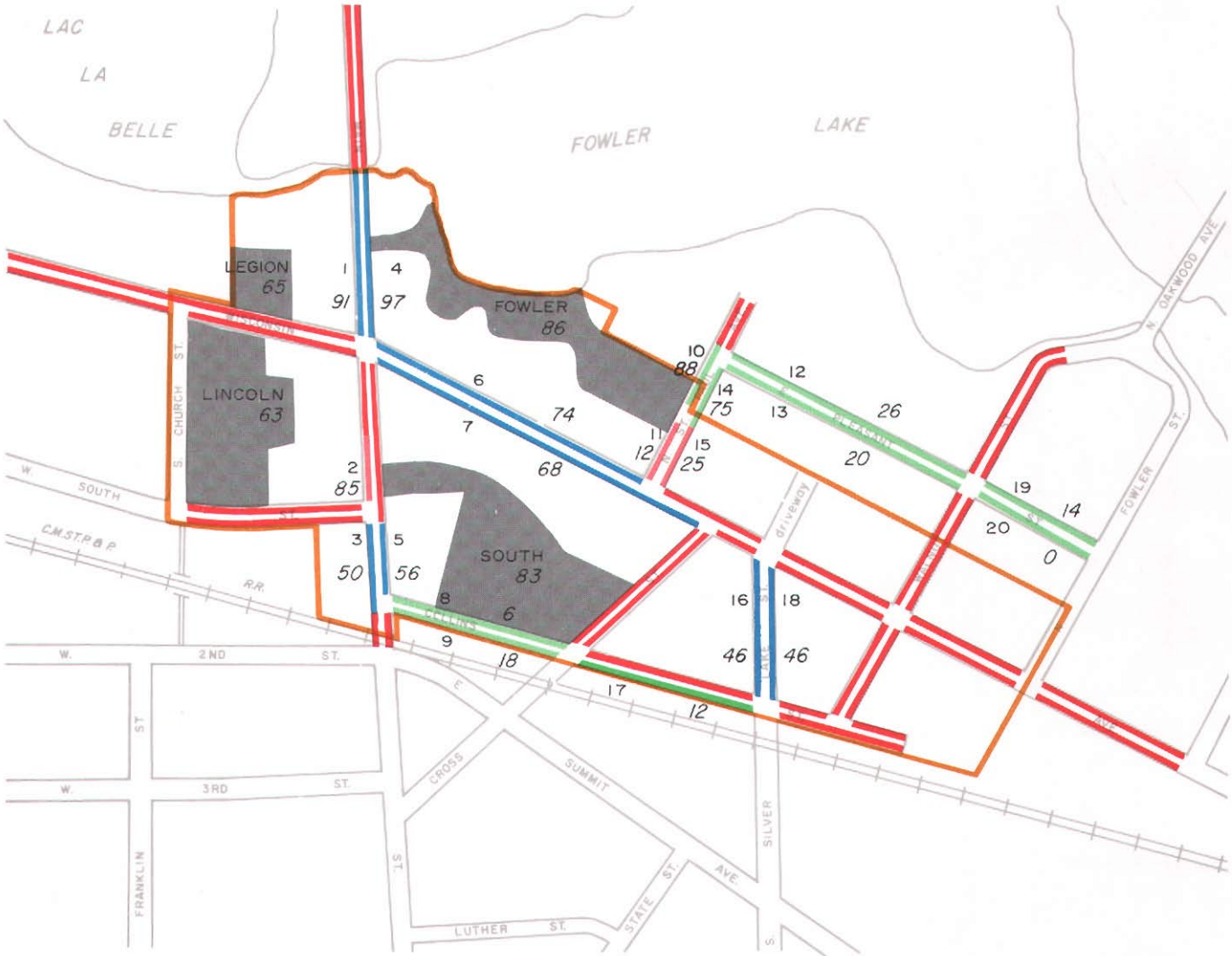
TRAFFIC ACCIDENTS

The incidence of traffic accidents provides another measure of the efficiency and operating characteristics of a community's transportation system. The three commonly used measures for quantifying traffic accidents are: 1) the total number of accidents per year; 2) the rate of accident occurrence expressed in accidents per million vehicles entering an intersection or per million vehicle miles of travel; and 3) the severity of the accidents as determined by the number of fatality, personal injury, and property damage accidents. At locations on the street and highway system where any of these measures appear relatively high in comparison to the accident experience at other locations, a more detailed investigation is warranted to determine possible traffic management actions that can be taken to reduce the severity and number of accidents at these locations in the future.

The motor vehicle accident history for the street and highway system of the study area was reviewed for all on-street traffic accidents which occurred during the years 1977 and 1978. Each of these accidents was plotted on a map of the study area to identify the location and severity of the highway-related accidents. It was determined from this analysis that there were a total of 380 on-street accidents in 1977 and 377 on-street accidents in 1978 within the study area. There were three fatal accidents during 1977 and one fatal accident during 1978. The majority of these accidents—75 percent in 1977 and 80 percent in 1978—resulted in property damage only. All

Map 19

PUBLIC PARKING FACILITY OCCUPANCY RATES IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979



LEGEND

- NO PARKING ANYTIME
- FIFTEEN MINUTE PARKING
- ONE HOUR PARKING
- TWO HOUR PARKING
- UNLIMITED PARKING
- 3 BLOCK FACE NUMBER
- 91 PARKING OCCUPANCY RATE (PERCENT) 10:00 A.M. TO 12:00 P.M. AND 1:00 P.M. TO 3:00 P.M.
- CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE
0 200 400 FEET

Source: SEWRPC.

Table 16

PUBLIC PARKING FACILITY OCCUPANCY RATES IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979

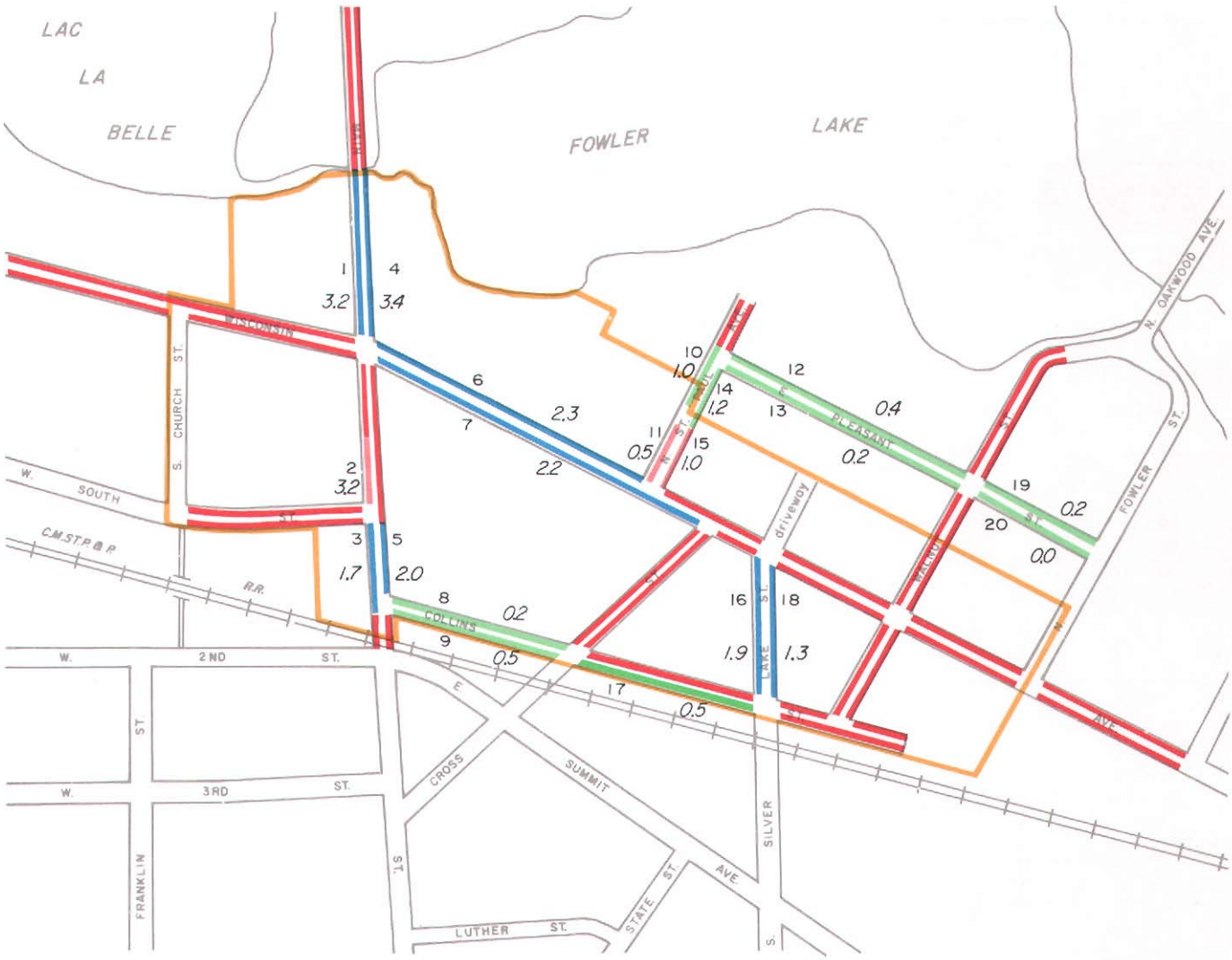
Facility	Number of Parking Stalls	Occupancy Rate (percent)				
		10:00 a.m. to 11:00 a.m.	11:00 a.m. to 12:00 p.m.	1:00 p.m. to 2:00 p.m.	2:00 p.m. to 3:00 p.m.	Average
On-Street[a]						
1	8	100	75	88	100	91
2	5	100	80	60	100	85
3	4	--	50	75	75	50
4	8	88	100	100	100	97
5	4	75	25	75	50	56
6	17	59	82	71	82	74
7	22	68	73	59	73	68
8	8	--	--	25	--	6
9	14	21	29	14	7	18
10	2	100	100	100	50	88
11	2	--	--	--	50	12
12	23	30	22	22	30	26
13	25	20	20	20	20	20
14	5	80	80	60	80	75
15	3	33	--	33	33	25
16	7	86	43	14	43	46
17	15	13	20	--	13	12
18	6	33	50	67	33	46
19	11	9	9	18	18	14
20	11	--	--	--	--	--
Total/Average	200	40	40	38	42	40
Off-Street						
Lincoln						
2 hours	50	50	40	64	58	53
12 hours	95	72	73	62	65	68
Subtotal/Average	145	64	61	63	63	63
South						
2 hours	61	69	77	82	72	75
12 hours	84	85	90	89	93	89
Subtotal/Average	145	78	85	86	84	83
Fowler						
15 minutes	2	--	50	--	--	12
2 hours	72	79	89	74	88	82
8 hours	35	100	100	100	100	100
Subtotal/Average	109	84	92	81	90	87
Legion						
2 hours	23	52	52	91	65	65
Total/Average	422	73	77	77	77	76

[a] *On-street block face numbers are indicated on Map 19.*

Source: SEWRPC.

Map 20

ON-STREET PUBLIC PARKING TURNOVER RATES IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979



LEGEND

- NO PARKING ANYTIME
- FIFTEEN MINUTE PARKING
- ONE HOUR PARKING
- TWO HOUR PARKING
- UNLIMITED PARKING
- 3 BLOCK FACE NUMBER
- 1.2 TURNOVER RATE (VEHICLES PER STALL) 10:00 A.M. TO 12:00 P.M. AND 1:00 P.M. TO 3:00 P.M.
- CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE
0 200 400 FEET

Source: SEWRPC.

Table 17

ON-STREET PUBLIC PARKING TURNOVER RATES IN THE OCONOMOWOC CENTRAL BUSINESS DISTRICT: 1979

Facility (block face number)[a]	Number of Parking Stalls	Parking Restrictions	Turnover Rate (vehicles per stall)		
			10:00 a.m. to 12:00 p.m.	1:00 p.m. to 3:00 p.m.	Total
1	8	1 hour	1.5	1.8	3.2
2	5	15 minutes	1.6	1.6	3.2
3	4	1 hour	0.5	1.2	1.7
4	8	1 hour	1.9	1.6	3.4
5	4	1 hour	0.8	1.2	2.0
6	17	1 hour	1.2	1.3	2.3
7	22	1 hour	1.2	1.1	2.2
8	8	All Day	--	0.2	0.2
9	14	All Day	0.4	0.1	0.5
10	2	All Day	1.0	1.0	1.0
11	2	15 minutes	--	0.5	0.5
12	23	All Day	0.3	0.2	0.4
13	25	All Day	0.2	0.2	0.2
14	5	All Day	0.8	1.0	1.2
15	3	15 minutes	0.3	0.7	1.0
16	7	1 hour	1.3	0.6	1.9
17	15	2 hours	0.3	0.1	0.5
18	6	1 hour	0.7	0.8	1.3
19	11	All Day	0.1	0.2	0.2
20	11	All Day	--	--	--
Total/Average	200	--	0.7[b]	0.6[b]	1.2[b]

[a] *On-street block face numbers are indicated on Map 20.*

[b] *Average.*

Source: SEWRPC.

locations with three or more motor vehicle accidents per year are shown on Maps 21 and 22 and in Tables 18 and 19 for the years 1977 and 1978, respectively.

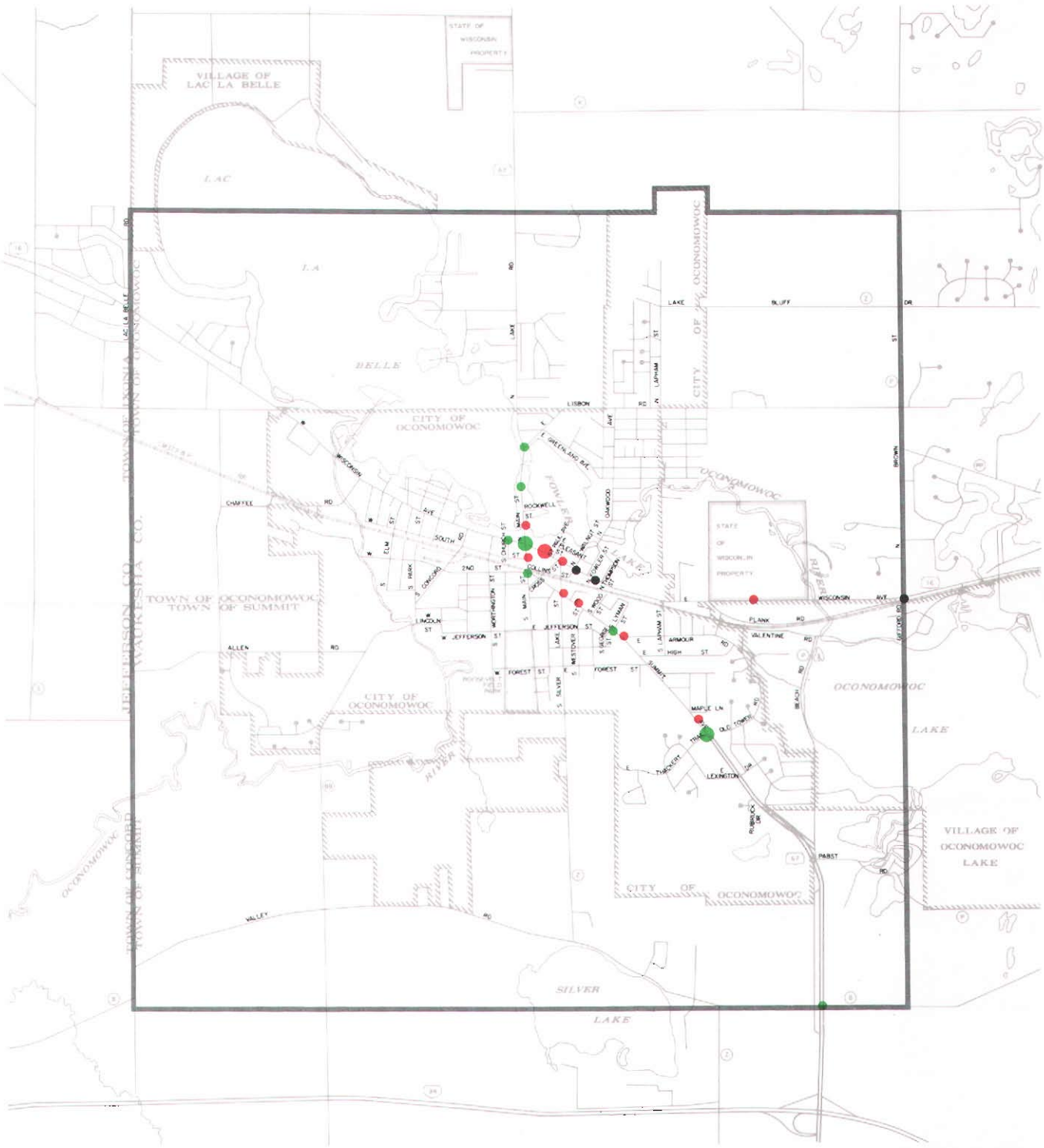
There were 22 separate locations on the arterial system in 1977 and 34 separate locations in 1978 where three or more motor vehicle traffic accidents occurred. The highest accident location in the study area was the intersection of Wisconsin Avenue and Main Street, with 16 accidents reported in 1977 and 23 accidents reported in 1978. The two-year average accident rate for this intersection was 2.50 accidents per million vehicles entering the intersection. The next two highest accident locations in the study area during 1977 and 1978 were not located at arterial street intersections but, instead, on two roadway segments—namely, E. Wisconsin Avenue between N. Main Street and N. St. Paul Street, with an average of 16 accidents per year, and E. Wisconsin Avenue between N. Fowler Street and N. Thompson Street, with an average of 14 accidents per year. The accident rates for these roadway segments were not calculated because of the short distance of highway included in each segment. The variation in roadway segment distances yields accident rates which are not directly comparable. Collision diagrams, which indicate accident type—i.e., rear end, right angle, etc.— location within the intersection, date, time of day, weather, and roadway conditions, were prepared for the intersections and roadway segments listed in Tables 18 and 19 and are included in Appendix E.

RAILROAD TRAFFIC

A major transportation facility traversing the study area is the railway trackage over which the Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) operates. As stated in Chapter II of this report, the Milwaukee Road trackage bisects

Map 21

ON-STREET MOTOR VEHICLE ACCIDENT LOCATIONS WITH THREE OR MORE ACCIDENTS PER YEAR IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1977



LEGEND

NUMBER OF ACCIDENTS

- 3 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 OR MORE

STUDY AREA BOUNDARY

GRAPHIC SCALE

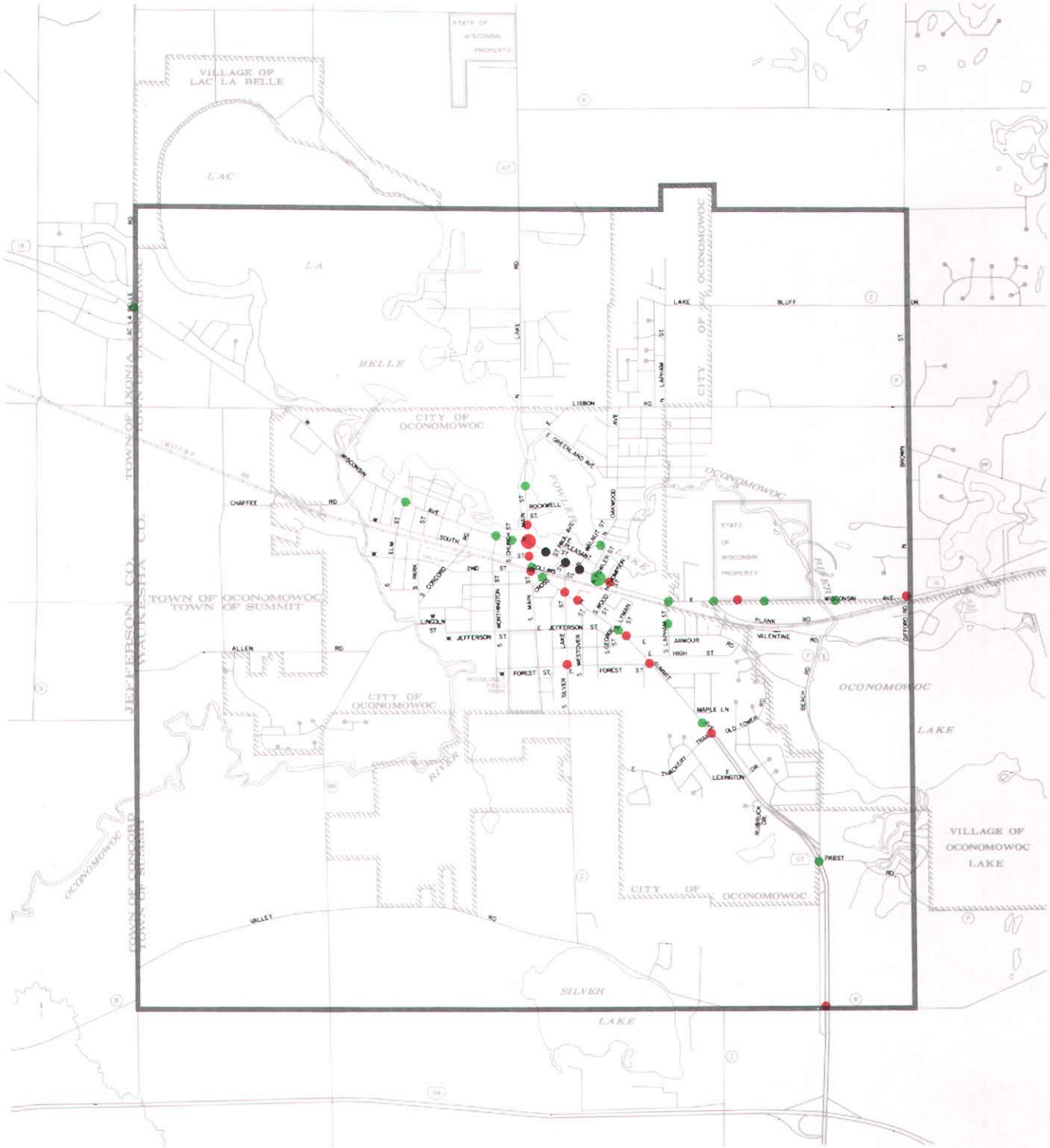
0 1/4 1/2 MILE

0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Map 22

ON-STREET MOTOR VEHICLE ACCIDENT LOCATIONS WITH THREE OR MORE ACCIDENTS PER YEAR IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1978



LEGEND

NUMBER OF ACCIDENTS

- 3 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 OR MORE

STUDY AREA BOUNDARY

GRAPHIC SCALE

0 1/2 1 MILE

0 1000 2000 3000 4000 FEET

Source: SEWRPC.

Table 18

TRAFFIC ACCIDENTS AND ACCIDENT RATES AT SELECTED INTERSECTIONS WITHIN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1977 AND 1978

Intersection	1977					1978					Two-Year Average				
	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]
N. Main Street and E. Wisconsin Avenue	13	3	--	16	2.11	21	2	--	23	2.88	17	2	--	19	2.50
E. Summit Avenue and E. Thackery Trail	11	4	--	15	3.27	5	3	--	8	1.55	8	4	--	12	2.41
E. Wisconsin Avenue and N. Walnut Street	7	4	--	11	1.62	8	4	--	12	2.32	8	4	--	12	1.97
E. Wisconsin Avenue and CTH P	6	4	--	10	1.71	5	2	--	7	1.15	6	3	--	9	1.43
E. Wisconsin Avenue and S. Silver Lake Street	5	--	--	5	0.78	9	1	--	10	1.47	7	1	--	8	2.25
S. Main Street and W. South Street	5	2	--	7	1.90	6	1	--	7	1.88	6	2	--	8	1.89
E. Summit Avenue and E. Armour Road	5	1	--	6	1.30	6	--	--	6	1.23	6	1	--	7	1.26
E. Summit Avenue and S. Silver Lake Street	6	1	--	7	1.25	5	--	--	5	0.84	6	--	--	6	1.04
E. Summit Avenue and CTH B	1	2	--	3	0.98	5	3	--	8	2.40	3	2	--	5	1.69
E. Summit Avenue and E. Forest Street	4	1	--	5	1.06	5	1	--	6	1.19	4	1	--	5	1.12
S. Main Street and W. 2nd Street and E. Summit Avenue	2	1	--	3	0.76	6	1	--	7	1.65	4	1	--	5	1.20
S. Main Street and Collins Street	1	--	1	2	0.55	4	--	--	4	1.08	3	--	1	4	1.63
E. Summit Avenue and S. Lyman Street and S. George Street	2	2	--	4	0.93	4	--	--	4	0.86	3	1	--	4	0.90
E. Forest Street and S. Silver Lake Street	--	--	--	--	--	5	1	--	6	3.23	2	1	--	3	1.62
E. Summit Avenue and Pabst Road	--	--	--	--	--	3	1	--	4	1.72	2	1	--	3	0.86
N. Lake Road and E. Lisbon Road	3	1	--	4	1.66	--	--	--	--	--	2	1	--	3	0.83
W. Wisconsin Avenue and S. Church Street	2	2	--	4	0.93	3	--	--	3	0.70	2	1	--	3	0.82
E. Summit Avenue and Cross Street	2	--	--	2	0.52	3	1	--	4	0.95	2	1	--	3	0.74
E. Wisconsin Avenue and S. Lapham Street	2	--	--	2	0.36	2	2	--	4	0.72	2	1	--	3	0.54
N. Walnut Street and N. Fowler Street	--	--	--	--	--	--	3	--	3	1.46	--	2	--	2	0.73
W. Wisconsin Avenue and Lac La Belle Road	--	--	--	--	--	4	--	--	4	0.93	2	--	--	2	0.46
W. Wisconsin Avenue and S. Worthington Street	--	--	--	--	--	3	--	--	3	0.69	2	--	--	2	0.34
W. Wisconsin Avenue and S. Elm Street	--	--	--	--	--	3	--	--	3	0.68	2	--	--	2	0.34
E. Wisconsin Avenue and Plank Road	1	--	--	1	0.20	3	--	--	3	0.59	2	--	--	2	0.30

[a] *Rate is accidents per 1,000,000 vehicles entering the intersection.*

Source: SEWRPC.

Table 19

TRAFFIC ACCIDENTS AT SELECTED NONINTERSECTION LOCATIONS WITHIN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1977 AND 1978

Route	Section	1977				1978				Two-Year Average			
		Property Damage	Personal Injury	Fatalities	Total Accidents	Property Damage	Personal Injury	Fatalities	Total Accidents	Property Damage	Personal Injury	Fatalities	Total Accidents
E. Wisconsin Avenue	N. Main Street to St. Paul Street .	17	3	--	20	9	2	--	11	13	3	--	16
E. Wisconsin Avenue	N. Fowler Street to N. Thompson Street.	10	--	--	10	16	2	--	18	13	1	--	14
N. Main Street	Rockwell Street to E. Wisconsin Avenue	4	1	--	5	7	2	--	9	6	2	--	8
E. Summit Avenue	S. Silver Lake Road to S. Westover Street	3	5	--	8	4	1	--	5	4	3	--	7
E. Wisconsin Avenue	Plank Road to CTH P, 36833 E. Wisconsin Avenue . . .	1	5	--	6	2	2	--	4	2	3	--	5
E. Summit Avenue	Maple Lane to Thackery Trail . . .	3	2	--	5	3	--	--	3	3	1	--	4
E. Wisconsin Avenue	Plank Road to CTH P, 36933 E. Wisconsin Avenue . . .	--	2	--	2	5	1	--	6	2	2	--	4
Lake Road	E. Lisbon Road to Rockwell Street	1	2	--	3	3	--	--	3	2	1	--	3
E. Wisconsin Avenue	N. Thompson Street to S. Wood Drive	--	--	--	--	3	2	--	5	2	1	--	3
S. Lapham Street	E. Armour Road to E. Wisconsin Avenue	--	--	--	--	4	--	--	4	2	--	--	2
E. Wisconsin Avenue	Plank Road to CTH P, 36355 E. Wisconsin Avenue . . .	--	--	--	--	3	--	--	3	2	--	--	2

Source: SEWRPC.

the study area in an east-west direction and is located adjacent to the southern boundary of the Oconomowoc CBD. This trackage results in 11 arterial street/railroad trackage intersections. Since only two of these crossings are grade-separated, railway traffic has an important impact on the arterial street and highway system of the study area. Accordingly, information was obtained relating to the volume of train traffic on the Milwaukee Road trackage during the hours of 7:00 a.m. to 7:00 p.m. on a typical weekday in 1979. As indicated in Table 20, there were 13 trains operating in the study area during the 12-hour survey period. Of these 13 trains, 10 were freight trains, two were AMTRAK passenger trains, and one was a local freight providing switching service. These trains caused interruptions of vehicular traffic on the arterial street crossings in the Oconomowoc CBD ranging from a low of 0.50 minute to a high of 3.50 minutes, with an average interruption of 1.25 minutes. According to information obtained from the Milwaukee Road, the volume of train traffic on its trackage through the Oconomowoc study area varies between 13 to 18 trains during the 7:00 a.m. to 7:00 p.m. time period. In addition to the train traffic noted above, the Milwaukee Road conducts local switching activities during the late evening hours to serve manufacturing firms located in the City of Oconomowoc.

Table 20

RAILROAD TRAIN TRAFFIC SURVEY ON THE MILWAUKEE ROAD TRACKS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 7:00 A.M. TO 7:00 P.M., JUNE 13, 1979

Time	Train Type	Direction of Travel	Crossing Signal Operation (minutes)
7:32 a.m.	Freight	Eastbound	0 minute 45 seconds
8:08 a.m.	Freight	Eastbound	1 minute 0 second
9:53 a.m.	Freight	Westbound	1 minute 0 second
10:31 a.m.	Freight	Eastbound	3 minutes 30 seconds
12:23 p.m.	Freight	Westbound	1 minute 0 second
1:28 p.m.	Freight	Westbound	2 minutes 0 second
2:16 p.m.	Passenger (AMTRAK)	Westbound	0 minute 45 seconds
2:31 p.m.	Freight	Eastbound	1 minute 0 second
3:05 p.m.	Freight	Westbound	1 minute 0 second
4:09 p.m.	Freight	Eastbound	1 minute 0 second
5:13 p.m.	Freight	Westbound	2 minutes 0 second
5:33 p.m.	Switch	Eastbound	0 minute 30 seconds
6:28 p.m.	Passenger (AMTRAK)	Eastbound	0 minute 45 seconds
Average	--	--	1 minute 15 seconds

Source: SEWRPC.

CITIZEN COMPLAINTS

The City of Oconomowoc Police Department has compiled a list of railroad crossing-related problems. This list covers the time period from January 1, 1979 through June 31, 1979, and is reproduced in Appendix F. According to the Department, there were nine reported occurrences of interruptions of vehicular traffic flow in the CBD due to malfunctioning railroad crossing gate control equipment at the Milwaukee Road trackage/arterial street intersections during the time period studied. The length of these interruptions is not known, but appear to be substantially greater than the maximum measured interruption of 3.5 minutes shown in Table 20.

A valuable source of information in identifying transportation-related problems is the citizen who uses, and is familiar with, the traffic conditions on a community's street and highway system. Not only are citizen complaints concerning traffic conditions at various locations throughout a study area useful in identifying potential problem areas, but they can also serve to reinforce and lend additional support to transportation system inventory findings. Therefore, the 24 members of the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study were asked to describe the traffic-related problems in the study area as they individually perceived them, and also to report the comments of non-committee members who had contacted them in response to local newspaper articles requesting comments from residents of the study area.

As a result of this public involvement effort, a list of 63 perceived traffic-related problems was compiled for the study area. A summary of this list is contained in Table 21 and shown on Map 23. The perceived traffic problems listed in Table 21 have been grouped into four principal categories including: congestion and delay; inadequate pavement markings—traffic- and pedestrian-related; inadequate turning capacity; and difficulty in entering the traffic stream. The majority of perceived traffic problems listed in Table 21 pertain directly to the two principal arterial streets in the study area—Wisconsin Avenue (STH 16), and E. Summit Avenue, N. and S. Main Street, and Lake Road (STH 67).

Table 21

SUMMARY OF TRAFFIC PROBLEMS AS PERCEIVED BY CITIZENS WITHIN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979

Facility	Location	Congestion or Delay	Inadequate Pavement Markings		Inadequate Turning Capacity	Difficulty in Entering Traffic Stream
			Vehicular	Pedestrian		
STH 16	Hewitt Point Road[a]	X				
	CTH P				X	
	Farmer's Exchange	X			X	X
	524 E. Wisconsin Avenue			X		X
	S. Cross Street	X				
	105 E. Wisconsin Avenue					X
	S. Main Street (STH 67)	X	X	X	X	
	128 W. Wisconsin Avenue					X
	Lincoln Parking Lot					X
	S. Church Street				X	X
	S. Concord Street	X				X
STH 67	E. Lisbon Road					X
	S. Silver Lake Street		X	X	X	
	S. Silver Lake Street to E. Armour Road	X				
	E. Armour Road to E. High Street	X				X
	E. Forest Street	X			X	X
	Oconomowoc Memorial Hospital					X
	Whitman Park Shopping Center					X
	E. Thackery Trail	X		X	X	
	E. Lexington Drive			X		
S. Cross Street	E. Wisconsin Avenue to E. Summit Avenue	X				
	South Parking Lot					X

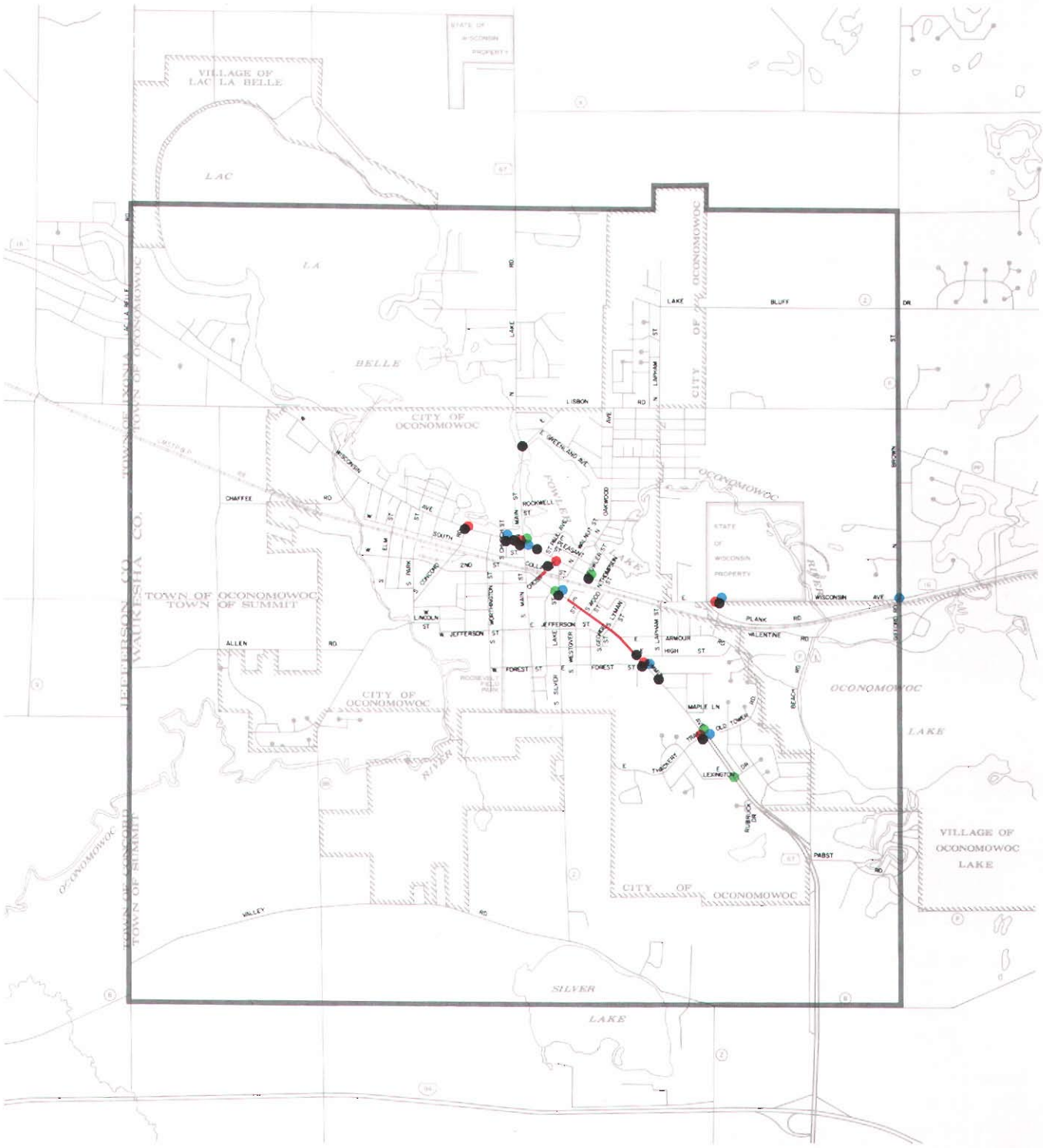
[a] *The intersection of STH 16 and Hewitt Point Road, while outside of the study area, is included to indicate that citizens within the study area are encountering problems using STH 16 while the facility is under reconstruction.*

Source: SEWRPC.

In addition to the perceived traffic problems summarized in Table 21, the following generalized transportation system inadequacies were included in the list of traffic-related problems for the study area: 1) the absence of a direct north-south traffic route that bypasses the CBD and serves the residential areas of the City north of STH 16; 2) the absence of a through traffic route between E. Summit Avenue and STH 16; 3) the heavy use of W. Lincoln Street, W. Jefferson Street, and E. Forest Street as traffic routes to access the junior and senior high schools; 4) an insufficient number of safe railroad crossings for traffic within the City, with the crossings at S. Lapham Street and S. Main Street being particularly inadequate; 5) the high volumes of truck traffic on S. Elm Street, which is a residential street; 6) intersections with inadequate turning radii for trucks; 7) the increasing volume of through traffic on STH 16 and STH 67, particularly during the morning and

Map 23

CITIZEN-PERCEIVED TRAFFIC-RELATED PROBLEM AREAS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



LEGEND

- CONGESTION OR DELAY
- PAVEMENT MARKINGS
- INADEQUATE TURNING CAPACITY
- DIFFICULTY IN ENTERING TRAFFIC STREAM
- STUDY AREA BOUNDARY

GRAPHIC SCALE
0 1/4 1/2 MILE
0 1000 2000 3000 4000 FEET

Source: SEWRPC.

evening peak-hour time periods; and 8) northbound vehicles on N. Lake Street using E. Rockwell Street to turnaround and travel southbound on N. Lake Street.

SUMMARY

This chapter has presented information on the existing vehicular traffic volumes utilizing the arterial street and highway system of the Oconomowoc traffic management study area; on the operating conditions of that system; and on travel patterns and trip purposes in the study area. This basic traffic information has been supplemented with data on public parking facility utilization, motor vehicle accident histories, railway traffic, and citizen complaints of perceived transportation system problems. This information on existing traffic conditions, together with the information on the physical characteristics of the existing street and highway system provided in Chapter II and the traffic management objectives and standards presented in Chapter IV, provide a basis for the identification of the existing traffic problems of the Oconomowoc traffic management study area. Those problems are discussed in Chapter V.

The vehicular traffic count information presented in this chapter indicates that the highest traffic volumes on the arterial street and highway system in the study area occur on STH 16, and range from 13,000 to 16,000 vehicles per annual average weekday. The second highest volumes occur on STH 67, and range from 4,500 to 14,000 vehicles per annual average weekday. The remaining arterial and collector streets in the study area have average annual weekday traffic volumes ranging from 500 to 5,500 vehicles per day, with the majority of these facilities carrying approximately 3,000 vehicles per average annual weekday.

Those months during which the highest traffic volumes occur are July and August, which exhibit an increase of 11 percent and 10 percent, respectively, over the annual average weekday volumes. January is the month during which the lowest traffic volumes of the year occur. Traffic volumes during January are 18 percent lower than the annual average weekday volumes.

Average Saturday traffic volumes are about 8 percent greater than average annual weekday volumes, while average Sunday traffic volumes are about 5 percent lower than average annual weekday volumes. The morning peak-hour traffic volumes occur between 7:30 a.m. and 8:30 a.m., comprising approximately 6.7 percent of the average weekday traffic volume, and the evening peak-hour traffic volumes occur between 3:30 p.m. and 4:30 p.m. or 4:00 p.m. and 5:00 p.m., depending upon the facility, and comprise approximately 8.6 percent of the average weekday traffic volume.

The efficiency of the utilization of the existing arterial street and highway system of the study area has been quantified by the determination of volume to capacity ratios, intersection load factors, intersection delays, average arterial operating speeds, motor vehicle accidents, and citizen complaints of perceived transportation problems. Vehicular traffic volumes exceed design capacities on two roadway segments, which comprise about 2.4 percent of the existing arterial and collector street system, and are at design capacity on another two roadway segments, which comprise about 1.5 percent of the existing arterial and collector street system in the study area. All of the high volume to capacity ratios occur within or enter the central business district of the City of Oconomowoc.

The majority of the signalized intersection approach load factors were determined to be zero, with only the W. Wisconsin Avenue eastbound approach at Main Street and the E. Summit Avenue westbound approach at S. Silver Lake Street exceeding a value of 0.30. Average vehicle operating speeds on STH 16 and STH 67, the two principal arterials in the study area, are 26 to 27 mph. During the evening peak hour, the average speed is reduced to approximately 23 mph, with average speeds in the CBD reduced to below 15 mph. Average vehicle delays at the five signalized intersections in the study exceed 15 seconds at four approaches during the morning peak hour and at six approaches during the evening peak hour.

An analysis of the trip purposes in the Oconomowoc study area indicates that 108,800 person trips were made on an average weekday in 1979 within the study area. All person trip purposes except "nonhome based" trips—those trips which do not originate or end at home—were in close agreement with the regional person trip percentages. The "nonhome based" person trip exceeds the regional percentage by about 11 percent, which implies that many of the trips in the Oconomowoc study area are comprised of multiple trips that are combined for various purposes, such as medical to shopping and social/recreational trip purposes between the initial and final trip from or to home.

It was determined that of the 56,900 vehicle trips which were estimated to enter the study area on an average weekday in 1979, approximately 20,900, or 37 percent, were internal trips, 29,300, or 52 percent, were internal/external trips, and the remaining 6,700, or 12 percent, were through trips. Of these total average weekday vehicle trips, approximately 48 percent were required to travel through the Oconomowoc central business district due to the limited number of arterial routes which traverse the study area outside the central business district. About 88 percent of the vehicular traffic currently using the arterial street and highway system in the Oconomowoc study area either originates within or is destined to the study area.

Off-street public parking facilities in the Oconomowoc central business district (CBD) have an average occupancy rate of approximately 76 percent, while on-street facilities have a 40 percent occupancy rate. This averages to a 64 percent occupancy rate for the entire public parking facilities in the CBD area. The average turnover rate for the on-street curb parking in the CBD is 1.2 vehicles per stall during the peak hours of parking demand between 10:00 a.m. and 12:00 p.m. and 1:00 p.m. and 3:00 p.m.

There were a total of 380 on-street motor vehicle accidents in the study area in 1977, and 377 in 1978. Of these accidents, three resulted in fatalities in 1977 and one in 1978. The majority of these accidents—75 percent in 1977 and 80 percent in 1978—resulted in property damage only. The highest traffic accident locations in the study area are the intersection of Main Street and Wisconsin Avenue, along E. Wisconsin Avenue (STH 16) between N. Main Street and N. St. Paul Street, and along E. Wisconsin Avenue between N. Fowler Street and N. Thompson Street.

A major transportation facility traversing the study area which interfaces with the operation of the existing arterial street and highway system is the Milwaukee Road Railroad. The train traffic on this rail line averages between 13 to 18 trains from 7:00 a.m. to 7:00 p.m. on an average weekday and results in interruptions to vehicular traffic at its at-grade arterial street intersections averaging 1.25 minutes. In addition, the Milwaukee Road conducts late evening switching operations in the study area to service the manufacturing firms located in the City of Oconomowoc. Finally, at least nine reports of crossing gate system malfunctions resulting in interruptions of vehicular traffic were received by the Oconomowoc Police Department between January 1 through June 31, 1979.

To supplement the traffic inventory data presented in this chapter, citizen complaints of perceived traffic-related problems were solicited from members of the community and of the Advisory Committee for the study. A list of 63 perceived problems was compiled to assist in identifying traffic management system problems. This list resulted in the identification of 22 locations of possible traffic-related problems in the study area, with the majority of these locations being on STH 16 and STH 67.

Chapter IV

OBJECTIVES, PRINCIPLES, AND STANDARDS

INTRODUCTION

Planning is a rational process for formulating objectives and finding means to meet those objectives. The formulation of objectives is therefore an essential task which must be undertaken before plans can be prepared. The objectives chosen guide the preparation of alternative plans and, when converted to standards, provide the criteria for evaluating and selecting from among the alternatives. In the case of a traffic management plan, the objectives must define, in effect, the level of performance—or service—which the community desires from its arterial street and highway system. The supporting standards must, in turn, permit an evaluation of the extent to which the existing system meets that level of performance, as well as an evaluation of the degree to which alternative traffic management actions will achieve the desired level of performance.

It is important to recognize that the objectives formulated in any planning process implicitly reflect the underlying value system of the residents of the area for which the plan is being prepared. Since the value systems of the individuals comprising a complex urban society are often diverse and sometimes conflicting in nature, the task of formulating objectives can be quite complicated and is often the most difficult task of the entire planning process. Because of the value system implications of any chosen set of objectives, every effort should be made to formulate those objectives through the active participation of interested and knowledgeable public officials and private citizens representing a broad range of interests in the community. For this reason, one of the major responsibilities of the 24-member Citizens and Technical Advisory Committee was to assist the Regional Planning Commission staff in defining the traffic management objectives for this study. Only by combining the accumulated knowledge, experience, views, and values of the members of the Committee was it considered possible to obtain a meaningful expression of the desired performance level of the arterial street and highway system of the Oconomowoc area, and thereby a set of traffic management objectives and supporting standards.

BASIC CONCEPTS AND DEFINITIONS

The term "objective" is subject to a wide range of interpretation and application and is closely linked to other terms often used in systems planning which are equally subject to a wide range of interpretation and application. Therefore, before presenting the objectives which were formulated for this planning process, the following established definitions of the terms "objective," "principle," "standard," "plan," "policy," and "program" are provided to serve as a common frame of reference.

1. Objective: a goal or end toward the attainment of which plans and policies are directed.

2. Principle: a fundamental, primary, or generally accepted tenet used to support objectives and prepare standards and plans.

3. Standard: a criterion used as a basis of comparison to determine the adequacy of plan proposals to attain objectives.

4. Plan: a design which seeks to achieve agreed-upon objectives.

5. Policy: a rule or course of action used to ensure plan implementation.

6. Program: a coordinated series of policies and actions to carry out a plan.

Although this chapter deals with only the first three of these terms, an understanding of the interrelationship among the foregoing definitions and the basic concepts which they represent is essential to the following discussion of objectives, principles, and standards.

OBJECTIVES

In the process of formulating the objectives to be met by a traffic management plan for the City of Oconomowoc, the Citizens and Technical Advisory Committee, working in cooperation with Regional Planning Commission staff members, initially

reviewed the transportation system development objectives used in preparing the Commission's year 2000 long-range regional land use and transportation plan.[1] Following that review, it was the consensus that the objectives to be pursued in the development of a traffic management plan for the City should be similar to the adopted long-range regional transportation system development objectives. The conclusion that a strong parallel exists between short-range community transportation system management objectives and long-range areawide transportation system development objectives was based on the reasoning that transportation system management and development objectives, whether short-range or long-range, essentially serve to formally define the basic needs which transportation facilities and services should satisfy, such as personal mobility, economic efficiency, environmental quality, and public safety. Consequently, the objectives established for meeting these basic needs should not be expected to change basically with time, or with the size of the community involved. It should be noted, however, that the length of the planning period may be expected to influence significantly the importance of, and the constraints on, the attainment of certain objectives, as well as the type of actions or improvements which will best meet the objectives within that time frame. Consequently, the objectives were revised, as necessary, to emphasize the short-range nature of the traffic management plan as opposed to the long-range nature of the regional transportation system plan. As a result of this analysis, the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study approved the following seven transportation system management and development objectives:

1. An integrated transportation system which, through its location, capacity, design, and management, will effectively serve the existing and developing community land use pattern, meeting the travel demand generated by that pattern.

2. A transportation system which is economical and efficient, satisfying all other objectives at the lowest possible cost.

3. A flexible, balanced transportation system which will provide the appropriate types of transportation needed by all residents of the community at an adequate level of service, and which will permit ready adaptation to both changes in travel demand and transportation technology, including travel modes and transportation system management.

4. Minimization of disruption of existing neighborhood and community development by the transportation system, including adverse effects upon the property tax base, and minimization of the deterioration and/or destruction of the community's natural resource base.

5. The facilitation of the efficient movement of people and goods within and through the community.

6. The reduction of accident exposure and the provision of increased travel safety.

7. A transportation system with a high aesthetic quality whose major facilities will possess the proper visual relation to the landscape and cityscape.

PRINCIPLES AND STANDARDS

Complementing each of the foregoing traffic management planning objectives is a planning principle and a set of planning standards. These are set forth in Table 22. Each set of standards is directly relatable to a specific objective and its supporting principle, and serves to facilitate the application of the objectives in the plan development process. The planning principle, moreover, supports each specific objective by asserting its validity.

In the process of formulating the supporting principles to the objectives for the Oconomowoc traffic management study, the Citizens and Technical Advisory Committee decided, as they did for the objectives, to adopt supporting planning principles similar to those adopted by the Regional Planning Commission for use in the preparation of the long-term regional transportation system plan. In the case of the planning standards adopted by the Committee for this study, it was decided to build upon the regional standards, deleting from and adding to those standards as necessary to meet

[1] *See Chapter II of SEWRPC Planning Report No. 25, A Regional Land Use and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volume Two, Alternative and Recommended Plans.*

the needs of the more detailed and localized planning effort for Oconomowoc and to reflect the short-range nature of the study.

The traffic management standards herein fall into two categories: comparative standards and absolute standards. By their nature, comparative standards must be evaluated through a comparison of alternative traffic management actions. An example of such a standard is the minimization of the total vehicle hours of travel within a community; a minimum value for this standard cannot be assigned. The application of the standard, therefore, must be a comparative one in which the alternative traffic management action providing the greatest reduction in vehicle hours of travel is deemed to best meet this standard. Absolute standards can be applied individually to each alternative plan proposal since they are expessed in terms of maximum, minimum, or desirable values. An example of such a standard is the establishment of a maximum limit of 0.80 for the volume to capacity ratio for an arterial street or highway to provide for uncongested operation of the facility. In the application of this standard, alternative traffic management actions would be evaluated on the basis of their ability to provide for operation of the arterial street or highway at a volume to capacity ratio of 0.80 or less.

It is important to recognize that it is not intended that every traffic management action recommended for implementation in this study satisfy every standard used to evaluate the attainment of the seven traffic management objectives set forth in Table 22. For example, a standard used to measure the objective to facilitate the efficient movement of people and goods is directed at reducing congestion on arterial streets and highways. On the other hand, a standard used to measure the objective to provide for a balanced transportation system is directed at providing a sufficient supply of on-street curb parking. An alternative traffic management action to reduce congestion on arterial streets and highways could be the removal of on-street curb parking to maximize the utilization of the existing roadway. However, this action could be in conflict with the objective of providing for a balanced transportation system as measured by the availability of on-street curb parking.

In the analysis of existing transportation problems, an attempt will be made to formulate alternative traffic management actions which will meet as many, if not all, of the traffic management objectives as practicable. When a recommended traffic management action cannot meet all of the traffic management objectives, the community will need to examine the alternatives and establish its priorities with regard to the relative importance of the objectives and select that traffic management action which will satisfy the community's overall development objectives.

OVERRIDING CONSIDERATIONS

In the application of the planning standards and in the preparation of the traffic management plan for the Oconomowoc study area, certain overriding considerations must be recognized:

1. That the proposed traffic management plan for the City of Oconomowoc should be consistent with the adopted long-range community and regional land use and transportation system development plans. Actions recommended for implementation in the traffic management plan should not be in conflict with transportation facility development recommendations contained in the long-range community and regional transportation system development plans for the area, even though some of these system development recommendations may not be implemented until much later.

2. That an overall evaluation should be made of the probable effect of each proposed traffic management action on ambient air quality in the area. This evaluation must be made to ensure compliance with the regional objectives of providing a healthful environment and protecting the natural resource base, as well as to ensure the satisfaction of national and state ambient air quality standards.

3. Finally, that all traffic engineering actions involving traffic control devices such as signs, signals, markings, and devices placed on or adjacent to a street or highway to warn, regulate, or guide traffic which are recommended in the traffic management plan must be in conformance with the standards set forth in the Manual on Uniform Traffic Control Devices, published by the U. S. Department of Transportation, Federal Highway Administration, and adopted by the Wisconsin Department of Transportation.

Table 22

OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA TRANSPORTATION SYSTEM MANAGEMENT OBJECTIVES, PRINCIPLES, AND STANDARDS

OBJECTIVE NO. 1

An integrated transportation system which, through its location, capacity, design, and management, will effectively serve the existing and developing community land use pattern, meeting the travel demand generated by that pattern.

PRINCIPLE

An integrated community transportation system should serve to freely interconnect the various land use activities within and around the community, thereby providing the attribute of accessibility and the terminal facilities essential to the support of these activities.

STANDARDS

1. The vehicular and pedestrian travel times of residents of the community in their daily travel within and through the community on the arterial street and highway system should be minimized.

2. The time required for the response of emergency vehicles to all areas of the community should be minimized.

3. Existing vehicular and pedestrian access to the various land use developments within the community should be maintained or improved.

4. Circuitous travel routings should be discouraged.

OBJECTIVE NO. 2

A transportation system which is economical and efficient, satisfying all other objectives at the lowest possible cost.

PRINCIPLE

The total financial resources of the community are limited, and any undue investment in transportation facilities and services must occur at the expense of other public and private investment. Therefore, total transportation costs should be minimized for the desired level of service.

STANDARDS

1. Capital investment in traffic management actions should be minimized.

2. Transportation facility operating and maintenance costs should be minimized.

3. Existing transportation system user costs of travel time and fuel consumption should be minimized.

OBJECTIVE NO. 3

A flexible, balanced transportation system which will provide the appropriate types of transportation needed by all residents of the community at an adequate level of service, and which will permit ready adaptation to both changes in travel demand and transportation technology, including travel modes and transportation system management.

Table 22 (continued)

PRINCIPLE

A flexible, balanced transportation system consisting of highway, mass transit, and terminal facilities for the movement of people and goods is necessary to provide an adequate level of transportation service to all segments of the population, to support essential economic and social activities, and to achieve economy and efficiency in the provision of transportation service.

STANDARDS

1. The arterial street and highway system should comprise from 15 to 25 percent of the total community street and highway system mileage.

2. Arterial streets and highways should be spaced no more than 0.5 mile in each direction in urban high-density areas (7.0 to 17.9 dwelling units per net residential acre), no more than 1 mile in each direction in urban medium-density areas (2.3 to 6.9 dwelling units per net residential acre), and no more than 2 miles in each direction in urban low-density and suburban-density areas (0.2 to 2.2 dwelling units per net residential acre).

3. Sufficient automobile parking spaces should be provided in the central business district so that the average annual weekday peak parking demand does not exceed 85 percent of the available on-street curb parking and public off-street parking spaces.

4. The number and distribution of automobile parking spaces serving the central business district should be distributed between on-street curb and off-street parking facilities such that there is a minimum of 150 parking spaces per 1,000 population, with 43 percent of those spaces comprised of on-street curb parking and the remaining 57 percent of off-street parking.

5. In the central business district, sufficient time-limited parking should be provided near concentrations of demand so that 90 percent of the short-term parkers need walk no more than 600 feet to reach their destination.

6. Separate truck loading and unloading zones should be provided where existing arterial street and highway capacity is restricted and where level of service "C" can be obtained through such provision on an arterial street or highway.

7. A traffic management action should be capable of being readily adaptable to changes in travel demand and in transportation technology.

OBJECTIVE NO. 4

Minimization of disruption of existing neighborhood and community development by the transportation system, including adverse effects upon the local property tax base, and minimization of the deterioration and/or destruction of the community's natural resource base.

PRINCIPLE

The social and economic costs attendant to the disruption and dislocation of homes, businesses, industries, and communication and utility facilities, as well as the adverse effects on the natural resource base, can be minimized through the proper location and design of the transportation system.

STANDARDS

1. The acquisition of land for transportation purposes should be minimized.

2. The reduction of existing property tax values should be minimized.

3. The population should not be exposed to harmful noise levels as set forth by the U. S. Department of Transportation.[a]

4. The penetration of residential and environmentally sensitive areas by arterial streets and highways should be avoided.

OBJECTIVE NO. 5

The facilitation of the efficient movement of people and goods within and through the community.

PRINCIPLE

To support the everyday activities of business, shopping, and social intercourse, a transportation system which provides for reasonably fast, convenient travel is essential. Furthermore, traffic congestion increases the cost of transportation, including the cost of the journey to work, which is necessarily reflected in higher production costs, and thereby adversely affects the relative market advantages of businesses and industries within the community.

STANDARDS

1. The total vehicle hours of travel occurring within the community should be minimized.

2. The total vehicle miles of travel occurring within the community should be minimized.

3. The conflict between the movement of through traffic and local traffic within a community should be minimized.

4. The volume to capacity ratio of existing arterial facilities should not exceed 0.80.

5. Peak-hour load factors for signalized intersections should not exceed 0.30.

6. Average vehicle delays at signalized intersections during peak hours should not exceed 28 seconds per vehicle.

7. Vehicular delays resulting from railroad crossing activity should be minimized.

8. Vehicular queue lengths at signalized intersections should be reduced so that they do not interfere with the operation of adjacent signalized intersections.

9. Traffic control devices such as traffic signals, stop signs, yield signs, and pavement markings should be installed as warranted.[b]

OBJECTIVE NO. 6

The reduction of accident exposure and the provision of increased travel safety.

PRINCIPLE

Accidents take a heavy toll in life, property damage, and human suffering; contribute substantially to overall transportation costs; and increase public costs for police and welfare services. Therefore, every attempt should be made to reduce both the incidence and severity of accidents.

STANDARDS

1. The number and severity of traffic accidents on the existing arterial street and highway system should be minimized. The following traffic management actions should serve as a guide for reducing traffic accidents:

   a. The number of potential intersection conflict points should be minimized;

   b. The relative speeds on the existing arterial street and highway system should be controlled to approach a normal speed distribution;

c. Multiple and compound merging and diverging maneuvers should be avoided;

d. The heaviest and fastest traffic flow should be favored in the design of a roadway or intersection;

e. The area of conflict within an intersection should be minimized; and

f. Nonhomogeneous traffic flows should be segregated, if possible.

2. Railroad crossing signal protection should be provided or upgraded where the application of such controls will reduce traffic-related accidents. These controls include: crossbuck signs, wigwags, flashing lights, automatic gates, and grade separation.

3. Pedestrians should be protected by the use of sidewalks, crosswalks, school crossing protection, and properly timed pedestrian signals.

OBJECTIVE NO. 7

A transportation system with a high aesthetic quality whose major facilities will possess the proper visual relation to the landscape and cityscape.

PRINCIPLE

Beauty in the physical environment is conducive to the physical and mental health and well-being of people; and, as major features of the landscape and cityscape, transportation facilities have a significant impact on the attractiveness of the total environment.

STANDARDS

1. Sound geometric, structural, and landscape design standards which are aesthetically pleasing to the transportation system user and to the property owners adjacent to the facility should be used in the formulation and implementation of traffic management actions.

2. The destruction of visually pleasing buildings, structures, and natural features and the interference with vistas to such features should be avoided.

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[a] *See U. S. Department of Transportation, Federal Highway Administration, Policy and Procedure Memorandum 90-2, February 8, 1973.*

[b] *U. S. Department of Transportation, Federal Highway Administration, "Warrants for the Installation of Traffic Signals and Stop and Yield Signs," Manual on Uniform Control Devices, 1971.*

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Chapter V

EXISTING TRAFFIC PROBLEMS

INTRODUCTION

This chapter identifies and describes the traffic problems which occur on the transportation system of the Oconomowoc traffic management study area. These traffic problems represent deficiencies in the existing transportation system as measured by a comparison of the performance of that system against the traffic management objectives and standards adopted for the study area by the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study.

In order to identify the existing traffic problems in the Oconomowoc study area, the existing traffic conditions presented in Chapter III of this report were compared to the traffic management objectives and standards set forth in Chapter IV of this report. Where this comparison indicated that the existing traffic conditions do not meet the objectives and standards, a transportation system deficiency has been identified.

Four basic categories of existing traffic problems have been identified: 1) traffic congestion problems; 2) arterial service problems; 3) vehicular parking supply problems; and 4) traffic accident problems. In the following descriptions of each these four problem categories, reference is made to the specific traffic management objectives and standards which were used to evaluate the existing traffic conditions in the study area, and thereby to identify the traffic problems. Those elements of the transportation system which did not meet the standards are identified for subsequent analysis in Chapter VI of this report.

Included in the identification of traffic problems of the area is a discussion of the citizen complaints with respect to such problems. This discussion consists of an analysis of each complaint and a determination as to whether the complaint is a valid reflection of an actual traffic problem as identified in the study, or if the complaint merely reflects a perceived, as opposed to an actual, traffic problem.

An attempt was made in identifying traffic problems to analyze the problems by facility or route. This analysis was intended to identify interrelated traffic problems—a particularly important step, as the implementation of a traffic management action designed to alleviate one type of traffic problem may, at the same time, abate or, conversely, intensify other problems on the system. For example, a traffic management action that reduces or eliminates a congestion problem on a facility may also reduce or eliminate accidents. Therefore, in analyzing specific traffic problems on a facility and recommending traffic management actions which address those problems, it is important to consider the possible effects of the recommended actions on the remainder of the transportation system. This analysis of the relationship of individual traffic problems is also helpful in identifying the most severe traffic problems. The information obtained from this analysis is utilized in Chapter VII of this report in establishing priorities for the implementation of the recommended traffic management actions, as well as in identifying the level of government—state, county, or local—which should assume responsibility for implementing the recommended actions. The implementation of the recommended traffic management actions should result in the achievement of an effective transportation system, as well as in the resolution of individual problems.

VEHICULAR TRAFFIC CONGESTION PROBLEMS

One of the principal problems experienced by vehicular traffic on arterial streets and highways in urban areas and occasionally in rural areas is traffic congestion. Traffic congestion can be detrimental to a community's economic vitality and directly results in increased motor vehicle operating costs and air and noise pollution. The Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study, accordingly, adopted several traffic management objectives and supporting standards relating to the abatement of traffic congestion. These include: Objective 1, Standard 1, which calls for reducing vehicular and pedestrian travel times; Objective 2, Standard 3, which calls for reducing direct transportation system user costs; and Objective 5, Standards 1 and 2, which call for reducing vehicle hours and vehicle miles of travel, and Standards 4 through 7, which specify desirable levels for

volume to capacity ratios, signalized intersection load factors, and vehicle delays. The desired levels of service defined in Objective 5, Standards 4 through 7, were, in particular, useful in identifying existing vehicular traffic congestion problems in the study area.

Objective 5, Standard 4 states that:

> The volume to capacity ratio of existing arterial facilities should not exceed 0.80.

As described in Chapter III of this report and shown on Map 17, there are two arterial streets in the study area currently operating at design capacity; that is, at a volume to capacity ratio of 0.80. These two arterials include the westbound roadway of E. Wisconsin Avenue between Main Street and S. Silver Lake Street and the eastbound roadway of E. Summit Avenue between S. Silver Lake Street and S. Main Street. While the volume to capacity ratios on these two arterial street segments do not yet exceed the standard, traffic has been increasing on these facilities at an annual rate of about 3.5 percent and 4.8 percent, respectively. Consequently, the volume to capacity ratios for these two arterials may exceed the standard in the very near future.

As indicated in Chapter III of this report and as shown on Map 17, there are also two arterial streets currently operating at a volume to capacity ratio greater than 0.80: the eastbound roadway of W. Wisconsin Avenue from approximately S. Concord Road to Main Street; and the westbound roadway of E. Summit Avenue from E. Armour Road to S. Silver Lake Street.

Objective 5, Standard 5 states that:

> Peak-hour load factors for signalized intersections should not exceed 0.30.

As indicated in Table 12 of Chapter III, in 1979 only two signalized intersection approaches in the study area exhibited a load factor of more than 0.30. These two intersections are the eastbound roadway of W. Wisconsin Avenue at Main Street and the westbound roadway of E. Summit Avenue at S. Silver Lake Street. The load factor of 0.30 was being exceeded between 3:30 p.m. and 5:00 p.m. at these two locations and was approached between 7:30 a.m. to 8:30 a.m. on the eastbound roadway of W. Wisconsin Avenue at Main Street on an average weekday. All of the other intersection approaches have a load factor of less than or equal to 0.13.

Objective 5, Standard 6 states that:

> Average vehicular delays at signalized intersections during peak hours should not exceed 28 seconds per vehicle.

The data presented in Table 12 of Chapter III indicate that, in 1979, only two signalized intersection approaches within the study area exhibited average vehicle delays greater than 28 seconds: the eastbound roadway of W. Wisconsin Avenue at Main Street, with an average delay value of 55.9 seconds per vehicle, and the westbound roadway of E. Summit Avenue at S. Silver Lake Street, with an average delay value of 37.7 seconds per vehicle. The next highest average vehicle delay was 20.6 seconds per vehicle, experienced on the eastbound roadway of W. Wisconsin Avenue at Main Street between 7:30 a.m. and 8:30 a.m. No other signalized intersection in the study area exhibited average vehicle delays exceeding 20 seconds.

In summary, two arterial street segments in the Oconomowoc traffic management study area have been identified as operating at the threshold of congestion, as defined by a volume to capacity ratio of 0.80. These two arterial segments are the westbound roadway of E. Wisconsin Avenue at Main Street and the eastbound roadway of E. Summit Avenue at S. Silver Lake Street. In addition, two arterial street segments have been identified as operating under congested conditions. These two arterial segments are the eastbound roadway of W. Wisconsin Avenue at Main Street and the westbound roadway of E. Summit Avenue at S. Silver Lake Street.

Based upon the standards for signalized load factors and average vehicle delays, the westbound roadway of W. Wisconsin Avenue at Main Street and the eastbound roadway of E. Summit Avenue at S. Silver Lake Street exhibit congestion. These two signalized intersection approaches represent the principal vehicular traffic congestion problems in the Oconomowoc study area. However, the intersection approaches of E. Wisconsin Avenue westbound at Main Street and of E. Summit Avenue eastbound at S. Silver Lake Street, which are currently operating at design capacity, are also analyzed in Chapter VI of this report as secondary vehicular traffic congestion problem locations.

ARTERIAL SERVICE PROBLEMS

One of the principal functions of a community's transportation system should be to provide good arterial service to all of the land uses within the community, meeting the travel demand generated by these land uses at an acceptable level of service. Good arterial service requires that the arterial and collector facilities of the street and highway system be properly located to conveniently serve the travel desires of both local and through traffic—convenience in this aspect being expressed in terms of "directness" of routes and acceptable average travel times to safely traverse the route—thereby properly interconnecting the various land uses that comprise the community.

The Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study was especially concerned about the provision of good arterial service to land uses throughout the study area and specifically directed that the study include consideration of any arterial service problems in the study area—problems created by the perception that the present street and highway system does not conveniently serve the travel demand generated by the existing land uses. Good arterial service is difficult to measure. The Citizens and Technical Advisory Committee adopted several quantitative and qualitative objectives and standards for use in identifying existing arterial service problems and in formulating and evaluating alternative traffic management actions to solve or mitigate those problems. Arterial service criteria, which are set forth in Chapter IV of this report, include Objective 1, Standards 1 through 4; Objective 2, Standard 3; Objective 3, Standards 1 and 2; Objective 4, Standard 4; and Objective 5, Standards 1, 2, 3, and 7. Of these arterial service criteria, Objective 3, Standards 1 and 2, Objective 4, Standard 4, and Objective 5, Standards 3 and 7 were particularly useful in identifying the existing arterial service problems in the study area. The remaining arterial service criteria referenced are more qualitative in nature and were used in the design and evaluation of alternative traffic management actions as described in Chapter VI of this report.

Objective 3, Standard 1 states that:

> The arterial street and highway system should comprise from 15 to 25 percent of the total community street and highway system mileage.

As shown in Table 3 and on Map 7 of Chapter II, in 1979 there were 9.31 miles of principal arterial streets and 16.42 miles of minor arterial streets within the study area. This 25.73 miles of arterial streets comprised approximately 33 percent of the total of 78.64 miles of streets and highways within the study area. Table 3 further indicates that within the City of Oconomowoc there were 5.42 miles of principal arterial streets and 4.36 miles of minor arterial streets. This total of 9.78 miles of arterial streets comprised approximately 23 percent of the total of 42.30 miles of streets and highways within the City. Therefore, the arterial street system within the City of Oconomowoc meets Objective 3, Standard 1. The higher percentage of arterial streets in the total study area reflects the rural and suburban, as opposed to urban, character of the study area outside of the City of Oconomowoc, where greater lengths of arterial streets are necessary to provide arterial service to the urban land uses. As the area continues to develop, additional local streets will be constructed to infill the arterial street network and provide arterial service to the new land uses, thereby lowering the proportion of the total street mileage composed of arterials to an acceptable level.

Objective 3, Standard 2 states that:

> Arterial streets and highways should be spaced no more than 0.5 mile in each direction in urban high-density areas (7.0 to 17.9 dwelling units per net residential acre), no more than 1 mile in each direction in urban medium-density areas (2.3 to 6.9 dwelling units per net residential acre), and no more than 2 miles in each direction in urban low-density and suburban-density areas (0.2 to 2.2 dwelling units per net residential acre).

Analysis of the data presented in this report indicates that there are an inadequate number of continuous arterial streets in the study area. The study area, which is approximately four miles on a side, consists of irregular shaped areas of urban development surrounded by rural and open land uses. Urban development in the study area is generally medium-density in character and extends continuously for approximately three miles each in an east-west and north-south direction. Traffic management Objective 3, Standard 2, calls for a one-mile arterial street spacing throughout such areas. This indicates a need for at least three

arterial streets in both the east-west and north-south directions through the developed areas of the study area.

STH 16 basically provides for east-west travel across the study area and is, therefore, identified for street spacing analysis purposes as an east-west arterial. It is difficult to characterize the arterial street direction of STH 67 because of its skewed routing through the center of the study area. While STH 67 is primarily a north-south route, it also serves as an east-west facility for local traffic across the southern half of the study area from approximately E. Thackery Trail to S. Main Street. Partial, indirect east-west arterial service is also provided in the northern half of the study area by CTH Z from CTH P to N. Lapham Street, south on N. Lapham Street to E. Lisbon Road, and then west on E. Lisbon Road to N. Lake Road, where east-west arterial service stops near Lac La Belle.

Application of the arterial spacing standard indicates that there is an east-west arterial service problem in the southern half of the study area, indicating a need for an additional east-west arterial. The identification of this problem is supported by the detailed 1972 travel pattern information contained in Chapter III. The magnitude of east-west travel patterns within and through the study area has increased since 1972. Figures 3 through 5 in Chapter III show a heavy demand for east to west travel in the study area—2,000 internal, 5,900 internal/external, and 4,250 through vehicle trips per average weekday in 1972 across the southern half of the study area. Because all of these trips must use STH 16 and STH 67, all were routed through the central business district.

An analysis of the north-south arterial routes, which traverse the urban land use sections of the study area, indicates that only two arterials cross STH 16 from the southern to the northern half of the study area. These two arterials, which are, moreover, not directly routed, are N. Main Street and N. Walnut Street southerly to S. Silver Lake Street and thence to E. Summit Avenue. An application of the arterial spacing standard shows that there is a north-south arterial service problem in the eastern half of the study area, indicating a need for an additional north-south arterial. This north-south arterial service problem is supported by the historic travel pattern information contained in Chapter III. Figures 3 through 5 in Chapter III indicate the following demand for travel across STH 16 in the eastern half of the study area—approximately 3,400 internal, 3,000 internal/external, and 250 through trips, or a total of 6,650 vehicle trips per average weekday in 1972.

Objective 4, Standard 4 states that:

> The penetration of residential and environmentally sensitive areas by arterial streets and highways should be avoided.

According to citizen complaints and to the findings of the special traffic volume counts made under the study, S. Elm Street is currently being used as a truck route from W. 2nd Street to W. Wisconsin Avenue (STH 16). A manual traffic count was taken at this intersection from 9:00 a.m. to 12:00 p.m. and 1:00 p.m. to 3:30 p.m. on Wednesday, May 2, 1979. The proportion of truck traffic at the intersection over these two time periods amounted to approximately 11 percent for the north approach, 8 percent for the south approach, 10 percent for the east approach, and 19 percent for the west approach. These percentages are quite high for land access streets and reflect the need for better arterial service to the City of Oconomowoc industrial park located at the western terminus of W. 2nd Street and to the manufacturing land uses located along W. 2nd Street from S. Park Street to S. Worthington Street, as shown on Map 3 in Chapter II. It may be concluded, therefore, that according to Standard 4 adequate arterial service is not currently being provided to the wholesale and manufacturing land uses located on W. 2nd Street, resulting in a transportation system problem of back routing over land access streets and penetration of the residential land uses located along those local streets, primarily S. Elm Street.

Objective 5, Standard 3 states that:

> The conflict between the movement of through traffic and local traffic within a community should be minimized.

The general relationship of vehicle trip movements in the study area for 1972 is discussed in Chapter III of this report. As shown in Figure 5, in 1972 4,500 through trips, or nearly 94 percent of all the through trips in the study area, were made on STH 16 or STH 67. Figure 5 further indicates that of these through trips, 3,200 vehicles per day used the segment of STH 67 (S. Main Street/E. Summit Avenue) south of Wisconsin Avenue, 250 used the segment of STH 67 (N. Main Street/Lake Road) north of Wisconsin Avenue, and

1,300 used the segment of STH 16 east of Main Street. Thus, a total of about 4,250 through trips per day used the segment of STH 16 west of Main Street. Therefore, of the approximately 11,000 vehicles using STH 16 on an average weekday in 1972 at the western side of the study area, 4,250, or about 39 percent, consisted of through traffic desiring to cross the study area. As indicated in Chapter III, the number of through vehicle trips made across the study area on an average weekday in 1972 had increased to about 6,700 vehicle trips by 1979. Thus, the 1972 through trip pattern has increased in magnitude and comprises approximately 12 percent of the total 56,900 vehicle trips made on an average weekday in 1979 in the study area.

Based on the analysis of the travel pattern data presented in Chapter III, it can be concluded that there is a conflict between through traffic and local traffic within the Oconomowoc traffic management study area. The application of Standard 4 indicates this as an arterial service problem relating to the restricted number of direct arterial east-west routes available to serve travel patterns through the study area.

Objective 5, Standard 7 states that:

> Vehicular delays resulting from railroad crossing activity should be minimized.

As indicated in Chapter II, the Chicago, Milwaukee, St. Paul & Pacific Railroad (the Milwaukee Road) and the National Railroad Passenger Corporation (AMTRAK) both operate railroad services over a double-track main line that bisects the study area in a generally east-west direction. As indicated in Chapter II, in passing through the study area these tracks intersect 11 streets. Nine of these street crossings are at-grade, while only two are grade-separated. The two grade-separated crossings are located on the eastern and western extremities of the study area and, because of advanced age and deteriorated structural condition, are posted with weight restrictions. The exact location of each railroad crossing is shown on Map 6.

Vehicle travel delays occur at each of the nine at-grade railroad crossings whenever there is railroad activity in the vicinity of these crossings or when the railroad crossing protection devices are not functioning properly. An analysis of the data compiled from a survey of railroad activity in the Oconomowoc traffic management study area, discussed in Chapter III, indicates that on a typical weekday during the 12-hour period from 7:00 a.m. to 7:00 p.m. a total of 13 trains—11 Milwaukee Road freight trains and 2 AMTRAK trains—activated the railroad crossing gates in the study area. As shown in Table 20 in Chapter III, the first of these trains passed through the study area at about 7:30 a.m. and the last at about 6:30 p.m., averaging about one train every 45 minutes. The shortest time interval between trains, excluding the single local freight train operating in the area involved in switching operations, was approximately 30 minutes, and the longest approximately two hours. The shortest interruption to street traffic was 30 seconds and the longest interruption was 3.5 minutes, an average delay to street traffic per train of 1.25 minutes.

These survey findings indicate that the total average traffic delay per train is not unusually long. This delay problem, however, is compounded by the problem of traffic delays caused by malfunctioning railroad crossing gate equipment devices which stop vehicular traffic when trains are not present. As reported in Chapter III, there were at least nine reported instances during the six-month period from January 1 through June 31, 1979, of extended traffic delays caused by malfunctioning protection devices. This dangerous situation may result in the general public's driving around the gates to cross the railroad tracks and thereby eventually disregarding the crossing gate protection entirely.

In summary, four arterial service problems have been identified, in the study area:

1. There is an inadequate number of continuous, directly designed east-west and north-south arterial streets through the southern and eastern portions of the study area. At least one additional arterial route is warranted in each of the two directions;

2. Heavy truck traffic is operating on a land access street, S. Elm Street, thus penetrating the residential land uses adjacent to that facility. This undesirable situation exists because arterial service to the wholesale and manufacturing land uses located along W. 2nd Street in the vicinity of S. Elm Street is presently inadequate;

3. There are heavy volumes of through traffic on STH 16 and STH 67 through the Oconomowoc central business district; and

4. Vehicular delays are caused by the railroad operations over the trackage which bisects the study area in an east-west direction. Of the 11 rail line/street and highway intersections, nine are at-grade. In addition, crossing gate protection devices experience periodic malfunctions and cause needless delays to vehicular traffic on the streets and highways which intersect with the railroad tracks. The other two rail line/street and highway intersections are grade-separated but are in poor structural condition due to advanced age and are posted with vehicle weight restrictions.

VEHICULAR PARKING SUPPLY PROBLEMS

An adequate supply of vehicular on-street and off-street parking spaces, especially in the downtown central business district (CBD), is an important element of a community's total transportation system. The Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study adopted traffic management Objective No. 3, Standards 3, 4, and 5 with regard to the provision of parking in the central business district of the City of Oconomowoc. These three standards are:

- Sufficient automobile parking spaces should be provided in the central business district so that the average annual weekday peak parking demand does not exceed 85 percent of the available on-street curb parking and public off-street parking spaces.

- The number and distribution of automobile parking spaces serving the central business district should be distributed between on-street curb and off-street parking facilities such that there is a minimum of 150 parking spaces per 1,000 population, with 43 percent of those spaces comprised of on-street curb parking and the remaining 57 percent of off-street parking.

- In the central business district, sufficient time-limited parking should be provided near concentrations of demand so that 90 percent of the short-term parkers need walk no more than 600 feet to reach their destination.

On-Street Parking Supply Problems

There are 200 on-street parking spaces in the downtown CBD of the City of Oconomowoc. These 200 parking spaces are distributed throughout the CBD in varying concentrations that range from 2 to 25 parking spaces per block face. With respect to time limitations, on-street parking supply is divided into the following categories: 10 spaces, or 5 percent, with parking restricted to 15 minutes or less; 76 spaces, or 38 percent, with parking restricted to one hour or less; 15 spaces, or 8 percent, with parking restricted to two hours or less; and 99 spaces, or 49 percent, with unrestricted all-day parking. Map 19 and Table 16 in Chapter III provide information on the location of the existing on-street parking supply and its associated parking restrictions.

The survey of existing on-street parking conditions, discussed in Chapter III, found that the existing demand for on-street parking exceeded the 85 percent parking occupancy rate standard adopted by the Committee during at least one hour of the four-hour parking survey period in five of the 20 block faces in the CBD. As shown on Map 19 and in Table 16, these five block faces were: block faces 1 and 4, the west and east sides, respectively, of N. Main Street between Wisconsin Avenue and the Lac La Belle/Fowler Lake bridge; block face 2, the west side of S. Main Street in front of the U. S. Post Office in the vicinity of W. South Street; block face 10, the west side of St. Paul Street in the vicinity of E. Pleasant Street; and block face 16, the west side of S. Silver Lake Street between E. Wisconsin Avenue and E. Collins Street.

Block faces 1 and 4 together have 16 short-term (one-hour) on-street parking spaces. The demand for the eight parking spaces along the west side of N. Main Street between Wisconsin Avenue and the Lac La Belle/Fowler Lake bridge (block face 1) exceeded the 85 percent parking occupancy rate standard during three of the four hours for which the parking survey was conducted. Block face 1 had an average parking occupancy rate for the entire four-hour survey period of 91 percent. The demand for the eight parking spaces along the east side of N. Main Street between Wisconsin Avenue and the Lac La Belle/Fowler Lake bridge (block face 4) exceeded the 85 percent parking occupancy rate standard during all four hours for which the survey was conducted. Block face 4 had an average parking occupancy rate for the entire four-hour survey period of 97 percent.

Block face 2 consists of five short-term (15-minute) on-street parking spaces, all located at the entrance to the U. S. Post Office along the west side of S. Main Street near W. South Street. The demand for these five spaces exceeded the 85 percent parking occupancy rate standard during two of the four hours for which the survey was conducted. Block face 2 had an average parking occupancy rate for the entire four-hour survey period of 85 percent.

Block face 10 consists of two long-term (unlimited) on-street parking spaces located along the west side of St. Paul Street adjacent to the Fowler off-street public parking lot. The demand for these two parking spaces exceeded the 85 percent parking occupancy rate standard during three of the four hours for which the survey was conducted. Block face 10 had an average parking occupancy rate for the entire four-hour survey period of 88 percent. Additional long-term on-street parking is, however, available in the immediate vicinity of these two spaces and is currently not being fully utilized. This additional long-term parking is available along block face 14 (5 parking spaces) on the east side of St. Paul Street across the street from block face 10 and in block faces 12 (23 parking spaces) and 13 (25 parking spaces) on the north and south sides of E. Pleasant Street, respectively, which intersects with block face 10. Together, these three block faces have parking available for a total of 53 vehicles. Not one of these three block faces exceeded the 85 percent parking occupancy rate standard at any time during the four-hour survey period, and the average parking occupancy rate for these three block faces together over the entire four-hour survey period was only 28 percent. Therefore, it may be concluded that the supply of long-term parking in this section of the CBD is more than adequate to accommodate the existing parking demand.

Block face 16 consists of seven short-term (one-hour) on-street parking spaces located along the west side of S. Silver Lake Street between E. Wisconsin Avenue and E. Collins Street. The demand for these seven parking spaces exceeded the 85 percent parking occupancy rate standard during one of the four hours for which the survey was conducted. Block face 16 had an average parking occupancy rate for the entire four-hour survey period of 46 percent. It should be noted, however, that an additional six short-term (one-hour) parking spaces are available across the street along the east side of S. Silver Lake Street (block face 18) between E. Wisconsin Avenue and E. Collins Street. Demand for short-term parking along the east side of this segment of S. Silver Lake Street did not exceed the 85 percent parking occupancy rate standard at any time during the four-hour survey period and, like the west side of the street, had a 46 percent average occupancy rate over the entire four-hour survey period. Therefore, it may be concluded that the supply of short-term parking in this section of the CBD is adequate to accommodate the existing parking demand.

From the survey of existing parking conditions, the rates of parking turnover for each of the 20 block faces in the downtown CBD could also be determined. Parking turnover rates, like parking occupancy rates, are an indication of parking demand and a measure of how efficiently parking spaces are being utilized. The parking turnover rate indicates how many different vehicles are served by the same parking space over a specified period of time. Ordinarily, for short-term, parking-restricted areas, where parking demand is high, the turnover rate will also be high.

As shown on Map 20 and in Table 17 in Chapter III, the parking turnover rates in the CBD range from a high of 3.4 vehicles during the four-hour survey period along block face 4, where parking duration is restricted to one hour or less and the average parking occupancy rate is 97 percent, to a low of zero along block face 20, where no vehicles were parked in the unrestricted all-day parking spaces, and of 0.2 vehicle in block faces 8, 13, and 19, where unrestricted all-day parking is also permitted and the average parking occupancy rates are 6, 20, and 14 percent, respectively. In analyzing the parking turnover rate data presented in Table 17, it is apparent that the short-term (one-hour) parking along N. Main Street between Wisconsin Avenue and the Lac La Belle/ Fowler Lake bridge (block faces 1 and 4) and along S. Main Street between W. South Street and Wisconsin Avenue (block face 2) is being well utilized. These three block faces were observed to have parking turnover rates of 3.2, 3.4, and 3.2 vehicles per space, respectively, during the four-hour survey period. These turnover rates, coupled with a parking occupancy rate that exceeds the 85 percent parking occupancy rate standard, indicate that the parking space supply in these three block faces is not adequate to accommodate the existing parking demand.

Two block faces in the Oconomowoc CBD exceed an occupancy rate of 70 percent and are, therefore, considered as approaching the 85 percent parking occupancy rate standard. These two block faces are block face 6, the north side of E. Wisconsin Avenue between Main Street and St. Paul Street, which has an average parking occupancy rate of 74 percent, and block face 14, the east side of St. Paul Street between E. Pleasant Street and E. Wisconsin Avenue, which has an average parking occupancy rate of 75 percent. Both of these block faces are in the near vicinity of the Fowler public parking lot, as is block face 4, which, as noted, exceeds the 85 percent parking occupancy rate standard.

Block face 6 contains 17 short-term parking spaces, all with one-hour parking restrictions. The demand for these 17 spaces exceeded the 70 percent occupancy rate during three of the four hours included in the survey, with a high of 82 percent occupancy between 11:00 a.m. and 12:00 p.m. and 2:00 p.m. and 3:00 p.m. The parking turnover rate for block face 6 was 2.3 vehicles during the survey period. Block face 14 contains five long-term parking spaces with all-day unrestricted parking. The demand for these five parking spaces also exceeded the 70 percent occupancy rate during three of the four hours included in the survey, with a high of 80 percent occupancy during all but the 1:00 p.m. to 2:00 p.m. time period, which had an occupancy rate of 60 percent. The parking turnover rate for block face 14 was 1.2 vehicles during the survey period.

In summary, an analysis of on-street parking conditions indicates that the on-street short-term parking supply is not adequate to accommodate existing parking demand along three of the 20 block faces in the CBD of the City of Oconomowoc. These block faces are block faces 1 and 4, the east and west sides, respectively, of N. Main Street between Wisconsin Avenue and the Lac La Belle/Fowler Lake bridge, and block face 2, the west side of S. Main Street in front of the U. S. Post Office in the vicinity of W. South Street. It was also determined that block faces 6 and 14—E. Wisconsin Avenue between Main Street and St. Paul Street and St. Paul Street between E. Pleasant Street and E. Wisconsin Avenue—are approaching the allowable standard of 85 percent vehicle occupancy of on-street public parking supply.

Off-Street Public Parking Supply Problems

There are four off-street public parking lots located in the CBD of the City of Oconomowoc. These four lots are referred to locally as: 1) the Lincoln lot; 2) the South lot; 3) the Fowler lot; and 4) the Legion lot. The locations of these lots are shown on Map 19 in Chapter III. Three of these off-street public parking lots, Lincoln, South, and Fowler, provide public parking for both long- and short-term parking. The Legion lot provides only short-term parking of two hours or less. Together, these four public off-street parking lots contain 422 public parking spaces. Of this total, 208 spaces, or 49 percent, are short-term spaces, with a limit of two hours or less, and 214 spaces, or 51 percent, are long-term spaces, with a limit of eight hours or longer.

Lincoln Lot: The Lincoln off-street public parking lot is located on the western edge of the CBD, as shown on Map 19 in Chapter III, and contains a total of 145 public parking spaces. Of this total, 50 spaces, or 34 percent, are restricted to short-term parking of two hours or less, with the remaining 95 spaces, or 66 percent, available for long-term parking for up to 12 hours.

As shown in Table 16 in Chapter III, at no time during the four-hour field survey of existing parking conditions did the actual parking occupancy rate in this lot exceed the 85 percent parking occupancy rate standard. The 50 short-term parking spaces in the lot had a maximum total occupancy of 64 percent, which occurred between 1:00 p.m. and 2:00 p.m., and an average total occupancy of 53 percent over the entire four-hour survey period. The 95 long-term parking spaces in the lot had a maximum total occupancy of 73 percent, which occurred between 11:00 a.m. and 12:00 p.m., and an average total occupancy of 68 percent over the entire four-hour survey period. The average occupancy for all parking spaces in this lot was 63 percent during the entire four-hour survey period.

Based on these survey findings, it may be concluded that the present available parking supply in the Lincoln lot is adequate to accommodate the demand for space in this lot. It is noted that the Bank of Oconomowoc, which is now located on the southeast corner of Main Street and Wisconsin Avenue, intends to relocate its banking facilities to the northwest corner of this City-owned public parking lot. City officials have approved the bank's plans to construct a 10,000- to 12,000-square-foot one-story building in the Lincoln lot under the condition that the bank will replace all of the existing parking spaces which will be lost due to the construction of this new facility in the CBD.

South Lot: The South off-street public parking lot is located near the center of the CBD and is within 600 feet of commercial development which may be expected to attract primarily short-term parkers. The lot has a total of 145 public parking spaces, of which 61 spaces, or 42 percent, are restricted to short-term parking of two hours or less. The remaining 84 spaces, or 58 percent, are available for long-term parking for up to 12 hours.

As shown in Table 16 in Chapter III, during the four-hour field survey of parking conditions in this lot, the demand for the short-term parking space approached, but did not exceed, the 85 percent parking occupancy rate standard, while the demand for the long-term parking space exceeded the standard during three of the four hours of the survey. The 61 short-term parking spaces in the lot had a maximum total occupancy of 82 percent, which occurred between 1:00 p.m. and 2:00 p.m., and an average occupancy of 75 percent over the entire four-hour survey period. The 84 long-term parking spaces in the lot had a maximum total occupancy of 93 percent, which occurred between 2:00 p.m. and 3:00 p.m., and an average occupancy of 89 percent. Thus, according to Objective 3, Standard 3, there is a problem of insufficient long-term parking capacity in the South lot. The average occupancy for all parking spaces in this lot exceeded the standard during one of the four hours of the survey—between 1:00 p.m. and 2:00 p.m.—when 86 percent of all the available parking was occupied. The average occupancy for all spaces during the entire four-hour period was 83 percent. Based on these survey findings, this lot is apparently just able to accommodate the existing measured parking demand with the current division of long-term and short-term spaces. However, as parking demand in the CBD increases, increasing the parking capacity of this lot should be considered.

Fowler Lot: The Fowler off-street public parking lot, like the South lot, is located near the center of the CBD, and is within 600 feet of commercial development which may be expected to attract primarily short-term parkers, as shown on Map 19 in Chapter III. The lot has a total of 109 public parking spaces, of which two spaces, or 2 percent, are restricted to short-term parking of 15 minutes or less, and 72 spaces, or 66 percent, are restricted to short-term parking of two hours or less. The remaining 35 spaces, or 32 percent, are available for long-term parking for up to eight hours.

As shown in Table 16 in Chapter III, the two 15-minute parking spaces had a maximum total occupancy of 50 percent, which occurred between 11:00 a.m. and 12:00 p.m., while at all other times during the four-hour survey period no use was made of these two spaces. The 72 two-hour parking spaces in the lot had a maximum total occupancy of 89 percent, which occurred between 11:00 a.m. and 12:00 p.m., and an average total occupancy of 82 percent for the entire four-hour survey period. The 35 long-term parking spaces in the lot, with parking available for up to eight hours, had an occupancy of 100 percent during each of the four hours for which the survey was conducted. The average occupancy for all parking space in this lot exceeded the standard during two of the four hours of the survey, the maximum total occupancy being 92 percent, which occurred between 11:00 a.m. and 12:00 p.m. The average occupancy for all spaces during the entire four-hour period was 87 percent. Based on these survey findings it may be concluded that, with the current division of long- and short-term spaces, the available parking supply is inadequate to accommodate the current parking demand in this lot. As a result, the time restrictions of this lot need to be altered and the parking capacity increased.

It should be noted that the City is considering constructing a new four-story City Hall and library complex on St. Paul Street just north of the Fowler parking lot. This new facility can be expected to increase the already high level of demand for space in the Fowler lot. Unless plans are made to increase the existing parking supply in the vicinity of the new City Hall and library complex, the parking supply problem in this lot may be expected to become more acute.

Legion Lot: The Legion off-street public parking lot is located on the western edge of the CBD, as shown on Map 19 in Chapter III. The lot has a total capacity of 23 parking spaces, all of which are restricted to short-term parking of two hours or less. As shown in Table 16 in Chapter III, the parking occupancy rate in this lot exceeded the 85 percent parking occupancy rate standard during only one of the four hours for which the parking survey was conducted—between 1:00 p.m. and 2:00 p.m., when the parking occupancy rate reached 91 percent of capacity. During each of the other three hours of the survey, however, the parking occupancy rate was well below the 85 percent standard, the average occupancy rate

being only 65 percent over the four-hour survey period. Furthermore, a review of similar parking occupancy rate data compiled for this lot in a parking survey conducted by the Greater Oconomowoc Area Chamber of Commerce in June 1977[1] found that the parking occupancy rate in the Legion lot on a Thursday in June 1977 at both 12:00 p.m. and 3:00 p.m. was only 20 percent. Thus, it may be concluded that the present available parking supply in the Legion lot is adequate to accommodate the peak parking demand for space in this lot.

In summary, an analysis of off-street public parking conditions has revealed that there is an inadequate supply of public parking spaces in the South and Fowler public parking lots in the CBD. Both facilities experience periods of 85 percent or greater parking space occupancy, with 92 percent of the Fowler lot being occupied between 11:00 a.m. and 12:00 p.m. and 90 percent being occupied between 2:00 p.m. and 3:00 p.m.; and 85 percent of the South lot being occupied between 11:00 a.m. and 12:00 p.m. and 86 percent being occupied between 1:00 p.m. and 2:00 p.m.

The Legion and Lincoln public parking lots do not exceed the 85 percent parking occupancy standard and currently have an adequate supply of public off-street parking space. As mentioned in Chapter I, the 1979 resident population of the City of Oconomowoc was estimated at 10,800 persons. According to traffic management Objective 3, Standard 4, there should be 1,620 public parking stalls in the Oconomowoc central business district, with 43 percent, or about 700 of the total, consisting of on-street curb parking and 57 percent, or about 920, consisting of off-street parking. As previously noted, there are only 200 on-street curb parking spaces and 422 off-street parking spaces in the Oconomowoc CBD. Thus, based on these survey findings, it may be concluded that there is a shortage of short- and long-term public parking spaces in the Oconomowoc CBD.

TRAFFIC ACCIDENT PROBLEMS

The measure of traffic accidents provides a good indicator of the efficiency and operating characteristics of a community's transportation system. Accordingly, the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study adopted Traffic Management Objective No. 6 (see Chapter IV), which requires the reduction of accident exposure and the provision of increased travel safety.

Objective No. 6, Standard 1 states that:

> The number and severity of traffic accidents on the existing arterial street and highway system should be minimized.

The accident inventory data presented in Chapter III of this report indicated that there were 380 on-street traffic accidents in 1977 and 377 on-street traffic accidents in 1978. This inventory further indicated that there were 22 locations on the existing arterial and collector system where three or more traffic accidents occurred in 1977, and 34 such locations in 1978. Maps 21 and 22 in Chapter III identify each of these locations.

Based on these initial inventory findings, a more detailed investigation of the circumstances surrounding each accident was conducted. Using the information provided on the motor vehicle accident reports, a series of collision diagrams was prepared indicating the type and severity of each accident, as well as the date, day of the week, and time of day of the accident, and the roadway and weather conditions at the time of the accident. These collision diagrams are presented in Appendix E of this report. This detailed investigation provided the information necessary to determine whether these traffic accident locations had any predominant pattern of circumstances relating to a specific collision type, time of day or year, or roadway or weather conditions which might indicate a traffic accident problem which could be solved or mitigated by traffic management actions.

Accident locations in the study area which did not have at least five accidents in either 1977 or 1978 were not included in this analysis because of the random accident pattern normally associated with such locations. Based on this initial screening of the 34 motor vehicle accident locations, a total of 20 high-accident locations were analyzed.

Intersection—Main Street and Wisconsin Avenue

This signalized intersection experienced a two-year total of 39 traffic accidents, 16 in 1977 and 23 in 1978, for an accident rate of 2.11 and 2.88 accidents per million vehicles entering the inter-

[1] *Greater Oconomowoc Area Chamber of Commerce, Downtown Oconomowoc Parking Survey, June 1977.*

section, respectively. Of the total accidents, 13 involved vehicles making left turns, 12 involved rear-end collisions, 3 involved vehicles making right turns, 3 involved cars entering or leaving the Lincoln or Legion off-street public parking lots, which are located approximately 300 feet west of this intersection, 3 involved vehicles that sideswiped each other while traveling in the same direction, 2 involved trucks making right turns from Main Street onto Wisconsin Avenue and striking a fixed object on the corner, 2 involved pedestrians—1 who was struck by a right-turning vehicle and 1 who was struck by a left-turning vehicle while crossing the roadway, and 1 involved a vehicle that was sideswiped by a vehicle traveling in the opposite direction. Fourteen of the 39 accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 4 of the 39 accidents—3 involving left-turning vehicles and 1 involving the pedestrian who was struck by a right-turning vehicle. These accidents were randomly distributed throughout the year, with 13 occurring in the winter, 6 in the spring, 11 in the summer, and 9 in the fall. In 13 of the 39 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Summit Avenue and E. Thackery Trail

This unsignalized intersection experienced a two-year total of 23 traffic accidents, 15 in 1977 and 8 in 1978, for an annual accident rate of 3.27 and 1.55 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 10 involved right-angle collisions, 5 involved vehicles making left turns, 5 involved rear-end collisions, 1 involved two vehicles that sideswiped each other, 1 involved a vehicle striking a foreign object in the roadway, and 1 involved a pedestrian who was struck by a vehicle while crossing the roadway. Eight of the 23 accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 7 of the 23 accidents—3 involving right-angle collisions, 2 involving left-turning vehicles, 1 involving the pedestrian who was struck by a vehicle while crossing the roadway, and one involving a vehicle that was sideswiped by another vehicle. These accidents were randomly distributed throughout the year, with 7 accidents occurring in the winter, 5 in the spring, 5 in the summer, and 6 in the fall. In 9 of the 23 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Wisconsin Avenue and Walnut Street

This signalized intersection experienced a two-year total of 23 traffic accidents, 11 in 1977 and 12 in 1978, for an annual accident rate of 1.62 and 2.32 accidents per million vehicles entering the intersection, respectively. Of this total, 8 accidents involved right-angle collisions, 5 involved vehicles making left turns, 4 involved two vehicles that sideswiped each other, 4 involved rear-end collisions, 1 involved a vehicle making a right turn, and 1 involved a pedestrian who was struck by a vehicle making a left turn. Eleven of the 23 accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 8 of the 23 accidents—2 involving left-turning vehicles, 5 involving right-angle accidents, and 1 involving the pedestrian who was struck by a left-turning vehicle. These accidents were randomly distributed throughout the year, with 6 accidents occurring in the winter, 5 in the spring, 5 in the summer, and 7 in the fall. In 8 of the 23 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Wisconsin Avenue and CTH P

This signalized intersection experienced a two-year total of 17 traffic accidents, 10 in 1977 and 7 in 1978, for an annual accident rate of 1.71 and 1.15 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 10 involved rear-end collisions, 4 involved right-angle collisions, 1 involved a left-turning vehicle, 1 involved a vehicle turning right and hitting a fixed object at the corner, and 1 involved a pedestrian who was struck by a vehicle while crossing the roadway. Six of the 17 accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 6 of the 17 accidents—3 involving right-angle collisions, 2 involving rear-end collisions, and 1 involving the pedestrian who was struck by a vehicle while crossing the roadway. These accidents were randomly distributed throughout the year, with 2 accidents occurring in the winter, 3 in the spring, 8 in the summer, and 4 in the fall. In 3 of the 17 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Wisconsin Avenue and S. Silver Lake Street

This signalized intersection experienced a two-year total of 15 accidents, 5 in 1977 and 10 in 1978, for an annual accident rate of 0.78 and

1.47 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 7 were rear-end collisions, 3 involved vehicles that sideswiped each other, 2 involved vehicles making left turns, 1 involved a vehicle making a right turn, 1 involved a vehicle making a right turn and hitting a fixed object at the corner, and 1 involved a pedestrian who was struck by a vehicle while crossing the roadway. Five of the 15 traffic accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in only 1 of the 15 accidents—the accident involving the pedestrian who was struck by a vehicle while crossing the roadway. These accidents were randomly distributed throughout the year, with 1 accident occurring in the winter, 5 in the spring, 4 in the summer, and 5 in the fall. In 5 of the 15 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—S. Main Street and W. South Street

This unsignalized intersection experienced a two-year total of 14 traffic accidents, 7 in 1977 and 7 in 1978, for an annual accident rate of 1.90 and 1.88 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 7 involved vehicles hitting cars parked in front of the Post Office on the west side of S. Main Street just north of W. South Street, 2 involved vehicles that sideswiped each other, 2 involved vehicles making left turns, 2 involved parked cars south of W. South Street, and 1 involved a pedestrian who was struck by a vehicle while crossing the roadway. Two of the 14 traffic accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 3 of the 14 accidents—2 involving vehicles hitting parked cars and one involving the pedestrian who was struck by a vehicle while crossing the roadway. These accidents were randomly distributed throughout the year, with 2 accidents occurring in the winter, 6 in the spring, 3 in the summer, and 3 in the fall. In 3 of the 14 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Summit Avenue and E. Armour Road

This intersection, which is controlled by a flashing amber light for traffic on E. Summit Avenue and a flashing red light for traffic on E. Armour Road, experienced a two-year total of 12 accidents, 6 in 1977 and 6 in 1978, for an annual accident rate of 1.30 and 1.23 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 4 were rear-end collisions, 3 involved right-angle collisions, 2 involved a truck turning right into the side of another vehicle, 1 involved vehicles that sideswiped each other, 1 involved a vehicle that hit an object in the roadway, and 1 involved a vehicle hitting a parked car. Two of the 12 traffic accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in the accident involving the vehicle hitting the parked car. These accidents were randomly distributed throughout the year, with 2 of the accidents occurring in the winter, 3 in the spring, 3 in the summer, and 4 in the fall. In 5 of the 12 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Summit Avenue and S. Silver Lake Street

This signalized intersection experienced a two-year total of 12 accidents, 7 in 1977 and 5 in 1978, for an annual accident rate of 1.25 and 0.84 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 6 involved rear-end collisions, 4 involved a vehicle turning left, 1 involved 2 vehicles that sideswiped each other, and 1 involved a pedestrian who was struck by a vehicle while crossing the roadway. Three of the 12 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in the accident involving the pedestrian who was struck by a vehicle while crossing the roadway. These accidents were randomly distributed throughout the year, with 2 accidents occurring in the winter, 3 in the spring, 3 in the summer, and 4 in the fall. In 5 of the 12 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Summit Avenue and CTH B

This unsignalized intersection experienced a two-year total of 11 accidents, 3 in 1977 and 8 in 1978, for an annual accident rate of 0.98 and 2.40 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 6 involved right-angle collisions, 3 involved a vehicle turning right, 1 involved a vehicle turning left, and 1 was a rear-end collision. Three of the 11 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 4 of the 6 right-angle collisions and in the collision involv-

ing a left turn. These accidents were randomly distributed throughout the year, with 4 accidents occurring in the winter, 2 in the spring, 2 in the summer, and 3 in the fall. In 4 of the 11 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Summit Avenue and E. Forest Street

This unsignalized intersection experienced a two-year total of 11 accidents, 5 in 1977 and 6 in 1978, for an annual accident rate of 1.06 and 1.19 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 4 involved rear-end collisions, 2 involved a vehicle turning right, 2 involved two vehicles that sideswiped each other, 1 was a rear-end collision, 1 involved a vehicle backing into the intersection and being struck by an oncoming vehicle, and 1 involved a bicyclist striking an object lying in the road. Three of the 11 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 1 of the rear-end collisions and in the accident involving the bicyclist who struck an object in the road. These accidents were randomly distributed throughout the year, with 1 accident occurring in the winter, 4 in the spring, 1 in the summer, and 5 in the fall. In 7 of the 11 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—S. Main Street, W. 2nd Street, and E. Summit Avenue

This unsignalized intersection experienced a two-year total of 10 accidents, 3 in 1977 and 7 in 1978, for an annual accident rate of 0.76 and 1.65 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 6 involved northbound trucks turning right from E. Summit Avenue onto S. Main Street, 1 involved a northbound vehicle turning right from E. Summit Avenue onto S. Main Street and striking a fixed object on the corner of the intersection, 1 involved a westbound truck striking a vehicle in the rear, 1 involved a vehicle driving into the side of a train crossing S. Main Street, and 1 involved a vehicle backing into a pedestrian crossing the intersection. Three of the 10 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 2 of the accidents—the 1 accident involving the vehicle driving into the side of the train and the accident involving the pedestrian struck by a vehicle backing up at the intersection. These accidents were randomly distributed throughout the year, with 1 accident occurring in the winter, 3 in the spring, 4 in the summer, and 2 in the fall. In one of the 10 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection—E. Forest Street and S. Silver Lake Street

This unsignalized intersection experienced no accidents in 1977 and 6 accidents in 1978, with a 1978 annual accident rate of 3.23 accidents per million vehicles entering the intersection. Of the total accidents, 3 involved right-angle collisions, 1 involved 2 vehicles backing into each other, 1 involved a right-turning vehicle, and 1 involved 2 vehicles that sideswiped each other. Two of the 6 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 1 of the 3 right-angle collisions. These accidents were randomly distributed throughout the year, with 1 accident occurring in the winter, 3 in the spring, 1 in the summer, and 1 in the fall. In 2 of the 6 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—E. Wisconsin Avenue Between Main Street and St. Paul Street

A two-year total of 31 traffic accidents, 20 in 1977 and 11 in 1978, occurred on this section of roadway. Of the total accidents, 9 involved rear-end collisions, all involving westbound vehicles, 8 involved vehicles entering traffic from the alley on the north side of E. Wisconsin Avenue, 7 involved westbound vehicles sideswiping parked vehicles, 5 involved vehicles parked at the curb attempting to pull out into the traffic stream, and 2 involved vehicles backing into parked cars. Five of the 31 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 5 of the accidents—4 involving rear-end collisions and 1 involving a vehicle entering traffic from the alley on the north side of E. Wisconsin Avenue and hitting a pedestrian on the sidewalk. These accidents were randomly distributed throughout the year, with 6 accidents occurring in the winter, 2 in the spring, 15 in the summer, and 8 in the fall. In 8 of the 31 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—E. Wisconsin Avenue Between N. Fowler Street and N. Thompson Street

A two-year total of 28 traffic accidents, 10 in 1977 and 18 in 1978, occurred on this section of roadway. Of the total accidents, 12 involved vehicles turning right or left into the path of another vehicle in the process of entering the driveway of a retail or commercial establishment located in this block, 11 involved rear-end collisions, 7 of which involved vehicles stopped to turn right or left into the driveway of a retail or commercial establishment, 3 involved right-angle collisions caused by vehicles exiting the driveway of a retail or commercial establishment, and 2 involved an out-of-control vehicle—in 1 case hitting an oncoming vehicle and in the other case a fixed object off the roadway. Four of the accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 2 accidents—1 involving a vehicle turning left into the path of an oncoming vehicle and 1 involving a rear-end collision caused by a vehicle turning left into the driveway of a retail or commercial establishment. These accidents were randomly distributed throughout the year, with 13 accidents occurring in the winter, 6 in the spring, 6 in the summer, and 3 in the fall. In 16 of the 28 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—N. Main Street Between Rockwell Street and Wisconsin Avenue

A two-year total of 14 traffic accidents, 5 in 1977 and 9 in 1978, occurred on this section of roadway. Of the total accidents, 4 involved vehicles parked at the curb pulling out into the traffic stream, 3 involved right-angle collisions experienced by vehicles exiting a driveway, 3 involved vehicles turning left into the path of another vehicle in the process of entering an off-street driveway, 3 involved a vehicle hitting a parked vehicle (on-street), and 1 involved a vehicle exiting a driveway and hitting another vehicle in the rear. Two of the 14 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 3 of the 14 accidents, 1 involving a vehicle hitting a parked vehicle (on-street), 1 involving a right-angle collision caused by a vehicle exiting a driveway, and 1 involving a vehicle parked at the curb pulling into the traffic stream. These accidents were randomly distributed throughout the year, with 6 accidents occurring in the winter, 2 in the spring, 5 in the summer, and 1 in the fall. In 6 of the 14 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—E. Summit Avenue Between S. Silver Lake Street and S. Westover Street

A two-year total of 13 traffic accidents, 8 in 1977 and 5 in 1978, occurred at this mid-block location. Of the total accidents, 9 involved rear-end collisions, 2 involved right-angle collisions caused by vehicles exiting a driveway, and 2 involved an out-of-control vehicle striking a fixed object off the roadway. One of the 13 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 6 of the accidents—4 involving rear-end collisions and the 2 involving vehicles striking fixed objects. These accidents were randomly distributed throughout the year, with 5 accidents occurring in the winter, 3 in the spring, 1 in the summer, and 4 in the fall. In 8 of the 13 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—36833 E. Wisconsin Avenue Between E. Plank Road and CTH P

A two-year total of 10 traffic accidents, 6 in 1977 and 4 in 1978, occurred on this section of roadway. Of the total accidents, 5 were rear-end collisions, 4 of which involved westbound vehicles stopped to turn left into a driveway on the south side of E. Wisconsin Avenue, 2 involved westbound vehicles turning left into the path of an oncoming vehicle in the process of entering a driveway on the south side of E. Wisconsin Avenue, 2 involved right-angle collisions caused by vehicles exiting a driveway into the path of an oncoming car, and 1 involved an out-of-control vehicle hitting an oncoming vehicle. Three of the 10 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 7 of the 10 accidents—3 rear-end collisions, the 2 right-angle collisions, 1 accident involving a vehicle turning left into the path of an oncoming vehicle, and the accident in which the out-of-control vehicle hit an oncoming vehicle. These accidents were randomly distributed throughout the year, with 4 accidents occurring in the winter, 1 in the spring, 1 in the summer, and 4 in the fall. In 6 of the 10 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—E. Summit Avenue Between E. Maple Lane and E. Thackery Trail

A two-year total of 8 traffic accidents, 5 in 1977 and 3 in 1978, occurred on this section of roadway. Of these total accidents, 3 involved right-angle collisions caused by vehicles entering traffic on E. Summit Avenue from a private driveway, 2 involved vehicles turning left into the path of another vehicle in the process of entering an off-street driveway, 2 involved rear-end collisions, and 1 involved a vehicle hitting a pole lying in the roadway. One of the 8 accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 2 of the 8 accidents—1 right-angle collision and 1 accident involving a vehicle turning left into the path of oncoming traffic. Six of the 8 traffic accidents occurred in the winter, and the other 2 accidents occurred in the spring. In 3 of the 8 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—36933 E. Wisconsin Avenue Between Plank Road and CTH P

A two-year total of 8 traffic accidents, 2 in 1977 and 6 in 1978, occurred at this mid-block location. Of the total accidents, 4 involved rear-end collisions, 3 of which involved westbound vehicles stopped to turn left into a driveway on the south side of E. Wisconsin Avenue, 2 involved right-angle collisions caused by vehicles exiting a driveway into the path of an oncoming vehicle, 1 involved a westbound vehicle turning left into the path of an oncoming vehicle in the process of entering a driveway on the south side of E. Wisconsin Avenue, and 1 involved an out-of-control vehicle that ran off the roadway. One of the 8 traffic accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 3 of the 8 accidents—1 rear-end accident, 1 right-angle accident, and the accident involving the out-of-control vehicle. These accidents were randomly distributed throughout the year, with 1 accident occurring in the winter, 1 in the spring, 3 in the summer, and 3 in the fall. In 4 of the 8 accidents, the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block—E. Wisconsin Avenue Between N. Thompson Street and S. Wood Street

A two-year total of 5 traffic accidents, all in 1978, occurred on this section of roadway. Of the total accidents, 2 involved rear-end collisions, 1 of which involved an eastbound vehicle stopped to turn left into a driveway on the north side of E. Wisconsin Avenue, 2 involved eastbound vehicles turning right into the path of another vehicle, and 1 involved an out-of-control vehicle that ran off the roadway and hit a fixed object. One of the 5 traffic accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in 2 of the 5 accidents—1 rear-end collision and the accident involving the out-of-control vehicle. All 5 of the accidents occurred in the winter, and in each case the weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

This detailed analysis of the 380 and 377 motor vehicle accidents which occurred in the Oconomowoc traffic management study area in 1977 and 1978, respectively, has identified 12 high-accident problem intersection locations and 8 high-accident problem nonintersection locations. At least 5 motor vehicle accidents in 1977 and/or 1978 occurred at these high-accident problem locations. These locations account for a total of 144 accidents in 1977, or 38 percent of the motor vehicle accidents that year, and 166 accidents in 1978, or 44 percent of the motor vehicle accidents that year.

CITIZEN COMPLAINTS

As indicated in Chapter III, a list of 63 citizen-reported traffic problems was compiled as a part of the study. A summary of this list is contained in Table 21 in Chapter III, and the locations concerned are shown on Map 23 in Chapter III. The residents of the Oconomowoc study area identified a total of 22 locations with traffic problems. An analysis of the traffic problems listed in Table 21 indicates that the residents of the study area identified 11 areas of congestion or delay problems, 2 areas of inadequate vehicular pavement markings, 5 areas of inadequate pedestrian pavement markings, 7 areas of inadequate turning capacity, and 13 areas of difficulty in entering the traffic stream, for a total of 38 traffic-related problems. In many instances, two or three problems were reported at the same location.

Some of these reported traffic problems, depending on their severity and relation to the traffic management objectives and standards, have been identified as traffic problems in the preceding sections of this chapter. The following analysis addresses each of the reported traffic problems in

Table 21 by location and identifies those reported problems as being in agreement with, or related to, a previously identified traffic problem, as being a problem that has not previously been identified, or as being only a perceived problem and not an actual traffic problem, based upon application of the adopted transportation system objectives and standards.

STH 16 at Hewitt Point Road

Citizen complaints indicate that a traffic problem of vehicular congestion and delay exists at this location. As indicated in the footnote to Table 21, the STH 16 (E. Wisconsin Avenue) vehicular congestion problem at Hewitt Point Road lies outside the study area proper. A calculation of the volume to capacity ratio for STH 16 at this location indicates that the westbound direction of travel on this roadway segment is currently operating at design capacity. The traffic problem on STH 16 at Hewitt Point Road should be ameliorated upon the completion of the proposed STH 16 freeway to the Oconomowoc city limits. Such construction will divert most of the existing through traffic from E. Wisconsin Avenue to the new freeway facility. A traffic problem at this location was not identified, based on the standards for vehicular congestion or delay, arterial service, parking, or traffic accidents. Thus, this citizen complaint was classified as a perceived traffic problem.

STH 16 at CTH P

Citizen complaints indicate that a traffic problem of inadequate left-turn capacity on STH 16 exists at this location. The volume to capacity ratios for the intersection approaches of STH 16 (E. Wisconsin Avenue) to CTH P are currently operating at design capacity. This traffic problem will be ameliorated in the future when the construction of the STH 16 freeway westerly to the Oconomowoc city limits has been completed. A traffic problem at this location was not identified, based on the standards for vehicular congestion or delay, arterial service, parking, or traffic accidents. Thus, this citizen complaint was classified as a perceived traffic problem.

STH 16 at the Farmer's Exchange

Citizen complaints indicate that traffic problems of vehicular congestion or delay, of inadequate turning capacity, and of difficulty in entering the traffic stream exist at this location. These reported traffic problems are related to the previously identified traffic accident problem at 36933 E. Wisconsin Avenue. These traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

STH 16 at 524 E. Wisconsin Avenue

Citizen complaints indicate that traffic problems of inadequate pedestrian pavement markings and difficulty in entering the traffic stream exist at this location. These reported traffic problems are related to the previously identified traffic accident problem at this location. These traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

STH 16 at S. Cross Street

Citizen complaints indicate that a traffic problem of vehicular congestion and delay exists at this location. At this location, STH 16 is currently operating at design capacity. This intersection is adjacent to the previously identified high traffic accident location at the intersection of STH 16 and S. Silver Lake Street, and the traffic problem at this intersection is related to the previously identified traffic accident problems on STH 16. This traffic problem will be considered in the design and analysis of alternative traffic management actions to ameliorate the traffic congestion and to solve or mitigate the traffic accident problems at this location.

STH 16 at 105 E. Wisconsin Avenue

Citizen complaints indicate that a traffic problem of difficulty in entering the traffic stream on STH 16 from the Bank of Oconomowoc driveway exists at this location. This reported traffic problem is in agreement with the previously identified traffic accident problem on the segment of E. Wisconsin Avenue from Main Street to St. Paul Avenue. This traffic problem will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

STH 16 at Main Street (STH 67)

Citizen complaints indicate that a traffic problem of vehicular congestion and delay, inadequate vehicular and pedestrian pavement markings, and inadequate turning capacity exists at this location. These reported traffic problems are in agreement with the previously identified vehicular congestion and traffic accident problems at this location. These traffic problems will be considered

in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion and traffic accident problems at this location.

STH 16 at 128 W. Wisconsin Avenue
Citizen complaints indicate that a traffic problem of difficulty in making a left turn to enter the traffic stream on W. Wisconsin Avenue from the driveway of the Spirits Tavern parking lot exists at this location. This reported traffic problem is related to the previously identified vehicular congestion problem on the eastbound approach of W. Wisconsin Avenue with Main Street. This traffic problem will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion problem at this location.

STH 16 at the Lincoln Parking Lot
Citizen complaints indicate that a traffic problem of difficulty in entering and exiting the Lincoln parking lot driveway on W. Wisconsin Avenue exists at this location. This reported traffic problem is related to the previously identified vehicular congestion problem on the eastbound approach of W. Wisconsin Avenue at its intersection with Main Street. This traffic problem will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion problem at this location.

STH 16 at S. Church Street
Citizen complaints indicate that a traffic problem of difficulty in entering the traffic stream on W. Wisconsin Avenue from S. Church Street exists at this location. This reported traffic problem is related to the previously identified vehicular congestion problem on the eastbound approach of W. Wisconsin Avenue at its intersection with Main Street. This traffic problem will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion problem at this location.

STH 16 at S. Concord Road
Citizen complaints indicate that traffic problems of vehicular congestion and delay and of difficulty in entering the traffic stream on W. Wisconsin Avenue from S. Concord Road exist at this location. These reported traffic problems are related to the previously identified vehicular congestion problem on the eastbound approach of W. Wisconsin Avenue at its intersection with Main Street. These traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion problem at this location.

STH 67 at E. Lisbon Road
Citizen complaints indicate that a traffic problem of difficulty in entering the traffic stream exists at this location for vehicles turning left onto STH 67 from E. Lisbon Road. A traffic problem at this location was not identified, based on the standards for vehicular congestion or delay, accessibility, parking, or traffic accidents. Thus, this citizen complaint was classified as a perceived traffic problem.

STH 67 at S. Silver Lake Street
Citizen complaints indicate that traffic problems of inadequate pavement markings, both vehicular and pedestrian, and inadequate left-turn capacity exist at this location. These reported traffic problems are in agreement with the previously identified vehicular congestion and traffic accident problems at this location. These traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion and traffic accident problems at this location.

STH 67 from S. Silver Lake Street to E. Armour Road
Citizen complaints indicate that a traffic problem of vehicular congestion and delay exists at this location. This reported traffic problem is in agreement with the previously identified vehicular congestion and traffic accident problems on this segment of STH 67. These traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion and traffic accident problems on this roadway segment.

STH 67 from E. Armour Road to E. High Street
Citizen complaints indicate that traffic problems of vehicular congestion and delay and of difficulty in entering the traffic stream on STH 67 exist on this segment of STH 67. A traffic problem on this roadway segment was not identified, based on the standards for vehicular congestion or delay, accessibility, parking, or traffic accidents. Because of the continuity of this roadway segment of STH 67 with the segment of STH 67 from S. Silver Lake Street to E. Armour Road, which was identified according to the traffic management standards as a vehicular congestion and traffic accident problem location, these related traffic problems

will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion and traffic accident problems on the continuous segment of STH 67 from S. Silver Lake Street to E. High Street.

STH 67 at E. Forest Street

Citizen complaints indicate that traffic problems of vehicular congestion and delay, inadequate turn capacity, and difficulty in entering the traffic stream exist on this segment of STH 67. These reported traffic problems are related to the previously identified traffic accident problem at this location. These related traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

STH 67 at the Oconomowoc Memorial Hospital

Citizen complaints indicate that a traffic problem of difficulty in entering the traffic stream exists at this location. A traffic problem at this location was not identified, based on the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. A broad interpretation of traffic management Objective 5 would imply that the efficient movement of people and goods within the community is restricted at this location. Therefore, although this reported traffic problem location does not exceed the standards for congestion or accidents, an analysis of the traffic problem at this location will be included in Chapter VI of this report.

STH 67 at the Whitman Park Shopping Center and E. Thackery Trail

Citizen complaints indicate that traffic problems of vehicular congestion and delay, inadequate pedestrian protection, inadequate turn capacity, and difficulty in entering the traffic stream exist at this location. These reported traffic problems are related to the previously identified traffic accident problem at this location. These related traffic problems will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

STH 16 at E. Lexington Drive

Citizen complaints indicate that a traffic problem of inadequate pedestrian protection exists at this location. A traffic problem at this location was not identified, based on the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. However, to ease the concerns of the residents of the study area and to satisfy the intent of traffic management Objective 6 to reduce accident exposure and increase travel safety, alternative management actions to reduce the pedestrian crossing hazard at this location will be considered.

S. Cross Street from E. Wisconsin Avenue to E. Summit Avenue

Citizen complaints indicate that a traffic problem of vehicular congestion and delay exists on this segment of S. Cross Street. This reported traffic problem is related to the previously identified vehicular congestion problems on E. Wisconsin Avenue and E. Summit Avenue in the vicinity of their intersections with S. Cross Street. This related traffic problem will be considered in the design and analysis of alternative traffic management actions to solve or mitigate the vehicular congestion problems on E. Wisconsin Avenue and E. Summit Avenue in the vicinity of S. Cross Street.

S. Cross Street at the South Parking Lot Driveway

Citizen complaints indicate that a traffic problem of difficulty in entering the traffic stream exists at this location. A traffic problem was not identified at this location, based on the standards for congestion, arterial service, parking, or traffic accidents. Thus, this citizen complaint was classified as a perceived traffic problem.

In addition to the citizen traffic problem complaints summarized in Table 21, a list of eight generalized transportation system problems was reported by the residents of the study area and described in Chapter III. The first two of these reported problems pertain to the need for a direct north-south traffic route that bypasses the central business district and serves the residential areas of the City north of STH 16, and the need for a through traffic route between E. Summit Street and W. Wisconsin Avenue. These reported problems were identified as traffic problems in the arterial service section of this chapter.

The third reported problem pertains to the heavy use of W. Lincoln Street, W. Jefferson Street, and E. Forest Street as traffic routes to access the junior and senior high schools. The average annual weekday traffic volumes on these three streets in 1979, as shown on Map 15 in Chapter III, range from a low of 1,500 to a high of 3,000 vehicles per average annual weekday. These facilities are classified as collector streets and may be expected

to have the indicated traffic volumes. The provision of a continuous east-west arterial in the southern portion of the study area, a need which was identified in the arterial service section of this chapter, could ameliorate this situation. A traffic problem was not identified on these roadway segments, based on the standards for vehicular congestion, arterial service, parking, or traffic accidents. Thus, this citizen complaint was classified as a perceived traffic problem.

The fourth reported problem pertains to an insufficient number of safe railroad crossings within the City, with the crossings at S. Lapham Street and S. Main Street reported as particularly inadequate. The Milwaukee Road trackage in the study area is currently protected by sophisticated crossing gate control devices. This is the highest form of railroad track crossing protection available, short of a high capital investment for the construction of a grade-separated crossing. The provision of a new north-south arterial bypass with a Milwaukee Road grade separation in the eastern half of the study area, as identified and described in the arterial service section of this chapter, would serve to ameliorate this reported railroad crossing problem. Neither the S. Lapham Street nor S. Main Street railroad crossings has exhibited an excessively high accident record in 1977 or 1978. There were no reported accidents in 1977 and four accidents in 1978 at the S. Lapham Street crossing. In 1977 two accidents were reported at the intersection of E. Wisconsin Avenue and S. Lapham Street, which is located directly north of the Milwaukee Road trackage, and four accidents were reported at this location in 1978, for a two-year average of three accidents per year, and an accident rate of 0.54 accident per million vehicles entering the intersection. This is a minor accident problem location compared to the high-accident problem locations identified earlier in this chapter. Two accidents were reported at the S. Main Street railroad crossing in 1977, one of which involved a fatality, and eight accidents were reported at this location in 1978. In 1977 three accidents were reported at the intersection of S. Main Street and E. Summit Avenue, which is located directly south of the Milwaukee Road trackage, and seven accidents were reported at this location in 1978, for a two-year average of five accidents per year, and an accident rate of 1.20 accidents per million vehicles entering the intersection. This intersection was previously identified as a traffic accident problem location. The reported railroad crossing problem will be included in the design and analysis of alternative traffic management actions to solve or mitigate the traffic accident problem at this location.

The fifth reported problem concerns the high volume of truck traffic on S. Elm Street, which is functionally classified as a land access street. This reported traffic problem has been identified as an arterial service problem involving arterial street traffic using a local street to access the wholesale and manufacturing development located along W. 2nd Street. Alternative traffic management actions will be designed and analyzed to solve or mitigate this arterial service problem.

The sixth reported problem concerns the generally inadequate design of arterial street curb radii to accommodate right-turning trucks. This problem was identified as being particularly acute at the intersection of E. Summit Avenue and S. Main Street. Specific arterial street design problems of this nature are difficult to identify without citizen complaints, as the magnitude of the problem is minor until it results in measurable accident or congestion problems. These design problems will be addressed in the design and analysis of alternative traffic management actions to solve or mitigate the previously identified accident and congestion problems in the study area.

The seventh reported transportation system problem concerns the increasing volume of through traffic on STH 16 and STH 67, particularly during the morning and evening peak-hour periods. As indicated in Chapter III, about 12 percent of the total vehicle trips on an average weekday in the study area in 1979, or 6,700 trips per day, were through trips. This is an increase of 1,700 through vehicle trips across the study area since 1972. In comparison, there was an increase of 5,110 internal/external vehicle trips and 3,300 internal vehicle trips within the study area between 1972 and 1979. According to the detailed historic travel pattern information, the total number of vehicle trips—through, internal/external, and internal—which had to pass through the Oconomowoc central business district in 1972 accounted for approximately 47 percent of the total vehicle trips in the study area. It would appear that, because of the urban development occurring within the study area, the increases in internal/external and internal vehicle trips on these two highways are perceived by local residents as increases in through traffic.

The measurement of through traffic quantifies the magnitude of vehicular traffic passing through the study area, but it does not allow for the qualitative definition of this traffic as a problem. Objective 5, Standard 3 states qualitatively that:

> The conflict between the movement of through traffic and local traffic within the community should be minimized.

Therefore, this traffic problem will be included in the design and analysis of alternative traffic management actions to provide for the facilitation of the efficient movement of people and goods within and through the community and to provide for adequate arterial service within the study area.

The final reported transportation system problem in the Oconomowoc study area pertains to an inadequate street circulation system for vehicular traffic on N. Lake Road between Wisconsin Avenue and E. Lisbon Road, which encourages vehicles to use private driveways along N. Lake Road and E. Rockwell Street to turn around to change their direction of travel. This is an arterial service problem which will be included in the design and analysis of alternative traffic management actions to provide for the facilitation of the efficient movement of people and goods within and through the community and to provide for adequate arterial service within the study area.

In summary, the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study reported a total of 63 traffic complaints. These complaints may be grouped into four categories: 1) vehicular congestion and delay; 2) inadequate pavement markings; 3) inadequate turning capacity; and 4) difficulty in entering the traffic stream. The 63 traffic complaints identified 22 street and highway locations of reported traffic problems. An additional eight generalized traffic complaints were also reported by the Committee. These complaints were primarily concerned with existing arterial service, dangerous railroad track/arterial street crossings, and improperly designed curb radii for right-turning trucks at arterial street corners. The reported traffic problems at 19 of the 22 street and highway locations and seven of the eight generalized traffic complaints were identified as either a valid traffic problem or directly related to a valid traffic problem based on the traffic management standards. The reported traffic problems which were not in conflict with the standards were classified as perceived traffic problems. The magnitude of these perceived traffic problems should be reduced through the implementation of traffic management actions in the study area.

SUMMARY

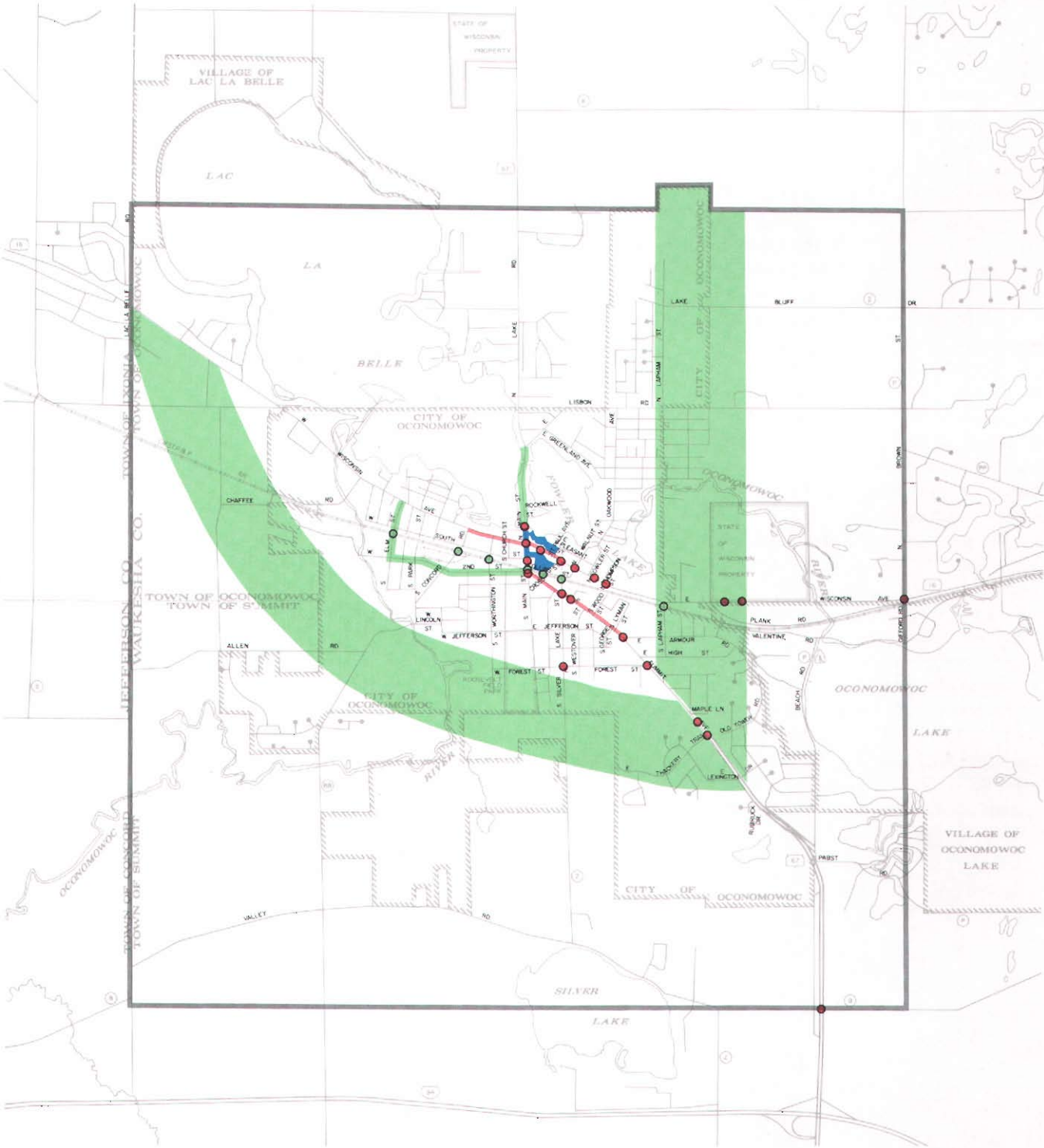
This chapter has identified and described the traffic problems which exist on the transportation system of the Oconomowoc area. The following summary of these traffic problems is organized by arterial facility to identify transportation system deficiencies which may be interrelated. The two principal arterial highways in the study area are STH 16 and STH 67. These two facilities carry the highest traffic volumes and, as shown on Map 24, have been identified as experiencing a majority of the traffic problems in the study area. Therefore, a summary of the traffic problems existing on these two facilities is essential to the sound resolution of a majority of the transportation system deficiencies of the study area. The intersection of STH 16 and CTH P has been identified as a traffic accident problem intersection, with a two-year total of 17 accidents since 1977. The segment of E. Wisconsin Avenue between CTH P and E. Plank Road has also been identified as having a traffic accident problem, with a two-year total of 18 traffic accidents since 1977. These problems should be alleviated upon the completion of the STH 16 freeway, an action which will divert heavy volumes of through traffic from E. Wisconsin Avenue to the proposed freeway facility.

The segment of STH 16 from W. Wood Street to S. Concord Road contains several areas of congestion, parking, and motor vehicle accident problems. The intersection of STH 16 and S. Main Street has been identified as having a congestion problem. Between St. Paul Avenue and Main Street, there is a lack of sufficient short-term parking spaces. This parking problem extends to the South and Fowler public parking facilities, which also do not have an adequate supply of parking spaces. Finally, it has been determined that there are high motor vehicle accident locations along this segment of STH 16 at its intersections with N. Walnut Street, S. Silver Lake Street, and Main Street, and on the roadway segments extending from S. Wood Street to N. Fowler Street and St. Paul Street to Main Street. In total, the segment of STH 16 from S. Wood Street to Main Street accounted for 141 traffic accidents in the two-year period since 1977.

The remaining traffic problems on STH 16 in the study area consist of the inherent conflict between

Map 24

TRAFFIC PROBLEMS ON THE TRANSPORTATION SYSTEM OF THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



Source: SEWRPC.

through and local traffic. An additional problem indirectly related to STH 16 is the lack of an additional continuous east-west arterial through the southern portion of the study area.

STH 67, at the southern boundary of the study area, has an accident problem at its intersection with CTH B. There were 11 motor vehicle accidents at this intersection over the two-year period since 1977. An accident problem also exists on the segment of STH 67 between E. Thackery Trail and E. Maple Lane. This segment of STH 67 accounted for 31 motor vehicle accidents in the two-year period since 1977. Furthermore, there is a high-accident problem at the intersection of STH 67 with E. Forest Street and with E. Armour Road, which together accounted for a two-year total of 23 motor vehicle accidents.

Vehicular traffic congestion problems exist on that segment of STH 67 between E. Armour Road and S. Main Street. The segment of STH 67 westbound at S. Silver Lake Street is operating over design capacity and the segment of STH 67 between S. Silver Lake Street and S. Main Street is operating at design capacity. Motor vehicle accident problems exist on STH 67 between S. Westover Road and S. Silver Lake Street and the intersection of STH 67 with S. Main Street. This segment of STH 67 accounted for 25 motor vehicle accidents in the two-year period since 1977. STH 67 exhibits problems of an inadequate supply of on-street short-term parking spaces between W. South Street and E. Rockwell Street, of congestion at its intersection with Wisconsin Avenue, and of motor vehicle accidents at its intersection with W. South Street and Wisconsin Avenue and on the segment of STH 67 between Wisconsin Avenue and E. Rockwell Street. In total, this segment of STH 67 accounted for 67 motor vehicle accidents in the two-year period since 1977. The segment of STH 67 between Wisconsin Avenue and E. Lisbon Road experiences vehicular traffic circulation problems—an arterial service problem.

An additional problem of inadequate arterial service was identified which indirectly affects some of the traffic problems on STH 67. This problem involves an inadequate number of continuous north-south arterial routes through the eastern portion of the study area. The resolution of this problem could ameliorate some of the congestion and accident problems identified on STH 67.

The remaining transportation system deficiencies identified in the study area pertain to arterial service problems on S. Elm Street, which is a local land access street currently carrying heavy volumes of truck traffic; to vehicular delays caused by railroad operations interrupting traffic flow at railroad track/arterial street intersections; and to accident problems at the intersection of S. Silver Lake Street and E. Forest Street, where a total of six motor vehicle accidents occurred in 1978. These are the principal transportation system deficiencies identified through a comparative evaluation of the existing traffic data presented in Chapter III and the traffic management objectives and standards set forth in Chapter IV of this report. The design and analysis of alternative traffic management actions to solve or mitigate these problems are considered in Chapter VI of this report.

Chapter VI

ALTERNATIVE AND RECOMMENDED TRAFFIC MANAGEMENT ACTIONS

INTRODUCTION

This chapter describes and evaluates alternative traffic management actions which were considered as possible solutions to the existing transportation system problems of the Oconomowoc study area. The alternatives considered were all relatively low-cost, short-range, operational traffic engineering measures such as intersection control devices, traffic routing, traffic regulations, and isolated roadway improvement projects. It must be recognized that there are limits to the effectiveness of such traffic management actions, all of which are intended to provide for the more efficient and safe operation of a community's existing transportation system without capital-intensive improvements to that system. In some instances, investment in major new transportation facilities may be the only feasible solution to the identified existing transportation system problems. As travel demand grows in the study area, the need to plan for and implement these major transportation system improvements will become increasingly important.

The evaluation of the alternative traffic management actions presented herein included consideration of the approximate capital and/or annual cost of each action, and of attendant advantages and disadvantages. Based upon this evaluation, a recommendation with respect to adoption and implementation of each alternative action was made. The traffic management actions recommended in the traffic congestion, arterial service, parking, and traffic accident problem sections of this chapter are summarized in tabular form at the end of each section.

In addition to the evaluation of each of the individual traffic management actions considered, an evaluation was made of the recommended traffic management actions by facility or route. This evaluation was intended to identify interrelated recommendations which may alleviate one specific type of traffic problem and concurrently abate or, conversely, intensify other problems. This analysis, in addition to assuring the technical soundness of the recommended measures on a systemwide, as opposed to an individual problem location, basis, was useful in establishing priorities for implementation of the recommended traffic management actions as set forth in Chapter VII of this report. In this manner, an effective and coordinated traffic management plan was designed which would achieve good total system operation.

VEHICULAR CONGESTION PROBLEM ANALYSIS

As noted in Chapter V, there are four segments of the arterial street and highway system in the Oconomowoc study area, two segments on Wisconsin Avenue and two segments on E. Summit Avenue, which have been operating at or over design levels. The traffic congestion problems on these four segments are associated with two intersections: that of Wisconsin Avenue and Main Street and that of E. Summit Avenue and S. Silver Lake Street. Five alternative traffic management actions have the potential to solve or mitigate these traffic congestion problems: 1) traffic signal timing revision; 2) modification of traffic movement patterns; 3) reconstruction of the existing roadway for increased capacity; 4) construction of new arterial streets and highways; and 5) work time rescheduling. The following analysis for each of the two intersections concerned sets forth the approximate cost, the advantages and disadvantages, and a recommendation with respect to the implementation of each alternative action. The recommended actions for resolving the traffic congestion problems are tabulated and summarized with capital cost data, and with an evaluation of their effect on vehicular air quality emissions and fuel consumption, at the end of this section.

Wisconsin Avenue and Main Street Intersection

Perhaps the most serious traffic congestion problems in the Oconomowoc study area occur at the intersection of Wisconsin Avenue and Main Street in the Oconomowoc central business district (CBD). The intersection approach pavement widths at this intersection are: 22 feet on the eastbound approach, 24 feet on the westbound approach, and 23 feet on the north- and southbound approaches. All four roadway approaches to this intersection provide one lane for exclusive use by left-turning

vehicles and one lane for use by through and right-turning vehicles. The traffic signal at this intersection has a 60-second cycle with a 21-second green phase for the north- and southbound approaches, a 24-second green phase for the east- and westbound approaches, and an additional exclusive eight-second green phase for the westbound approach. All approaches are provided with a three-second yellow phase and a one-second common red phase.

Traffic Signal Timing Revisions: The first alternative traffic signal timing revision with the potential to mitigate the traffic congestion problem at this intersection involves increasing the green phase time for the east- and westbound approaches from 24 to 26 seconds. For pedestrian safety reasons, a greater increase in the time provided for the green phase is not recommended. The time required for pedestrians to safely cross Main Street, based on an average pedestrian walking time of 3.5 feet per second and an additional seven-second starting or reaction time, indicates the need for a minimum green phase of 20 seconds for the north-and southbound Main Street approaches to the intersection. There is no capital cost associated with this alternative. The advantages of this alternative are that it would increase the operating capacity of the Wisconsin Avenue approaches at Main Street without increasing the volume to capacity ratio to over design levels for the Main Street approaches to the intersection, and it would decrease the average vehicle delay of vehicles using Wisconsin Avenue. The disadvantage of this alternative is that it would slightly increase the average delay of those vehicles on Main Street. It is recommended that this alternative be implemented.

Another alternative traffic signal timing revision involves reducing the exclusive eight-second green phase for the westbound approach to the intersection. This alternative has the advantage of increasing the green phase time for the eastbound approach to the intersection. The provision of additional green time would increase the operational capacity of the eastbound approach, resulting in an amelioration of the over-design-capacity operation on that approach. The disadvantage of this alternative is that it would slightly increase the conflict between westbound left-turning and eastbound through traffic vehicle movements. It should be noted that this alternative would not improve operating conditions on the westbound approach to the intersection, which would continue to operate at or over design levels. It is recommended that this alternative be implemented.

A final alternative traffic signal timing revision involves the elimination of the exclusive eight-second green phase for the westbound approach to the intersection. There is no capital cost associated with this alternative. This alternative also has the advantage of increasing the green phase time for the eastbound approach to the intersection. The provision of additional green time would increase the operational capacity of the eastbound approach, and reduce the volume to capacity ratio from over to below design levels. The disadvantage of this alternative is that it would greatly increase the conflict between westbound left-turning and eastbound through traffic vehicle movements. This disadvantage could be ameliorated by increasing the existing three-second yellow phase to four seconds and the one-second common red phase to two seconds to reduce the conflict and allow ample time for vehicles to clear the intersection. The resultant increase in green phase time of six seconds would be sufficient to reduce the volume to capacity ratio on the eastbound approach from over to below design levels. It should be noted that this alternative would not improve operating conditions on the westbound approach to the intersection, which would continue to operate at or over design levels. Implementation of this alternative is not recommended.

Modification of Traffic Movement Patterns: The first alternative modification of traffic movement patterns calls for removing the exclusive left-turn lane controls on selected intersection approaches. The capital cost of this alternative, which would consist of pavement marking and regulatory signing changes, would be approximately $200 per intersection approach. The two approaches to this intersection with the heaviest traffic volumes are the east- and westbound approaches of Wisconsin Avenue. The amount of left-turn traffic movement on these approaches is 123 and 116 vehicles per hour (vph), respectively, or 24 and 17 percent of the total approach traffic volumes. The north- and southbound intersection approaches experience lower hourly traffic volumes, with attendant left-turn movements of 149 and 73 vph, respectively, or 42 and 26 percent of the total approach traffic volumes. The advantages of this alternative are that it would significantly increase the operational capacity of the intersection approaches by maximizing utilization of the exclusive left-turn lane, which is currently operating well below design levels, and it would balance traffic over both intersection approach lanes, thereby decreasing vehicle queue length and average vehicle delay at the intersection. The disadvantages of this alternative

are that it would increase the conflict between left-turn and ahead traffic movements and result in a vehicle-merging problem on the far side of the intersection, which could result in an increased accident problem.This disadvantage could be offset by taking two seconds from the north- and southbound green phase and adding it to the east- and westbound green phase in the 60-second signal cycle to extend the east- and westbound traffic signal yellow phase from three to four seconds and the common red phase from one to two seconds to allow traffic, especially left-turning traffic, to clear the intersection; and by removing on-street curb parking on the far-side roadways of the intersection. Implementation of this alternative is not recommended.

Another alternative traffic movement pattern modification calls for the prohibition or restriction of left-turn movements. The capital cost of this alternative, which would consist of pavement marking and regulatory signing changes, would be approximately $200 per intersection approach. This alternative has the advantage of increasing the operational capacity of the intersection approach and eliminating the conflict between left-turn and through vehicle movements. The disadvantage of this alternative is that it would increase turning movement volumes and vehicle delays at other intersections in the study area, as drivers alter travel patterns to reach their trip destination. This may be expected to result in increased trip lengths, travel times, accident rates, and fuel consumption. Because of the lack of available alternative routes through the Oconomowoc central business district and the fact that the two important state trunk highways through the study area intersect at this location, implementation of this alternative is not recommended.

Another alternative traffic movement pattern modification calls for the delineation of a downtown bypass route for vehicular traffic currently using both STH 67 on the east side and STH 16 on the west side of the Oconomowoc central business district. This bypass alternative would be routed on W. 2nd Street and S. Concord Road. The capital cost of this alternative, which would consist of installing informational bypass route signs on W. 2nd Street from S. Main Street to S. Concord Road and on S. Concord Road from W. 2nd Street to W. Wisconsin Avenue, and installing a traffic signal at the intersection of W. Wisconsin Avenue and S. Concord Road, would be approximately $600 and $32,000, respectively. The advantage of this alternative is that it would attract vehicular traffic from the intersection of Wisconsin Avenue and Main Street, thereby improving operating conditions on the Wisconsin Avenue approaches to Main Street. It is estimated that this alternative would decrease traffic volumes on Wisconsin Avenue by 1,000 vehicles per day, or by about 7 percent. Existing land use adjacent to W. 2nd Street is intermixed with residential, retail, and manufacturing development. The disadvantage of this alternative is that it would encourage the use of W. 2nd Street, currently a land access street, by trucks and through traffic. This disadvantage could be ameliorated by asking the Wisconsin Department of Transportation to functionally classify W. 2nd Street as a collector street from Main Street to S. Concord Road. This alternative also has the disadvantages of increasing vehicular travel times and trip lengths between W. Wisconsin Avenue and S. Main Street from approximately 1.6 minutes to 2.1 minutes, or by about 31 percent, and from 0.5 mile to 0.7 mile, or by about 40 percent, respectively. Implementation of this alternative is recommended as a temporary solution until new construction can be undertaken to provide a permanent east-west arterial bypass facility.

A final alternative traffic movement pattern modification which partially utilizes the existing street network calls for the construction of a new arterial facility from the terminus of W. 2nd Street west of the Oconomowoc River northerly to Chaffee Road. This bypass would be routed on W. 2nd Street from S. Main Street to the new arterial facility west of the Oconomowoc River, which would intersect with W. 2nd Street and Chaffee Road, and then on Chaffee Road to W. Wisconsin Avenue. The capital cost of this alternative, which would consist of new roadway construction, railroad crossing protection devices, traffic signal installation at the intersections of W. 2nd Street with S. Main Street and W. Wisconsin Avenue with Chaffee Road and informational bypass route signing, would be about $440,000. This alternative would have the advantages of attracting vehicular traffic from the intersection of Wisconsin Avenue and Main Street, thereby improving operating conditions on the Wisconsin Avenue approaches to Main Street. It is estimated that this alternative would decrease traffic volumes on Wisconsin Avenue by 2,000 vehicles per day, or by about 15 percent. As noted under the previous alternative, existing land use adjacent to this bypass route is intermixed with residential, retail, and manufacturing development. The dis-

advantage of this alternative is that it also would encourage the use of W. 2nd Street and Chaffee Road, currently land access streets, by trucks and through traffic. This disadvantage could be ameliorated by asking the Wisconsin Department of Transportation to functionally classify W. 2nd Street and Chaffee Road as collector streets. Another disadvantage of this alternative is that it would increase vehicular travel time and trip lengths between W. Wisconsin Avenue and S. Main Street from approximately 2.2 minutes to 3.0 minutes, or by about 36 percent, and from 1.15 miles to 1.35 miles, or by about 17 percent. And finally, this alternative has the potential to increase accident rates through the construction of an additional at-grade arterial street railroad crossing. Implementation of this alternative is not recommended.

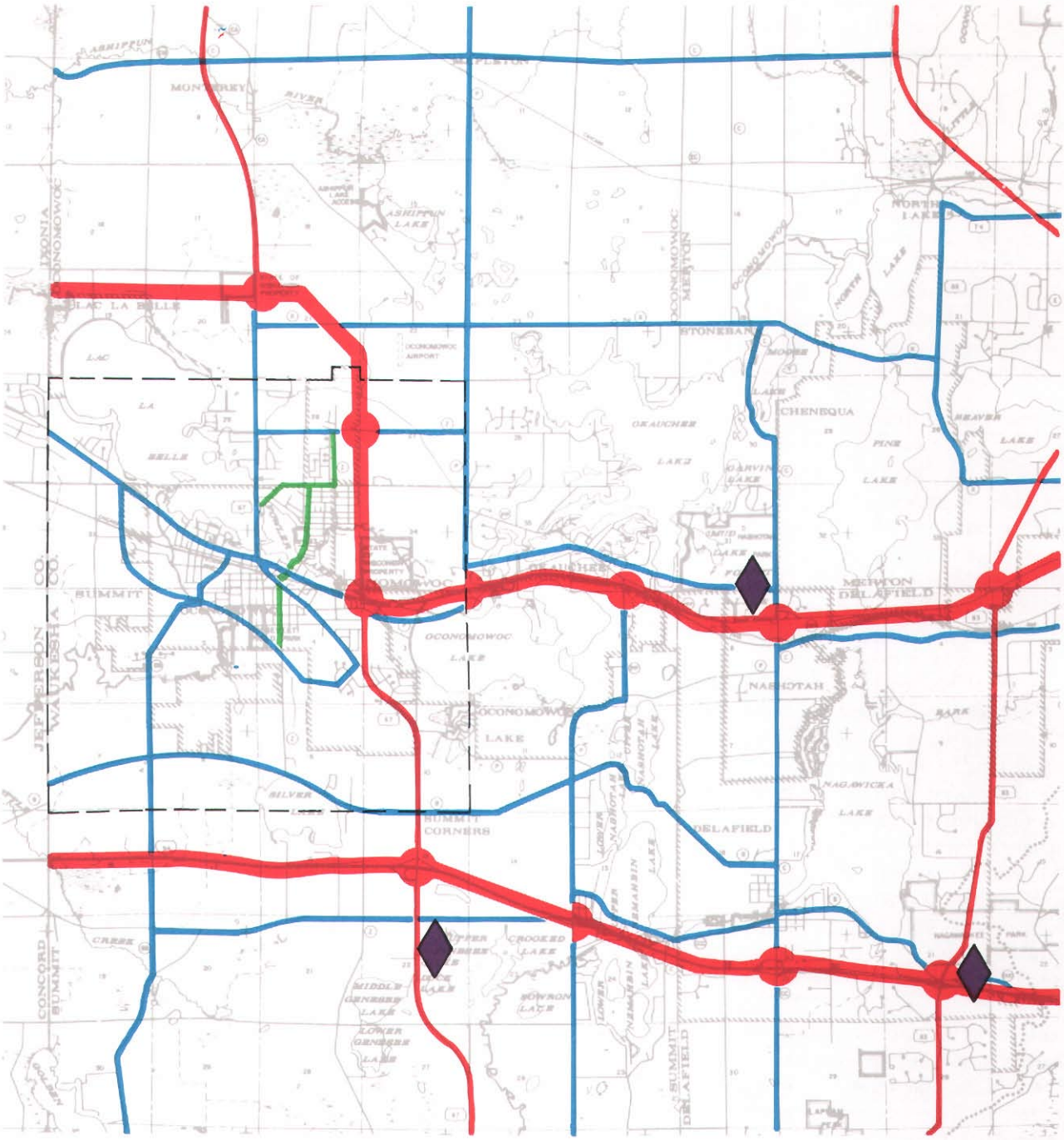
Reconstruction of Existing Roadway for Increased Capacity: The only traffic management action involving reconstruction calls for increasing the intersection approach pavement width to allow for an additional 12-foot-wide right-turn or through movement traffic lane on selected approaches to this intersection. The capital cost of this alternative would be about $50,000 per approach for reconstruction, plus the cost of the land required to accommodate the increased pavement width. The existing peak right-turn traffic movements on the east- and westbound approaches to this intersection are 121 and 111 vehicles per hour (vph), respectively—27 and 16 percent, respectively, of the total approach traffic volumes. The north- and southbound intersection approaches experience lower hourly traffic volumes, with attendant lower right-turn traffic movements of 64 and 69 vph, respectively—18 and 21 percent, respectively, of the total intersection approach traffic volumes. The advantage of this alternative is that it would increase roadway capacity, thereby reducing vehicle queue lengths and delay at the intersection. The disadvantages of this alternative are that there is insufficient right-of-way available for reconstruction without requiring the razing of the commercial establishments adjacent to the intersection and/or the elimination of the existing sidewalks which provide for the safe movement of pedestrians at the intersection. Reconstruction of the westbound approach to the intersection could be accommodated without the razing of any commercial establishments, but would have the disadvantage of not providing for lane continuity across the intersection, which would adversely affect roadway capacity and increase the possibility of additional vehicular accidents. Implementation of this alternative is not recommended.

Construction of New Arterial Streets and Highways: The first alternative action involving the construction of a new arterial street or highway calls for constructing an east-west arterial across the southern portion of the Oconomowoc study area. As shown on Map 25, which depicts the Commission's long-range transportation system plan for the study area, this proposed facility would be located within a one-half-mile-wide corridor extending from E. Summit Avenue in the vicinity of E. Thackery Trail to W. Wisconsin Avenue in the vicinity of the City of Oconomowoc's west city limits. The capital cost of this alternative, including right-of-way acquisition and roadway and railroad grade crossing construction costs, would be approximately $2.4 million for an undivided four-lane highway, or $3.1 million for a divided four-lane highway. The advantages of this alternative are that: it would reduce traffic volumes and resultant traffic congestion to below design levels in the Oconomowoc central business district by providing an additional arterial route for vehicular traffic; it would encourage the separation of local and through traffic by providing a bypass route for through traffic around the central business district; it would reduce trip lengths and travel times of selected trips by providing a more direct route across the study area; and it would reduce the conflict between highway traffic and railroad traffic on the Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road). There are no significant disadvantages to this alternative. It is, therefore, recommended that this alternative be implemented.

Another construction alternative calls for the construction of a north-south arterial across the eastern portion of the study area. As shown on Map 25, this facility would be located within a one-half-mile-wide corridor extending from E. Summit Avenue in the vicinity of E. Thackery Trail northerly to CTH Z, and would then proceed in a westerly direction past the Waukesha County Line to its intersection with STH 16. The capital cost of this alternative, including right-of-way acquisition and roadway and railroad grade crossing construction costs, would be approximately $23 million. The advantages of this alternative are the same as those noted for the east-west arterial construction alternative. There are no

Map 25

SEWRPC TRANSPORTATION SYSTEM PLAN IN THE VICINITY OF THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 2000



LEGEND

ARTERIAL STREET AND HIGHWAY SYSTEM

JURISDICTIONAL CLASSIFICATION

- STATE TRUNK HIGHWAY — FREEWAY
- STATE TRUNK HIGHWAY — NON FREEWAY
- COUNTY TRUNK
- LOCAL TRUNK
- FREEWAY — NONFREEWAY INTERCHANGE

URBAN MASS TRANSIT SYSTEM

- PARK AND POOL LOT

— — STUDY AREA BOUNDARY

GRAPHIC SCALE

0 1/2 1 MILE

0 2000 4000 6000 8000 FEET

Source: SEWRPC.

significant disadvantages to the alternative. It is, therefore, also recommended that this alternative be implememented.

It is further recommended that action be taken by the City of Oconomowoc and other concerned agencies of government in the study area to precisely define the location of the recommended east-west bypass as identified in the Regional Planning Commission's long-range transportation system plan. Once precisely defined, the location of the east-west, and of the north-south, bypass facilities should be placed on the City's Official Map to preserve the needed right-of-way for the construction of these facilities.

Work Time Rescheduling: The final alternative traffic management action with the potential to solve or mitigate the traffic congestion problem on the Wisconsin Avenue approaches to Main Street involves the rescheduling of work time starting and quitting hours by major employers in the Oconomowoc study area. There is no capital cost associated with this alternative. An analysis of the major public and private employment centers in the study area, identified in Table 23 of this report, indicates that there are a large number of employees reporting to work at 7:00 a.m. and finishing work at 3:30 p.m. More specifically, as indicated in Table 23, of the 1,852 employees of the major public and private employment centers in the study area who commute to or from work between 6:00 a.m. and 8:00 a.m., 756, or 41 percent, report to or finish work at 7:00 a.m.; and of the 2,040 employees of the major public and private employment centers of the study area who commute to or from work between 2:00 p.m. and 5:30 p.m., 635, or 31 percent, report to or finish work at 3:30 p.m. The foregoing data do not include students, staff, and parents who may arrive at or depart from the public and parochial schools in the study area during the peak travel periods. The morning peak arrival period for schools is between 7:30 a.m. and 8:30 a.m., and thus does not conflict with the peak employee work time schedule. However, the evening peak departure period for the schools is between the hours of 3:00 p.m. and 4:00 p.m., which does conflict with, and therefore potentially exacerbates, the evening peak employee work time schedule. It is recommended that the major public and private employers of the study area be asked to consider rescheduling some, or all, of the 7:00 a.m. and 3:30 p.m. work starting and quitting times by 15 minutes or more. A total of about 250 employees would be required to change work time schedules under this alternative to effectively balance the major public and private employee demand for transportation services in the study area.

Table 23

SUMMARY OF MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTER WORK SCHEDULES IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Work Starting or Quitting Time	Employees			
	Existing		Recommendation	
	Number	Percent of Total	Number	Percent of Total
Morning Peak Period				
6:00 a.m.	305	17	305	17
6:30 a.m.	20	1	70	4
7:00 a.m.	756	41	506	27
7:30 a.m.	322	17	522	28
8:00 a.m.	449	24	449	24
Total	1,852	100	1,852	100
Evening Peak Period				
2:00 p.m.	197	10	197	10
2:30 p.m.	200	10	200	10
3:00 p.m.	460	23	460	23
3:30 p.m.	635	31	385	19
4:00 p.m.	5	0	255	12
4:30 p.m.	313	15	313	15
5:00 p.m.	218	10	218	10
5:30 p.m.	12	1	12	1
Total	2,040	100	2,040	100

Source: SEWRPC.

Concluding Remarks: In conclusion, to alleviate traffic congestion problems at the intersection of Wisconsin Avenue and Main Street, it is recommended that: 1) traffic signals be retimed by shifting two seconds from the north- and southbound green phase to the east- and westbound green phase; 2) the existing eight-second exclusive left-turn arrow for westbound vehicles be reduced to a six-second exclusive left-turn arrow; and 3) the traffic movement patterns at the intersection of Wisconsin Avenue and Main Street be modified by delineating a downtown bypass route on W. 2nd Street and S. Concord Road and installing traffic signals at the intersection of W. Wisconsin Avenue and S. Concord Road.

It is also recommended that the construction of the east-west and north-south bypasses, as identified in the Commission's long-range transportation plan, be pursued around the Oconomowoc central business district. The City, in cooperation with Waukesha County, should conduct the necessary engineering studies to precisely locate the east-west bypass facility, and, following the completion of such studies, the City should place both facilities on the City's Official Map to preserve the corridors from encroachment by urban development. It is also recommended that some, or all, of the 7:00 a.m. and 3:30 p.m. starting and quitting times be rescheduled by 15 minutes or more. This recommendation would affect approximately 250 employees of the major public and private employers in the study area.

E. Summit Avenue and
S. Silver Lake Street Intersection

The other significant problems of traffic congestion in the Oconomowoc study area involve the intersection of E. Summit Avenue and S. Silver Lake Street. The intersection approach pavement widths at this intersection are: 15 feet on the east- and westbound approaches; 15 feet on the northbound approach; and 21 feet on the southbound approach. The southbound roadway approach to this intersection provides one lane for exclusive use by left-turning vehicles and one lane for through and right-turning vehicles. The traffic signal at this intersection has a 60-second cycle, with a 26-second green phase for the east- and westbound approaches and a 26-second green phase for the north- and southbound approaches. All approaches are provided with a four-second yellow phase.

Traffic Signal Timing Revisions: The traffic signal timing revision with the potential to mitigate the traffic congestion problem at this intersection involves increasing the green phase time for the east- and westbound approaches of E. Summit Avenue from 26 seconds to 32 seconds. For pedestrian safety reasons, a greater increase in the time provided for the green phase is not recommended. The time required for pedestrians to safely cross S. Silver Lake Street, based on an average pedestrian walking time of 3.5 feet per second plus a seven-second starting or reaction time, indicates the need for a minimum green phase phase of 20 seconds for the north- and southbound approaches to the intersection. There is no capital cost associated with this alternative. The advantages of this alternative are that it would increase the operating capacity of the E. Summit Avenue approaches at S. Silver Lake Street without increasing the volume to capacity ratio to over design levels for the S. Silver Lake Street approaches to the intersection, and it would decrease the average vehicle delay of the vehicles using E. Summit Avenue. The disadvantage of this alternative is that it would slightly increase the average delay of those vehicles using S. Silver Lake Street. It is recommended that this alternative be implemented.

Modification of Traffic Movement Patterns: The modification of traffic movement patterns considered calls for the prohibition or restriction of left-turn movements. The capital cost of this alternative, which would consist of pavement marking and regulatory signing changes, would be approximately $200 per intersection approach. The two approaches to this intersection with the heaviest traffic volumes are the east- and westbound approaches on E. Summit Avenue. The existing peak left-turn traffic movement on these approaches is 11 and 4 vehicles per hour (vph), respectively—3 and 1 percent, respectively, of the total approach traffic volumes. The north- and southbound intersection approaches experience lower hourly traffic volumes, with attendant larger left-turn movements of 175 and 60 vph, respectively—63 and 31 percent, respectively, of the total approach traffic volumes. The advantage of this alternative is that it would increase the operational capacity of the intersection approach and eliminate the conflict between left-turn and through vehicle movements. The disadvantage of this alternative is that it would increase turning movement volumes and vehicle delays at other intersections in the study area, as drivers alter travel patterns to reach their trip destinations. This may be expected to result in increased trip lengths, travel times, accident rates, and fuel consumption. Because of the lack of available alternative routes through the Oconomowoc central business district, implementation of this alternative is not recommended.

Reconstruction of Existing Roadway for Increased Capacity: The only traffic management action involving reconstruction calls for increasing the intersection approach pavement width to allow for an additional 12-foot-wide right-turn or through movement traffic lane. The capital cost of this alternative would be about $50,000 per approach for reconstruction, plus the cost of the land required to accommodate the increased pavement width. The existing peak right-turn traffic move-

ments on the east- and westbound approaches to this intersection are 44 and 239 vehicles per hour (vph), respectively—12 and 38 percent, respectively, of the total approach traffic volumes. The north- and southbound intersection approaches experience lower hourly traffic volumes, with attendant lower right-turn movements of 5 and 21 vph, respectively—2 and 8 percent, respectively, of the total approach volumes. The advantage of this alternative is that it would increase roadway capacity, thereby reducing vehicle queue length and delay at the intersection. The disadvantage of this alternative is that it would relocate vehicular traffic closer to the residential land development located on the corners of the intersection. It is recommended that the westbound approach to the intersection be reconstructed to provide an additional lane for right-turning traffic on E. Summit Avenue. It is noted that the City of Oconomowoc acted to implement this recommendation prior to the completion of the study.

Construction of New Arterial Streets and Highways: An alternative action involving the construction of a new arterial street or highway across the southern and eastern portions of the study area was described under the preceding section of this report. The recommendation for the construction of such facilities is further supported by the results of this analysis, which indicate that the new facilities would reduce traffic volumes and resultant traffic congestion at the E. Summit Avenue and S. Silver Lake Street intersection by providing additional arterial routes through the study area for vehicular traffic.

Work Time Rescheduling: The previous section also described how the rescheduling of approximately 250 employees of the major public and private employers in the Oconomowoc study area would assist in balancing the demand for transportation services in the study area. It was recommended that the starting and quitting times of these employees, who start or quit work at 7:00 a.m. and 3:30 p.m., be rescheduled by 15 minutes or more. This recommendation is further supported by the desirable effect such rescheduling may have on the traffic congestion problems at the E. Summit Avenue approaches to S. Silver Lake Street.

Concluding Remarks: In conclusion, to alleviate the traffic congestion problems at the intersection of E. Summit Avenue and S. Silver Lake Street, it is recommended that 1) the traffic signals at the intersection be retimed by shifting six seconds from the north- and southbound green phase to the green phase time for the east- and westbound approaches to the intersection; and 2) the westbound approach to the intersection be reconstructed to provide for an exclusive right-turn lane. The previous recommendations to construct an east-west and a north-south bypass around the Oconomowoc central business district and to reschedule the starting and quitting times of approximately 250 employees of the major public and private employers in the study area are further supported by analysis of the traffic congestion problems on the E. Summit Avenue approaches to S. Silver Lake Street.

An additional traffic management action which would directly affect the operational efficiency of the arterial street system in the Oconomowoc central business district is the interconnection of the traffic signals on those arterial streets. More specifically, this action calls for using the recommended traffic signal timing plans shown in Table 24 and interconnecting them so that they provide for coordinated operation along Wisconsin Avenue, as shown in Figures 6 and 7. This interconnection system for Wisconsin Avenue would maintain a 15- and 17-second green band width in the east- and westbound directions, respectively, with an attendant eastbound travel speed of 15 miles per hour (mph) and westbound travel speed of 17 mph. The existing traffic signal green width band is not determinable, as it varies throughout the year since the existing traffic signals are not interconnected and coordinated. However, as indicated in Table 13 in Chapter III, the average peak-hour travel speeds on E. Wisconsin Avenue are 9 and 12 mph in the east- and westbound directions, respectively. The capital cost of this action, which would consist of installing a time-base coordinator control unit at each of the traffic signal pretimed controllers in the Oconomowoc central business district, would be about $2,000 per signalized intersection. The advantage of interconnecting traffic signals is that it assures the facilitation of the efficient flow of traffic on the arterial streets and highways. Platoons of vehicles traveling in a progressive system can maintain continuous movement through the system. There is no significant disadvantage to interconnecting traffic signals. Therefore, it is recommended that this alternative be implemented.

Table 24

RECOMMENDED TRAFFIC SIGNAL OPERATION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

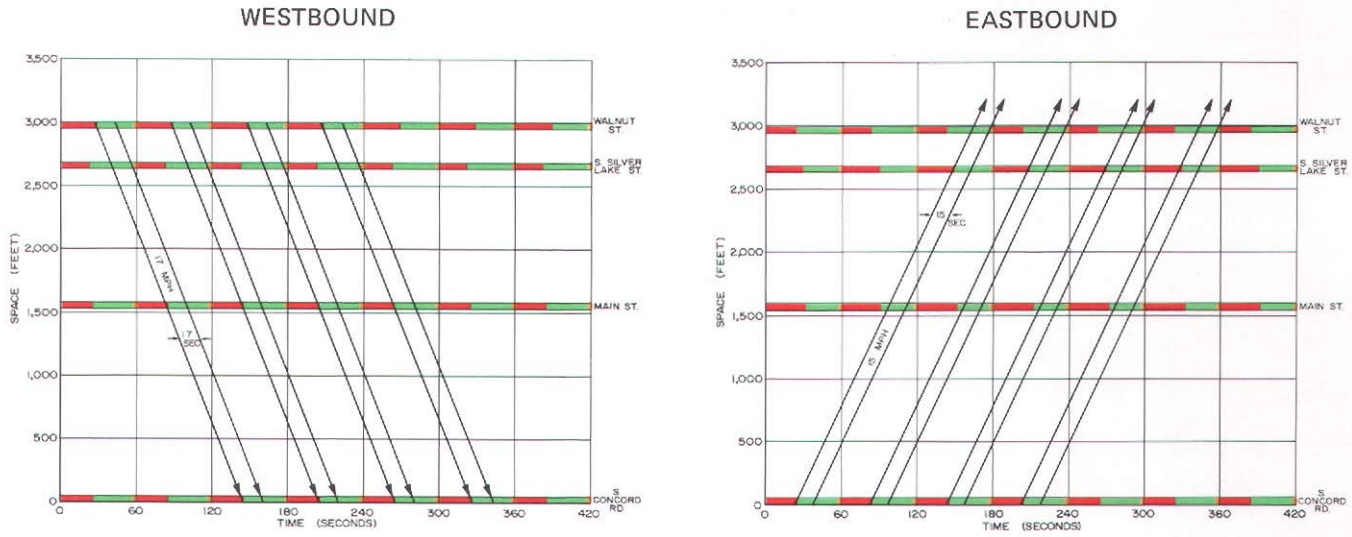
Phase	Seconds per Phase at Intersection[a]	
	Wisconsin Avenue	Main Street
Green	26 seconds	20 seconds
Yellow	3 seconds	3 seconds
Red	25 seconds	37 seconds
Westbound Green with Left-Turn Arrow	6 seconds	--
Total Cycle	60 seconds	60 seconds
	E. Summit Avenue	S. Silver Lake Street
Green	30 seconds	20 seconds
Yellow	4 seconds	4 seconds
Red	26 seconds	36 seconds
Total Cycle	60 seconds	60 seconds
	S. Silver Lake Street	E. Wisconsin Avenue
Green	17 seconds	29 seconds
Yellow	3 seconds	3 seconds
Red	40 seconds	22 seconds
Westbound Green with Left-Turn Arrow	--	6 seconds
Total Cycle	60 seconds	60 seconds
	N. Walnut Avenue	E. Wisconsin Avenue
Green	18 seconds	28 seconds
Yellow	3 seconds	3 seconds
Red	39 seconds	23 seconds
Eastbound Green with Left-Turn Arrow	--	6 seconds
Total Cycle	60 seconds	60 seconds
	W. Wisconsin Avenue	S. Concord Road
Green	32 seconds	20 seconds
Yellow	3 seconds	3 seconds
Red	25 seconds	37 seconds
Total Cycle	60 seconds	60 seconds

[a] *Fixed time traffic controllers operate on a percentage of the total cycle length for each phase. The values shown on this table are rounded to the nearest whole second.*

Source: SEWRPC.

Figure 6

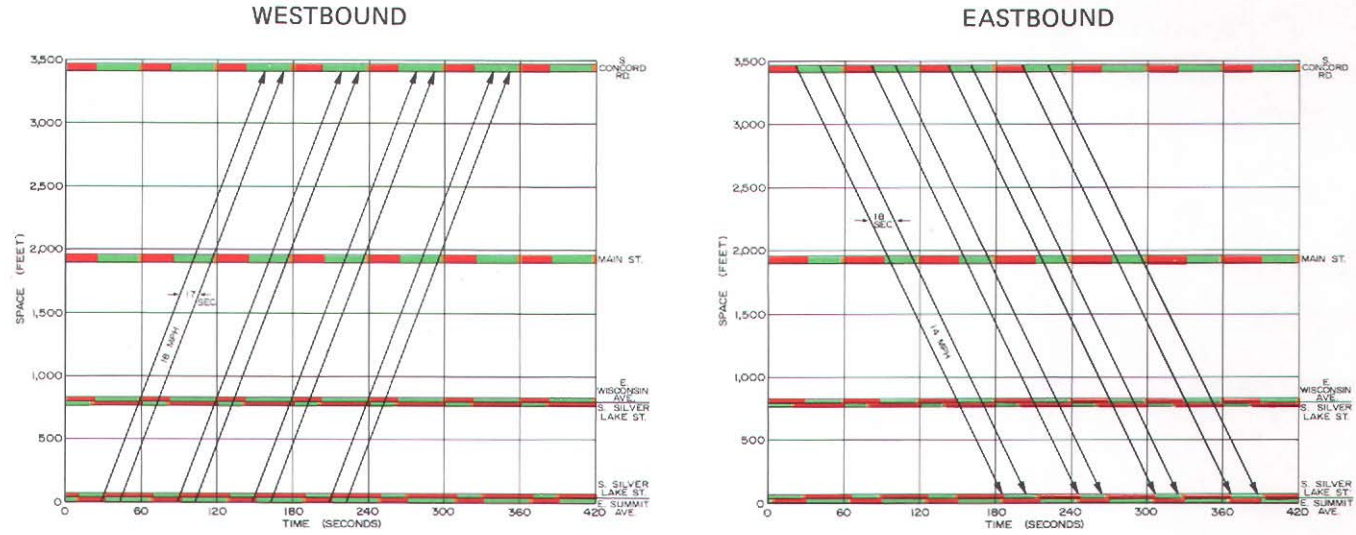
TIME-SPACE DIAGRAM FOR WISCONSIN AVENUE



Source: SEWRPC.

Figure 7

TIME-SPACE DIAGRAM FOR E. SUMMIT AVENUE-S. SILVER LAKE STREET-WISCONSIN AVENUE SYSTEM



Source: SEWRPC.

Summary

The traffic congestion analyses presented in this chapter have investigated the causes of the problems, evaluated alternative traffic system management actions which should solve or mitigate those problems, and recommended for implementation those alternatives judged best. The principal traffic congestion problems in the Oconomowoc study area occur on the Wisconsin Avenue approaches to Main Street and the E. Summit Avenue approaches to S. Silver Lake Street. Table 25 summarizes the traffic management recommendations resulting from the analyses, and indicates the capital costs of implementing each alternative and the effects that the recommended actions may be expected to have on vehicular air quality emissions and fuel

Table 25

SUMMARY OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE TRAFFIC CONGESTION PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Actions	Capital Cost	Effect on Vehicular	
			Emissions	Fuel Consumption
Wisconsin Avenue at Main Street	● Retime traffic signal sequence	$ --	Reduction	Reduction
	● Delineate downtown bypass route	600	--	--
	● Install traffic signal at intersection of W. Wisconsin Avenue with S. Concord Road	32,000	--	--
E. Summit Avenue at S. Silver Lake Street	● Retime traffic signal sequence	$ --	Reduction	Reduction
	● Reconstruct westbound approach to intersection to provide for an exclusive right-turn lane[a]	50,000	Reduction	Reduction
All Arterial Streets and Highways in the Oconomowoc Study Area	● Construct an east-west bypass south of the Oconomowoc CBD in the southern portion of the study area	$ 2,400,000 to 3,100,000	Reduction	Reduction
	● Construct a north-south bypass east of the Oconomowoc CBD in the eastern portion of the study area	23,000,000	Reduction	Reduction
	● Reschedule the work time starting and quitting times of approximately 250 employees of the major public and private employers in the study area	--	Reduction	Reduction
Arterial Streets and Highways in the Oconomowoc CBD	● Interconnect traffic signals	$ 10,500	Reduction	Reduction

[a] *Recommendation was implemented by the City of Oconomowoc prior to the completion of the study.*

Source: SEWRPC.

consumption. A total of nine recommended traffic management actions are presented in Table 25. The implementation of more than one traffic management action is required at each location to reduce traffic congestion in the Oconomowoc central business district. In addition to these recommended actions, it is recommended that implementation of the transportation system elements contained in the Commission's long-range transportation system plan be pursued, and that the traffic signals in the Oconomowoc central business district be interconnected to provide for the efficient progression of vehicular traffic through that district.

ARTERIAL SERVICE PROBLEM ANALYSIS

Arterial service problems in the Oconomowoc study area were identified in Chapter V of this report. These problems, which affect travel conditions on the existing street and highway system,

are: 1) a deficiency in direct, continuous east-west arterial routes; 2) a deficiency in direct, continuous north-south arterial routes; 3) the penetration of residential areas by truck traffic on land access streets; 4) conflicts between through traffic and local traffic; 5) vehicular delays resulting from railroad crossing activity; and 6) a poor traffic circulation pattern in the Oconomowoc central business district (CBD). The alternative traffic management actions which have the potential to solve or mitigate these arterial service problems are: 1) diversion of existing traffic to an alternative route; and 2) construction of a new arterial facility.

The following analysis for each of the identified arterial service problems sets forth the approximate cost, the advantages and disadvantages, and a recommendation with respect to the implementation of each alternative action. Recommendations for resolving the arterial service problems are tabulated and summarized with capital cost data, and with an evaluation of their effect on vehicular air quality emissions and fuel consumption, at the end of this section.

East-West Arterial Street Spacing Deficiency

As discussed in Chapter V, there are an inadequate number of east-west arterial routes in the southern portion of the study area south of Wisconsin Avenue and west of E. Summit Avenue. According to the traffic management standards set forth in Chapter IV of this report, the provision of at least one additional arterial route is warranted in this portion of the study area.

Traffic Diversion to an Alternative Route: The first alternative traffic management action having the potential to mitigate this arterial service problem is the diversion of through traffic on the E. Summit Avenue-Main Street-W. Wisconsin Avenue route to an alternative route composed of existing facilities south of and around the Oconomowoc central business district (CBD). The first alternative route analyzed as a continuous east-west bypass route is S. Concord Road-W. Lincoln Street-W. Jefferson Street-S. Main Street-E. Forest Street. It is estimated that this route would attract approximately 1,500 vehicles per day (vpd) from the E. Summit Avenue-Main Street-W. Wisconsin Avenue route through the CBD. This alternative would involve: the installation of traffic signals at the intersection of S. Concord Road and W. Wisconsin Avenue and at the intersection of E. Forest Street and E. Summit Avenue; the installation of stop signs on S. Silver Lake Street at E. Forest Street and on S. Concord Road at W. Lincoln Street; the removal of stop signs on E. Forest Street at S. Silver Lake Street, on W. Lincoln Street at S. Concord Road, on S. Concord Road at S. Elm Street, and on W. 2nd Street at W. South Street; and the installation of informational traffic routing signs. The capital cost of this alternative would be approximately $66,000.

The advantages of this alternative are that it may be expected to reduce traffic volumes by about 10 percent on E. Summit Avenue and W. Wisconsin Avenue and ameliorate attendant traffic congestion on E. Summit Avenue. However, E. Summit Avenue may be expected to continue to operate over design capacity. In addition, implementation of this alternative would reduce traffic congestion on W. Wisconsin Avenue, and that facility would then operate at design capacity. The route would utilize streets which presently function as collector facilities. The disadvantages of this alternative are that it would increase traffic on the bypass route from 2,700 vpd to 4,200 vpd, or by about 56 percent, and it would increase vehicular travel times and trip lengths between E. Forest Avenue and S. Concord Road from approximately 3.4 minutes to 5.5 minutes, or by about 62 percent, and from 1.3 miles to 1.9 miles, or by about 46 percent. Implementation of this alternative is not recommended.

The second alternative considered as a continuous east-west bypass route is W. 2nd Street to S. Concord Road. This alternative was described and recommended for implementation in the preceding section of this chapter. The recommendation that this alternative be implemented is supported by the results of this analysis, which indicate that a bypass route on W. 2nd Street and S. Concord Road would temporarily serve to ameliorate arterial service problems in the southern portion of the study area until new construction can be undertaken to provide a permanent east-west arterial bypass facility.

Construction of a New Arterial Facility: A third alternative considered to provide the needed cross-town arterial is construction of a new east-west arterial across the southern portion of the study area. As mentioned in the traffic congestion section of this chapter, this proposed facility would be located within a one-half-mile-wide corridor extending from E. Summit Avenue in the vicinity of E. Thackery Trail to W. Wisconsin Avenue in the vicinity of the west city limits (see Map 25). It is

estimated that, if constructed and opened to traffic in 1980, this facility would divert approximately 5,000 vehicles per day from the E. Summit Avenue-Main Street-W. Wisconsin Avenue route through the CBD. The capital cost of this alternative would be about $2.4 million for an undivided four-lane facility, and $3.1 million for a divided, four-lane facility.

The advantages of this alternative are: 1) it may be expected to reduce future traffic volumes and resultant traffic congestion to below design levels in the Oconomowoc CBD; 2) it would provide local arterial service for future development; 3) it would encourage the separation of local and through traffic by providing a good bypass route for through traffic around the CBD; 4) it may be expected to reduce the trip lengths and travel times of selected trips by providing a direct route across the study area even though the length of this new facility—3.4 miles—would be approximately 13 percent longer than the 3.0-mile Summit Avenue-Main Street-W. Wisconsin Avenue route; and 5) it would reduce conflicts between vehicular traffic and railroad traffic on the Chicago, Milwaukee, St. Paul & Pacific Railroad. This alternative is substantially higher in cost than the other two considered. There are no other significant disadvantages to this alternative. It is recommended that this alternative be implemented.

As stated in the previous section on traffic congestion problems, it is further recommended that the precise location of this facility be determined and placed on the City of Oconomowoc's Official Map to preserve the needed right-of-way in advance of further urbanization in the Oconomowoc area.

Concluding Remarks: In conclusion, there do not appear to be any low-capital traffic management actions which will ultimately solve the east-west arterial street spacing deficiency problem in the southern portion of the Oconomowoc study area. A recommended traffic management action which should serve to temporarily ameliorate the east-west arterial street spacing deficiency problem is the delineation of a bypass route on W. 2nd Street and S. Concord Road. The traffic management actions recommended in the other sections of this chapter should serve to increase the safety and promote the efficient operation of the existing arterial street and highway system. As urbanization and attendant traffic volumes continue to increase in the Oconomowoc area, the ultimate solution to the problems of arterial street spacing will be the implementation of the recommendation to construct the east-west bypass south of the Oconomowoc CBD. Pending implementation of that recommendation, the City of Oconomowoc and other concerned agencies of government should seek to define the precise location of the proposed east-west bypass and to place that facility on the City's Official Map in order to preserve the needed right-of-way for the future construction of that facility.

North-South Arterial Street Spacing Deficiency

As discussed in Chapter V, there are an inadequate number of north-south arterial routes in the eastern portion of the study area east of the E. Summit Avenue-S. Silver Lake Street-N. Walnut Street-N. Oakwood Avenue arterial route.

Traffic Diversion to an Alternative Route: The first alternative traffic management action with potential to mitigate this alternative service problem is the diversion of through traffic on the E. Summit Avenue-S. Silver Lake Street-N. Walnut Street-N. Oakwood Avenue arterial route and on the E. Summit Avenue-S. Silver Lake Street-E. Wisconsin Avenue-N. Main Street arterial route to an alternative route composed of existing facilities east of the Oconomowoc CBD. The first alternative route analyzed as a continuous north-south route would consist of E. Summit Avenue-S. Wood Street-E. Wisconsin Avenue. It is estimated that this alternative route would divert approximately 3,000 vehicles per day (vpd) from the E. Summit Avenue-S. Silver Lake Street-E. Wisconsin Avenue route. The capital cost of this alternative, which would consist of the installation of traffic signals at the intersections of S. Wood Street with E. Wisconsin Avenue and E. Summit Avenue, the reconstruction of the S. Wood Street railroad crossing, and the installation of railroad crossing gates at the S. Wood Street railroad crossing, would be approximately $200,000.

The advantage of this alternative is that it would decrease travel times of selected vehicle trips in the study area by providing a shorter route for traffic desiring to use both E. Wisconsin Avenue and E. Summit Avenue east of the Oconomowoc CBD. The disadvantages of this alternative are: 1) it has the potential to increase vehicular accident rates because of the proximity of the Milwaukee Road trackage, approximately 70 feet, to E. Wisconsin Avenue, and of the fact that seven tracks would have to be crossed by S. Wood Street if it were extended to E. Wisconsin Avenue; 2) it

would encourage through traffic on a facility which presently functions as a land access street; 3) it would increase vehicle delay on E. Wisconsin Avenue and E. Summit Avenue; and 4) it would shift the existing over design capacity problem identified on E. Summit Avenue at S. Silver Lake Street to E. Summit Avenue at S. Wood Street. Implementation of this alternative is not recommended.

The second alternative route considered as a continuous north-south bypass east of the Oconomowoc CBD is E. Armour Road to S. Lapham Street. It is estimated that this alternative route, which presently functions as a collector facility, would divert approximately 500 vpd from the E. Summit Avenue-S. Silver Lake Street-S. Walnut Street-E. Wisconsin Avenue route. The capital cost of this alternative, which would consist of the installation of traffic signals at the intersection of E. Wisconsin Avenue and S. Lapham Street and the intersection of E. Summit Avenue and E. Armour Road, and information signing as a bypass route, would be about $65,000.

The advantages of this alternative are that it would decrease the vehicular travel time of selected vehicle trips in the study area by encouraging traffic desiring to use both E. Wisconsin Avenue and E. Summit Avenue east of the Oconomowoc CBD to use a shorter route, and it would route through traffic over facilities which presently function as collector streets. The disadvantages of this alternative are: 1) it has the potential to increase vehicular accident rates owing to the proximity of the Milwaukee Road trackage—approximately 50 feet—to E. Wisconsin Avenue and to the fact that the vertical alignment of the Milwaukee Road trackage at this location is approximately 10 feet above that of E. Wisconsin Avenue and S. Lapham Street (a railroad underpass could not be constructed to ameliorate the vertical alignment problem because of the proximity of the Milwaukee Road trackage to E. Wisconsin Avenue); 2) the use of this route by heavy trucks and buses would be restricted because of the previously noted vertical alignment problem; 3) E. Armour Road does not provide a direct north-south route between E. Summit Avenue and E. Wisconsin Avenue; and 4) this alternative may be expected to increase vehicle delay on E. Summit Avenue and E. Wisconsin Avenue. Implementation of this alternative is not recommended.

A third alternative route considered as a continuous north-south bypass east of the Oconomowoc CBD is an extension of S. Lapham Street from E. High Street south to its intersection with E. Summit Avenue. This route would divert approximately 2,000 vpd from the E. Summit Avenue-S. Silver Lake Street-S. Walnut Street-E. Wisconsin Avenue route. The capital cost of this alternative, which would consist of the installation of traffic signals at the intersections of S. Lapham Street with E. Summit Avenue and E. Wisconsin Avenue, the acquisition of right-of-way, and the construction of a new roadway between E. High Street and E. Summit Avenue, would be about $450,000.

The advantage of this alternative is that it would decrease the vehicular travel time of selected vehicle trips in the study area by providing a direct north-south route between E. Wisconsin Avenue and E. Summit Avenue east of the Oconomowoc CBD. The disadvantages of this alternative are: 1) it has the potential to increase vehicular accident rates owing to the proximity of the Milwaukee Road trackage—approximately 50 feet—to E. Wisconsin Avenue, and to the fact that the vertical alignment of the Milwaukee Road trackage at this location is approximately 10 feet above that of E. Wisconsin Avenue and S. Lapham Street (a railroad underpass could not be constructed to ameliorate the vertical alignment problem because of the proximity of the Milwaukee Road trackage to E. Wisconsin Avenue); 2) the use of this route by heavy trucks and buses would be restricted because of the previously noted vertical alignment problem; 3) this alternative would increase the vehicle delay on E. Wisconsin Avenue and E. Summit Avenue; and 4) this alternative would require the relocation of three residences located in its proposed path between E. High Street and E. Marymere Street. Implementation of this alternative is not recommended.

A fourth alternative route considered as a continuous north-south bypass of the Oconomowoc CBD utilizes Old Tower Road-Valentine Road. This alternative route, which would require the reopening of the Old Tower Road intersection with E. Summit Avenue, would divert approximately 1,000 vpd from the E. Summit Avenue-S. Silver Lake Street-S. Walnut Street-E. Wisconsin Avenue route. The capital cost of this alternative, which would consist of the installation of traffic signals at the intersection of Old Tower Road and E. Summit Avenue and the realignment of the Old Tower Road intersection with E. Summit Avenue and E. Thackery Trail, would be about $180,000.

The advantage of this alternative is the same as that noted for the extension of S. Lapham Street to E. Summit Avenue. This alternative has the additional advantage of encouraging utilization of the grade separation provided by the Valentine Road bridge over the Milwaukee Road trackage. The disadvantages of this alternative are: 1) the use of this route by heavy trucks and buses would be restricted owing to the deteriorated condition of the bridge deck on the Valentine Road bridge—it is estimated that the replacement of this bridge deck would cost an additional $15,000; 2) it would route through traffic over a local land access street, Old Tower Road; 3) it would not provide a direct north-south route between E. Wisconsin Avenue and E. Summit Avenue; and 4) it would increase vehicle delay on E. Summit Avenue. Implementation of this alternative is not recommended.

Construction of a New Arterial Facility: To ameliorate the north-south arterial street spacing deficiency problem, the construction of a north-south arterial across the eastern portion of the study area was considered. As noted in the traffic congestion section of this chapter, this proposed facility would be located within a one-half-mile-wide corridor extending from E. Summit Avenue in the vicinity of E. Thackery Trail northerly to CTH Z, proceeding thence in a westerly direction across the Waukesha County line to an intersection with STH 16 (see Map 25). It is estimated that, if constructed and opened to traffic in 1980, this facility would divert approximately 2,000 vpd from the E. Summit Avenue-S. Silver Lake Street-S. Walnut Street-E. Wisconsin Avenue route through the Oconomowoc CBD. Furthermore, it is estimated that this new facility would divert an additional 1,000 vpd from the Oconomowoc CBD area, primarily from the N. Main Street and N. Oakwood Avenue arterial routes. The capital cost of this alternative would be about $23 million, of which $3 million would be required to construct the proposed segment from E. Wisconsin Avenue to E. Summit Avenue. The advantages of this alternative are the same as those noted for the east-west arterial construction alternative, except that the length of this new facility would be approximately 7.0 miles, with the segment from E. Wisconsin Avenue to E. Summit Avenue comprising approximately 0.8 mile, or 11 percent, of the total.

It is recommended that this alternative be implemented. As stated in the previous section on traffic congestion problems, it is further recommended that the precise location of this facility be placed on the City of Oconomowoc's Official Map to preserve the needed right-of-way in advance of further urbanization in the Oconomowoc area.

Concluding Remarks: In conclusion, there does not appear to be any low-capital traffic management action which will adequately mitigate the north-south arterial spacing deficiency problem which exists in the eastern portion of the Oconomowoc study area. The traffic management actions recommended in the other sections of this chapter should serve to increase the safety and promote the efficient operation of the existing arterial street and highway system. As urbanization and attendant traffic volumes continue to increase in the Oconomowoc study area, the ultimate solution to the problems of arterial street spacing will be the implementation of the recommendation to construct the north-south STH 16 freeway bypass east of the Oconomowoc CBD. As already noted, the City of Oconomowoc should seek to place that facility on the City's Official Map, and thereby preserve the needed right-of-way for the future construction of that facility.

Truck Traffic on Land Access Streets

As discussed in Chapter V, high volumes of truck traffic are using a street in the study area which is intended to function as a land access facility—namely, S. Elm Street between W. Wisconsin Avenue and W. 2nd Street. According to the traffic management standards set forth in Chapter IV, the penetration of residential areas by arterial streets and attendant heavy volumes of through traffic should be avoided.

Traffic Diversion to an Alternative Route: The traffic management action with the potential to solve or mitigate this arterial service problem is the diversion of the truck traffic to another street. Two alternatives were considered with regard to this action. The first calls for shifting the through truck traffic from S. Elm Street to S. Park Street. The capital cost of this alternative, which would consist of regulatory signing to prohibit through truck traffic on S. Elm Street and informational truck route signing on W. Wisconsin Avenue and S. Park Street, would be about $800. The advantage of this alternative is that it would remove the truck traffic from S. Elm Street, shifting that traffic to a facility—S. Park Street—with a wider pavement cross-section—approximately 28 feet wide, compared to 24 feet wide on S. Elm Street. This facility would be better able to accommodate heavy truck traffic. The disadvantage of this alternative is that it does not solve the basic problem,

but instead merely shifts the truck traffic from one land access street to another while slightly increasing the travel time of certain truck trips on W. Wisconsin Avenue. Implementation of this alternative is not recommended.

The second alternative considered would shift the through truck traffic to S. Concord Road. The capital cost of this alternative, which would consist of regulatory signing to prohibit through truck traffic on S. Elm Street, informational truck route signing on W. Wisconsin Avenue and S. Concord Road, and the restriction of parking between the hours of 8:00 a.m. and 4:30 p.m. on the segment of S. Concord Road from W. Wisconsin Avenue to W. 2nd Street, would be about $1,100. Implementation of this alternative would also include the installation of traffic signals at the intersection of W. Wisconsin Avenue and S. Concord Road, which was recommended under the section on traffic congestion problems, at an approximate cost of $32,000. The advantage of this alternative is that it would remove truck traffic from S. Elm Street, shifting that traffic to a facility presently functioning as an arterial street. The disadvantage of this alternative is that it would slightly increase the travel time of certain truck trips on W. Wisconsin Avenue. It is recommended that this alternative be implemented.

Construction of a New Arterial Facility: The construction of a new arterial street west of S. Blain Street and extending in a northerly direction from the City of Oconomowoc industrial park to Chaffee Road was considered to relieve the truck routing problem. The capital cost of this alternative, which would consist of right-of-way acquisition, roadway construction, the installation of railroad crossing protection devices, and the installation of traffic signals at the intersection of Chaffee Road with W. Wisconsin Avenue, would be about $440,000.

The advantages of this alternative are that it would remove through truck traffic from S. Elm Street, shifting such traffic to a new arterial facility which does not penetrate residential areas, and it would shorten the travel times of certain truck trips on W. Wisconsin Avenue. The disadvantage of this alternative is that it would have the potential to increase accident rates because of the construction of an additional at-grade arterial street railroad crossing. Implementation of this alternative is not recommended.

Another new construction alternative considered calls for implementing the previously recommended east-west bypass in the southern portion of the study area and constructing a new collector street from the City of Oconomowoc's industrial park to the east-west bypass. The capital cost of this alternative would be about $120,000 for right-of-way acquisition and construction of the new collector street, plus the $2.4 to $3.1 million cost of constructing the east-west bypass.

The advantages of this alternative are that it would remove through truck traffic from S. Elm Street, reduce the travel time of certain truck trips in the study area, and encourage the separation of through traffic and local traffic. There are no significant disadvantages associated with this alternative. It is, therefore, recommended that this alternative be implemented.

Concluding Remarks: In conclusion, it is recommended that through truck traffic on S. Elm Street be prohibited and that this traffic be temporarily shifted to S. Concord Road through the use of informational truck route signing, the restriction of parking between 8:00 a.m. and 4:30 p.m. on the segment of S. Concord Road from W. Wisconsin Avenue to W. 2nd Street, and the installation of traffic signals at the intersection of W. Wisconsin Avenue and S. Concord Road. In the long range, it is recommended that the east-west bypass south of the Oconomowoc CBD be constructed, as well as a new collector street from the City's industrial park to the east-west bypass facility.

Conflict Between Through and Local Traffic

As discussed in Chapter V, there is a conflict in the study area between through traffic and local traffic. According to the traffic management standards in Chapter IV, the conflict between the movement of through traffic and local traffic within a community should be minimized. The solution to this arterial service problem is directly linked to the problem of an inadequate number of east-west and north-south arterials in the study area. The traffic management actions recommended in this chapter to solve or mitigate the arterial spacing deficiency problems in the Oconomowoc study area consist of the construction of an east-west bypass in the southern portion of the study area, and of a north-south bypass in the eastern portion of the study area. The alternative actions are the same actions which would be considered to resolve the conflict between through

and local traffic. Thus, the conclusions and recommendations of the arterial street spacing problem analysis are further supported by the analysis of the conflict between through and local traffic in the Oconomowoc study area.

Railroad Crossing Vehicle Delays

As discussed in Chapter V, there is excessive vehicle delay and traffic flow interruptions at the crossings of the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks by certain arterial streets in the study area. According to the traffic management standards set forth in Chapter IV, vehicular delays resulting from railroad crossing activity should be minimized.

Traffic Diversion to an Alternative Route: The first alternative traffic management action with the potential to mitigate this arterial service problem is the diversion of vehicular traffic from the existing at-grade arterial street/railroad track crossings in the Oconomowoc CBD to the grade-separated arterial street/railroad crossings located on Valentine Road and Chaffee Road. The capital cost of this alternative, which would consist of informational route signing, would be about $600 for each grade-separated crossing.

This alternative is considered impractical in that the grade separations are too far removed from the Oconomowoc CBD, with Valentine Road being located approximately 0.7 mile east of the CBD and Chaffee Road approximately 1.3 miles west of the CBD, to effectively divert traffic from the arterial street railroad track crossings located in the Oconomowoc CBD. In addition, the Valentine Road bridge is currently posted with a four-ton load limit, which restricts its use to automobile traffic only. Implementation of this alternative is not recommended.

Another traffic diversion action considered was the reopening of the S. Wood Street railroad crossing. The action was discussed under the north-south arterial street spacing deficiency section of this chapter. The capital cost of this alternative would be about $200,000. The implementation of this alternative would not effectively mitigate the railroad crossing problem in the study area. When the arterial street/railroad crossings in the CBD are closed because of the passage of a freight or passenger train, S. Wood Street would similarly be closed to cross traffic. Therefore, the recommendation to not implement this alternative is further supported by this analysis.

Construction of a New Arterial Facility: The traffic management actions recommended in this chapter to solve or mitigate the arterial street spacing deficiency problems in the Oconomowoc study area are the construction of an east-west bypass in the southern portion of the study area and of a north-south bypass in the eastern portion of the study area. These are the same actions considered as new construction alternatives to solve or mitigate the railroad crossing delay problem. The conclusions and recommendations of the arterial street spacing problem analysis are further supported by the analysis of the railroad crossing delay problem.

Three alternative actions in addition to the construction of an east-west and a north-south bypass were considered as potential solutions to the railroad crossing delay problem in the Oconomowoc CBD. The first action involves interconnecting the traffic signals in the Oconomowoc CBD to the railroad crossing gates. The capital cost of this alternative would be about $3,800 per signalized intersection. The advantage of this alternative is that, when the railroad crossing gates are in operation, the traffic signals would be preempted and the east- and westbound traffic on Wisconsin Avenue and E. Summit Avenue provided with a green signal, thus minimizing delays to traffic not desiring to cross the railroad tracks. In addition, immediately prior to and after the operation of the crossing gates, the north- and southbound traffic on Main Street and S. Silver Lake Street would be provided additional green time to reduce congestion and delay on those arterials. The disadvantage of this alternative is that vehicles on the streets intersecting with the railroad tracks which desire to travel east or west and not cross the tracks at the signalized intersection may be trapped in the queue on those streets which receive a stop indication, since the east-west traffic is provided preferential treatment. This disadvantage is exacerbated by the fact that many of the vehicles on E. Summit Avenue desire to travel east or westbound on Wisconsin Avenue, and must cross the railroad tracks to reach their destination. Implementation of this alternative is not recommended.

Another action considered was the replacement of the existing railroad gate actuation equipment, which consists of magnetic detectors and audio frequency overlay (AFO) track circuits, with a constant time warning device. The existing magnetic detectors and AFO track circuits actuate the

railroad crossing gates upon sensing that a train is on the approach track section in the vicinity of the gates. These devices actuate the crossing protection equipment at a preset train distance from the crossing, regardless of the speed of the train. Constant time warning devices have the capability to sense a train in the approach section, measuring its speed and distance, and to set the crossing gate mechanism in operation when the train is at a preset time, usually 20 seconds or more from the crossing. The capital cost of this alternative would be about $15,000 per crossing.

The advantage of this alternative is that it would serve to detect train operations on the track approaches to a street crossing, sensing the speed and direction of the train, so that trains traveling slowly, stopping, or backing up would not actuate the crossing signals. The disadvantage of this alternative is the higher power requirements of the constant warning time devices. It is recommended that this alternative be implemented at the S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road tracks.

Another action considered to solve or mitigate the railroad crossing delay problem in the Oconomowoc CBD is the hiring of an additional railroad employee to manually operate the railroad crossing devices during the 6:00 a.m. to 4:00 p.m. time period. The Milwaukee Road currently employs a person to manually operate the crossing devices during the 4:00 p.m. to 10:00 p.m. time period. The annual cost of this alternative would be about $20,000.

The advantages of this alternative are that the crossing gates could be manually operated during periods of train switching activity in the vicinity of the crossing gate track approaches, and malfunctioning crossing gate actuations could be overridden by the railroad employee. While there are no significant disadvantages associated with this alternative, the annual cost of improved automatic signalization is lower and the reliability of the automatic signalization is believed to be higher. Implementation of this alternative is not recommended.

The final action considered to mitigate the railroad crossing delay problem in the Oconomowoc area is the removal of the stop sign traffic controls at the at-grade gate-protected street crossings with the Milwaukee Road tracks. The capital cost of this alternative, which would consist of removing the stop signs at the Milwaukee Road crossings with S. Elm Street, S. Park Street, S. Concord Road, S. Worthington Street, S. Cross Street, S. Silver Lake Street, and S. Lapham Street (the railroad crossing stop sign control for northbound traffic on S. Lapham Street is not recommended for removal due to the vertical highway alignment problem at that crossing), would be about $650. The advantage of this alternative is that it would reduce vehicle delays and attendant travel times. There are no significant disadvantages to this alternative. It is recommended, therefore, that this alternative be implemented.

Concluding Remarks: In conclusion, the recommendation to construct an east-west and north-south bypass around the Oconomowoc CBD to solve or mitigate the arterial spacing deficiency, the conflict between through and local traffic, and the truck traffic problem on local streets is also recommended to mitigate the railroad crossing delay problem in the Oconomowoc CBD. In addition, it is recommended that constant time warning devices be installed at the S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road tracks and that at the at-grade stop sign traffic controls be removed at selected street crossings of the Milwaukee Road tracks.

Traffic Circulation Problem

In the preceding chapter, poor traffic circulation was identified as an arterial service problem on that segment of N. Lake Road from Wisconsin Avenue to E. Lisbon Road. According to the traffic management standards set forth in Chapter IV, the design of alternative traffic management actions should provide for the efficient movement of people and goods within a community.

Traffic Diversion to an Alternative Route: The first alternative traffic management action with potential to mitigate this arterial service problem calls for the diversion of traffic which finds itself northbound on N. Lake Road but desires to travel southbound to reach the CBD, and therefore makes a "U-turn" in this segment. This alternative consists of diverting U-turn traffic northbound on N. Lake Road to E. Lisbon Road and then to E. Pine Street to turn around and proceed southbound on N. Lake Road. The capital cost of this alternative, which would consist of informational signing and regulatory "No U-Turn" signing, would be about $600. The advantages of this alternative are that it would reduce the U-turn activity on N. Lake Road and provide a route for northbound traffic to use as a turnaround to redirect itself in a southbound direction. The disadvantage of this

alternative is that it would increase travel times and miles of travel of certain vehicle trips in the study area. Implementation of this alternative is not recommended.

Construction of a New Arterial Facility: This alternative calls for constructing a turnaround facility on N. Lake Road in the vicinity of E. Rockwell Street. The capital cost of this alternative would be about $50,000.

The advantage of this alternative is that it would concentrate U-turn activity at a given location designed to accommodate that traffic movement. The disadvantages of this alternative are that it has the potential to increase accident rates on N. Lake Road by encouraging U-turn activity on an arterial street, and it would not be compatible with the aesthetic quality and visual relation of the land and residential development adjacent to N. Lake Road. Implementation of this alternative is not recommended.

An additional alternative traffic management action having potential to mitigate the U-turn problem on N. Lake Road is the prohibition of parking on the east side of N. Lake Road. It is estimated that many of the vehicles making the U-turn maneuver from north- to southbound do so after parking on the east side of N. Lake Road to shop at the commercial establishments located in the Oconomowoc central business district, and/or use the library services located on the west side of N. Lake Road. The capital cost of this alternative, which would consist of the installation of regulatory signing, would be about $300. The advantage of this alternative is that it would remove a contributory source of the problem of U-turn movement. The disadvantage of this alternative is that it would remove parking spaces from a location that has a heavy demand for short-term parking, which has been identified as inadequate in the Oconomowoc central business district. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it does not appear that there are any traffic management actions which will solve or mitigate the traffic circulation problem on N. Lake Road. This problem is primarily attributed to the restriction in alternative routes immediately north of the Oconomowoc central business district because of the transportation barriers posed by the location and size of Lac La Belle and Fowler Lake. Since this arterial service problem does not contribute to the accident problem on N. Lake Road, it would appear to be more of an inconvenience to motorists and nuisance problem to residents on N. Lake Road. Without a viable alternative solution, the posting of "No U-Turn" restrictions on N. Lake Road or E. Rockwell Street would not appear to ameliorate the problem.

Summary

The arterial service problems presented in this chapter investigated the causes of the problems, evaluated alternative traffic system management actions which would solve or mitigate those problems, and recommended for implementation those alternatives judged best. The arterial service problems in the Oconomowoc study area are a result of arterial street spacing deficiencies; arterial traffic using land access streets; conflicts between through traffic and local traffic; vehicle delays from railroad crossing activity; and a poor traffic circulation pattern in the Oconomowoc central business district. Table 26 summarizes the traffic management recommendations resulting from the analysis, and indicates the capital costs of implementing each alternative and the effects that the recommended actions may be expected to have on vehicular air quality emissions and fuel consumption. A total of 9 recommended traffic management actions are contained in Table 26. The construction of the east-west bypass in the southern portion of the study area and the north-south bypass in the eastern portion of the study area is the basic recommendation to solve all of the arterial service problems in the Oconomowoc study area, except the traffic circulation problem on N. Lake Road, for which there is no recommended solution. Except for the delineation of a bypass route on W. 2nd Street and S. Concord Road, the restriction of heavy trucks from S. Elm Street, and the installation of constant time warning devices on the Milwaukee Road tracks at S. Main Street and S. Silver Lake Street, there are no low-capital traffic management actions that will substitute for the construction of the two bypass routes across the study area.

VEHICULAR PARKING SUPPLY PROBLEM ANALYSIS

As noted in Chapter V, a parking supply problem exists in the Oconomowoc central business district (CBD). There is an inadequate supply of short-term on-street parking space, and of both short- and long-term off-street parking space in the South and Fowler public parking facilities. This parking supply problem is reflected by the number of

Table 26

SUMMARY OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE ARTERIAL SERVICE PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem	Recommended Traffic Management Actions	Capital Cost	Effect on Vehicular	
			Emissions	Fuel Consumption
East-West Arterial Street Spacing Deficiency	● Officially map and construct east-west bypass	$2.4 to $3.1 million	Reduction	Reduction
	● Delineate downtown bypass route on W. 2nd Street and S. Concord Road	600	--	--
	● Install traffic signals at the intersection of W. Wisconsin Avenue and S. Concord Road	32,000	--	--
North-South Arterial Street Spacing Deficiency	● Officially map and construct north-south STH 16 freeway bypass	$23 million	Reduction	Reduction
Truck Traffic on Land Access Streets	● Restrict trucking on S. Elm Street, divert truck traffic to S. Concord Road, and restrict parking on S. Concord Road	$ 1,100	--	--
	● Install traffic signals at the intersection of W. Wisconsin Avenue and S. Concord Road	--[a]	--	--
	● Construct new land access street from Oconomowoc Industrial Park to proposed east-west bypass	120,000	Reduction	Reduction
Conflict Between Through and Local Traffic	● Officially map and construct east-west and north-south bypasses	$2.4 to $3.1 million and $23 million	Reduction	Reduction
Railroad Crossing Vehicle Delays	● Officially map and construct east-west and north-south bypasses	$2.4 to $3.1 million and $23 million	Reduction	Reduction
	● Install constant time warning devices at S. Main Street and S. Silver Lake Street crossing of the Milwaukee Road tracks	30,000	Reduction	Reduction
	● Remove stop signs at selected Milwaukee Road at-grade street crossings	650	Reduction	Reduction
Traffic Circulation	● No recommendations	--	--	--

[a] *Traffic signal installation cost at intersection of STH 16 with S. Concord Road included in east-west arterial street spacing deficiency cost.*

Source: SEWRPC.

parking stalls in the central business district (CBD) with occupancy rates exceeding the maximum desirable occupancy rate standard of 85 percent set forth in Chapter IV. The alternative traffic management actions which have the potential to solve or mitigate the parking supply problem are: 1) modification of existing parking restrictions; 2) addition of on-street parking space at selected locations; and 3) construction of additional off-street parking facilities. The first two actions are applicable to the on-street parking problems, and all three actions are applicable to the off-street parking problems. The following analysis of the Oconomowoc CBD parking problem sets forth the approximate cost, the advantages and disadvantages, and a recommendation with respect to the

implementation of each alternative traffic management action. The recommended actions for the on-street and off-street parking supply problem are tabulated and summarized with capital cost data at the end of this section. It should be noted that all of the alternative actions analyzed in this section would have a positive, although minor, effect on vehicular air quality emissions and fuel consumption, reducing such emissions and consumption slightly.

On-Street Parking Supply Problem

There are currently 200 on-street parking stalls in the Oconomowoc CBD. Thirty, or 15 percent, of these stalls violate the 85 percent parking stall occupancy rate standard. The parking stalls which exceed the standard are located along the east and west side of N. Main Street from Wisconsin Avenue to the Lac La Belle/Fowler Lake Bridge (16 stalls); along the west side of S. Main Street from W. South Street to Wisconsin Avenue (5 stalls); along the west side of N. St. Paul Street from the Fowler public parking facility driveway to E. Pleasant Street (2 stalls); and along the west side of S. Silver Lake Street from E. Collins Street to E. Wisconsin Avenue (7 stalls).

Modification of Existing Parking Restrictions: The first alternative parking restriction modification with the potential to mitigate the on-street parking supply problem in the Oconomowoc CBD is the changing of the parking restrictions on N. St. Paul Street. This alternative calls for changing the 15-minute parking restriction on the east side of N. St. Paul Street, blockface 15 on Map 19 in Chapter III, to a one-hour restriction. The capital cost of this alternative, which would consist of the installation of parking meters and regulatory signing changes, would be about $600. The advantage of this alternative is that three one-hour parking stalls would be added in the vicinity of the 17 and 22 one-hour restricted stalls on either side of E. Wisconsin Avenue from Main Street to N. St. Paul Street, which experienced average parking stall occupancy rates of 0.74 and 0.68, respectively; and in the vicinity of the 72 two-hour restricted stalls in the Fowler public parking facility, which experienced an average parking stall occupancy rate of 0.82. The disadvantage of this action is that it would reduce the number of 15-minute parking stalls adjacent to the Oconomowoc City Hall. Currently there are four other 15-minute parking stalls adjacent to City Hall, two along N. St. Paul Street and two in the Fowler facility. These four parking stalls have not been fully utilized, as evidenced by their 12 percent average vehicle occupancy rates. The average vehicle occupancy rate of the three stalls proposed to be changed to one-hour restricted stalls was 25 percent. It is, therefore, recommended that this alternative be implemented.

A second parking restriction modification alternative calls for changing the two-hour parking area on the south side of E. Collins Street, blockface 17 on Map 19 in Chapter III, to an unrestricted all-day parking area. The capital cost of this alternative, which would consist of the removal of existing parking meters and regulator signing changes, would be about $500. The advantage of this alternative is that it would add 15 all-day parking stalls in the vicinity of the 84, 12-hour restricted stalls of the South public parking facility, which experienced an average vehicle occupancy rate of 89 percent. The disadvantage of this alternative is that it would reduce the number of short-term one- and two-hour stalls in the CBD. The 15 two-hour stalls along E. Collins Street, which are located along the boundary of the CBD, were not fully utilized as short-term restricted stalls, as evidenced by their 12 percent average vehicle occupancy rate. It is, therefore, recommended that this alternative be implemented.

The final parking modification alternative calls for reducing the one-hour parking restrictions along N. Main Street or E. Wisconsin Avenue to 30-minute restrictions. The capital cost of this alternative, which would consist of parking meter and regulatory signing changes, would be about $600. The advantage of this alternative is that it would increase the utilization of the existing one-hour parking stalls by encouraging a higher parking stall turnover rate. The existing parking stall turnover rate on N. Main Street and E. Wisconsin Avenue ranges from a low of 2.2 to a high of 3.2 vehicles per stall during the parking study survey time period of 10:00 a.m. to 3:00 p.m.—a very good parking stall turnover for the five-hour survey period. The disadvantage of this alternative is that it would increase interference with traffic on N. Main Street and E. Wisconsin Avenue, thus possibly raising the level of traffic congestion and increasing the number of accidents involving parked vehicles. Since both of these roadway segments are identified as high-accident problem areas, implementation of this alternative is not recommended.

Addition of On-Street Parking Space at Selected Locations: The first alternative with the potential to solve or mitigate the parking supply problem in the Oconomowoc CBD through the addition of

on-street parking space calls for changing the all-day parking restriction along the north side of W. South Street in the vicinity of the Post Office to a 15-minute restriction. The capital cost of this alternative, which would consist of parking meter and regulatory signing installation, would be about $600. The advantage of this alternative is that it would increase the number of 15-minute parking stalls at this location from five to eight. The average vehicle occupancy rate at the five 15-minute parking stalls along S. Main Street is 85 percent. The addition of three 15-minute restricted stalls along W. South Street should reduce the heavy demand on the 15-minute stalls along S. Main Street and thereby ameliorate the high accident problem at that location. The disadvantage of this alternative is that it would reduce the vehicular capacity of W. South Street, which has a 36-foot-wide pavement at its intersection with S. Main Street. The disadvantage can be offset by allowing 15-minute parking at this location only between the hours of 8:00 a.m. and 3:30 p.m. It is, therefore, recommended that this alternative be implemented.

A second parking addition alternative calls for changing the all-day parking restriction area (no parking) along the north side of E. Collins Street between S. Cross Street and S. Silver Lake Street to an unrestricted, all-day parking area. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $100. The advantage of this alternative is that 15 parking stalls would be added to the supply of on-street, all-day parking in the vicinity of the 84, 12-hour restricted stalls of the South public parking facility, which experienced an average occupancy rate of 89 percent. The disadvantage of this alternative is that the vehicular capacity of E. Collins Street, which has a 33-foot-wide pavement, would be reduced. In addition, implementation of this alternative would interfere with the access to the private off-street parking facility at this location. Implementation of this alternative is not recommended.

Another parking addition alternative calls for changing the all-day parking restriction area along the west side of S. Cross Street from the South public parking facility driveway on S. Cross Street to E. Collins Street to an unrestricted, all-day parking area. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $100. The advantage of this alternative is that six all-day parking stalls would be added to the supply of on-street parking in the vicinity of the 84, 12-hour restricted stalls of the South public parking facility, which experiences an average vehicle occupancy rate of 89 percent. The disadvantage of this alternative is the vehicular capacity of S. Cross Street, which has a 33-foot-wide pavement, and which serves as a collector street for vehicles using the South public parking facility, would be reduced. It is recommended that this alternative be implemented.

The final parking addition alternative calls for changing the all-day parking restrictions along the north side of W. Wisconsin Avenue from Main Street to S. Church Street, along the north and south side of E. Wisconsin Avenue from S. Silver Street to N. Fowler Street, and along the east side of S. Main Street from Wisconsin Avenue to E. Collins Street. These locations are grouped together because the advantages and disadvantages of adding parking space at these locations are similar. The advantage of this alternative is that the supply of on-street short-term parking along the principal arterials traversing the Oconomowoc CBD would be increased. The disadvantage is that vehicular capacity on the respective roadway segment would be reduced and the conflict between high volumes of traffic and parked vehicles would increase, thus increasing the potential for accident problems. Since all of these locations are adjacent to or identified as high accident problem areas, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the parking restriction on the east side of N. St. Paul Street be changed from a 15-minute limit to a one-hour limit, and that the south side of E. Collins Street be changed from a two-hour parking area to an all-day unrestricted parking area. It is also recommended that the number of on-street parking stalls be increased by removing the all-day parking restrictions both on the north side of W. South Street to allow for three 15-minute parking stalls between the hours of 8:00 a.m. and 3:30 p.m. and on the west side of S. Cross Street to allow for six unrestricted all-day parking stalls.

Off-Street Parking Supply Problem

There are currently 422 off-street public parking stalls in the Oconomowoc CBD. Violation of the 85 percent parking stall occupancy rate standard occurs at 214, or 51 percent, of these stalls. The parking stalls exceeding the standard include the 84, 12-hour stalls in the South parking facility,

the 72 two-hour stalls and the 35 eight-hour stalls in the Fowler parking facility, and the 23 two-hour stalls in the Legion parking facility. The average 10:00 a.m. to 3:00 p.m. occupancy rates for all parking stalls in these facilities are: for the South parking facility, 83 percent, which is approximately at the 85 percent standard; for the Fowler parking facility, 87 percent, which is over the standard; and for the Legion parking facility, 65 percent, which is below the standard.

Modification of Existing Parking Restrictions: The first alternative parking restriction modification with potential to solve or mitigate the off-street parking supply problem in the Oconomowoc CBD is the changing of the short- and long-term parking restrictions in the South public parking facility. This alternative calls for changing the parking restriction on six of the short-term, two-hour, restricted stalls to a long-term 12-hour restriction, thereby increasing the number of long-term parking stalls from 84 to 90. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $200. This alternative has the advantage of better balancing the average parking stall occupancy rates between the short- and long-term stalls in the South parking facility by increasing the number of long-term stalls, thereby lowering the long-term parking stall average occupancy rate below the 85 percent standard without raising the short-term parking stall occupancy rate above that standard. The disadvantage of this alternative is that it does not decrease the average overall occupancy rate for the South parking facility. Should parking demand increase, the overall occupancy rate for the South parking facility would exceed the 85 percent standard. Implementation of this alternative is not recommended.

The other parking restriction modification alternative considered is changing the short- and long-term parking restrictions in the Fowler public parking facility. This alternative calls for changing the parking restriction on 10 of the long-term, eight-hour restricted stalls to a short-term, two-hour restriction. The capital cost of this alternative, which would consist of parking meter changes and regulatory signing changes, would be about $300. The advantage of this alternative is that the supply of short-term parking stalls would be increased, with the resultant effect of lowering the short-term parking stall hourly occupancy rate below the 85 percent standard. The disadvantage of this alternative is that it would increase the shortage of long-term parking stalls in the Fowler lot, which currently experience a 100 percent occupancy rate. This disadvantage is offset by the fact that the 58 long-term unrestricted parking stalls on E. Pleasant Street, which experience an average occupancy rate of only 23 percent, could provide a convenient substitute for the displaced long-term parking space. It is, therefore, recommended that this alternative be implemented.

Addition of On-Street Parking Stalls at Selected Locations: As previously stated, the changing of the existing two-hour parking restriction area on E. Collins Street to an unrestricted all-day parking location would add 15 long-term parking stalls in the vicinity of the South public parking facility. This recommendation is further supported by the fact that there is an inadequate supply of long-term parking stalls in the South public parking facility.

Construction of Additional Off-Street Parking Facilities: The first alternative action involving the construction of additional facilities to solve or mitigate the off-street parking supply problem in the Oconomowoc CBD calls for constructing a new off-street surface public parking lot. The capital cost of this alternative would be about $700 per parking stall, plus the cost of land required for the lot. The advantage of this alternative is that the number of both short- and long-term parking stalls in the Oconomowoc CBD would be increased. The disadvantages of this alternative are that the new parking stalls would be located beyond the recommended 600-foot walking distance to the CBD commercial establishments for 90 percent of the parkers if the additional stalls were constructed adjacent to the CBD boundary, and that some of the commercial establishments the alternative is intended to serve would have to be razed if the new lot were constructed within the CBD area. Implementation of this alternative is not recommended.

Another alternative which would increase the number of off-street parking stalls through the construction of a surface public parking lot calls for locating such a facility on the site of the Lakeland Oldsmobile garage facility, located in the center of the South public parking facility. The capital cost of this alternative would be about $20,000, plus the cost of purchasing, relocating, and razing the Lakeland garage. The advantage of this alternative is that it would add about 30 parking stalls to the existing 145 parking stalls in the South public parking facility, and it would allow

for the more orderly layout of parking stalls in that facility. The disadvantage of this alternative is that it would require one of the commercial establishments the new parking was intended to serve to be razed. Implementation of this alternative is not recommended. Should Lakeland Oldsmobile decide to relocate, the City of Oconomowoc should consider purchasing the property for additional short-term parking in the South public parking facility.

The final construction alternative calls for constructing an off-street parking structure with approximately 300 parking stalls on the existing location of the South or Fowler public parking facilities. The capital cost of this alternative would be about $1.2 million. The advantage of this alternative is that the number of short- and long-term parking stalls in the Oconomowoc CBD would be increased. In addition, parking stalls would be located where the heaviest demand for CBD parking currently exists. The disadvantage of this alternative is that it would increase the proportion of off-street parking to 78 percent of the total number of parking stalls in the Oconomowoc CBD. It is recommended that this alternative be implemented. The precise number and location of parking stalls included in this recommendation should be determined in the preliminary engineering design of the parking structure.

Concluding Remarks: In conclusion, it is recommended that the parking restriction on 10 of the long-term, eight-hour restricted stalls in the Fowler public parking facility be changed to a short-term, two-hour restriction. It is also recommended that a parking structure with approximately 300 parking stalls be constructed at the South or Fowler public parking facilities.

Summary

The preceding parking supply problem analysis has investigated the shortage of short- and long-term parking stalls, evaluated alternative traffic management actions to solve or mitigate the problem, and recommended for implementation those alternative actions best suited to solve the Oconomowoc CBD parking problems. Both on-street and off-street parking problems were studied as a part of the analysis. Table 27 summarizes the traffic management recommendations based on this analysis, and indicates the number of parking stalls effected and

Table 27

SUMMARY OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE PARKING SUPPLY PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Action	Number of Parking Stalls	Capital Cost
East Side of N. St. Paul Street	● Change parking restriction from 15-minute to one-hour and install three parking meters	3	$ 600
South Side of E. Collins Street	● Remove two-hour parking restriction to allow all-day unrestricted parking	15	500
North Side of W. South Street	● Change all-day parking restriction to allow three metered, 8:00 a.m. to 3:30 p.m., 15-minute restricted parking spaces	3	600
West Side of S. Cross Street	● Remove all-day parking restriction to allow all-day unrestricted parking south of South public parking facility entrance	6	100
Fowler Public Parking Facility	● Change 10 of the eight-hour parking stall restrictions to two-hour restrictions	10	300
South or Fowler Public Parking Facility	● Construct a parking structure	300	1,200,000

Source: SEWRPC.

the capital cost of implementing each alternative. A total of six recommended traffic management actions are set forth in the table.

TRAFFIC ACCIDENT PROBLEM ANALYSIS

As noted in Chapter V, there are 20 high motor vehicle accident problem locations on the arterial street and highway system in the Oconomowoc study area. These accident problem locations, along with the total number of accidents which occurred in 1977 and 1978 at each location, are listed in Table 28. Included in Table 28 is an indication of the predominant type of collision involved in these accidents and a range of alternative traffic management actions which have proven to be successful in reducing each type of collision. The alternative actions are classified into seven categories: 1) traffic signals, 2) street lighting, 3) signing, 4) pavement markings, 5) construction, 6) regulation, and 7) other. Applications of one or more of the traffic management actions indicated in Table 28 for a specific collision type should reduce the number and/or severity of accidents at each location. The following analysis for each of the 20 accident problem locations sets forth the approximate cost and the advantages and disadvantages and a recommendation with respect to the implementation of each alternative traffic management action. The recommended actions for each accident problem location are tabulated and summarized with capital cost data, and with an evaluation of their effect on vehicular air quality emissions and fuel consumption, at the end of this section.

Main Street and Wisconsin Avenue

The predominant collision patterns experienced at this signalized intersection involved vehicles turning left into the opposing traffic stream and colliding with oncoming vehicles—14 accidents—and vehicles colliding into the rear of stopped vehicles—12 accidents. These two collision types, therefore, accounted for 26, or 67 percent, of the total 39 accidents at this location in calendar years 1977 and 1978. Fifteen, or 38 percent, of the accidents occurred at night.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the left-turn accident problem at this intersection include: the provision of a separate left-turn phase in the existing traffic signal cycle; improved street lighting; pavement markings for turning guidelines; construction of separate turning channels or lanes; and the prohibition of left turns. Of the 14 left-turn accidents at this intersection, 10 accidents involved vehicles traveling in a north-south direction on Main Street. Eight, or 53 percent, of the nighttime accidents at this intersection involved left-turning vehicles.

The capital cost of the first alternative—the provision of a left-turn phase in the existing traffic signal cycle—would be about $400. As shown on Map 16 in Chapter III, the peak-hour, left-turning vehicle movement on Main Street was 149 vehicles per hour (vph), with an opposing traffic volume of 124 vph, indicating a high level of conflicting vehicle movements. The provision of a separate left-turn phase in the traffic signal cycle at this location would facilitate the unopposed movement of the left-turning vehicles through the intersection, thereby reducing the number of vehicular conflicts. A disadvantage of this alternative is that the green cycle time currently utilized by other vehicular movements through the intersection would be reduced. This disadvantage is further compounded by the fact that the westbound and eastbound approaches to the intersection, as mentioned in Chapter III, have been operating at and over design capacity, respectively. An analysis of the peak-hour traffic volumes at this intersection indicates that the level of congestion at the intersection approach would be increased by the addition of a turning phase in the traffic signal sequence. Therefore, the installation of a separate turning phase in the traffic signal sequence at this intersection is not recommended.

The second alternative—improved street lighting at this intersection—would consist of the installation of an overhead light on each of the four corners of the intersection. The installation of an upgraded street lighting system at this intersection would improve lighting conditions. The capital cost of this alternative would be about $3,500. As previously noted, 53 percent of the left-turn accidents which occurred at this intersection occurred at night. This is an above-average number of nighttime accidents. The advantage of improved street lighting at this location is that it would provide for the safer and more efficient flow of traffic through the intersection during hours of darkness. There are no significant disadvantages to this alternative. Therefore, it is recommended that the street lighting at this intersection be improved.

Table 28

ALTERNATIVE TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE MOTOR VEHICLE ACCIDENT PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Number of Accidents 1977 and 1978	Type	Number	Traffic Signals					Street Lighting	Signing		Pavement Markings			Construction			Regulations			Other
				Install Traffic Signals	Modify Existing Signals[a]	Separate Turning Phase	Revise Signal Sequence	Retime Signal Sequence	Improve Street Lighting	Increase Size of Signs	Install Advance Warning Signs	Install Limit Lines	Install Advance Markings	Apply Turning Guidelines	Widen Roadway	Install Island or Channelization	Remove View Obstructions	Prohibit Turns	Prohibit Parking	Reduce Speed Limits	
Main Street and Wisconsin Avenue	39	Left turn into opposite Rear End	14 12		 X	X		 X	X X		 X			X		X		X			--
E. Summit Avenue and E. Thackery Trail	23	Right angle Rear end Left turn into opposite	10 5 5	X					X X X		 X			 X				 X		X	--
E. Wisconsin Avenue and Walnut Street	23	Right angle Left turn into opposite	8 5		X	 X	X X		 X				X	 X		X		X			--
E. Wisconsin Avenue and CTH P	17	Rear end	10					X	X		X		X							X	--
E. Wisconsin Avenue and S. Silver Lake Street	15	Rear end	7		X			X			X										--
S. Main Street and W. South Street	14	Parked car	7								X		X		X				X		--
E. Summit Avenue and E. Armour Road	12	Rear end Right angle	4 3		X X				X X							X					--
E. Summit Avenue and S. Silver Lake Street	12	Rear end	6		X		X		X			X									--
E. Summit Avenue and CTH B	11	Right angle	6	X					X		X									X	--
E. Summit Avenue and E. Forest Street	11	None	--																		Skidproof roadway
S. Main Street, W. 2nd Street, and E. Summit Avenue	10	Right turn	6										X	X				X	X		Prohibit trucks; restrict driveway operation
E. Forest Street and S. Silver Lake Street	6	Right angle	3	X					X		X	X									--
E. Wisconsin Avenue-Main Street to St. Paul Street	31	Rear end Right angle Sideswipe	9 8 7							 X	X						 X		 X X		Restrict driveway operation Restrict driveway operation
E. Wisconsin Avenue-N. Fowler Street to N. Thompson Street	28	Rear end Right turn Wrong lane Left turn into opposite	11 6 6												X	X X X		X X X			--
N. Main Street-E. Rockwell Street to Wisconsin Avenue	14	Parked car	7																X		--
E. Summit Avenue-S. Silver Lake Street to S. Westover Street	13	Rear end	9								X										Skidproof roadway
E. Wisconsin Avenue[b]-Plank Road to CTH P	13	Rear end	9						X						X	X		X		X	Skidproof roadway
E. Summit Avenue-E. Maple Lane to E. Thackery Trail	8	Right angle	3						X											X	--
E. Wisconsin Avenue-N. Thompson Street to S. Wood Street	5	None	--																		Skidproof roadway

[a] *Increase lens size or relocate signal heads with mast arms or backboards.*

[b] *The midblock accidents listed in Table 19 of this report are combined to indicate the predominant collision type at 36833 and 36933 E. Wisconsin Avenue, which are adjacent accident problem areas.*

There are currently no left-turn pavement marking guidelines at this intersection. The annual cost of the alternative calling for such guidelines would be about $100 per approach. Pavement markings provide for the ready identification of traffic lanes and the facilitation of orderly traffic flow through an intersection. This is especially advantageous at intersections with wide approaches and one or two predominant turning movements. The disadvantage of turning guidelines at an intersection is that they can confuse drivers desiring to make other movements across the intersection; i.e., turning guidelines for all four left-turn movements through an intersection would be difficult to separate and identify. It is recommended that the south to west turn movement, which exceeds all other left-turn volumes by about 17 percent at this intersection, be identified with pavement marking guidelines.

Traffic islands or channelized turning lanes provide benefits similar to those of pavement marking guidelines, but in a more positive manner, by physically separating traffic movements at an intersection. The capital cost of constructing a traffic island or channelized turning lane is about $10,000 per approach. Traffic islands or channelized turning lanes are particularly applicable at wide approach intersections with heavy turning movements. The main disadvantage of this alternative is that it would reduce the usable roadway approach width at the intersection, which would result in reduced roadway capacity. Because of the narrow roadway approach widths at this intersection—23 feet from the north and south, 24 feet from the east, and 22 feet from the west—and the existing over and at design capacity operation of the east- and westbound approaches, to this intersection, respectively, implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the left-turn accident problem at this intersection is the prohibition of left turns. The capital cost of implementing this alternative, which would consist of regulatory signing, would be about $200 per approach. This alternative would eliminate the possibility of left-turn collisions and increase intersection capacity for through and right-turn traffic movements. The disadvantage of this alternative is that it would increase turning movement volumes at other intersections in the study area as drivers alter travel patterns to reach their trip destinations. This would result in increased trip lengths, travel times, accidents, and fuel consumption. Because of the lack of available alternative routes through the Oconomowoc central business district and the intersection of the two principal state trunk highways through the study area at this location, implementation of this alternative is not recommended.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem at this intersection include the modification of the traffic signals, retiming of the traffic signals, improved street lighting, and the installation of "signal ahead" warning signs. The 12 rear-end collisions which occurred at this intersection in 1977 and 1978 were evenly distributed on all four approaches to the intersection.

The first alternative—modification of the traffic signals—would consist of adding backboards and/or black signal faces to the signal heads and/or placing the signals on mast arms extended over the roadway. The capital cost of adding backboards or block signal faces to the signal heads would be about $100 per signal, and the capital cost of placing the signals on mast arms would be about $2,200 per signal. The advantage of using backboards and mast arms is that they increase the visibility of the traffic signal to motorists, thereby aiding the motorist in identifying and obeying the signal. Mast arms are particularly effective at wide-approach intersections or on rural high-speed arterials. There are no significant disadvantages to this alternative. It is not recommended that the signals be placed on mast arms, but it is recommended that backboards and/or black signal faces be used where appropriate on all traffic signal heads at this intersection.

Traffic signal timing plans are designed to proportionally match vehicular traffic demand to the phases in the signal sequence. There is no capital cost involved in retiming traffic signals. The advantage of retiming traffic signals is that, as traffic patterns change, the traffic signal phases are changed to more efficiently accommodate the new traffic volumes. This reduces the number of stopped vehicles and minimizes delays experienced by drivers at signalized intersections, thereby decreasing overall vehicular travel times. There are no significant disadvantages to retiming traffic signal sequences. Therefore, it is recommended that the traffic signal timing plan designed in the traffic congestion problem analysis section of this chapter be implemented to ameliorate the rear-end collison problem at this intersection.

Traffic signals, if part of a progressive system, can reduce the number of stops experienced by vehicles at signalized intersections. The capital cost of interconnecting traffic signals to provide for a progressive system is approximately $2,000 per signalized intersection. The advantage of interconnecting traffic signals is that it ensures the facilitation of traffic flow on the arterial streets and highways. Platoons of vehicles traveling in a progressive system can maintain continuous movement through the system. There is no significant disadvantage to interconnecting traffic signals. Therefore, it is recommended that the traffic signal interconnection system designed in the traffic congestion problem analysis section of this chapter be implemented to ameliorate the rear-end accident problem at this intersection.

As stated in the left-turn accident analysis for this intersection, the existing street lighting at this intersection should be improved to provide for safer nighttime travel. This recommendation is further supported by the fact that 3, or 20 percent, of the 15 nighttime accidents at this intersection involved rear-end collisions.

The installation of advance warning signs, specifically "signal ahead" signs, is another alternative solution to the rear-end accident problem at this signalized intersection. The capital cost of placing "signal ahead" signs on all four approaches to this intersection would be about $400. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead, and are normally reserved for use on arterial streets that have continuous uninterrupted segments with occasional traffic sign or signal-controlled intersections. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. The installation of "signal ahead" warning signs at this intersection is not recommended.

Concluding Remarks: In conclusion, it is recommended that the street lighting at this intersection be improved; that a south to west left-turn pavement marking guideline be painted; that backboards and/or black signal faces be added to the traffic signal heads controlling the intersection; and that the traffic signals at this intersection be retimed and interconnected with the other traffic signals in the Oconomowoc central business district.

E. Summit Avenue and E. Thackery Trail

The accident history shown in the collision diagram for this intersection (see Appendix E) reflects the original operation of this intersection as a four-legged intersection. This intersection was recently changed to a three-legged intersection with the closure to traffic of the westbound approach to the intersection. This closure should reduce the number of right-angle accidents at this intersection. The accident problem analysis for this intersection considers this change. The predominant accident collision pattern experienced at this nonsignalized intersection involved vehicles colliding at right angles—10 accidents—vehicles colliding into the rear of stopped vehicles—5 accidents—and vehicles turning left into the opposing traffic stream and colliding with oncoming vehicles—5 accidents. These three collision types, therefore, accounted for 20, or 87 percent, of the total 23 accidents at this intersection in calendar years 1977 and 1978. Eight, or 35 percent, of the accidents occurred at night.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem at this intersection include installing traffic signals, improving street lighting, and reducing the existing speed limit. Four, or 40 percent, of the right-angle accidents at this intersection in calendar years 1977 and 1978 occurred at night.

The capital cost of the first alternative—the installation of traffic signals—would be about $31,100. The principal advantage of this alternative is that it would stop oncoming traffic and provide for the more orderly movement of traffic, both vehicular and pedestrian, through the intersection, thereby reducing the frequency of right-angle accidents. The disadvantage of this alternative is that it would increase vehicle delay by stopping vehicles which previously were uncontrolled; e.g., vehicles using E. Summit Avenue. However, this overall delay would be minimized by the fact that the signal, conversely, would reduce vehicle delay experienced by vehicles on E. Thackery Trail attempting to enter the uncontrolled traffic on E. Summit Avenue. According to the Manual on Uniform Traffic Control Devices, a traffic signal can be installed at this intersection based on Warrant No. 2, "Interruption of Continuous Traffic," and Warrant No. 6, "Accident Experience." Therefore,

it is recommended that traffic signals be installed at this intersection.

Street lighting at this intersection consists of an overhead light located on the southwest corner of the intersection. The street lighting could be upgraded by providing for lighting on the E. Summit Avenue approaches. The capital cost of this alternative would be about $9,000. As previously noted, 40 percent of the right-angle accidents at this location occurred at night. This is an above-average number of nighttime accidents. The advantage of improved street lighting at this intersection is that it would provide for the safer and more efficient flow of traffic through the intersection. Currently, the roadway cross-section at this intersection changes from a rural 48-foot divided highway to an urban 44-foot undivided street. Improved street lighting would aid the motorists in making this transition from rural to urban driving conditions. There are no significant disadvantages to this alternative. Therefore, it is recommended that street lighting be provided on the E. Summit Avenue approaches to this intersection.

The final alternative traffic management action suggested to solve the right-angle accident problem at this intersection is the reduction of the posted speed limit. The posted speed on E. Summit Avenue at the intersection is 35 miles per hour (mph), which increases to 45 mph approximately 600 feet south of the intersection. The capital cost of reducing the speed limit, which would consist of regulatory signing changes, would be about $400. As in all regulatory procedures, the limits imposed on highway speeds should be reasonable and appropriate. An important basis for establishing the proper speed limit on any street or highway is the nationally recognized "85th percentile speed"—that is, the speed at or below which 85 percent of the observed traffic is moving. Factors used to supplement the "85th percentile speed" in establishing speed limits are accident experience and traffic volume. The collision pattern of accidents at this intersection involves right-angle collisions, the severity of which can be reduced through a lower intersection approach speed. The safe movement of pedestrians and motor vehicles desiring to cross, enter, or exit the main traffic flow on E. Summit Avenue would be enhanced by reducing the speed limit to 35 mph on E. Summit to approximately E. Lexington Avenue. This speed limit reduction would be further supported by the installation of the previously recommended traffic signals, which would provide for more uniform speeds and a lower rate of deceleration of vehicles required to stop for the proposed signal. The disadvantages of this alternative are that speed limits would have to be enforced, as drivers may have a tendency to drive at a speed higher than that posted because of the rural and suburban character of the land development adjacent to E. Summit Avenue south of this intersection. It is recommended that this alternative be implemented.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem at this intersection include improving street lighting and installing advance warning signs. As stated in the right-angle accident problem analysis for this intersection, it is recommended that street lighting be installed on the E. Summit Avenue approaches to this intersection. The installation of advance warning signs, specifically "signal ahead" signs, would be desirable in conjunction with the traffic signal installation previously recommended for this intersection. The capital cost of advance warning signs is approximately $200. Both of these alternative traffic management actions should reduce the frequency and severity of motor vehicle accidents at this intersection.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the left-turn accident problem at this intersection include improved street lighting, pavement markings for turning guidelines, and the prohibition of left turns. As stated in the right-angle and rear-end accident problem analysis for this intersection, it is recommended that street lighting be installed on the E. Summit Avenue approaches to this intersection.

There are currently no left-turn pavement marking guidelines at this intersection. The annual cost of painting turning guidelines is approximately $100 per approach. There is a rumble strip median divider on the E. Summit Avenue approaches and a grassed median on the west approach of E. Thackery Trail to the intersection. These roadway dividers assist in separating opposing traffic movements. Pavement markings provide for the ready identification of traffic lanes and the facilitation of orderly traffic flow through the intersection. This is particularly important at uncontrolled intersections, where vehicles are in constant conflict with opposing traffic movements. The disadvantages of turning guidelines at an intersection is

that they can confuse drivers desiring to make other movements across the intersection; i.e., turning guidelines for all four left-turn movements through an intersection would be difficult to separate and identify. As previously stated, the operation of this intersection has been changed from a full four-legged approach intersection to a "T," or three-legged, approach intersection. Based on that change and the proposed signalization of the intersection, implementation of this alternative is not recommended. If the intersection is reopened to a four-legged approach operation without any realignment or change in the design of the westbound approach, pavement marking would be recommended for the south to east left-turn movement.

The final alternative traffic management action suggested to solve the left-turn accident problem at this intersection is the prohibition of left turns. The capital cost of implementing the alternative, which would consist of regulatory signing, would be about $200 per approach. This alternative would eliminate the possibility of left-turn collisions and increase intersection capacity for through and right-turn traffic movements. The disadvantage of this alternative is that it would increase turning movement volumes at other intersections in the study area as drivers alter travel patterns to reach their trip destinations. This would result in increased trip lengths, travel times, accidents, and fuel consumption. Because of the lack of available alternative routes to access the land development adjacent to E. Thackery Trail and E. Summit Avenue, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that traffic signals be installed at this intersection, that street lighting be provided for on the E. Summit Avenue approaches to the intersection, that "signal ahead" warning signs be installed on E. Summit Avenue, and that the posted speed limit on E. Summit Avenue to E. Lexington Avenue be reduced to 35 mph.

E. Wisconsin Avenue and Walnut Street

The predominant accident collision pattern experienced at this signalized intersection involved vehicles colliding at right angles—8 accidents—and vehicles turning left into the opposing traffic stream and colliding with oncoming vehicles—5 accidents—in calendar years 1977 and 1978. These two collision types, therefore, accounted for 13, or 56 percent, of the total 23 accidents at this location in 1977 and 1978. Eleven, or 48 percent, of the accidents occurred at night.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem at this location include modification of the traffic signals, revision of the traffic signal cycle, and the painting of advance pavement markings.

The first alternative—modification of the existing traffic signals—would consist of adding backboards and/or black signal faces to the signal heads. The capital cost of adding backboards or black signal faces would be about $100 per signal. Five of the right-angle collisions involved northbound vehicles being struck by traffic on E. Wisconsin Avenue. This fact would indicate either that traffic on E. Wisconsin Avenue is disregarding or not noticing the traffic signal controls or that traffic on Walnut Street is not completely clearing the intersection on the yellow phase of the traffic signal sequence. The advantage of using backboards and/or black signal faces is that they increase the visibility of the traffic signals. There are no significant disadvantages to this alternative. Therefore, it is recommended that backboards and/or black signal faces be installed where appropriate on the traffic signal heads at this intersection.

Signal sequence revision at this intersection would consist of the inclusion of a one-second common red indication in the existing 60-second cycle. There is no capital cost associated with this alternative. The advantage of this alternative is that it would provide additional time for all vehicles to clear the intersection without conflicting with opposing traffic flow. The disadvantage of the signal sequence revision is that it would remove a minor portion of green time from the signal cycle, which would slightly increase average vehicle delay. This loss of green time could be accommodated on all four approaches to the intersection without reducing operating conditions to below design levels. Therefore, it is recommended that this alternative be implemented.

The final alternative traffic management action suggested to solve the right-angle accident problem at this intersection is the painting of advance pavement markings. This alternative would consist of painting "signal ahead" warnings on the roadway.

The annual cost of this alternative would be about $700. Pavement markings notify the motorist of changing or hazardous conditions ahead. The disadvantage of such markings is that they require additional driver response time to comprehend the warning. Implementation of this alternative is not recommended.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the left-turn accident problem at this intersection include: the provision of a separate left-turn phase in the existing traffic signal cycle; revision of the traffic signal sequence; improved street lighting; establishment of pavement markings for turning guidelines; the construction of separate turning channels or lanes; and the prohibition of left turns.

The capital cost of the first alternative—the provision of a left-turn phase in the existing traffic signal cycle—would be about $400. Three of the five left-turn collisions in 1977 and 1978 involved eastbound vehicles on E. Wisconsin Avenue turning left to go north on N. Walnut Street. Currently, there is a six-second green left-turn arrow included in the signal cycle for this movement. As shown on Map 16 in Chapter III, the peak-hour left-turning vehicle movement on E. Wisconsin Avenue was 59 vehicles per hour (vph) in the eastbound direction, with an opposing traffic volume of 546 vph, indicating a high level of conflicting vehicle movements. The six-second left-turn arrow should be sufficient to accommodate the existing left-turn demand. Left turns from the westbound direction on E. Wisconsin Avenue are currently prohibited. The highest left-turn volume conflict from the north, or south approach, at this intersection, as shown on Map 16 in Chapter III, is 54 vph, with an opposing traffic volume conflict of 108 vph, indicating a low level of conflicting vehicle movements, which can be adequately accommodated without a separate left-turn phase. Accordingly, changing the existing turning phase or installing a separate turning phase in the traffic signal at this intersection is not recommended.

As stated in the right-angle accident analysis for this intersection, the traffic signal sequence should be revised to include a one-second common red phase to reduce conflicts between opposing traffic flows. This recommendation is further supported by the analysis of the left-turn accident problem at this intersection.

Street lighting at this intersection consists of an overhead light on the southwest corner of the intersection. The installation of an upgraded street lighting system at this intersection would improve lighting conditions during nighttime hours. The capital cost of improved street lighting conditions at this intersection would be about $3,500. All of the left-turn accidents at this intersection occurred during hours of darkness. The advantage of improved street lighting at this location is that it would provide for the safer and more efficient flow of traffic through the intersection during hours of darkness. There are no significant disadvantages to this alternative. Therefore, it is recommended that the street lighting at this intersection be upgraded.

There are currently no left-turn pavement marking guidelines at this intersection. The annual cost of painting turning guidelines is approximately $100 per approach. Pavement markings provide for the easy identification of traffic lanes and the faciltation of orderly traffic flow through an intersection. They are especially advantageous at intersections with wide approaches and one or two predominant turning movements. The disadvantage of turning guidelines at an intersection is that they can confuse drivers desiring to make other movements across the intersection; i.e., turning guidelines for all four left-turn movements through an intersection would be difficult to separate and identify. Since the north to east and west to north left turns are approximately equal and of low volume, currently not exceeding 60 vph, the establishment of left-turn pavement marking guidelines at this intersection is not recommended.

Traffic islands and channelized turning lanes provide benefits similar to those offered by pavement markings, but in a more positive manner; they physically separate different traffic movements at an intersection. The capital cost of constructing a traffic island or channelized turning lane is approximately $10,000 per approach. This construction alternative is particularly applicable at wide approach intersections with heavy turning movements. The main disadvantage of this alternative is that it reduces the usable roadway approach width at an intersection, which thereby results in reduced roadway capacity. Because of the narrow roadway approach widths at this intersection—18 feet from the north and south and 24 feet from the east and west—implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the left-turn accident problem at this location is the prohibition of left turns. The capital cost of implementing this alternative, which would consist of regulatory signing, would be about $400 per approach. This alternative would eliminate the possibility of left-turn collisions and increase intersection capacity for through and right-turn traffic movements. The disadvantage of this alternative is that it would increase turning movements at other intersections in the study area as drivers alter travel patterns to reach their trip destinations. This could result in increased trip lengths, travel times, accidents, and fuel consumption. Since Walnut Street is one of the two arterial streets which provides for travel in a north-south direction across Lac La Belle and Fowler Lake, where there is a previously identified arterial service deficiency, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that backboards and/or black signal faces be installed on the traffic signal heads at this intersection; that a one-second common red indication be included in the traffic signal sequence; and that the street lighting at this intersection be improved.

E. Wisconsin Avenue and CTH P

The predominant accident collision pattern experienced at this signalized intersection involved vehicles colliding into the rear of stopped vehicles—10 accidents. This collision type accounted for 59 percent of the total 17 accidents at this intersection in calendar years 1977 and 1978. Of the 10 rear-end accidents which occurred at this intersection, 5 occurred on the eastbound approach, 4 on the southbound approach, and 1 on the westbound approach to the intersection. Six, or 35 percent, of the accidents occurred at night.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem at this intersection include: retiming of the traffic signals; improved street lighting; the installation of "signal ahead" warning signs; the painting of advance warning pavement markings; and reducing the speed limit.

Traffic signal timing plans are designed to proportionally match vehicular traffic demand to the phases in the signal sequence. There is no capital cost associated with the first alternative—retiming of the traffic signals. The advantage of retiming traffic signals is that as traffic patterns change, traffic signal phases are changed to more efficiently accommodate the new traffic volumes. As stated in Chapter II of this report, the traffic signals at this intersection are traffic actuated. The advantage of a traffic-actuated signal is that it can continuously adjust cycle lengths and phase intervals to efficiently accommodate changing traffic volumes. The existing signal sequence is adequate to provide for safe operation. Therefore, implementation of this alternative is not recommended.

Street lighting at this location consists of two overhead lights suspended over the intersection plus street lights located on the northwest and southeast corners of the intersection. Street lighting could be upgraded at this intersection with overhead lights located on the approaches. The capital cost of improved street lighting at this intersection would be about $12,000. Four, or 40 percent, of the rear-end accidents at this intersection in calendar years 1977 and 1978 occurred during hours of darkness. This is an above average number of nighttime accidents. The advantage of improved street lighting at this intersection is that it would provide for the safer and more efficient flow of traffic through the intersection during hours of darkness. There are no significant disadvantages to this alternative. Therefore, it is recommended that the street lighting at this intersection be upgraded.

The installation of advance warning signs, specifically "signal ahead" signs, is another alternative solution to the rear-end accident problem at this signalized intersection. The "signal ahead" sign on the southbound approach to the intersection is hidden by a tree and not readily visible to the motorist. This condition should be corrected by changing the sign's location so that it is clearly visible to southbound traffic on CTH P. The capital cost of this alternative would be about $100. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. It is recommended that the advance "signal ahead" warning sign on the southbound approach be relocated to increase motorist awareness of the traffic signal at the intersection.

The advance warning pavement marking alternative calls for painting "signal ahead" warnings on the roadway. The annual cost of this alternative would

be about $700 per approach. The advantages and disadvantages of pavement markings are similar to those offered by advance warning signs, except that pavement markings are more noticeable to the motorist. The disadvantage of pavement markings is that they require additional driver response time to comprehend the warning. In addition, if such markings are not maintained on a regular—usually semi-annual—basis, they will become obliterated through normal wear from passing traffic. Implementatation of this alternative is not recommended.

The final alternative traffic management plan suggested to solve the rear-end traffic accident problem at this intersection is reducing the posted speed limit. The posted speed on CTH P at the intersection is 35 miles per hour (mph) and on W. Wisconsin Avenue at the intersection is 50 mph. The capital cost of reducing the speed limit, which would consist of regulatory signing changes, would be about $400. As in all regulatory procedures, the limits imposed on highway speeds should be reasonable and appropriate. An important basis for establishing the proper speed limit on any street or highway is the nationally recognized "85th percentile speed"—that is, the speed at or below which 85 percent of the observed traffic is moving. Factors used to supplement the "85th percentile speed" in establishing speed limits are accident experience and traffic volume. The predominant types of accidents observed on the segment of E. Wisconsin Avenue from Plank Road to CTH P, as will be identified in a subsequent analysis in this section, are rear-end and turning accident collisions, which indicates that other factors, such as driveways, are preventing a uniform flow of traffic. The higher the volume of traffic, the more important it is that most vehicles maintain the same speed. The 35-mph speed limit on CTH P and the 50-mph speed limit on E. Wisconsin Avenue are satisfactory for the geometric conditions approaching the signalized intersection. The disadvantage of this alternative is that reduced speed limits would have to be enforced, as drivers may have a tendency to drive at a higher speed than that posted speed because of the rural and suburban character of the land development adjacent to E. Wisconsin Avenue east of this intersection. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the street lighting at this intersection be improved, and that the "signal ahead" sign on the southbound approach of CTH P be relocated.

E. Wisconsin Avenue and S. Silver Lake Street

The predominant accident collision pattern experienced at this signalized intersection involved vehicles colliding into the rear of stopped vehicles—7 accidents. This collision type accounted for 47 percent of the total 15 accidents at this intersection in calendar years 1977 and 1978. Five, or 33 percent, of the accidents occurred at night.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end collision problem at this intersection include modification and retiming of the traffic signal sequence and the painting of "signal ahead" pavement warnings.

The first alternative—the modification of the traffic signals—would consist of adding backboards and/or black signal faces to the signal heads and/or placing the signals on mast arms above the roadway. The capital cost of adding backboards or black signal faces to the signal heads would be about $100 per signal, and the capital cost of placing the signals on mast arms would be about $2,200 per signal. The advantage of using backboards and mast arms is that they increase the visibility of the traffic signal to vehicular traffic, thereby aiding the motorist in identifying and obeying the signals. Mast arms are particularly effective at wide approach intersections and on rural high-speed arterials. There are no significant disadvantages to this alternative. It is not recommended that the signals be placed on mast arms, but it is recommended that backboards and/or black signal faces be placed where appropriate on all traffic signal heads controlling traffic on E. Wisconsin Avenue at this intersection.

Traffic signal timing plans are designed to proportionally match vehicular traffic demand to the phases in the signal sequence. There is no capital cost involved in retiming traffic signals. The advantage of retiming traffic signals is that as traffic patterns change, the traffic signal phases are changed to more efficiently accommodate the new traffic volumes. This reduces the number of stopped vehicles and minimizes delays experienced by drivers at signalized intersections, thereby decreasing overall vehicular travel times. There are no significant disadvantages to retiming traffic signal sequences. Therefore, it is recommended that the traffic signal timing plan designed in the traffic congestion problem analysis section of the chapter be implemented to ameliorate the rear-end collision problem at this intersection.

Traffic signals, if part of a progressive system, can also reduce the number of stops experienced by vehicles at signalized intersections. The capital cost of interconnecting traffic signals to provide for a progressive system is approximately $2,000 per signalized intersection. The advantage of interconnecting traffic signals is that it ensures the facilitation of the efficient flow of traffic on the arterial streets and highways. Platoons of vehicles traveling in a progressive system can maintain continuous movement through the system. There is no significant disadvantage to interconnecting traffic signals. Therefore, it is recommended that the traffic signal interconnection system designed in the traffic congestion problem analysis section of this chapter be implemented to ameliorate the rear-end accident problem at this intersection.

The final alternative traffic management action suggested to solve the rear-end accident problem at this intersection is the painting of advance pavement markings. This alternative would consist of painting "signal ahead" warnings on the roadway. The annual cost of this alternative would be about $700 per approach. Pavement markings notify the motorist of changing or hazardous conditions ahead. The disadvantage of such markings is that they require additional driver response time to comprehend the warning. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that backboards and/or black signal faces be installed on the traffic signal heads controlling traffic on E. Wisconsin Avenue, and that the traffic signals at this intersection be retimed and interconnected with the other traffic signals in the central business district.

S. Main Street and W. South Street

The predominant accident collision pattern experienced at this unsignalized intersection in calendar years 1977 and 1978 involved vehicles hitting cars parked in front of the Post Office on the west side of S. Main Street just north of W. South Street—7 accidents. This collision type accounted for 50 percent of the total 14 accidents at this intersection.

Parked Car Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the parked car collision problem at this intersection include: the installation of advance warning signs; the painting of advance pavement markings; reconstruction to widen the roadway; and the prohibition of curb parking along S. Main Street.

The capital cost of the first alternative—the installation of advance warning signs—would be about $100. This alternative would consist of installing a "lane ends merge left" warning sign north of the existing curb parking on the west side of S. Main Street. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. Implementation of this alternative is not recommended.

The advance warning pavement parking alternative calls for painting yellow diagonal warning lines on the roadway immediately north of and preceding the curb parking on the west side of S. Main Street. The annual cost of this alternative would be about $150. The advantages and disadvantages of pavement markings are similar to those of advance warning signs except that they are more noticeable to the motorist and can reinforce advance warning sign messages. The disadvantage of such markings is that they require additional driver response time to comprehend. Also, if not maintained on a regular—usually semi-annual—basis, pavement markings will become obliterated through normal wear from passing traffic. Therefore, it is recommended that this alternative be implemented.

Reconstructing S. Main Street to widen the roadway would provide increased vehicular capacity and clearance room for vehicles traveling parallel to the parked cars by the Post Office. The capital cost of this alternative would be about $20,000. The advantage of this alternative is that it would eliminate the conflict between through traffic on S. Main Street and vehicles maneuvering to enter or exit curbside parking spaces. This alternative would also eliminate the need to merge the two southbound lanes at Wisconsin Avenue into a single lane as it approaches the curbside parking area. The disadvantage of this alternative is that there is a very limited amount of space available to widen the roadway in this area. Consequently, such widening would reduce the sidewalk area used by pedestrians and would move the roadway very close to the adjacent commercial establishments along S. Main Street. Implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the parked car accident problem at the location is the prohibition of curb parking. The capital cost of this alternative, which would consist of regulatory signing, would be about $200. This alternative would eliminate the possibility of parked car collisions at this location, and would increase roadway capacity by maintaining lane continuity on this section of S. Main Street. The disadvantages of this alternative are that it would decrease accessibility to the Post Office and reduce the supply of on-street curb parking spaces. The current supply of on-street curb parking spaces was identified in Chapter V as inadequate in the Oconomowoc central business district. Therefore, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that pavement markings be installed north of the curb parking on the west side of S. Main Street at this location.

E. Summit Avenue and E. Armour Road

The predominant accident collision pattern experienced at this nonsignalized intersection in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—4 accidents—and vehicles colliding with another vehicle at right angles—3 accidents. These two collision types, therefore, accounted for 7, or 58 percent, of the total 12 accidents at this intersection. Of the 4 rear-end accidents at this intersection, 3 involved southbound traffic on E. Summit Avenue, while the 3 right-angle accidents involved westbound traffic on E. Armour Road and northbound traffic on E. Summit Avenue.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem at this intersection include modification of the existing traffic signals and improved street lighting.

The existing traffic signal at this intersection, as indicated in Chapter III of this report, is suspended over the center of the intersection and consists of a flashing red beacon for traffic on E. Armour Road and a flashing yellow warning beacon for traffic on E. Summit Avenue. The first alternative—modification of the traffic signal—calls for increasing the beacon's visibility with the addition of backboards to the signal head or by replacing the suspended beacon head with two roadside-mounted beacons. The capital cost of placing a backboard on the signal would be about $100, and the cost of replacing the existing traffic signal with two roadside-mounted signals would be about $1,000. The advantage of modifying the traffic signal at this intersection, either with backboards or roadside-mounted beacons, is that it would increase the visibility of the signal to the motorist, thereby calling attention to the conflicting traffic movements associated with E. Armour Road. The disadvantage of this alternative is that a backboard on the yellow signal beacon would obscure the visibility of the red signal beacon which faces E. Armour Road, and the replacement of the suspended beacon with two roadside-mounted beacons would not be practicable because of the limited amount of right-of-way available between the existing roadway curb, sidewalk, and the Oconomowoc Union High School campus. Implementation of this alternative is not recommended.

Street lighting at this intersection consists of an overhead light on the west side of the intersection. An upgraded street lighting system at this intersection would improve lighting conditions during nighttime hours. The capital cost of installing such a system would be about $7,000. Of the 12 accidents which occurred at this intersection in calendar years 1977 and 1978, 2, or 17 percent, occurred at night, not a high enough number to warrant the installation of a new street lighting system. Therefore, implementation of this alternative is not recommended.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem at this intersection include modification of the existing signal, improved street lighting, and the construction of an island or channelization.

As stated in the rear-end accident analysis for this intersection, the modification of the suspended traffic warning signal at this intersection with the addition of a backboard for increased visibility is not recommended, and the existing street lighting at this intersection appears adequate to provide for safe nighttime operation and, therefore, does not require upgrading.

The final alternative traffic management action suggested to solve the right-angle accident problem at this intersection is the construction of a separate right-turn lane on the east approach to the intersection. The capital cost of this alternative would be about $15,000. Basically, this alternative would consist of increasing the radius of the existing curb

line on the northeast corner of the intersection. The advantage of this alternative is that it would reduce the sharp turning maneuver required of right-turning vehicles and allow those vehicles to enter the traffic stream at E. Summit Avenue at an improved merging speed. The disadvantage of this alternative is that it would increase the roadway width of E. Armour Road at its intersection with E. Summit Avenue, and the intersection would then require lane identification to control the orderly flow of traffic through the intersection. This problem—inherent to skewed intersection alignments—could be partially ameliorated through the application of a painted center island on the E. Armour Road approach to the intersection and well identified lane pavement markings. The annual cost of pavement markings at this intersection would be about $700. It is recommended that a larger turning radius for right turns be provided on the northeast corner of the intersection and that pavement markings be installed for lane identification.

Concluding Remarks: In conclusion, it is recommended that an increased turning radius be provided on the northeast corner of this intersection, and that pavement markings for lane identification be installed on E. Armour Road.

E. Summit Avenue and S. Silver Lake Street

The predominant accident collision pattern experienced at this signalized intersection in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—6 accidents. This collision type accounted for 50 percent of the total 12 accidents at this intersection. Five of the 6 rear-end collisions occurred on E. Summit Avenue, 3 on the eastbound approach and 2 on the westbound approach to the intersection.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem at this intersection include: modification of the existing signals; retiming of the signal sequence; improved street lighting; and the painting of advance pavement markings.

The first alternative—modification of the traffic signals—would consist of adding backboards and/or black signal faces to the signal heads and/or placing the signals on mast arms above the roadway. The capital cost of adding backboards or black signal faces to the signal heads would be about $100 per signal, and the capital cost of placing the signals on mast arms would be about $2,200 per signal. The advantage of using backboards, black signal faces, and mast arms is that they increase the visibility of the traffic signal to vehicular traffic, thereby aiding the motorist in identifying and obeying the signals. Mast arms are particularly effective at wide approach intersections or on rural high-speed arterials. There are no significant disadvantages to this alternative. Therefore, it is recommended that backboards and/or black signal faces be placed where appropriate on all signal heads at this intersection, and that the far side signals controlling the east- and westbound approaches to the intersection be placed on mast arms.

Traffic signal timing plans are designed to proportionally match vehicular traffic demand to the phases in the signal sequence. Signal sequence retiming at this intersection would involve changing the proportion of green time allotted to each intersection approach to maximize complete utilization of the 60-second signal cycle. There is no capital cost involved in retiming traffic signals. The advantage of retiming traffic signals is that, as traffic patterns change, traffic signal phases are changed to more efficiently accommodate the new traffic volumes. This reduces the number of stopped vehicles and minimizes delays experienced by drivers at signalized intersections, thereby decreasing overall vehicular travel times. There are no significant disadvantages to retiming traffic signal sequences. Therefore, it is recommended that the traffic signal timing plan designed in the traffic congestion problem analysis section of this chapter be implemented to ameliorate the rear-end accident problem at this intersection.

Street lighting at this intersection consists of overhead lights on the southwest and northeast corners of the intersection. A new street lighting system at this intersection would improve lighting conditions during nighttime hours. The capital cost of installing improved street lighting at this intersection would be about $800. Of the 12 accidents which occurred at this intersection in calendar years 1977 and 1978, 3, or 25 percent, occurred at night, not a high enough number to warrant the installation of a new street lighting system. Therefore, implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the rear-end collision accident problem at this intersection is the application of pavement markings. This alternative would consist

of painting "stop" lines on the E. Summit Avenue approaches to the intersection. The annual cost of this alterantive would be about $100. Stop line pavement markings can serve as an effective means of indicating to the motorist the point behind which vehicles are required to stop, in compliance with a stop sign or traffic signal control. Stop lines have the disadvantage, as do other painted pavement markings, of being obliterated by snow, of not being clearly visible when wet, and of being subject to wear under heavy traffic. Even though 4 of the 6 rear-end accidents at this intersection occurred when roadway conditions were wet, it is recommended that stop lines be painted on the E. Summit Avenue approaches to the intersection to ameliorate the rear-end accident problem which currently exists.

Concluding Remarks: In conclusion, it is recommended that backboards and/or black signal faces be installed on the signal heads and that the far side traffic signals controlling traffic on E. Summit Avenue be placed on mast arms, that the traffic signals be retimed and interconnected to reduce the number of stopped vehicles at the intersection, and that "stop" lines be painted on the E. Summit Avenue approaches to the intersection.

E. Summit Avenue and CTH B

The predominant accident collision pattern experienced at this nonsignalized intersection in calendar years 1977 and 1978 involved vehicles colliding at right angles—6 accidents. This collision type accounted for 54 percent of the total 11 accidents at this intersection. All 6 accidents involved vehicles traveling eastbound on CTH B.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem at this intersection include: installing traffic signals; improving street lighting; installing advance warning signs; and reducing the existing speed limit.

The capital cost of the first alternative—installing traffic signals—would be about $32,000. The principal advantage of this alternative is that the traffic signals would stop oncoming traffic and provide for the orderly movement of traffic, both vehicular and pedestrian, through the intersection, thereby reducing the frequency of right-angle accidents. The disadvantage of this alternative is that it would increase vehicle delay by stopping vehicles which previously were uncontrolled; e.g., vehicles using E. Summit Avenue. However, this overall delay would be minimized by the fact that the signal, conversely, would reduce vehicle delay experienced by vehicles on CTH B attempting to enter the uncontrolled traffic on E. Summit Avenue. According to the Manual on Uniform Traffic Control Devices, a traffic signal is not warranted at this location, and therefore the installation of such a signal is not recommended.

Another type of traffic control signal is a flashing intersection control beacon. The capital cost of installation of such a beacon would be about $2,000. Intersection control beacons are intended for use at intersections where traffic or physical conditions do not justify conventional traffic signals but where high accident rates indicate a special hazard. The accident rate at this intersection in 1978 was 2.40 accidents per million vehicles entering the intersection. This was the third highest intersection accident rate in the study area. The advantage of an intersection control beacon is that it supplements other traffic control devices and it provides better identification of an intersection. The disadvantage of these beacons is that, if used at locations where they are not warranted, they soon lose much of their effectiveness. According to the Manual on Uniform Traffic Control Devices, a flashing intersection control beacon is warranted at this intersection. Therefore, it is recommended that suspended yellow flashing intersection control beacons be installed at this intersection.

Street lighting at this intersection consists of an overhead light on the southwest corner of the intersection. A new street lighting system at this intersection would improve lighting conditions during nighttime hours. The capital cost of installing improved street lighting at the intersection would be about $10,000. Of the 11 accidents which occurred at this intersection, 3, or 27 percent, occurred at night, not a high enough number to warrant the installation of a new street lighting system. Therefore, implementation of this alternative is not recommended.

The installation of advance warning signs, specifically "cross road" signs, is another alternative solution to the right-angle accident problem at this intersection. Advanced warning signs are used in conjunction with intersection control beacons. The capital cost of this alternative would be about $200. The advantage of advance warning signs is that they notify the motorist of changing or

hazardous conditions ahead. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. It is recommended that advance warning signs be installed on the E. Summit Avenue approaches to its intersection with CTH B.

The final alternative traffic management action suggested to solve the right-angle accident problem at this intersection is the reduction of the posted speed limit. The posted speed on E. Summit Avenue at its intersection with CTH B is 55 miles per hour (mph). The capital cost of reducing the speed limit, which would consist of regulatory signing, would be about $400. As in all regulatory procedures, the limits imposed on highway speed should be reasonable and appropriate. An important basis for establishing the proper speed limit on any street or highway is the nationally recognized "85th percentile speed"—that is, the speed at or below which 85 percent of the observed traffic is moving. Factors used to supplement the "85th percentile speed" in establishing speed limits are accident experience and traffic volume. The severity of the right-angle accidents experienced at this intersection could be reduced with a lower intersection approach speed. The disadvantage of this alternative is that reduced speed limits would have to be enforced, as drivers may have a tendency to drive at a higher speed than the posted speed because of the rural character of the land development adjacent to E. Summit Avenue at this intersection. Therefore, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that two flashing yellow intersection control beacons be installed at this intersection and that advance "cross road" warning signs be installed at the E. Summit Avenue approaches to the intersection.

E. Summit Avenue and E. Forest Street

A total of 11 accidents occurred at this unsignalized intersection in calendar years 1977 and 1978—5 in 1977 and 6 in 1978. There was no predominant collision pattern. The only common factors between the accidents were that 7, or 64 percent, occurred during the time of school opening or closing and that 7, or 64 percent, occurred when roadway conditions were wet or icy and/or it was raining, sleeting, or snowing.

The only traffic management action indicated in Table 28 to have potential to solve or mitigate the accident problem at this intersection is skidproofing the roadway surface. The capital cost of this alternative would be about $9,000 for the 150-foot approaches of E. Summit Avenue on either side of the intersection. The advantage of this alternative is that it would reduce the braking distance of vehicles slowing down or stopping to accommodate conflicting traffic movements. The disadvantage of this alternative is that it would increase the noise level of vehicular traffic. Implementation of this alternative is not recommended at this time, pending the accident reduction effectiveness of the following recommendations. It is recommended that the 15 mile-per-hour (mph) speed limit in the area of the high school be strictly enforced when children are present. This is recommended since many of the accidents appear to be associated with the increased traffic activity during the arrival and departure of students at the Oconomowoc Senior High School.

Concluding Remarks: In conclusion, it is recommended that the 15-mph speed limit on the roadway approaches to this intersection be strictly enforced. Should this recommendation not be completely effective in solving the accident problem at this intersection, it is then recommended that the E. Summit Avenue approaches to this intersection be skidproofed.

S. Main Street, W. 2nd Street, and E. Summit Avenue

The predominant accident collision pattern experienced at this unsignalized intersection in calendar years 1977 and 1978 involved trucks turning right from the left lane and colliding with vehicles in the right lane—6 accidents. This collision type accounted for 60 percent of the total 10 accidents at this intersection. All 6 of the right-turn accidents occurred on the westbound approach to the intersection.

Right-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-turn accident problem at this intersection include: the installation of advance warning signs; the establishment of pavement markings for turning guidelines; prohibition of right turns; and the prohibition of trucks.

The capital cost of the first alternative—the installation of advance warning signs—would be about $100. This alternative would consist of installing a "watch for right turning trucks from left lane" warning sign on the westbound approach to the

intersection. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead. The disadvantage of such signs is that, if used in excess, they lose their effectiveness. It is recommended that a "watch for right turning trucks from left lane" sign be installed on the westbound approach to this intersection.

There are currently no pavement marking turning guidelines at this intersection. The annual cost of painting turning guidelines would be about $100. Pavement markings provide for the easy identification of traffic lanes and the facilitation of orderly traffic flow through an intersection. They are especially advantageous at intersections with wide approaches and one or two predominant turning movements. The disadvantage of turning guidelines at an intersection is that they can confuse drivers desiring to make other movements across the intersection. Right-turn pavement markings at this intersection would not be effective, as tractor-trailer truck units turning right from a left lane cannot, as a practical matter, keep their trailer confined to the left lane through the entire turning maneuver. Therefore, implementation of this alternative is not recommended.

The prohibition of right turns is another alternative solution to the right-turn accident problem at this intersection. The capital cost of implementing this alternative, which would consist of regulatory signing, would be about $200. This alternative would eliminate the possibility of right-turn collisions and increase intersection capacity for through and left-turn traffic volumes. The disadvantage of this alternative is that it would increase turning movements at other intersections in the study area, as drivers alter travel patterns to reach their trip destinations. This would result in increased trip lengths, travel times, accidents, and fuel consumption. Because of the lack of available routes through the Oconomowoc central business district, implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the right-turn accident problem at this intersection is the prohibition of trucks. The capital cost of this alternative, which would consist of regulatory signing, would be about $400. This alternative would eliminate the possibility of trucks causing right-turn accidents at this intersection. The disadvantage of this alternative, like the previous alternative, is that it would increase turning movements at other intersections in the study area. Because of the lack of available alternative routes through the Oconomowoc central business district, implementation of the alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that an advance warning sign stating "watch for right turning trucks from left lane" be installed on the westbound approach of E. Summit Avenue to this intersection.

E. Forest Street and S. Silver Lake Street

The predominant accident collision pattern experienced at this unsignalized intersection in calendar years 1977 and 1978 involved vehicles colliding at right angles—3 accidents. This collision type accounted for 50 percent of the total 6 accidents at this intersection.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem at this intersection include: the installation of traffic signals; improved street lighting; the installation of advance warning signs; and the painting of advance pavement markings.

The capital cost of the first alternative—the installation of traffic signals—would be about $32,000. The principal advantage of this alternative is that it would stop oncoming traffic and provide for the more orderly movement of traffic, both vehicular and pedestrian, through the intersection, thereby reducing the frequency of right-angle accidents. The disadvantage of this alternative is that it would increase vehicle delay by stopping vehicles which were previously uncontrolled; e.g., vehicles using S. Silver Lake Street. However, this overall delay would be minimized by the fact that the signal, conversely, would reduce the vehicle delay experienced by vehicles on E. Forest Street attempting to enter the uncontrolled traffic on S. Silver Lake Street. According to the Manual on Uniform Traffic Control Devices, a traffic signal is not warranted at this intersection. Therefore, the installation of traffic signals at this intersection is not recommended.

Another type of traffic control signal is a flashing yellow intersection control beacon. The capital cost of installing such beacons at this intersection would be about $1,000. Intersection control beacons are intended for use at intersections where traffic or physical conditions do not justify conventional traffic signals, but where high accident rates indicate a special hazard. The accident

rate at this intersection in 1978—there were no reported accidents at this intersection in 1977—was 3.23 accidents per million vehicles entering the intersection. This was the highest intersection accident rate in the study area in 1978. The advantage of an intersection control beacon is that it supplements other traffic control devices and it provides better identification of an intersection. The disadvantage of such beacons is that, if used at locations where they are not warranted, they soon lose much of their effectiveness. According to the Manual on Uniform Traffic Control Devices, a flashing intersection control beacon is not warranted at this intersection. Therefore, the installation of such beacons at this intersection is not recommended.

Four-way stop signs are yet another form of traffic control at an intersection with relatively low traffic volumes. Currently, there are stop signs controlling traffic on E. Forest Street at its intersection with S. Silver Lake Street. The capital cost of installing additional stop signs at this intersection would be about $400. Stop signs reduce right-angle collision accidents by requiring all vehicles approaching an intersection to stop and then proceed through the intersection in an orderly manner. The disadvantage of stop signs is that they cause a substantial inconvenience to motorists by delaying vehicles which were previously uncontrolled; e.g., vehicles using S. Silver Lake Street. According to the Manual on Uniform Traffic Control Devices, additional stop signs are not warranted at this intersection. Therefore, the installation of such signs at this intersection is not recommended.

A new street lighting system at this intersection would improve lighting conditions during nighttime hours. The capital cost of installing improved street lighting at this intersection would be about $3,500. Of the 6 accidents which occurred at this intersection in calendar years 1977 and 1978, 2, or 33 percent, occurred at night, not a high enough number to warrant the installation of a new street lighting system. Therefore, implementation of this alternative is not recommended.

The installation of advance warning signs—specifically, symbolic "cross road" signs—is another alternative solution to the right-angle accident problem at this intersection. The capital cost of this alternative would be about $200. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead. Therefore, this alternative would, in particular, be advantageous at the northbound approach to the urbanized areas of Oconomowoc from the rural area south of E. Forest Street. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. Implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the right-angle collision accident problem at this intersection is the application of pavement markings. This alternative would consist of painting "stop" lines on the E. Forest Street approaches to the intersection. The annual cost of this alternative would be about $100. Stop line pavement markings serve as an effective means of indicating to the motorist the point behind which vehicles are required to stop, in compliance with a stop sign or traffic signal control. Stop lines have the disadvantage, as do other painted pavement markings, of being obliterated by snow, of not being clearly visible when wet, and of being subject to wear under heavy traffic. However, because of the high accident rate at this intersection, implementation of this alternative is recommended.

Concluding Remarks: In conclusion, it is recommended that "stop" line pavement markings be painted on the E. Forest Street approaches to its intersection with S. Silver Lake Street.

E. Wisconsin Avenue—Main Street to N. St. Paul Street

The predominant accident collision patterns experienced on this roadway segment in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—9 accidents—vehicles colliding at right angles—8 accidents—and vehicles sideswiping parked vehicles—7 accidents. These three collision types, therefore, accounted for 24, or 77 percent, of the total 31 accidents on this roadway segment.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem on this roadway segment include the installation of advance warning signs, the prohibition of curb parking, and the restriction of driveway operations. All of the 9 rear-end accidents which were reported on this roadway segment in calendar years 1977 and 1978 involved vehicles traveling westbound on E. Wisconsin Avenue.

The first alternative—the installation of advance warning signs—would specifically involve the installation of an informational "parking lot entrance" sign. The capital cost of this alternative would be about $100. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead, thereby reducing the need for sudden stops. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. It is recommended that a "parking lot entrance" sign be installed in the vicinity of the First National Bank of Oconomowoc' driveway entrance on E. Wisconsin Avenue.

The prohibition of curb parking would eliminate the conflict between through traffic and vehicles entering or exiting the curb parking stalls on E. Wisconsin Avenue. The capital cost of this alternative, which would consist of regulatory signing, would be about $300. The advantage of this alternative is that it would increase roadway capacity, maintaining lane continuity, and provide the motorist with an unobstructed view of vehicles using the First National Bank of Oconomowoc' driveway entrance on E. Wisconsin Avenue. The disadvantages of this alternative are that it would decrease accessibility to the commercial establishments along E. Wisconsin Avenue and decrease the supply of on-street curb parking spaces. The current supply of on-street curb parking spaces was identified in Chapter V as inadequate in the Oconomowoc central business district. To improve motorist awareness of vehicles using the bank's driveway and to provide a refuge lane for right-turning vehicles entering the driveway, it is recommended that one curb parking space be removed immediately east of the bank's driveway entrance on E. Wisconsin Avenue.

The final traffic management action suggested to solve the rear-end accident problem on this roadway segment is the restriction of driveway operations along E. Wisconsin Avenue. The capital cost of this alternative would be about $400. There are two driveway openings on this segment of E. Wisconsin Avenue: the First National Bank of Oconomowoc' driveway, which serves as an entrance to the bank's parking lot drive-in banking service, and the Fowler public parking lot and the alley driveway immediately west of the bank's driveway, which serves as an exit from the bank's drive-in banking service and the Fowler public parking lot. The reinforcement of the bank's driveway as an "entrance only" operation with additional "do not exit" or "one-way" signs, and the closure of the alley exit onto E. Wisconsin Avenue, would significantly reduce the conflict between westbound vehicular traffic on E. Wisconsin Avenue and motorists using the driveways on this segment of E. Wisconsin Avenue. Therefore, it is recommended that the present "entrance only" operation of the First National Bank of Oconomowoc' driveway be reinforced with "do not exit" or "one-way" signs, and that the alley exiting onto E. Wisconsin Avenue be closed.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem on this roadway segment include: the installation of advance warning signs; the removal of view obstructions; the prohibition of curb parking; and the restriction of driveway operations. All of the 8 right-angle accidents in calendar years 1977 and 1978 involved vehicles exiting the First National Bank of Oconomowoc' driveway or alley, both of which are located on the north side of E. Wisconsin Avenue. As noted in the rear-end accident problem analysis for this roadway segment, it is recommended that an advance warning informational sign be installed in the vicinity of the bank's driveway, that one curb parking stall be removed east of the bank's driveway, that the bank's driveway be made an entrance only operation, and that the alley west of the bank be closed to traffic. The implementation of these actions should eliminate right-angle motor vehicle accidents on this roadway segment of E. Wisconsin Avenue.

Sideswipe Accident Problem: The alternative traffic management action indicated in Table 28 to have the potential to solve or mitigate the sideswipe accident problem at this intersection is the removal of on-street parking. The capital cost of this alternative, which would consist of parking meter removal and regulatory signing, would be about $600. All of the sideswipe accidents involved vehicles parked on the north side of E. Wisconsin Avenue. As noted in the rear-end accident problem analysis for this roadway segment, the removal of curb parking would eliminate the possibility of parked car collisions and increase roadway capacity by maintaining lane continuity. The disadvantages of this alternative are that it would decrease accessibility to retail development along E. Wisconsin Avenue and reduce the number of on-street curb

parking spaces. The current supply of on-street curb parking spaces was identified in Chapter V as inadequate in the Oconomowoc central business district. Therefore, implementation of this alternative is not recommended.

Short of prohibiting parking on E. Wisconsin Avenue, there are no alternative traffic management actions which have the potential to reduce the parked car sideswipe accident problem on this segment of E. Wisconsin Avenue. However, implementation of the traffic management actions recommended under the rear-end and right-angle accident problem analyses for this roadway segment should ameliorate the parked car sideswipe accident problem by reducing vehicle conflicts and thereby improving operating conditions on E. Wisconsin Avenue.

Concluding Remarks: In conclusion, it is recommended that an informational "parking lot entrance" sign be installed at the First National Bank of Oconomowoc' driveway, that one curb parking space on the north side of E. Wisconsin Avenue be removed immediately east of the bank's driveway entrance, that the "entrance only" operation of the bank's driveway be reinforced with "do not exit" or "one-way" signs, and that the alley driveway exit onto E. Wisconsin Avenue, which is located immediately west of the bank, be closed.

E. Wisconsin Avenue—N. Fowler Street to N. Thompson Street

The predominant accident collision patterns experienced on this roadway segment in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—11 accidents—vehicles making a right turn from the left lane and colliding with vehicles in the right lane—6 accidents—and left-turning vehicles colliding with oncoming vehicles—6 accidents. These three collision types, therefore, accounted for 23, or 82 percent, of the total 28 accidents on this roadway segment.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem on this roadway segment include: widening the roadway; installing islands or channelization; prohibiting turns; and skidproofing the roadway surface. Seven of the 11 rear-end accidents occurred during wet or icy roadway conditions, and 6 of the 11 accidents involved vehicles making a left or right turn into the driveways of commercial establishments along E. Wisconsin Avenue.

The first alternative—widening the roadway—would provide for the construction of a median with separated left-turn channelization. The existing roadway is 44 feet wide, which provides for four 11-foot traffic lanes. This alternative would consist of increasing the roadway width to 48 feet, with a 24-foot median. The capital cost of this alternative would be about $750,000. The advantage of this alternative is that it would separate the conflict between through traffic and provide a refuge area for vehicles slowing or stopping to turn left into the driveways of the commercial establishments along E. Wisconsin Avenue. The disadvantage of this alternative is that it would relocate the roadway closer to the commercial establishments along E. Wisconsin Avenue and reduce the number of off-street parking stalls serving those commercial establishments. Implementation of this alternative is not recommended.

The prohibition of left and/or right turns is another alternative solution to the rear-end accident problem on this roadway segment. The capital cost of this alternative, which would consist of regulatory signing, would be about $400. This alternative would eliminate the reason for vehicles to slow down or stop, thereby reducing the conflict between vehicular traffic movements. The disadvantage of this alternative is that it would reduce and/or eliminate the vehicular access to the commercial establishments along E. Wisconsin Avenue. Implementation of this alternative is not recommended.

The final alternative traffic management action suggested to solve the rear-end accident problem on this roadway segment consists of skidproofing the roadway surface. The capital cost of this alternative would be about $12,000 for the 400-foot roadway length between N. Fowler Street and N. Thompson Street. The advantage of this alternative is that it would reduce the braking distance of vehicles slowing down or stopping to accommodate conflicting traffic movements. The disadvantage of this alternative is that it would increase the noise level of vehicular traffic. Implementation of this alternative is not recommended at this time, pending the accident reduction effectiveness of the following recommendations.

It is recommended that the existing 25-mile-per-hour (mph) speed limit be strictly enforced to minimize the speed differential between conflicting traffic movements. This action is required because of the tendency of drivers to drive at a speed higher than the posted speed. According to the off-peak travel speed data contained in Table 13 in Chapter III, the average operating speed on this roadway segment is 26 mph in the westbound direction and 32 mph in the eastbound direction between N. Lapham Road and Walnut Street on E. Wisconsin Avenue. This higher average travel speed is encouraged by the rural and suburban land development and the 55-mph speed limit immediately east of this roadway segment of E. Wisconsin Avenue. It is also recommended that the pavement lane markings be well maintained on a regular—usually semi-annual—basis to provide motorists with ready identification of the proper lanes for left- and right-turning vehicles.

Right-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-turn accident problem on this roadway segment include the construction of right-turn channelization and prohibition of right turns. All 6 of the right-turn accidents in 1977 and 1978 involved vehicles making a right turn from the left-hand lane.

The first alternative—the construction of right-turn channelization—calls for constructing exclusive right-turn lanes to the driveway entrances of the commercial establishments along E. Wisconsin Avenue. The capital cost of this alternative would be about $20,000 per driveway entrance. The advantage of this alternative is that it would separate the conflict between through traffic and right-turning vehicles by providing a refuge area for vehicles manuevering to make right turns into the commercial establishments along E. Wisconsin Avenue. The disadvantage of this alternative is that additional right-of-way would be required from the commercial establishments along E. Wisconsin Avenue to facilitate the construction of the exclusive right-turn lanes. Thus, the construction of such lanes should be limited to only the highest-volume driveway entrances along E. Wisconsin Avenue, avoiding over-use of the action, which would produce a very irregular curb line that would be confusing to the motorist and act as an impediment to smooth traffic flow. Implementation of this alternative is not recommended.

The other alternative traffic management action with potential to reduce the right-turn accident problem on this roadway segment is the prohibition of right turns. As stated in the rear-end accident analysis for this roadway segment, the prohibition of left or right turns is not recommended, as it would substantially decrease accessibility to the commercial establishments along E. Wisconsin Avenue.

There are no low-capital traffic management solutions to the right-turn accident problem on this roadway segment. As stated in the rear-end accident analysis for this roadway segment, it is recommended that the 25-mph speed limit be strictly enforced to minimize the speed differential between conflicting traffic movements and to maintain the lane pavement markings.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the left-turn accident problem on this roadway segment include the construction of left-turn channelization and prohibition of left turns. All 6 of the left-turn accidents in calendar years 1977 and 1978 involved westbound vehicles turning left and being struck by vehicles traveling eastbound. As noted in the rear-end and right-turn accident analyses for this roadway segment, implementation of either of these two traffic management actions is not recommended.

There are no recommended traffic management solutions to the left-turn accident problem on this roadway segment. However, to ameliorate the left-turn accident problem, it is recommended, as stated in the rear-end and right-turn accident problem analyses, that the 25-mph speed limit be strictly enforced to minimize the speed differential between conflicting traffic movements and to maintain the pavement lane markings.

Concluding Remarks: In conclusion, it is recommended that the 25-mph speed limit be strictly enforced, and that the pavement markings on this roadway segment be maintained. Should these recommendations not be completely effective in solving the accident problems on this roadway segment of E. Wisconsin Avenue, it is then recommended that the roadway surface on E. Wisconsin Avenue from N. Fowler Street to N. Thompson Street be skidproofed.

N. Main Street—E. Rockwell Street to Wisconsin Avenue

The predominant accident collision pattern experienced on this roadway segment in calendar years

1977 and 1978 involved parked cars. These accidents occurred when vehicles pulled out of parking spaces and collided with vehicles in the traffic stream—4 accidents—and when vehicles in the traffic stream collided with parked cars—3 accidents. This collision type, therefore, accounted for 7, or 50 percent, of the total 14 accidents at this location.

Parked Car Accident Problem: The only traffic management action indicated in Table 28 to have potential to solve or mitigate the parked car accident problem on this roadway segment is the prohibition of on-street curb parking. The capital cost of this alternative, which would consist of parking meter removal and regulatory signing, would be about $800. The prohibition of curb parking would eliminate the conflict between through traffic and parked vehicles or vehicles entering or exiting the parking stalls on N. Main Street. In addition, this alternative would increase roadway capacity, maintaining lane continuity and providing the motorist with an unobstructed view of vehicles using the Fowler public parking lot driveway on N. Main Street. The disadvantages of this alternative are that it would decrease accessibility to the commercial establishments along N. Main Street and reduce the supply of on-street curb parking spaces. The current supply of on-street curb parking spaces was identified in Chapter V as inadequate in the Oconomowoc central business district. Therefore, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, there are no recommended traffic management solutions for the parked car accident problem on N. Main Street. In the future, should additional public parking spaces be provided in the close vicinity of the commercial establishments along N. Main Street, it would be advisable to consider removing the on-street curb parking from this roadway segment to solve the existing parked car accident problem.

E. Summit Avenue—S. Silver Lake Street to S. Westover Street

The predominant accident collision pattern experienced on this roadway segment in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—9 accidents. This collision type accounted for 69 percent of the total 13 accidents on this roadway.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem on this roadway segment include the installation of advance warning signs and skidproofing the roadway surface. Six, or 69 percent, of the 9 rear-end accidents in calendar years 1977 and 1978 occurred under wet or icy roadway conditions.

The first alternative—the installation of advance warning signs—would specifically involve the installation of "truck entrance" signs. The capital cost of this alternative would be about $200. The advantage of advance warning signs is that they notify the motorist of changing or hazardous conditions ahead. The disadvantage of such signs is that, if used in excess, they tend to lose their effectiveness. It is recommended that advance warning signs be installed on the roadway approaches to the Brownberry Ovens' plant driveway on E. Summit Avenue.

The other alternative traffic management action suggested to solve the rear-end accident problem on this roadway segment is skidproofing the roadway surface. The capital cost of this alternative would be about $15,000 for the 700-foot roadway length between S. Silver Lake Street and S. Westover Street. The advantage of this alternative is that it would reduce the braking distance of vehicles slowing down or stopping to accommodate conflicting traffic movements. The disadvantage of this alternative is that it would increase the noise level of vehicular traffic. Therefore, implementation of this alternative is not recommended at this time, pending the accident reduction effectiveness of the advance warning signs traffic management action.

Concluding Remarks: In conclusion, it is recommended that advance warning "truck entrance" signs be installed on the E. Summit Avenue approaches to the Brownberry Ovens' driveway. Should this traffic management action not be completely effective in solving the rear-end accident problem on this segment of E. Summit Avenue, it is then recommended that the roadway surface of E. Summit Avenue from S. Silver Lake Street to S. Westover Street be skidproofed.

E. Wisconsin Avenue—Plank Road to CTH P

The predominant accident collision pattern experienced on this roadway segment in calendar years 1977 and 1978 involved vehicles colliding into the rear of stopped vehicles—9 accidents. All of the 9 rear-end collisions involved westbound vehicles, with 7, or 78 percent, of these accidents involving vehicles stopped to make a left turn. This collision

type accounted for 50 percent of the total 18 accidents on the roadway segment. Ten, or 56 percent, of the accidents in calendar years 1977 and 1978 resulted in personal injuries.

Rear-End Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the rear-end accident problem on this roadway segment include: improved street lighting; the widening of the roadway; the installation of islands or channelization; the prohibition of turns; reducing the existing speed limit; and skidproofing the roadway surface.

The capital cost of the first alternative—installation of a street lighting system—would be about $70,000. Four, or 22 percent, of the 18 accidents which occurred on this roadway segment in calendar years 1977 and 1978 occurred at night, not a high enough number to warrant the installation of a street lighting system. Therefore, implementation of this alternative is not recommended.

The reconstruction of E. Wisconsin Avenue to widen the roadway is another alternative solution to the rear-end accident problem on this roadway segment. The existing roadway is 22 feet wide, with 10-foot gravel shoulders, which provides for two 11-foot traffic lanes. This alternative calls for increasing the roadway width to 44 feet to provide for four traffic lanes. The capital cost of this alternative would be about $500,000. The advantage of this alternative is that it would provide increased vehicular capacity and reduce the conflict between vehicular traffic movements. The disadvantage of this alternative is that E. Wisconsin Avenue traffic volumes would be substantially reduced when the freeway section of STH 16 is extended from its present terminus east of the study area to the City of Oconomowoc's city limits. The existing E. Wisconsin Avenue will then serve as a local frontage road and will not require four lanes of traffic. Therefore, implementation of this alternative is not recommended.

The construction of roadway channelization on this segment of E. Wisconsin Avenue would consist of paving the gravel shoulders on the north side of the roadway opposite the driveway entrances to the principal commercial establishments along the south side of the roadway. The capital cost of this alternative would be about $10,000 per driveway. The advantage of this alternative is that it would provide a bypass lane for through traffic when vehicles are slowing down or stopped to make a left turn or to enter the driveways on the south side of the roadway. The disadvantage of this alternative is that it would require vehicular traffic to slow down when changing lanes to bypass left-turning vehicles. It is recommended that bypass lanes be constructed for westbound traffic in the vicinity of the Deer Park and Farmer's Exchange driveway entrances on E. Wisconsin Avenue.

The prohibition of left turns is yet another solution to the rear-end accident problem on this roadway segment. The capital cost of this alternative, which would consist of regulatory signing, would be about $400. Implementation of this alternative would reduce the need for westbound vehicles to stop and would eliminate a conflicting traffic movement. The disadvantage of this alternative is that it would reduce the accessibility to the commercial establishments on the south side of E. Wisconsin Avenue. Implementation of this alternative is not recommended.

The number and severity of rear-end traffic accidents on this roadway segment could be ameliorated through a reduction in the posted speed limit. The posted speed limit on E. Wisconsin Avenue is 55 miles per hour (mph). The capital cost of reducing the speed limit, which would involve regulatory signing changes, would be about $400. As in all regulatory procedures, the limit imposed on highway speeds should be reasonable and appropriate. An important basis for establishing the proper speed limit on any street or highway is the nationally recognized "85th percentile speed"—that is, the speed at or below which 85 percent of the observed traffic is moving. Factors used to supplement the "85th percentile speed" in establishing speed limit are accident experience and traffic volume. The rear-end and turning accident collisions on this segment of E. Wisconsin Avenue are caused by driveway-oriented traffic movements and not the existing speed limit. The higher the traffic volume, the more important it is that most vehicles maintain the same speed. The existing traffic volume on this roadway segment is 16,000 vehicles per average annual weekday. This is one of the highest traffic volumes in the study area, and thus, for safety purposes, traffic speeds on this segment should be uniform. The disadvantage of this alternative is that speed limits would have to be strictly enforced, as drivers may have a tendency to drive at a speed higher than that posted because of the

rural and suburban character of the land development adjacent to this segment of E. Wisconsin Avenue. Implementation of the alternative is not recommended.

The final alternative traffic management action suggested to solve the rear-end accident problem at this intersection is skidproofing the roadway surface. The capital cost of this alternative would be about $2,400 for the westbound approaches to the Deer Park and Farmer's Exchange driveways. Implementation of this alternative would reduce the braking distance of vehicles slowing down or stopping to accommodate conflicting traffic movements. The disadvantage of this alternative is that it would increase the noise levels of vehicular traffic. Because of the large speed differential between through traffic and left-turning vehicles on this roadway segment, and of the fact that the weather and/or roadway conditions might have been a contributing factor in 10 of the 18 accidents, it is recommended that the westbound roadway approaches to the Deer Park and Farmer's Exchange driveways be skidproofed.

Concluding Remarks: In conclusion, it is recommended that westbound bypass lanes be constructed on the existing roadway shoulder and that the roadway for westbound traffic be skidproofed at the approaches to the driveway entrances to the Deer Park and Farmer's Exchange commercial establishments.

E. Summit Avenue—E. Maple Lane to E. Thackery Trail

The predominant accident collision pattern experienced on this roadway segment in calendar years 1977 and 1978 involved vehicles colliding at right angles—3 accidents. This collision type accounted for 38 percent of the total 8 accidents on this roadway segment.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 28 to have potential to solve or mitigate the right-angle accident problem on this roadway segment include improved street lighting and reducing the existing speed limit.

The capital cost of the first alternative—the installation of a street lighting system—would be about $15,000. Of the 8 accidents which occurred on this roadway segment in calendar years 1977 and 1978, 3, or 38 percent, occurred at night. This is an above average number of nighttime accidents. The installation of a street lighting system on this roadway segment would aid the motorist in making the transition from rural to urban driving conditions and provide system continuity between the existing street lighting north of E. Maple Lane and that at the intersection of E. Summit Avenue and E. Thackery Trail, a distance of approximately 700 feet. There is no significant disadvantage to this alternative. Therefore, it is recommended that street lighting be installed on this roadway segment.

The final alternative traffic management action suggested to solve the right-angle accident problem on this roadway segment is reducing the posted speed limit. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $400. The posted speed limit is currently 35 miles per hour (mph). As in all regulatory procedures, the limits imposed on highway speeds should be reasonable and appropriate. The basis for the proper speed on any street or highway is the nationally recognized "85th percentile speed"—that is, the speed at or below which 85 percent of the observed traffic is moving. The travel speed data in Table 13 in Chapter III indicate an average off-peak travel speed of 36 mph between Robruck Drive and E. Armour Road on this roadway segment. Thus, it would appear that this speed is being exceeded. This speed level is a contributing factor to the right-angle accident problem. The proposed installation of a traffic signal at the intersection of E. Summit Avenue and E. Thackery Trail and the extension of the posted 35-mph speed limit south of that intersection should serve to lower the travel speed on this segment of E. Summit Avenue so that it conforms with the "85th percentile speed" guidelines. Therefore, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that a street lighting system be installed on this segment of E. Summit Avenue.

E. Wisconsin Avenue—N. Thompson Street to S. Wood Street

A total of 5 accidents occurred on this roadway segment, all during the year 1978. There was no predominant collision pattern. The only common factor among the accidents was that they all occurred in the winter, when roadway conditions were wet or icy and/or it was raining, sleeting, or snowing.

The alternative traffic management action indicated in Table 28 to have potential to solve or mitigate the accident problem on this roadway segment is skidproofing the roadway surface. The capital cost of this alternative would be about $8,300 for the 250-foot roadway length between N. Thompson Street and S. Wood Street. The advantage of this alternative is that it would reduce the braking distance of vehicles slowing down or stopping to accommodate conflicting traffic movements. The disadvantage of this alternative is that it would increase the noise level of vehicular traffic. Implementation of this alternative is not recommended at this time, pending the accident reduction effectiveness of the recommendations contained in the accident location analysis for E. Wisconsin Avenue—N. Fowler Street to N. Thompson Street, which is immediately west of this roadway segment.

Concluding Remarks: In conclusion, it is recommended that the 25-mph-speed limit be strictly enforced, and that the pavement markings on this roadway segment be maintained. Should these recommendations not be completely effective in solving the accident problem on this roadway segment of E. Wisconsin Avenue, it is then recommended that the roadway surface of E. Wisconsin Avenue from N. Thompson Street to S. Wood Street be skidproofed.

Summary

The preceding accident problem analysis has investigated the causes of the traffic problems in the Oconomowoc study area, evaluated alternative traffic system management actions to solve or mitigate the problems, and recommended for implementation those alternatives judged best. Twenty accident problem locations were studied as a part of this analysis. Table 29 summarizes the traffic management recommendations resulting from this analysis and indicates the capital cost and/or annual cost of implementing each recommendation and the effect that the recommended action would have on vehicular air quality emissions and fuel consumption. A total of 42 recommended traffic management actions are set forth in Table 29. In some instances, the implementation of more than one traffic management action would be required to reduce the number and/or severity of the different collision patterns experienced at each problem location. For one accident location, N. Main Street—E. Rockwell Street to Wisconsin Avenue, no traffic management solution was recommended. The vehicular collision types at this location may be primarily attributed to the existing on-street parking activity. Because of the current shortage of on-street parking spaces in the Oconomowoc central business district, the restriction of on-street parking along this segment of N. Main Street, the only action with potential to solve this accident problem, was not recommended.

SUMMARY AND CONCLUSIONS

This chapter has presented and evaluated a broad range of alternative traffic management actions, primarily of a low-cost, short-range operational nature, and recommended those actions judged to best mitigate the existing traffic problems of the Oconomowoc area. Those problems, as described in Chapter V of this report, may be categorized as problems relating to traffic congestion, arterial service, parking, and traffic accidents. The traffic management actions recommended to resolve each individual problem were further evaluated by arterial facility to identify interrelated recommendations and assure a sound systemwide management plan.

As previously noted, the two principal arterials in the study area are STH 16 (Wisconsin Avenue) and STH 67 (E. Summit Avenue, Main Street, and N. Lake Road). The majority of the congestion and accident traffic problems occur on these two arterial highways, and, therefore, the resulting recommended traffic management actions to mitigate those problems relate to these two arterial highways.

The initial traffic problem encountered on STH 16 involves the intersection of STH 16 and CTH P at the eastern boundary of the study area. It is recommended that the street lighting on the approaches to this intersection be improved and that the "signal ahead" advance warning sign be relocated on the southbound approach to the intersection.

The next traffic problem on STH 16 occurs on the segment of STH 16 from CTH P to Plank Road, which exhibits an excessive number of accidents. It is recommended that a westbound bypass lane on the existing roadway shoulder be constructed and that the roadway surface of the westbound approaches to the driveway entrances to the Deer Park and Farmer's Exchange commercial establishment be skidproofed.

Continuing westward along STH 16 as it enters the city limits of Oconomowoc, a traffic accident problem was identified on the roadway segment from S. Wood Street to N. Fowler Street. It is recommended that the 25-mile-per-hour (mph)

Table 29

SUMMARY OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE TRAFFIC ACCIDENT PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Total Number of Accidents	Recommended Traffic Management Actions	Capital Cost	Effect on Vehicular Emissions	Effect on Vehicular Fuel Consumption
Main Street and Wisconsin Avenue	39	● Improve street lighting	$ 3,500	--	--
		● Establish turning guidelines	100	--	--
		● Modify existing signals	800	--	--
		● Retime signal sequence	--	Reduction	Reduction
		● Interconnect signals	10,500	Reduction	Reduction
E. Summit Avenue and E. Thackery Trail	23	● Install traffic signal	$31,100	Increase	Increase
		● Improve street lighting	9,000	--	--
		● Reduce speed limit	400	Increase	Reduotion
		● Install advance warning signs	200	--	--
E. Wisconsin Avenue and Walnut Street	23	● Modify existing signals	$ 800	--	--
		● Revise signal sequence	--	--	--
		● Improve street lighting	3,500	--	--
		● Interconnect signals	--[a]	Reduction	Reduction
E. Wisconsin Avenue and CTH P	17	● Improve street lighting	$12,000	--	--
		● Relocate advance warning sign	100	--	--
E. Wisconsin Avenue and S. Silver Lake Street	15	● Modify existing signals	$ 600	--	--
		● Retime signal sequence	--	Reduction	Reduction
		● Interconnect signals	--[a]	Reduction	Reduction
S. Main Street and W. South Street	14	● Install pavement markings	$ 150	--	--
E. Summit Avenue and E. Armour Road	12	● Reconstruct roadway curb	$15,000	--	--
		● Install pavement markings	700	--	--
E. Summit Avenue and S. Silver Lake Street	12	● Modify existing signals	$ 5,000	--	--
		● Retime signal sequence	--	Reduction	Reduction
		● Install pavement markings	100	--	--
		● Interconnect signals	--[a]	Reduction	Reduction
E. Summit Avenue and CTH B	11	● Install signal beacons	$ 2,000	--	--
		● Install advance warning signs	200	--	--
E. Summit Avenue and E. Forest Street	11	● Strictly enforce 15-mph school-zone speed limit	$ --	--	--
		● Skidproof roadway surface[b]	9,000	--	--
S. Main Street, W. 2nd Street, and E. Summit Avenue	10	● Install advance warning sign	$ 100	--	--
E. Forest Street and S. Silver Lake Street	6	● Install pavement markings	$ 100	--	--
E. Wisconsin Avenue-- Main Street to St. Paul Street	31	● Install advance warning signs	$ 100	--	--
		● Prohibit parking	100	--	--
		● Restrict driveway operation	400	--	--

Table 29 (continued)

Problem Location	Total Number of Accidents	Recommended Traffic Management Actions	Capital Cost	Effect on Vehicular	
				Emissions	Fuel Consumption
E. Wisconsin Avenue— N. Fowler Street to N. Thompson Street	28	● Strictly enforce speed limit ● Maintain pavement markings ● Skidproof roadway surface[b]	$ -- -- 12,000	-- -- --	-- -- --
N. Main Street— E. Rockwell Street to Wisconsin Avenue	14	● No recommendation	--	--	--
E. Summit Avenue— S. Silver Lake Street to S. Westover Street	13	● Install advance warning signs ● Skidproof roadway surface[b]	$ 200 15,000	-- --	-- --
E. Wisconsin Avenue— Plank Road to CTH P	9	● Install channelization ● Skidproof roadway surface[b]	$20,000 2,400	Reduction --	Reduction --
E. Summit Avenue— E. Maple Lane to E. Thackery Trail	3	● Improve street lighting	$15,000	--	--
E. Wisconsin Avenue— N. Thompson Street to S. Wood Street	5	● Strictly enforce speed limit ● Maintain pavement markings ● Skidproof roadway surface[b]	$ -- -- 8,300	-- -- --	-- -- --

[a] *Total interconnection costs included in Main Street-Wisconsin Avenue intersection recommendation.*

[b] *Action recommended pending accident reduction effectiveness of other recommendations.*

Source: SEWRPC.

posted speed limit be strictly enforced and that the pavement markings be maintained in good condition. Should these recommendations prove not to be completely effective in solving the accident problem on this roadway segment, it is then recommended that the roadway surface of STH 16 from S. Wood Street to W. Fowler Street be skidproofed.

As STH 16 enters the Oconomowoc central business district, a traffic accident and congestion problem exists at the intersection of STH 16 with Walnut Street. It is recommended that the street lighting at this intersection be improved, that the visibility of the traffic signals be improved through the addition of backboards and/or black signal faces, that the traffic signal sequence be revised through the addition of a common red indication, and that the traffic signals at this intersection be interconnected with the other traffic signals in the area of the Oconomowoc central business district.

A traffic accident problem occurs at the intersection of STH 16 with S. Silver Lake Street. It is recommended that the visibility of the traffic signals be improved through the addition of backboards and/or black signal faces, and that the traffic signal sequences be retimed and the traffic signals be interconnected with the other traffic signals in the area of the Oconomowoc central business district.

The segment of STH 16 from St. Paul Avenue to Main Street was identified as having a traffic accident problem. It is recommended that a "parking lot entrance" sign be installed at the First National Bank of Oconomowoc' driveway on STH 16, that the operation of that driveway as an "entrance only" driveway be reinforced with "do not exit" or "one-way" signs, that one curb parking space be removed immediately east of the bank's driveway entrance on the north side of STH 16, and that the driveway exit onto

STH 16 from the alley immediately west of the bank be closed.

The principal intersection in the Oconomowoc central business district, STH 16 with STH 67, was identified as a traffic accident and congestion problem location. This intersection is the location of the most extensive number of traffic management recommendations in the study area. It is recommended that the visibility of the traffic signals be improved through the addition of backboards and/or black signal faces, that the traffic signal sequence be retimed to increase the operational capacity of Wisconsin Avenue, that a traffic signal be installed at the intersection of STH 16 and S. Concord Road, that these signals be interconnected with the other traffic signals in the central business district, and that a downtown route be delineated on W. 2nd Street and S. Concord Road. It is further recommended that the street lighting be improved and that a south-to-west pavement marking left-turn guideline be painted here.

The final traffic problem identified on STH 16 involves truck traffic destined for the Oconomowoc industrial park, located on W. 2nd Street west of W. Elm Street. This is an arterial service problem and it is recommended that truck traffic be restricted on S. Elm Street, that STH 16 and S. Concord Road be posted as the arterial truck route to the industrial park, and that parking be restricted on the segment of S. Concord Road from W. Wisconsin Avenue to W. 2nd Street during the hours of 8:00 a.m. to 4:30 p.m.

The initial traffic problem encountered on STH 67 involves the intersection of STH 67 with CTH B, which is located on the southern boundary of the study area. It is recommended that flashing yellow overhead signal beacons and "cross road" advance warning signs be installed on the STH 67 approaches to the intersection.

The intersection of STH 67 with E. Thackery Trail was identified as having a traffic accident problem. It is recommended that a traffic signal and "signal ahead" warning signs be installed at this intersection, that street lighting be provided for on the STH 67 approaches to the intersection, and that the posted speed limit be reduced to 35 mph on STH 67 from E. Thackery Trail to E. Lexington Avenue.

A traffic accident problem exists on the roadway segment of STH 67 extending northwesterly to E. Maple Lane. It is recommended that street lighting be installed on this segment of STH 67 which would be compatible with the improved street lighting recommendation for the intersection of STH 67 with E. Thackery Trail.

Proceeding along STH 67 in a northwesterly direction, a traffic accident problem was identified at the intersection of STH 67 and E. Forest Street. It is recommended that the 15-mph school zone speed limit on the segment of STH 67 in the vicinity of this intersection be strictly enforced. Should this traffic management action prove not to be completely effective in reducing the accident problem at this location, it is then recommended that the STH 67 approaches to the intersection be skidproofed.

The intersection of STH 67 with E. Armour Road has a traffic accident problem. It is recommended that the northeast corner roadway curb be reconstructed with an increased turning radius for right-turning vehicles, and that pavement markings be installed at this intersection.

The segment of STH 67 extending from S. Westover Street to and including the intersection of S. Silver Lake Street was identified as having traffic accident and congestion problems. It is recommended that advance warning "truck entrance" signs be installed on the STH 67 approaches to the Brownberry Ovens' driveway. Should this traffic management action prove not to be completely effective in solving the accident problem at this location, it is then recommended that the roadway surface of STH 67 from S. Westover Street to S. Silver Lake Street be skidproofed. It is also recommended that the sequence of the traffic signals at the intersection of STH 67 with S. Silver Lake Street be retimed to increase the operating capacity of the STH 67 approaches to the intersection, and that the traffic signals at this intersection be interconnected with the other traffic signals in the area of the Oconomowoc central business district. The final recommendation at this location, which was implemented by the City of Oconomowoc prior to the completion of this report, is the reconstruction of the westbound approach to the intersection to provide for an exclusive right-turn lane.

Following STH 67 through the Oconomowoc central business district, a traffic accident problem was identified at the intersection of E. Summit Avenue with S. Main Street and W. 2nd Street. It is recom-

mended that an advance warning "watch for right turning trucks from left lane" sign be installed on the westbound approach to the intersection.

The intersection of S. Main Street with W. South Street was also identified as having a traffic accident problem. It is recommended that advance warning pavement markings be painted north of the 15-minute restricted curb parking on the west side of S. Main Street.

The final traffic problem location on STH 67 is the segment of N. Main Street from STH 16 to E. Rockwell Street. There are no recommended solutions for this problem. In the future, should additional public parking spaces be provided in the vicinity of the commercial establishments along N. Main Street, it would be advisable to consider removing the on-street curb parking from this roadway segment.

A traffic management action involving the rescheduling of the starting and quitting times of employees of the major public and private employers in the Oconomowoc study area is recommended in order to balance demand for transportation services during the peak hours of traffic congestion on STH 16 and STH 67. There is no capital cost directly associated with this recommendation. However, implementation of this recommendation will require the cooperation of the public and private employers concerned.

In addition to these recommended traffic management actions to solve or mitigate the existing traffic accident and congestion problems identified on STH 16 and STH 67, a traffic management action consisting of painting "stop" line pavement markings on the east- and westbound roadway approaches was recommended to solve the traffic accident problem identified at the intersection of E. Forest Street with S. Silver Lake Street.

The cost of these low-capital, short-term traffic management action recommendations, in 1979 dollars, exclusive of the roadway surface skidproofing recommendations for STH 16 from S. Wood Street to N. Fowler Street and for STH 67 at E. Forest Street and from S. Westover Street to S. Silver Lake Street, was estimated at $216,750. The capital cost of the roadway surface skidproofing recommendations, which are recommended to be implemented should the other traffic management actions fail to solve the traffic accident problems at those locations, was estimated at $44,300. The total cost of the recommended short-range, low-capital traffic management actions to solve the existing traffic accident and congestion problems in the Oconomowoc traffic management study area is thus about $261,050.

It must be recognized that the capacity which can be effectively obtained from an existing arterial street system through traffic management actions has a definite limit. Therefore, certain long-range, high-capital investment recommendations were also identified in this chapter as ultimate solutions to certain of the existing, as well as to probable future, traffic problems which may be expected to occur as urban development continues in the Oconomowoc area. These long-range, high-capital investment recommendations consist of constructing an east-west arterial bypass south of the Oconomowoc central business district, through the southern portion of the study area, at an approximate cost of $2.4 million to $3.1 million, and of constructing a north-south arterial bypass east of the Oconomowoc central business district, through the eastern portion of the study area, at an approximate cost of $23 million, in 1979 dollars. In pursuing the implementation of these two arterial bypass recommendations, it is further recommended that the City of Oconomowoc and other concerned agencies of government in the study area take action to precisely define the locations of each facility and, once so defined, place these facilities on the City's Official Map to preserve the needed rights-of-way for their construction prior to further urbanization in the study area.

Another category of traffic problems identified in the Oconomowoc study area is arterial service problems. An east-west and a north-south arterial spacing deficiency problem and a conflict problem between through and local traffic in the Oconomowoc central business district has been identified in the southern and eastern portions of the study area. Aside from the delineation of a downtown bypass on W. 2nd Street and S. Concord Road, there do not appear to be any low-capital traffic management actions which will solve or mitigate these problems. The ultimate solution to these arterial service problems will require the construction of the previously recommended long-range, high-capital investment, east-west and north-south arterial bypasses.

One of these arterial service problems, as already noted, involves truck traffic on local streets. It is recommended that truck traffic be restricted

on S. Elm Street and diverted to S. Concord Road. This recommendation includes the restriction of on-street curb parking between the hours of 8:00 a.m. and 4:30 p.m. on the segment of S. Concord Road from W. Wisconsin Avenue to W. 2nd Street. The ultimate recommended solution to this arterial service problem is the construction of a new land access street from the Oconomowoc industrial park located along W. 2nd Street west of S. Elm Street to the previously recommended east-west arterial bypass.

Another arterial service problem which was identified in the study area involves railroad crossing vehicle delays. It is recommended that the at-grade stop sign traffic controls be removed at the Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) trackage gate-protected crossings with S. Elm Street, S. Park Street, S. Concord Road, S. Worthington Street, S. Cross Street, S. Silver Lake Street, and S. Lapham Street. (The railroad crossing stop sign control for northbound traffic on S. Lapham Street is not recommended for removal because of the vertical highway alignment problem at that crossing.) It is also recommended that constant time warning devices be installed at the S. Main Street and S. Silver Lake Street crossings with the Milwaukee Road trackage. Again, the ultimate recommendation to ameliorate this railroad crossing vehicle delay problem is the construction of the previously recommended east-west and north-south arterial bypasses.

The final arterial service problem identified in the study area involves poor traffic circulation in the Oconomowoc central business district, principally on N. Lake Road. There are no recommended traffic management actions which will solve or mitigate this arterial service problem.

The capital costs of implementing the recommended traffic management solutions to the arterial service problems in the study area are: approximately $33,100 for the trucking restriction recommendation on S. Elm Street (of the $33,100 capital cost, $32,000 is also included in the cost of the traffic signal installation recommended in the delineation of a downtown bypass route), and $30,650 for the constant time warning device installation and at-grade stop sign removal recommendations on the Milwaukee Road trackage, plus the long-range, high-capital investment of approximately $26.2 million required to construct the east-west and north-south arterial bypasses and a new land access street from the Oconomowoc industrial park to the east-west arterial bypass facility.

The final traffic problem identified in the Oconomowoc study area is an inadequate supply of parking spaces in the Oconomowoc central business district. There is an inadequate number of short-term, on-street, and of both short- and long-term off-street, parking spaces in this district. The following low-cost traffic management actions will not solve, but are recommended to ameliorate, these parking supply problems. It is recommended that parking meters be installed and that the 15-minute restriction be changed to a one-hour parking restriction for the three parking spaces on the east side of N. St. Paul Street; that the parking meters and the two-hour parking restriction for the 15 parking spaces on the south side of E. Collins Street be removed to allow for all-day unrestricted parking; that the all-day parking restriction for three parking spaces on the north side of W. South Street be changed to an 8:00 a.m. to 3:30 p.m., 15-minute restriction; that the all-day, no-parking restriction for the six parking spaces on the west side of S. Cross Street be removed to allow for all-day unrestricted parking; and that 10 of the eight-hour parking stall restrictions in the Fowler public parking facility be changed to two-hour restrictions. The capital cost of implementing these traffic management action recommendations would be about $2,100.

In addition to the low-capital traffic management actions recommended to ameliorate the existing parking supply problems in the Oconomowoc central business district, it is recommended that an off-street parking structure with approximately 300 parking stalls be constructed at the South or Fowler public parking lots. The estimated capital cost for this recommendation is $1.2 million.

In conclusion, the cost of implementing the short-range, low-capital traffic management actions and long-range, high-capital investment recommendations to solve or mitigate the existing traffic problems identified in the study area would be $294,900 and $27.4 million, respectively. The following chapter will identify the governmental agency which should assume responsibility for implementing each action, set forth recommended priorities for implementing the recommended traffic management actions, and recommend funding sources for each action.

Chapter VII

PLAN IMPLEMENTATION

INTRODUCTION

Implementation of the recommended traffic management actions described in the preceding chapter of this report should provide the Oconomowoc area with a more efficient and safe transportation system. This chapter is presented as a guide for use in such implementation. Basically, it outlines which levels and agencies of government are responsible for the actions which must be taken if the recommended traffic management plan is to be fully carried out. Those units and agencies of government which have plan adoption and plan implementation powers applicable to the recommended plan are identified; desirable formal plan adoption actions are specified; specific implementation measures and responsibilities are set forth with respect to the recommended traffic management recommendations for each of the units and agencies of government concerned; and a priority schedule for implementation of each recommendation is provided. In addition, financial assistance and government funding programs available to such units and agencies of government in implementation of the transportation management plan recommendations are identified.

Any plan implementation program should emphasize those elements of the adopted plan that have the greatest potential to relieve the most serious problems and thereby most effectively achieve the plan objectives. Accordingly, primary attention should be focused on those plan recommendations which are intended to mitigate the traffic congestion and the traffic accident problems of the Oconomowoc area, and thereby increase the efficiency and safety of the area transportation system. This is not to say, however, that implementation of the arterial service or parking supply improvement recommendations set forth in the plan need not be implemented in a timely manner, but only that primary attention in plan implementation should be focused on those recommendations that have the most direct effect on transportation system efficiency and safety.

A priority schedule for implementation is an important element of a traffic management plan. Successful completion of a high-priority traffic management recommendation, however, is not required, and should not be necessarily insisted upon, prior to initiating implementation of another, lower-priority recommendation. The implementation of a lower-priority recommendation which can be readily accomplished may and should whenever possible be undertaken concurrently with recommendations that require more time-consuming engineering design, funding, and/or administrative procedures and approvals.

PLAN IMPLEMENTATION ORGANIZATIONS

Implementation of the recommended traffic management actions will be largely dependent upon the action of four units or agencies of government: the U. S. Department of Transportation, Federal Highway Administration; the Wisconsin Department of Transportation; the Waukesha County Board; and the City of Oconomowoc. Although the actions required by these four agencies are, for convenience, herein discussed separately, the interdependence of the actions of the various levels of government concerned and the need for close interagency cooperation cannot be over-emphasized. Below is a brief discussion of the duties and functions of these four agencies as they relate to implementation of the traffic management plan.

U. S. Department of Transportation, Federal Highway Administration

The U. S. Department of Transportation, Federal Highway Administration, administers all federal highway aid programs, working through the Wisconsin Department of Transportation. The Federal Highway Administration must approve all projects on, and changes to, the federal aid highway system. It is important to note that federal aid highway funds may be available to finance from 75 to 100 percent of the implementation costs of the majority of traffic management actions recommended in the plan. A subsequent section of this chapter will briefly describe the available funding programs and respective traffic management actions which should qualify for federal aid.

Wisconsin Department of Transportation

The Wisconsin Department of Transportation is

broadly charged and empowered to provide the State with a good transportation system. The Department is responsible for the administration of all state and federal aids for highway improvements; the planning, design, construction, and maintenance of all state trunk highways; and the planning, laying out, revision, construction, reconstruction, maintenance, and management of the national system of interstate and defense highways and the federal aid primary, secondary, and urban highway systems. The Department is authorized to enter into cooperative agreements with the governing bodies of any county, city, village, or town, or with the federal government, with respect to the financing, planning, establishment, improvement, maintenance, use, regulation, or vacation of highways within their respective jurisdictions.

The planning and programming procedure developed by the Wisconsin Department of Transportation to coordinate the expenditure of state and federal highway funds determines when and where the various improvement projects will be accomplished on the existing state trunk highway system and establishes standards for such determination. The procedure provides an orderly means whereby the many complex and highly interrelated tasks involved in the final accomplishment of highway improvement projects can be carried out. The Wisconsin Department of Transportation, through its administration of state and federal aids to local units of government and through its highway design and engineering functions, exerts a powerful influence on street and highway system improvement planning and development within Wisconsin, and is probably the singularly most important agency in highway improvement plan implementation.

Waukesha County Board

At the county level of government in Wisconsin, county highway transportation committees, operating under the aegis of the county boards, are responsible for the administration and expenditure of all county funds for highway construction and maintenance; are empowered to establish and change the county trunk highway system, subject to the approval of the Wisconsin Department of Transportation; are responsible in cooperation with the Wisconsin Department of Transportation for the selection of a system of federal aid secondary roads; and are empowered to acquire land for county highway purposes by purchase or condemnation. In rural areas, the county maintains the state trunk highway system under contract to the Wisconsin Department of Transportation.

City of Oconomowoc

At the local level of government within Wisconsin, the city common councils and the town and village boards, through boards of public works and upon the advice of city plan commissions, are responsible for the administration of all city, town, or village funds for highway construction and maintenance; for the design, construction, and operation of the local streets within the geographic limits of the municipality; for the maintenance and management of connecting highways—that is, of city streets over which state trunk highways are routed through incorporated municipalities—in cooperation with the Wisconsin Department of Transportation; and for the acquisition of land for city, town, or village street and highway purposes by purchase or condemnation. As a local unit of government, the City of Oconomowoc, acting through the Common Council, carries out these important transportation-related responsibilities.

PLAN ADOPTION

Adoption or endorsement of the recommended Oconomowoc area traffic management plan by the four major implementation agencies is important to assure a common understanding among the several governmental agencies and to enable their staffs to program, in an orderly way, the necessary plan implementation work. It is important to understand, in this respect, that adoption or endorsement of the traffic management plan by any unit or agency of government pertains only to the statutory duties and functions of the adopting or endorsing agency, and that such adoption or endorsement does not and cannot in any way preempt or commit action by another unit or agency of government within its functional and geographic area of jurisdiction. Thus, the adoption or endorsement of the traffic management plan by the State and by the City of Oconomowoc would make the plan applicable as a guide for state and city highway system management but not for county trunk or town highway system management. To make the plan applicable as a guide for county trunk and town highway system management would require its adoption by those governmental units directly concerned.

The following specific plan adoption or endorsement actions are hereby recommended:

1. The Common Council of the City of Oconomowoc should, after due consideration and recommendation by the Board of Public

Works and the City Plan Commission, formally adopt the recommended traffic management plan as a guide to arterial street and highway system development and management within the City.

2. Upon adoption of the recommended plan by the Common Council of the City of Oconomowoc, the Waukesha County Board of Supervisors, after due consideration and recommendation by the Waukesha County Highway and Transportation Committee and the Waukesha County Park and Planning Commission, should formally act to endorse the recommended traffic management plan as a guide to the management of the county trunk highways and their extensions into and through the City of Oconomowoc and the Oconomowoc area.

3. Upon approval of the recommended traffic management plan by the Common Council of the City of Oconomowoc, the Wisconsin Department of Transportation should act formally to endorse the recommended traffic management plan as a guide to the management of the state trunk highways and their extensions into and through the City of Oconomowoc and the Oconomowoc area.

4. Upon approval of the recommended traffic management plan by the Wisconsin Department of Transportation, the U. S. Department of Transportation, Federal Highway Administration, should endorse the recommended traffic management plan as a guide to the administration of its federal aid programs for traffic management actions in the Oconomowoc area.

5. Upon approval of the recommended traffic management plan by the Common Council of the City of Oconomowoc, the Southeastern Wisconsin Regional Planning Commission should incorporate the plan recommendations into the regional transportation systems management plan in its annual review and updating of that plan element.

A model resolution that can be used in adopting the Oconomowoc area traffic management plan is set forth in Appendix G.

Subsequent Plan Adjustment

No plan can be permanent in all of its aspects. Monitoring of changing conditions and of the effectiveness of implemented plan actions is essential if the validity and viability of the adopted plan is to be maintained. It is recommended that the City of Oconomowoc assume responsibility for periodically updating the adopted plan as new urban development occurs and travel patterns and tripmaking characteristics change, and as data on the effectiveness of completed plan implementation measures become available. The plan updating will require the same close cooperation among the local, county, state, and federal agencies that was evidenced in the preparation of the initial traffic management plan itself. To achieve this necessary coordination among local, county, state, and federal agencies and, therefore, the timely implementation and updating of the plan, it is recommended that the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study periodically review the operating conditions of the existing transportation system in the study area; evaluate those conditions against the traffic problems identified in the initial plan; and, based on a comparison of the updated operating conditions to the transportation system objectives and standards, recommend as may be necessary new traffic management actions for consideration by the various implementing agencies.

PLAN IMPLEMENTATION

Implementation of the recommended traffic management plan may be considered under three distinct but interrelated areas of action by the major implementing agencies concerned: 1) implementation of actions on the state trunk highway system under the jurisdiction of the Wisconsin Department of Transportation; 2) implementation of actions on the county trunk highway system under the jurisdiction of the Waukesha County Highway and Transportation Committee; and 3) implementation of actions on the local arterial street and highway system under the jurisdiction of the City of Oconomowoc. The recommended plan implementation actions are summarized in the following paragraphs by level of government concerned.

Wisconsin Department of Transportation

It is recommended that the traffic management actions listed in Table 30 be implemented by the

Wisconsin Department of Transportation. As indicated in Table 30, eight traffic management actions are recommended for four different locations on the state trunk highway system, with an estimated total capital cost of $68,300.

A recommended traffic management action not listed in Table 30 because it is a high-capital investment of a long-range nature, but which is also the responsibility of the Wisconsin Department of Transportation, is the design of, acquisition of right-of-way for, and construction of the recommended north-south STH 16 freeway bypass northerly through the eastern portion of the Oconomowoc traffic management study area, and thence westerly beyond the study area to rejoin existing STH 16 in Jefferson County. The estimated cost of this recommendation is $23 million. At the present time, the Wisconsin Department of Transportation has officially laid a state trunk highway in the bed of the proposed north-south STH 16 freeway bypass and, pending approval of funding for construction of the project by the State Legislature, is acquiring right-of-way for the facility on a case-by-case hardship basis. The right-of-way for the facility has been placed on the official street and highway width map adopted by the Waukesha County Board of Supervisors.

Waukesha County

It is recommended that Waukesha County, acting through the County Highway and Transportation Committee, relocate a "stop ahead" advance warning sign on the southbound approach of CTH P to its intersection with STH 16, at an estimated capital cost of $100. In addition to this action, it is recommended that Waukesha County, through the County Highway and Transportation

Table 30

TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO BE IMPLEMENTED BY THE WISCONSIN DEPARTMENT OF TRANSPORTATION IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Actions	Capital Cost
Intersection STH 16 with CTH P	● Improve street lighting	$12,000
STH 16 from CTH P to Plank Road	● Install channelization	$20,000
	● Skidproof roadway surface	2,400
	Subtotal	$22,400
Intersection STH 67 with CTH B	● Install signal beacons	$ 2,000
	● Install advance warning signs	200
	Subtotal	$ 2,200
Intersection STH 67 with E. Thackery Trail	● Install traffic signals[a]	$31,100
	● Reduce speed limit	400
	● Install advance warning signs	200
	Subtotal	$31,700
	Total	$68,300

[a] *Recommendation is being implemented by the Wisconsin Department of Transportation prior to the completion of the study.*

Source: SEWRPC.

Committee, conduct a preliminary engineering study to determine the appropriate centerline location and right-of-way requirements for the recommended east-west arterial bypass through the southern portion of the study area. The adopted Waukesha jurisdictional highway system plan recommends that this facility be a county trunk highway. Upon completion of the preliminary engineering study, it is further recommended that the facility be placed by Waukesha County on the official county street and highway width map.

A final traffic management action recommended for implementation by Waukesha County is a high-capital investment, long-range recommendation for the design of, acquisition of right-of-way for, and construction of an east-west arterial bypass through the southern portion of the study area. If the final design recommends a four-lane divided facility, this action will cost an estimated $3.1 million, and if a four-lane, undivided facility is recommended, it will cost an estimated $2.4 million.

City of Oconomowoc

It is recommended that the traffic management actions listed in Table 31 be implemented by the City of Oconomowoc. As indicated in Table 31, 45 traffic management actions are recommended for 22 different locations, with an estimated total capital cost of $226,500. Of these recommended traffic management actions, 13 actions, or 29 percent, are on the connecting highway system and require the approval of the Wisconsin Department of Transportation before they can be implemented. It should be noted that one of these actions, the reconstruction of the westbound approach to the intersection of STH 67 with Silver Lake Street to provide for an exclusive right-turn lane, has already been implemented by the City of Oconomowoc.

In addition to implementing the traffic management actions listed in Table 31, it is recommended that the City of Oconomowoc:

1. Amend its Official Map pursuant to Section 62.23(6) of the Wisconsin Statutes to place on that map the right-of-way for the recommended north-south STH 16 freeway bypass facility.

2. Upon completion of the aforenoted preliminary engineering study for Waukesha County, amend its Official Map to place on that map the right-of-way for the proposed east-west arterial bypass in the southern portion of the study area pursuant to Section 62.23(6) of the Wisconsin Statutes.

3. Amend its Official Map to place on the map, and subsequently construct, the recommended land access street from the Oconomowoc industrial park to the recommended east-west arterial bypass facility pursuant to Section 62.23(6) of the Wisconsin Statutes.

4. Construct the recommended parking structure at the Fowler or South public parking facility location.

IMPLEMENTATION PRIORITY

In order to implement the traffic management actions recommended in the plan in the most effective manner practicable, it is essential to set forth an implementation schedule which establishes a priority listing for initiating the implementation of each recommendation. To assist in the implementation of the traffic management actions, recommended implementation priority lists have been set forth in Tables 32, 33, and 34. However, this does not mean that several traffic management actions cannot be implemented simultaneously, or that implementation of a specific action must be completed before initiating the implementation of a subsequent priority action.

The priority listings in Tables 32, 33, and 34 have purposely not been combined in order to allow the City of Oconomowoc to determine its own priority of needs among traffic accident and congestion, arterial service, and parking problem solutions. The priority to be assigned to meeting each of these needs cannot be established in a wholly objective manner, but will vary with the changing value system of the citizens of the community and of their elected and appointed officials. It is recommended, though, that those traffic management actions which increase the operating efficiency and safety of the existing transportation system be undertaken as soon as practicable, followed, subsequently, by the implementation of the long-range, high-capital investment actions recommended to solve or mitigate the parking supply or arterial service problems in the study area. It is recommended, however, that the official mapping of the east-west arterial bypass in the southern portion of the study area

Table 31

TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO BE IMPLEMENTED BY THE CITY OF OCONOMOWOC IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Actions	Capital Cost
Intersection STH 16 with STH 67	● Improve street lighting	$ 3,500
	● Establish turning guidelines	100
	● Modify existing traffic signals	800[a]
	● Retime traffic signal sequence	--[a]
	● Interconnect traffic signals	10,500[a]
	● Install and interconnect traffic signals at intersection of STH 16 and S. Concord Road	32,000[a]
	● Delineate a downtown bypass route on W. 2nd Street and S. Concord Road	600[a]
	● Implement work time rescheduling	--
	Subtotal	$ 47,500
Intersection STH 16 with Walnut Street	● Modify existing traffic signals	$ 800[a]
	● Revise traffic signal sequence	--[a]
	● Improve street lighting	3,500
	● Interconnect traffic signals	--[b]
	Subtotal	$ 4,300
Intersection STH 16 with S. Silver Lake Street	● Modify existing traffic signals	$ 600[a]
	● Retime traffic signal sequence	--[a]
	● Interconnect traffic signals	--[b]
	Subtotal	$ 600
Intersection STH 67 with E. Thackery Trail	● Improve street lighting	$ 9,000
Intersection STH 67 with W. South Street	● Install pavement markings	$ 150
Intersection STH 67 with E. Armour Road	● Reconstruct roadway curb	$ 15,000[a]
	● Install pavement markings	700
	Subtotal	$ 15,700
Intersection STH 67 with S. Silver Lake Street	● Modify existing traffic signals	$ 5,000[a]
	● Retime traffic signal sequence	--[a]
	● Install pavement markings	100
	● Interconnect traffic signals	--[b]
	● Reconstruct westbound approach to provide for an exclusive right-turn lane[c]	50,000
	Subtotal	$ 55,100
Intersection STH 67 with E. Forest Street	● Strictly enforce 15-mph school-zone speed limit	$ --
	● Skidproof roadway surface	9,000
	Subtotal	$ 9,000
Intersection STH 67 with W. 2nd Street	● Install advance warning sign	$ 100
STH 16—W. Main Street to N. St. Paul Street	● Install advance warning sign	$ 100
	● Prohibit parking	100
	● Restrict driveway operation	400
	Subtotal	$ 600
STH 16—N. Fowler Street to N. Thompson Street	● Strictly enforce speed limit	$ --
	● Maintain pavement markings	--
	● Skidproof roadway surface	12,000
	Subtotal	$ 12,000
STH 16—N. Thompson Street to S. Wood Street	● Strictly enforce speed limit	$ --
	● Maintain pavement markings	--
	● Skidproof roadway surface	8,300
	Subtotal	$ 8,300

Table 31 (continued)

Problem Location	Recommended Traffic Management Actions	Capital Cost
STH 67—S. Silver Lake Street to S. Westover Street	● Install advance warning signs ● Skidproof roadway surface	$ 200 15,000
	Subtotal	$ 15,200
STH 67—E. Thackery Trail to E. Maple Lane	● Improve street lighting	$ 15,000
Intersection E. Forest Street with S. Silver Lake Street	● Install pavement markings	$ 100
W. Elm Street—STH 16 to W. 2nd Street	● Restrict trucking on S. Elm Street, divert truck traffic to S. Concord Road, and restrict parking on S. Concord Road from W. Wisconsin Avenue to W. 2nd Street between the hours of 8:00 a.m. and 4:30 p.m. ● Install traffic signals at the intersection of STH 16 with S. Concord Road	$ 1,100 --[d]
	Subtotal	$ 1,100
Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road)	● Install constant time warning devices at S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road tracks ● Remove stop signs at selected gate-protected railroad crossings	$ 30,000[a] 650
	Subtotal	$ 30,650
East Side of N. St. Paul Avenue	● Change parking restriction from 15 minutes to one hour and install three parking meters	$ 600
South Side of E. Collins Street	● Remove two-hour parking restriction to allow unrestricted, all-day parking	$ 500
North Side of W. South Street	● Change all-day parking restriction to allow three metered 8:00 a.m. to 3:30 p.m., 15-minute restricted parking spaces	$ 600
West Side of S. Cross Street	● Remove all-day parking restriction to allow all-day unrestricted parking south of South parking facility entrance	$ 100
Fowler Public Parking Facility	● Change 10 of the eight-hour parking stall restrictions to two-hour restrictions	$ 300
	Total	$226,500

[a] *Traffic management actions which are local responsibility and require the approval of the Wisconsin Department of Transportation, Division of Transportation Districts, prior to their implementation.*

[b] *Total traffic signal interconnection costs included in intersection of STH 16 with STH 67 recommendation.*

[c] *Recommendation was implemented by the City of Oconomowoc prior to the completion of the study.*

[d] *Traffic signal installation cost at intersection of STH 16 with S. Concord Road included in intersection of STH 16 with STH 67 recommendation.*

Source: SEWRPC.

Table 32

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE TRAFFIC ACCIDENT AND CONGESTION PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	EPDO[a] Index	Implementation Priority
Intersection STH 16 with STH 67	41	1
Intersection STH 67 with S. Silver Lake Street	6	2
STH 16—W. Main Street to N. St. Paul Street	49	3
STH 67—S. Silver Lake Street to S. Westover Street	40	4
Intersection STH 67 with E. Thackery Trail	56	5
Intersection STH 16 with Walnut Street	56	6
Intersection STH 16 with CTH P	42	7
STH 16—CTH P to Plank Road	38	8
Intersection STH 67 with W. South Street	30	9
Intersection STH 67 with CTH B	27	10
STH 16—N. Fowler Street to N. Thompson Street	25	11
Intersection STH 16 with S. Silver Lake Street	19	12
Intersection STH 67 with E. Armour Road	18	13
Intersection STH 67 with W. 2nd Street	16	14
Intersection STH 67 with E. Forest Street	16	15
STH 67—E. Thackery Trail to E. Maple Lane	15	16
Intersection E. Forest Street with S. Silver Lake Street	14	17
STH 16—N. Thompson Street to S. Wood Street	14	18
All Arterial Streets and Highways		
Officially map and construct east-west arterial bypass in southern portion of study area	--	19
Officially map and construct north-south STH 16 freeway bypass in eastern portion of study area	--	20
Reschedule the work starting and quitting time of approximately 250 employees of the major public and private employers in the study area	--	21

[a] *Equivalent Property Damage Only Index.*

Source: SEWRPC.

be implemented at an early date to prevent further urban development from occurring within the planned right-of-way corridor, which could preclude the future development of that facility.

The priority list contained in Table 32 is based on a need to solve those traffic accident and congestion problems which occur concurrently at a specific location. An "equivalent property damage only" (EPDO) index value was computed for each traffic accident problem location to establish a priority for the implementation of those traffic management actions recommended to solve or mitigate the problem. The EPDO index value is based not only on the frequency of accidents but also on the severity of accidents, thereby rank-

Table 33

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE ARTERIAL SERVICE PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Recommended Traffic Management Action	Implementation Priority
Officially map recommended east-west arterial bypass and north-south STH 16 freeway bypass	1
Remove "stop" signs at selected gate-protected street crossings of the Milwaukee Road railroad tracks	2
Install constant time warning devices at the S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road railroad tracks	3
Restrict trucking on S. Elm Street, divert truck traffic to S. Concord Road, and restrict parking on S. Concord Road between the hours of 8:00 a.m. and 4:30 p.m. from STH 16 to W. 2nd Street	4
Construct east-west arterial bypass	5
Construct a new land access street from the Oconomowoc industrial park to the recommended east-west bypass	6
Construct north-south STH 16 freeway bypass	7

Source: SEWRPC.

ing accident problem locations with fatalities and injuries higher than accident problem locations with property-damage-only accidents. The traffic management actions recommended to solve the concurrent traffic accident and congestion problems in the study area were placed as the highest priority recommendations, followed by the remaining traffic accident-solving recommendations, in order of their respective EPDO index value. The traffic management actions recommended to solve the traffic accident problems in the study area are provided a higher priority in Table 32 than are the traffic management actions recommended to solve traffic congestion problems in the study area which are of a congestion only nature. In this manner, initial consideration is given to the need for the safe operation of the Oconomowoc area transportation system, followed by the need for the efficient operation of that system.

The traffic management actions listed in Table 33—those recommended to solve or mitigate the arterial service problems in the Oconomowoc study area—are ranked according to their effectiveness in improving arterial service for the majority of motorists using the arterial streets and highways in the study area. The recommendation to officially map the proposed east-west arterial bypass is listed as the highest priority to avoid the future nullification of that recommendation because of the intrusion of new urban development into the right-of-way necessary for that facility's construction. This recommendation is then followed in priority order by the recommendation to reduce vehicle delays from railroad operations on the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks and to eliminate the truck traffic on land access streets. These recommended traffic management actions are followed in priority by the long-range, high-capital investment recommendations which should ultimately solve the existing and future arterial service problems in the Oconomowoc study area.

The traffic management actions prioritized in Table 34—those recommended to solve or mitigate the parking supply problems in the Oconomowoc central business district—are listed according to their ability within the central business district—to: 1) increase the number of parking spaces; 2) utilize the existing on-street parking spaces; 3) utilize the existing off-street parking facilities; and 4) provide future parking space capacity.

FEDERAL FINANCIAL ASSISTANCE

The monies required to implement the traffic management actions recommended in the plan must be provided by the governmental units responsible for their implementation as set forth earlier in this chapter. In order to reduce the financial impact on these units of government, it is recommended that they seek to maximize the use of federal highway aid funds for proposed projects. To this end, the following description of the federal highway aid programs is provided, together with recommendations for the funding of the recommended traffic management actions.

Federal Highway Aids

Federal aids for highway construction are derived from federal highway user excise taxes and the federal motor fuel tax, the latter presently established at $0.04 per gallon, and are administered by the U. S. Department of Transportation, Federal Highway Administration, as a segregated fund

Table 34

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE PARKING SUPPLY PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Action	Implementation Priority
North Side of W. South Street Immediately West of S. Main Street (STH 16)	Change all-day parking restriction to allow three metered, 8:00 a.m. to 3:30 p.m., 15-minute restricted parking spaces	1
West Side of S. Cross Street from E. Collins Street to E. Wisconsin Avenue (STH 16)	Remove all-day parking restriction to allow all-day unrestricted parking south of South parking facility entrance	2
East Side of N. St. Paul Street from the Fowler Public Parking Facility Entrance to E. Wisconsin Avenue (STH 16)	Change parking restriction from 15-minute to one-hour and install three parking meters	3
South Side of E. Collins Street from S. Cross Street to S. Silver Lake Street	Remove two-hour parking restriction parking meters to allow all-day unrestricted parking	4
Fowler Public Parking Facility	Change 10 of the eight-hour parking stall restrictions to two-hour restrictions	5
South or Fowler Public Parking Facility	Construct a parking structure	6

Source: SEWRPC.

which can be used only for highway, highway-related, and, as of 1973, limited mass transit improvement purposes. Federal aids are provided as reimbursements for previously expended funds on authorized projects on the interstate system and the federal aid primary, secondary, and urban systems, and for bridge replacement, off-system improvements, safety improvements, and roadway beautification. Federal aid may be used for preliminary engineering, design, right-of-way acquisition, and construction, but may not be used for maintenance or administration. Federal aid urban funds can be used on designated collector as well as arterial facilities on the federal aid urban system. The 1976 Federal Aid Highway Act does identify an off-system improvement program and provides

funds under this program essentially for safety and capacity improvements to existing streets and highways not on the federal aid highway system.

Federal aid interstate and primary funds received by Wisconsin are distributed throughout the State on the basis of the highway construction schedule established by the State Secretary of Transportation. The federal aid secondary funds received by Wisconsin are divided into two categories: funds for use on state trunk highways on the federal aid secondary system and funds distributed to the counties on the basis of federal aid secondary system mileage and registered motor vehicles. Funds allocated to Wisconsin under the federal aid urban program are made available to urban areas within the State on the basis of each urban area's proportionate share of the total urban population of the State. It is significant that the language of the Federal Aid Highway Act of 1973 provides that funds shall be made available to urban areas, not to municipalities or other levels of government. The 1973 Act, however, provides that the allocation formula developed by the State shall provide for fair and equitable treatment of incorporated municipalities of 200,000 or more population. The remainder of the federal aid urban (FAU) funds are allocated within each urbanized area according to a formula based on the mileage of facilities on the federal aid urban system under the jurisdiction of each potential recipient. Table 35 shows the amount of federal aid urban system funds available for use in the Oconomowoc traffic management study area in 1980.

Table 35

FEDERAL AID URBAN SYSTEM HIGHWAY FUND ENTITLEMENTS TO THE LOCAL UNITS OF GOVERNMENT IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1980

Unit of Government	Annual Entitlement	1980 Entitlement Balance
Waukesha County	$ 5,300	$ 37,800
City of Oconomowoc. . . .	35,600	170,700
Town of Oconomowoc. . .	3,200	34,600
Town of Summit.	3,000	23,800

Source: Wisconsin Department of Transportation.

During 1978, a new comprehensive Surface Transportation Assistance Act was passed by Congress, and was signed into law by the President in November 1978. Title I of this Act is the new Federal Aid Highway Act of 1978. In addition to authorizing interstate funds for federal fiscal years 1980 through 1990, and federal aid primary funds—including funds for extensions of federal aid primary routes into urban areas—federal aid secondary funds, and federal aid urban system funds for federal fiscal years 1979 through 1982, this act contains several new provisions. Among the more noteworthy are:

Section 109. Transferability—Existing transferability between the primary system and the secondary system is changed from 40 percent to 50 percent. Existing transferability between the primary system and the urban system is changed from 20 percent to 50 percent.

Section 117. Traffic Control Signalization—This section provides a 100 percent federal share for traffic control signalization projects.

Section 129. Federal Share—The federal share for primary, secondary, and urban system projects is changed from 70 to 75 percent; for elimination of hazards at railroad crossings, from 70 to 75 percent of the costs of right-of-way acquisition and property damages; for repair or reconstruction with emergency relief funds, from 70 to 75 percent; and for school bus driver training programs from 70 to 75 percent.

Section 168. Hazard Elimination—The federal share for projects dealing with hazard elimination is 90 percent. Under this section, 50 percent of the funds obligated for hazard elimination must be used for highway safety construction projects.

In general, the funds used to match federal highway aid funds cannot be derived from other federal funding programs; they must come from state or local sources. There are, however, two federal programs which can be used to provide local matching funds for federal aid highway programs: 1) the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512), as amended in 1976 (General Revenue Sharing); and 2) the Housing and Urban Development (HUD) Community Development Block Grants Program—highway expenditures under this program must be in support of broader community development programs.

The local matching requirements for use of federal funds are set forth in Table 36. It should be noted that up to 10 percent of a state's apportioned funds for the federal aid system and safer off-system road program may be used at a 100 percent rate for the elimination of hazards at railroad-highway grade crossings or traffic control signalization projects at arterial intersections.

Federal Aid Program Eligibility

A recommended traffic management action must meet certain requirements to be eligible for federal aid funding, as set forth in Title 23 of United States Codes 103 and 104. The basic requirement for federal aid grant eligibility for the majority of highway improvement projects is that the project be on a federal aid highway system. There are some exceptions to this basic requirement, which are briefly described in the following summary of federal aid program requirements.

Primary System: Eligible projects must be on the primary federal aid system. In general, funds are made available for engineering studies, right-of-way acquisition, relocation assistance, and construction of highway improvements. Funding is also available for projects on the primary system involving traffic operational improvements, resurfacing, safety improvements, vanpools, bicycle and pedestrian facilities, and park-and-ride facilities, and some transit-related facilities.

Rural Secondary System: Eligible projects must be on the rural secondary federal aid system. In general, funds are made available for engineering studies, right-of-way acquisition, relocation assistance, and construction of highway improvements. Funding is also available for projects on the rural secondary system involving traffic operational improvements, resurfacing, safety improvements, bicycle and pedestrian facilities, and park-and-ride facilities.

Urban System: Eligible projects must be on the urban federal aid system. In general, funds are made available for engineering studies, right-of-way acquisition, relocation assistance, and construction of highway improvements in urban areas of 5,000

Table 36

MATCHING REQUIREMENTS FOR USE OF FUNDS UNDER FEDERAL AID HIGHWAY FUNDING PROGRAMS

Highway Program	Federal Aid Share (percent)[a]	Local Matching Share (percent)[a]
Interstate	90	10
Primary	75	25
Secondary	75	25
Urban	75	25
Railway-Highway Grade Crossing	90	10
Pavement Marking	100 or 90	0 or 10
Hazard Elimination	90	10
Bridge Replacement and Rehabilitation	80	20
Safer Off-System	90 or 75	10 or 25
Interstate Resurfacing, Restoring, and Rehabilitation	75	25

[a] *The federal aid programs and funding percentages are based on the Surface Transportation Assistance Act of 1978. The local matching funds specified in the respective programs are comprised of state, county, and/or local monies.*

Source: Wisconsin Department of Transportation.

population or more. Funding is also available for projects on the urban system involving traffic operational improvements, resurfacing, safety improvements, vanpools, bicycle and pedestrian facilities, park-and-ride facilities, and some transit-related capital improvements.

Railway-Highway Grade Crossings: Program funds may be used on any street or highway, both on and off the federal aid system, except the interstate system, and are made available for the installation of standard signs and markings, installation of automatic warning devices, crossing surface and alignment improvements, and separations or relocations to eliminate grade crossings.

Pavement Marking: Program funds may be used to improve the pavement markings on any street or highway, both on and off the federal aid system, except the interstate system, providing the street or highway meets certain minimum requirements. Funds are made available for placing new markings, replacing nonconforming existing markings, and upgrading markings with improved materials. Markings may include centerlines, edgelines, pedestrian crosswalks, stopline markings to railroad crossings, and other types of markings and delineators.

Hazard Elimination: Program funds may be used on any federal aid highway system but the interstate system. Funds may be used to correct or improve high hazard locations, eliminate roadside obstacles, improve highway signing and pavement markings, or install traffic control or warning devices at high accident potential locations.

Bridge Replacement and Restoration: Program funds may be used to replace structurally deficient or functionally obsolete bridges both on and off the federal aid system. Funds are made available for rehabilitating structures if the rehabilitation, when completed, solves the deficiencies and meets federal design standards.

Safer Off-System: Program funds may be used on any roadway open to the public and maintained by a public authority and not on any federal aid system. Funds are made available for engineering studies, right-of-way acquisition, relocation assistance, and construction, and for improvement projects for removing roadside obstacles, correcting high hazard locations, widening narrow bridges, and properly marking and signing highways.

State and Local Highway Improvement Programs
Upon satisfying these federal aid highway program eligibility requirements, a state and local program of projects is developed in each fiscal year for each federal aid program category. Local priorities established by local officials are submitted to the Wisconsin Department of Transportation, Division of Transportation Districts, where the submittals from all the local units of government in the State are combined for each program category and then analyzed for project funding approval, based on statewide priorities and total federal aid funds available in each program category.

The successful application for and approval of highway project funding requests requires close coordination between local governmental representatives and the Wisconsin Department of Transportation, Division of Transportation District offices. Close cooperation will assure satisfactory and timely completion of project requests and approvals.

The federal aid highway programs applicable to the traffic management actions recommended in the plan are listed in Table 37. The 60 recommended traffic management actions have a total estimated capital cost of $27.7 million. Of these actions, 30, or 50 percent, qualify for federal aid highway funds totaling approximately $19.8 million. It should be noted that the long-range high-capital projects contained in the plan will have to be programmed over a period of years because of their complex nature and the limited amount of funds available to accomplish all of the projects in the foreseeable future. Neither the STH 16 freeway bypass nor the east-west arterial bypass is scheduled for construction within the time span covered by the Wisconsin Department of Transportation six-year state highway improvement program, 1980-1985, and unless additional state highway revenues are made available, it is unlikely that these projects can be constructed within the next several years.

The local funds required of the City of Oconomowoc and Waukesha County to implement the recommended traffic management actions in the plan total approximately $2.3 million. Removal of the long-range high-capital investment recommendations from this total results in a short-range traffic management implementation capital cost to the City of Oconomowoc of approximately $72,880. Since the City of Oconomowoc has a 1980 federal aid urban system entitlement of $170,700, it is reasonable to expect that a majority of the recommended traffic management actions will qualify for and receive federal funds, based

Table 37

FEDERAL AID HIGHWAY PROGRAM FUNDING SOURCES FOR THE TRAFFIC MANAGEMENT ACTIONS RECOMMENDED IN THE OCONOMOWOC AREA TRAFFIC MANAGEMENT PLAN

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion Problems	Intersection STH 16 with STH 67	● Improve street lighting	$ 3,500	FAU	$ 2,625	$ --	$ --	$ 875
		● Install turning guidelines	100	PM	100	--	--	--
		● Modify existing traffic signals	800	HE	720	--	--	80
		● Retime traffic signal sequence	--	--	--	--	--	--
		● Interconnect traffic signals	10,500	FAU[b]	10,500	--	--	--
		● Delineate a downtown bypass route on W. 2nd Street and S. Concord Road	600	--	--	--	--	600
		● Install and interconnect traffic signals at intersection of STH 16 and S. Concord Road	32,000	FAU[b]	32,000	--	--	--
		● Implement Work Time Rescheduling	--	--	--	--	--	--
		Subtotal	$ 47,500		$ 45,945	$ --	$ --	$ 1,555
	Intersection STH 67 with S. Silver Lake Street	● Modify existing traffic signals	$ 5,000	FAU[b]	$ 5,000	$ --	$ --	$ --
		● Retime traffic signal sequence	--	--	--	--	--	--
		● Install pavement markings	100	PM	100	--	--	--
		● Interconnect traffic signals	--[c]	FAU[b]	--[c]	--	--	--
		● Reconstruct westbound approach to provide for an exclusive right-turn lane	50,000	FAU[d]	37,500	--	--	12,500
		Subtotal	$ 55,100		$ 42,600	$ --	$ --	$ 12,500
	STH 16—Main Street to N. St. Paul Street	● Install advance warning sign	$ 100	--	$ --	$ --	$ --	$ 100
		● Prohibit parking	100	--	--	--	--	100
		● Restrict driveway operation	400	--	--	--	--	400
		Subtotal	$ 600	--	$ --	$ --	$ --	$ 600
	STH 67—S. Silver Lake Street to S. Westover Street	● Install advance warning signs	$ 200	--	$ --	$ --	$ --	$ 200
		● Skidproof roadway surface	15,000	--	--	--	--	15,000
		Subtotal	$ 15,200	--	$ --	$ --	$ --	$ 15,200
	Intersection STH 67 with E. Thackery Trail	● Install traffic signals	$ 31,100	FAP	$ 23,325	$ 7,775	$ --	$ --
		● Improve street lighting	9,000	FAU	6,750	--	--	2,250
		● Reduce speed limit	400	FAP	300	100	--	--
		● Install advance warning signs	200	FAP	150	50	--	--
		Subtotal	$ 40,700		$ 30,525	$ 7,925	$ --	$ 2,250
	Intersection STH 16 with Walnut Street	● Modify existing traffic signals	$ 800	FAU[b]	$ 800	$ --	$ --	$ --
		● Revise traffic signal sequence	--	--	--	--	--	--
		● Improve street lighting	3,500	FAU	2,625	--	--	875
		● Interconnect traffic signals	--[c]	FAU[b]	--[c]	--	--	--
		Subtotal	$ 4,300		$ 3,425	$ --	$ --	$ 875

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion Problems (continued)	Intersection STH 16 with CTH P	● Improve street lighting	$ 12,000	HE	$ 10,800	$ 0 to 1,200	$ 0 to 1,200	$ --
		● Relocate advance warning sign	100	FAS	75	--	25	--
		Subtotal	$ 12,100		$ 10,875 to 1,200	$ 0 to 1,225	$ 25	$ --
	STH 16—CTH P to Plank Road	● Install channelization	$ 20,000	FAP	$ 15,000	$ 5,000	$ --	$ --
		● Skidproof roadway surface	2,400	FAP	1,800	600	--	--
		Subtotal	$ 22,400		$ 16,800	$ 5,600	$ --	$ --
	Intersection STH 67 with W. South Street	● Install pavement markings	$ 150	PM	$ 150	$ --	$ --	$ --
	Intersection STH 67 with CTH B	● Install signal beacons	$ 2,000	FAP	$ 1,500	$ 500	$ --	$ --
		● Install advance warning signs	200	FAP	150	50	--	
		Subtotal	$ 2,200		$ 1,650	$ 550	$ --	$ --
	STH 16—N. Fowler Street to N. Thompson Street	● Strictly enforce speed limit	$ --	--	$ --	$ --	$ --	$ --
		● Maintain pavement markings	--	--	--	--	--	--
		● Skidproof roadway surface	12,000	--	--	--	--	12,000
		Subtotal	$ 12,000		$ --	$ --	$ --	$ 12,000
	Intersection STH 16 with S. Silver Lake Street	● Modify existing traffic signals	$ 600	FAU[b]	$ 600	$ --	$ --	$ --
		● Retime traffic signal sequence	--	--	--	--	--	--
		● Interconnect traffic signals	--[c]	FAU[b]	--[c]	--	--	--
		Subtotal	$ 600		$ 600	$ --	$ --	$ --
	Intersection STH 67 with E. Armour Road	● Reconstruct roadway curb	$ 15,000	HE	$ 13,500	$ --	$ --	$ 1,500
		● Install pavement markings	700	PM	700	--	--	--
		Subtotal	$ 15,700		$ 14,200	$ --	$ --	$ 1,500
	Intersection STH 67 with W. 2nd Avenue	● Install advance warning sign	$ 100	FAP	$ 75	$ 25	$ --	$ --
	Intersection STH 67 with E. Forest Street	● Strictly enforce 15-mph school-zone speed limit	$ --	--	$ --	$ --	$ --	$ --
		● Skidproof roadway surface	9,000	--	--	--	--	9,000
		Subtotal	$ 9,000		$ --	$ --	$ --	$ 9,000
	STH 67—E. Thackery Trail to E. Maple Street	● Improve street lighting	$ 15,000	FAU	$ 11,250	$ --	$ --	$ 3,750

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion Problems (continued)	Intersection E. Forest Street with S. Silver Lake Street	● Install pavement markings	$ 100	PM	$ 100	$ --	$ --	$ --
	STH 16—N. Thompson Street to S. Wood Street	● Strictly enforce speed limit	$ --	--	$ --	$ --	$ --	$ --
		● Maintain pavement markings	--	--	--	--	--	--
		● Skidproof roadway surface	8,300	--	--	--	--	8,300
		Subtotal	$ 8,300		$ --	$ --	$ --	$ 8,300
	All arterial streets and highways	● Officially map and construct east-west arterial bypass in southern portion of study area	$ 2.4 million to 3.1 million	FAU	$ 1,800,000 to $ 2,325,000	$ --	$300,000 to $387,500	$ 300,000 to $ 387,500
		● Officially map and construct north-south STH 16 Freeway bypass in eastern portion of study area	$23.0 million	FAP	$17,250,000	$5,750,000	$ --	$ --
		Subtotal	$25.4 million to $26.1 million		$19,050,000 to $19,575,000	$5,750,000	$300,000 to $387,500	$ 300,000 to $ 387,500
	Total		$25,661,050 to $26,361,050		$19,228,195 to $19,753,195	$5,764,100 to $5,765,300	$300,025 to $388,725	$ 367,530 to $ 455,030
Arterial Service Problems	East-west arterial street spacing deficiency in the southern portion of the study area	● Officially map and construct east-west arterial bypass	$ --	FAU	$ --	$ --	$ --	$ --
	North-south arterial street spacing deficiency in eastern portion of the study area	● Officially map and construct north-south STH 16 Freeway bypass	$ --	FAP	$ --	$ --	$ --	$ --
	Truck traffic on land access road problem on S. Elm Street between W. Wisconsin Avenue (STH 16) and W. 2nd Street	● Restrict trucking on S. Elm Street, divert truck traffic to S. Concord Road, and restrict parking on S. Concord Road from W. Wisconsin Avenue to W. 2nd Street between 8:00 a.m. and 4:30 p.m.	$ 1,100	--	$ --	$ --	$ --	$ 1,100
		● Install traffic signals at the intersection of W. Wisconsin Avenue (STH 16) and S. Concord Road	-- [f]	--	-- [f]	--	--	--
		● Construct a new land access street from the Oconomowoc industrial park to proposed east-west arterial bypass	120,000	--	--	--	--	120,000
		Subtotal	$ 121,100		$ --	$ --	$ --	$ 121,100
	Conflict between through and local traffic problem on arterial streets and highways in study area	● Officially map and construct east-west arterial and north-south STH 16 freeway bypasses	$ --	FAP/FAU	$ --	$ --	$ --	$ --

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Arterial Service Problems	Traffic delay problem at the at-grade railroad track and arterial street and highway crossings	● Officially map and construct east-west arterial and north-south STH 16 freeway bypasses	$ --[a]	FAP/FAU	$ --	$ --	$ --	$ --
		● Install constant time warning devices at S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road tracks	30,000	RRG	27,000	1,500	$ --	1,500
		● Remove "stop" signs at selected at-grade gate-protected railroad crossings	650	--	--	--	$ --	650
		Subtotal	$ 30,650		$ 27,000	$ 1,500	$ --	$ 2,150
	Total		$ 151,750		$ 27,000	$ 1,500	$ --	$ 123,250
Parking Problems	North side of W. South Street immediately west of S. Main Street (STH 67)	● Change all-day parking restriction to allow three metered, 8:00 a.m. to 3:30 p.m., 15-minute restricted parking spaces	$ 600	--	$ --	$ --	$ --	$ 600
	West side of S. Cross Street from E. Collins Street to E. Wisconsin Avenue (STH 16)	● Remove all-day parking restriction to allow all-day unrestricted parking south of South parking facility entrance	$ 100	--	$ --	$ --	$ --	$ 100
	East side of N. St. Paul Street from the Fowler public parking facility entrance to E. Wisconsin Avenue (STH 16)	● Change parking restriction from 15 minute to one hour and install three parking meters	$ 600	--	$ --	$ --	$ --	$ 600
	South side of E. Collins Street from S. Cross Street to S. Silver Lake Street	● Remove two-hour parking restriction and parking meters to allow all-day unrestricted parking	$ 500	--	$ --	$ --	$ --	$ 500
	Fowler public parking facility	● Change 10 of the eight-hour parking stall restrictions to two-hour restrictions	$ 300	--	$ --	$ --	$ --	$ 300
	South or Fowler public parking facility	● Construct a parking structure	$ 1,200,000	--	$ --	$ --	$ --	$1,200,000
		Total	$ 1,202,100		$ --	$ --	$ --	$1,202,100
	Total		$27,014,900 to $27,714,900		$19,255,195 to $19,780,195	$5,765,600 to $5,766,800	$300,025 to $388,725	$1,692,880 to $1,780,380

[a] *Federal aid highway programs identified as funding sources include: federal air primary (FAP), federal aid secondary (FAS), federal aid urban (FAU), railway-highway grade crossing (RRG), pavement marking (PM), and hazard elimination (HE) systems.*

[b] *Action eligible for Federal Aid Urban traffic signalization control project funding.*

[c] *Capital cost included in recommended action at other location.*

[d] *City of Oconomowoc has completed implementation of this project.*

[e] *Capital cost included in recommended action to solve or mitigate other traffic problem.*

[f] *Capital cost included in recommended action to solve or mitigate other traffic problem.*

Source: SEWRPC.

upon the highway improvement funding priority schedule of the Wisconsin Department of Transportation. It is recommended that the principal traffic management actions which qualify for funds under the federal aid hazard elimination, pavement markings, and traffic control signalization programs be packaged or combined into a single system funding request to efficiently obtain Wisconsin Department of Transportation approvals and coordinated action implementation.

State Highway Aids

The Wisconsin Department of Transportation is in the process of completing the development of a new grant program, in accordance with Wisconsin Statute 85.045, for funding the implementation of transportation system management actions. This new grant program, the administrative details of which have not as yet been finalized, would provide for demonstration of new initiatives—traffic management actions which improve vehicle flow and transit services, give preferential treatment to high-occupancy vehicles, reduce peak-period travel, and promote nonvehicular travel modes and the use of high-occupancy vehicles. It is anticipated that $112,500 will be budgeted for this program in 1980. When the requirements of this program are finalized, it may be found that some of the traffic management actions in the plan may qualify for funding under this program.

SUMMARY

This chapter has identified the governmental agencies responsible for implementing each of the recommended traffic management actions constituting the traffic system management plan for the Oconomowoc area; set forth a priority schedule for the implementation of each recommended action; and identified the federal and state aid programs available to fund the implementation of each action. In total, nine actions are proposed to be implemented by the Wisconsin Department of Transportation; three actions are proposed to be implemented by Waukesha County; and the remaining 48 actions are proposed to be implemented by the City of Oconomowoc.

The priorities for implementing the recommended traffic management actions are based on a desire to provide for the more efficient and safe operation of the existing arterial street and highway system in the study area. The traffic management actions within each transportation system problem category were, accordingly, prioritized on the basis of their ability to improve operating conditions on the existing arterial street and highway system. Those actions which can most effectively serve to reduce traffic accidents and traffic congestion are accorded the highest priority in the recommended plan implementation schedule.

Although prioritized within the categories of transportation system problems—accident and congestion reduction, improved arterial service, and improved parking—the recommended traffic management actions were not prioritized between these categories in order to allow the City of Oconomowoc to determine its own priority of transportation needs over time.

Finally, each traffic management action was evaluated in terms of its eligibility for federal aid program funds. It is noted that of the estimated $27.7 million capital cost that will be required to implement the traffic management actions in the plan, approximately $19.8 million is eligible for coverage under existing federal aid highway programs. This conclusion is based on the assumption that adequate funds are available in each federal aid program category and that eligibility will be approved by the Wisconsin Department of Transportation. To assure timely funding of plan implementation actions, it will be particularly important that close coordination be maintained between the City of Oconomowoc, Waukesha County, and the Wisconsin Department of Transportation.

Chapter VIII

SUMMARY AND CONCLUSIONS

INTRODUCTION

A concern over increasing traffic congestion within the City of Oconomowoc by local elected officials, businessmen, and residents resulted in the formation by the City of a committee of officials and community leaders. This committee, the Citizens and Technical Advisory Committee for the Oconomowoc Area Traffic Management Study, met with staff representatives of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) on August 11, 1978, to discuss the traffic-related problems of the Oconomowoc area and to seek the Commission's assistance in undertaking a study to improve traffic operations. At a second meeting between the Committee and the Commission staff, held on September 22, 1978, the Commission's willingness to assist the City in a traffic management planning study was conveyed and a study format was agreed upon. On October 3, 1978, the City of Oconomowoc Common Council adopted a resolution formally requesting the Commission's assistance in conducting a traffic management study of the Oconomowoc area.

The primary objective of the study was to identify short-range, low-cost, traffic engineering actions that could be taken to provide safer and more efficient operation of the existing transportation system, thereby alleviating existing traffic problems. The short-range traffic management actions were to be consistent with the long-range transportation system plan for the Oconomowoc area so that the short-range actions would not foreclose implementation of the area's long-range plan when the practical limits of traffic management were reached and such long-range plan implementation became necessary. The Commission initiated work on the traffic management study in January 1979. Recognizing that traffic problems do not begin or end at corporate limits, the study area was expanded to include the immediate environs of the City, as well as the city proper. The study area, therefore, encompassed an approximately 16-square-mile area, of which 5.49 square miles were within the Oconomowoc city limits.

EXISTING STREET AND HIGHWAY SYSTEM

It is only through careful detailed analyses of the existing street and highway system, and particularly of those factors directly affecting the operation of the system—including the existing traffic control measures, that the deficiencies of that system and the causes of those deficiencies can be identified. Alternative actions can then be designed and evaluated to determine the most effective means of correcting those deficiencies. To facilitate the necessary analyses, inventories of the existing land use development and of the transportation system of the area were undertaken. The inventories found that there were, in 1979, 78.64 miles of streets and highways in the Oconomowoc study area, of which 42.30 miles, or 54 percent, were within the city limits. Of the 78.64 miles within the study area, 25.73 miles, or 33 percent, were functionally classified as arterials; 3.01 miles, or 4 percent, as collectors; and the remaining 49.90 miles, or 63 percent, as land access streets. Of the 42.30 miles within the city limits, 9.78 miles, or 23 percent, were functionally classified as arterials; 2.69 miles, or 6 percent, as collectors; and 29.83 miles, or 70 percent, as land access streets. Of the 78.64 miles of arterials within the study area, 9.09 miles, or 11 percent, were state trunk highways or connecting streets; 11.10 miles, or 14 percent, were county trunk highways; and the remaining 58.45 miles, or 75 percent, were local trunks. Of the 42.30 miles of arterials within the city limits, 5.20 miles, or 12 percent, were state trunk highways or connecting streets; 0.47 mile, or 1 percent, was county trunk highway; and the remaining 36.63 miles, or 87 percent, were local trunks. Furthermore, of the 78.64 miles of arterials within the study area, 16.06 miles, or 20 percent, were on the federal aid highway system. Of the 42.30 miles within the city limits, 9.62 miles, or 23 percent, were on the federal aid system. The right-of-way and pavement widths of all of the arterials within the study area were determined under the system inventory, as were the locations of all major traffic generators on the system and all appurtenant parking facilities in the central business district of the City.

EXISTING TRAFFIC CONDITIONS

In addition to a complete inventory of the physical street and highway system and of land development affecting the system, a traffic system management study requires an examination of the manner in which the existing system is used and how that system functions to meet the needs of the traveling public. To this end, information on vehicular traffic volumes was collected, traffic operating conditions on the system were observed, and travel patterns and trip purposes were examined. Information was also collected on public parking facility utilization, traffic accident histories, railroad traffic, and citizen traffic complaints. This information, together with the information on the physical characteristics of the street and highway system, provides the basis for identifying the existing traffic problems of the study area.

The highest traffic volumes on the arterial street and highway system in the study area were found to occur on STH 16, and range from 13,000 to 16,000 vehicles per annual average weekday. STH 67 was found to carry the next highest traffic volumes, ranging from 4,500 to 14,000 vehicles per average weekday. The remaining arterial and collector streets in the study area were found to have average weekday volumes ranging from 500 to 5,500 vehicles per day, with the majority of these facilities carrying about 3,000 vehicles per annual average weekday. These traffic volumes were found to vary seasonally, with the highest volumes occurring in July and August, when volumes average 111 percent of the annual average weekday volumes. Traffic volumes in January were found to average about 82 percent of the annual average weekday volumes.

Daily traffic volume fluctuations also occur, with Saturday traffic volumes found to average about 108 percent of average annual weekday volumes, and Sunday traffic volumes found to average about 95 percent of average annual weekday volumes. The morning and evening weekday peak-hour traffic volumes were found to comprise approximately 6.7 percent and 8.6 percent, respectively, of the average weekday traffic volumes. The morning peak hour was found to occur between 7:30 a.m. and 8:30 a.m., and the evening peak hour between 3:30 p.m. and 4:30 p.m. or 4:00 p.m. and 5:00 p.m., depending upon the particular facility concerned.

Measures of existing arterial street and highway system utilization include volume to capacity ratios, intersection load factors and delay, average operating speeds, and traffic accidents. Existing traffic volumes were found to exceed design capacity on two roadway segments in the study area comprising 0.68 mile, or 2.4 percent, of the existing arterial and collector street system mileage. Existing traffic volumes were found to be at design capacity on an additional two roadway segments comprising 0.42 mile, or 1.5 percent, of the existing arterial and collector street system mileage. The roadway segments experiencing high volume to capacity ratios occur primarily within, or on the fringes of, the central business district of the City.

Signalized intersection approach load factors in excess of 0.30 were found to occur on the eastbound approach of W. Wisconsin Avenue at Main Street and the westbound approach of E. Summit Avenue at S. Silver Lake Street, while the remaining signalized intersection approach load factors were found to be zero. Nonpeak-hour vehicle operating speeds on the principal arterials in the study area, STH 16 and STH 67, were found to average 26 to 27 miles per hour (mph). These average speeds were found to be reduced during the evening peak hour to about 23 mph, with average speeds in the central business district found to be reduced to below 15 mph. Average vehicle delays at the five signalized intersections in the study area were found to exceed 15 seconds at three intersection approaches during the morning peak hour and at five intersection approaches during the evening peak hour.

It was estimated that on an average weekday in 1979, 108,800 person trips were made in the study area. A comparison of the breakdown of person trips by trip purpose for the Oconomowoc study area with that for the Region indicated that all trip purpose percentages were in agreement except the percentages for nonhome-based trips—trips which do not originate or end at home. The nonhome-based person trip was found to exceed the regional average by 11 percent, implying that many trips in the Oconomowoc area were multiple purpose in nature. It was estimated that 56,900 vehicle trips entered the study area on an average weekday in 1979, with 20,900, or 37 percent, being internal trips; 20,300, or 51 percent, being internal/external trips; and 6,700, or 12 percent,

being through trips. It was found that approximately 48 percent of all the average weekday vehicle trips in the study area must travel through the Oconomowoc central business district because of the limited number of direct arterial routes traversing the study area.

Information collected on public parking facilities in the Oconomowoc central business district indicated an average parking space occupancy rate of 64 percent during the hours of peak parking demand—10:00 a.m. to noon and 1:00 p.m. to 3:00 p.m. Off-street parking facilities in the central business district experienced an average occupancy rate of about 76 percent, compared to about 40 percent for on-street parking facilities. However, the on-street parking occupancy rate was considerably higher in the heart of the central business district, averaging about 83 percent. The average turnover rate for on-street parking spaces was found to be 1.2 vehicles per stall during the 10:00 a.m. to noon and 1:00 p.m. to 3:00 p.m. time periods.

There were 380 on-street traffic accidents, three of them involving fatalities, in 1977, and 377 accidents, with one fatality, in 1978 within the study area. Seventy-five percent of the traffic accidents in 1977 involved property damage only, compared to 80 percent in 1978. The intersection of Main Street and Wisconsin Avenue and the roadway segments of E. Wisconsin Avenue between Main Street and N. St. Paul Street and between N. Fowler Street and N. Thompson Street were the highest traffic accident locations in the study area.

The main line of the Chicago, Milwaukee, St. Paul & Pacific Railroad traverses the study area in an east-west direction, carrying between 13 and 18 trains on an average weekday between 7:00 a.m. and 7:00 p.m. Vehicular traffic delay experienced at the at-grade arterial street-railroad track crossings was found to approximate 1.25 minutes. In addition, the Oconomowoc Police Department received periodic reports of crossing gate system malfunction, which causes disruption to vehicluar traffic movement.

EXISTING TRAFFIC PROBLEMS

A number of transportation system objectives were formulated, each with its own set of performance indicators or standards, to assess the efficiency of, and to help identify problems on, the existing arterial system and to evaluate proposed traffic management action alternatives designed to solve the identified problems. Based on the application of the objectives and standards to the existing transportation system, the two principal arterials in the study area, STH 16 and STH 67, were identified as having the majority of the transportation deficiencies in the study area. High traffic accident locations, areas of congestion, and areas of insufficient on-street, short-term parking were found to exist on both facilities.

High traffic accident locations on STH 16 were found at the intersections with Walnut Street, S. Silver Lake Street, and Main Street, and from N. St. Paul Street to Main Street, where 141 accidents occurred in the two-year period between 1977 and 1979. Additional traffic accident problems were found at the intersection of STH 16 with CTH P, with a two-year total of 17 accidents, and on the segment of STH 16 between CTH P and Plank Road, with a two-year total of 18 accidents.

Excessive traffic congestion was found to occur at the intersection of STH 16 with Main Street. Insufficient on-street parking was found to exist on STH 16 between N. St. Paul Street and Main Street. In addition, it was found that there is an inherent conflict between local and through traffic on STH 16, which is exacerbated by the lack of a continuous east-west arterial facility through the southern portion of the study area.

On STH 67, high traffic locations were found at the intersection with CTH B, which accounted for 11 accidents, at the intersection with E. Forest Street and E. Armour Road, which accounted for 23 accidents, and at the intersection with S. Main Street, which accounted for 10 accidents within the two-year period between 1977 and 1979. In addition, the following roadway segments on STH 67 were found to have traffic accident problems: E. Thackery Trail to E. Maple Lane; S. Westover Road to S. Silver Lake Street; and Wisconsin Avenue to E. Rockwell Street, with 31 accidents, 23 accidents, and 67 accidents, respectively, in the two-year period between 1977 and 1979. Excessive traffic congestion was found to occur on the segment of STH 67 between E. Armour Road and S. Main Street. An inadequate supply of on-street, short-term parking was found to exist between W. South Street and E. Rockwell Street. In addition, STH 67 between Wisconsin Avenue and E. Lisbon Road was found to experience a traffic circulation problem which is adversely affected by the location and street pattern of the central business district.

While the two principal arterials—STH 16 and STH 67—experienced the majority of the traffic problems identified in the Oconomowoc study area, additional problems were also identified. These consisted of an arterial service problem on S. Elm Street; a vehicular delay problem caused by railroad operations at railroad-arterial street crossings; and a traffic accident problem at the intersection of S. Silver Lake Street with E. Forest Street. Finally, the South and Fowler off-street public parking facilities were found to lack sufficient short- and long-term capacity to serve the existing parking demand in the central business district.

RECOMMENDED TRAFFIC MANAGEMENT ACTIONS

A broad range of alternative traffic management actions was designed and evaluated to solve or mitigate the problems identified on the arterial street and highway system in the study area. The alternative management actions judged to provide the most improvement in the level of overall transportation service at the least cost were recommended for implementation. The alternative traffic management actions recommended for implementation at each problem location were further evaluated on a systemwide basis to ensure a sound systemwide transportation management plan.

The traffic management actions recommended for implementation in the Oconomowoc study area are listed in Table 38. Each traffic problem location identified in Table 38 is shown on, and keyed to, Map 26. It should be noted that two traffic problems were identified in the study area for which no traffic management action recommendations have been proposed. First, a traffic accident problem was identified on the segment of N. Main Street (STH 67) from E. Wisconsin Avenue (STH 16) to E. Rockwell Street. In the future, should additional public parking be provided in proximity to the commercial establishments on N. Main Street, it would be advisable to prohibit on-street curb parking on this roadway segment. Second, an arterial service problem of poor traffic circulation in the Oconomowoc central business district, principally on N. Lake Road, was identified. Resolution of this problem by means of short-range, low-capital solutions is not feasible because of the existing topography and location of the Oconomowoc central business district.

The majority of the alternative traffic management actions recommended are of a low-capital, short-range, operational nature. The total capital investment, in 1979 dollars, required to implement these low-cost, short-range actions is estimated at $294,900, with the cost of individual actions ranging from $100 for the relocation of an advance warning sign to $50,000 for construction of an exclusive right-turn lane. It should be noted that many of the recommended traffic management actions require no capital investment whatsoever, and that approximately 80 percent of the low-capital, short-range actions require an investment of less than $10,000.

Two recommendations contained herein have been at least partially implemented as of December 31, 1979. The Wisconsin Department of Transportation has let a contract for the installation of traffic signals at STH 67 and E. Thackery Trail, and the westbound approach of STH 67 at S. Silver Lake Street has been reconstructed to provide for an exclusive right-turn lane. The monies for these two projects have already been obligated, thereby effectively reducing the total capital necessary to fully implement the low-cost, short-range actions to $213,800, expressed in 1979 dollars.

It must be recognized that the ability to improve the level of existing transportation service through traffic management actions has a definite limit. Therefore, certain long-range, high-capital investment recommendations have also been made, representing the ultimate solutions to certain of the existing, as well as probable future, traffic problems expected to occur as the Oconomowoc area continues to develop. Four long-range, high-capital investment recommendations, estimated to have a total cost of $27.4 million in 1979 dollars, have been made in this report. These recommendations include: the construction of a local access street from the City of Oconomowoc industrial park to the proposed east-west bypass, requiring $120,000; the construction of a 300-stall parking structure in the Oconomowoc central business district, with the final site to be determined with the design of the structure, requiring $1.2 million; the construction of an east-west bypass route through the southern portion of the study area, requiring $2.4 million if a four-lane, undivided facility is built, or $3.1 million if a four-lane, divided facility is constructed; and the construction of a north-south bypass route through the eastern portion of the study area at a cost of $23 million.

Table 38

SUMMARY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO MITIGATE OR SOLVE THE TRANSPORTATION SYSTEM PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Traffic Problem	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1979 dollars)	Implementation	
					Agency	Priority
Accidents/ Congestion	1	Intersection STH 16 with CTH P	● Improve street lighting	$ 12,000	Wisconsin Department of Transportation	7
			● Relocate advance warning sign	100	Waukesha County	
			Subtotal	$ 12,100		
	2	STH 16—CTH P to Plank Road	● Install channelization	$ 20,000	Wisconsin Department of Transportation	8
			● Skidproof roadway surface	2,400	Wisconsin Department of Transportation	
			Subtotal	$ 22,400		
	3	STH 16—N. Thompson Street to S. Wood Street	● Strictly enforce speed limit	$ --	City of Oconomowoc	18
			● Maintain pavement marking	--	City of Oconomowoc	
			● Skidproof roadway surface	8,300	City of Oconomowoc	
			Subtotal	$ 8,300		
	4	STH 16—N. Fowler Street to N. Thompson Street	● Strictly enforce speed limit	$ --	City of Oconomowoc	11
			● Maintain pavement marking	--	City of Oconomowoc	
			● Skidproof roadway surface	12,000[a]	City of Oconomowoc	
			Subtotal	$ 12,000		
	5	Intersection STH 16 with Walnut Street	● Modify existing traffic signals	$ 800	City of Oconomowoc	6
			● Revise traffic signal sequence	--	City of Oconomowoc	
			● Improve street lighting	3,500	City of Oconomowoc	
			● Interconnect traffic signals	--[b]	City of Oconomowoc	
			Subtotal	$ 4,300		
	6	Intersection STH 16 with S. Silver Lake Street	● Modify existing traffic signals	$ 600	City of Oconomowoc	12
			● Retime traffic signal sequence	--	City of Oconomowoc	
			● Interconnect traffic signals	--[b]	City of Oconomowoc	
			Subtotal	$ 600		
	7	STH 16—Main Street to St. Paul Street	● Install advance warning signs	$ 100	City of Oconomowoc	3
			● Eliminate one parking space	100	City of Oconomowoc	
			● Restrict driveway operations	400	City of Oconomowoc	
			Subtotal	$ 600		
	8	Intersection STH 16 with STH 67	● Improve street lighting	$ 3,500	City of Oconomowoc	1
			● Install turning guidelines	100	City of Oconomowoc	
			● Modify existing traffic signals	800	City of Oconomowoc	
			● Retime traffic signal sequence	--	City of Oconomowoc	
			● Interconnect traffic signals	10,500	City of Oconomowoc	
			● Delineate a downtown bypass route on W. 2nd Street and S. Concord Road	600	City of Oconomowoc	
			● Install and interconnect traffic signals at intersection of STH 16 and S. Concord Road	32,000	City of Oconomowoc	
			● Officially map and construct east-west arterial bypass in southern portion of study area	--[c]	City of Oconomowoc/ Waukesha County	19
			● Officially map and construct north-south STH 16 freeway bypass in eastern portion of study area	--[c]	City of Oconomowoc/ Wisconsin Department of Transportation	20
			● Implement work time rescheduling	--	City of Oconomowoc	21
			Subtotal	$ 47,500		
	9	Intersection STH 67 with CTH B	● Install signal beacons	$ 2,000	Wisconsin Department of Transportation	10
			● Install advance warning signs	200	Wisconsin Department of Transportation	
			Subtotal	$ 2,200		
	10	Intersection STH 67 with E. Thackery Trail	● Install traffic signals	$ 31,100[d]	Wisconsin Department of Transportation	5
			● Improve street lighting	9,000	City of Oconomowoc	
			● Reduce speed limit	400	Wisconsin Department of Transportation	
			● Install advance warning signs	200	Wisconsin Department of Transportation	
			Subtotal	$ 40,700		

Table 38 (continued)

Traffic Problem	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1979 dollars)	Implementation	
					Agency	Priority
Accidents/ Congestion	11	STH 67—E. Thackery Trail Trail to E. Maple Lane	● Improve street lighting	$ 15,000	City of Oconomowoc	16
	12	Intersection STH 16 with E. Forest Street	● Strictly enforce 15-mph school-zone speed limit	$ --	City of Oconomowoc	15
			● Skidproof roadway surface	9,000[a]	City of Oconomowoc	
			Subtotal	$ 9,000		
	13	Intersection STH 67 with E. Armour Road	● Reconstruct roadway curb	$ 15,000	City of Oconomowoc	13
			● Install pavement marking	700	City of Oconomowoc	
			Subtotal	$ 15,700		
	14	STH 67—S. Silver Lake Street to S. Westover Street	● Install advance warning signs	$ 200	City of Oconomowoc	4
			● Skidproof roadway surface	15,000[a]	City of Oconomowoc	
			Subtotal	$ 15,200		
	15	Intersection STH 67 with S. Silver Lake Street	● Retime traffic signal sequence	$ --	City of Oconomowoc	2
			● Reconstruct westbound approach to provide an exclusive right-turn lane	50,000[e]	City of Oconomowoc	
			● Interconnect traffic signals	--[b]	City of Oconomowoc	
			● Modify existing signals	5,000	City of Oconomowoc	
			● Install pavement markings	100	City of Oconomowoc	
			Subtotal	$ 55,100		
	16	Intersection STH 67 with W. 2nd Avenue	● Install advance warning sign	$ 100	City of Oconomowoc	14
	17	Intersection STH 16 with W. South Street	● Install pavement markings	$ 150	City of Oconomowoc	9
	18	Intersection E. Forest Street with S. Silver Lake Street	● Install pavement markings	$ 100	City of Oconomowoc	17
Arterial Service	19	East-west arterial street spacing deficiency problem in the southern portion of the study area	● Officially map proposed east-west arterial bypass	$ --	City of Oconomowoc/ Waukesha County	1
			● Construct east-west arterial bypass	2.4 to 3.1 million	Waukesha County	5
			Subtotal	2.4 to 3.1 million		
	20	North-south arterial street spacing deficiency problem in the eastern portion of the study area	● Officially map proposed north-south STH 16 Freeway bypass	$ --	City of Oconomowoc	1
			● Construct north-south STH 16 Freeway bypass	23 million	Wisconsin Department of Transportation	7
			Subtotal	$ 23 million		
	21	Truck traffic on local access road problem on S. Elm Road between W. Wisconsin Avenue (STH 16) and W. 2nd Street	● Restrict trucking on S. Elm Street, divert truck traffic to S. Concord Road, and restrict parking on S. Concord Road from W. Wisconsin Avenue to W. 2nd Street between 8:00 a.m. and 4:30 p.m.	$ 1,100	City of Oconomowoc	4
			● Construct a new land access street from the Oconomowoc industrial park to proposed east-west bypass	120,000	City of Oconomowoc	6
			Subtotal	$ 121,100		
	22	Conflict between through and local traffic problems on arterial streets and highways in the study area	● Officially map proposed east-west and north-south bypasses	$	City of Oconomowoc/ Waukesha County	1
			● Construct east-west and north-south bypasses	--[c]	Waukesha County/ Wisconsin Department of Transportation	5/7
	23	Traffic delay problems at the at-grade railroad track and arterial street and highway crossings	● Officially map proposed east-west and north-south bypasses	$	City of Oconomowoc/ Waukesha County	1
			● Construct east-west and north-south bypasses	--[c]	Waukesha County/ Wisconsin Department of Transportation	5/7
			● Install constant time warning devices at S. Main Street (STH 67) and S. Silver Lake Street crossings of the Milwaukee Road tracks	30,000	City of Oconomowoc	3
			● Remove stop signs at crossing gate-protected at-grade crossings	650	City of Oconomowoc	2
			Subtotal	$ 30,650		

Table 38 (continued)

Traffic Problem	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1979 dollars)	Implementation	
					Agency	Priority
Parking Supply	24	East Side of N. St. Paul Street from the Fowler public parking facility entrance to E. Wisconsin Avenue (STH 16)	● Change parking restriction from 15 minutes to one hour and install three parking meters	$ 600	City of Oconomowoc	3
	25	South Side of E. Collins Street from S. Cross Street to S. Silver Lake Street	● Remove two-hour parking restriction and parking meters to allow all-day unrestricted parking	$ 500	City of Oconomowoc	4
	26	North Side of W. South Street immediately west of S. Main Street (STH 67)	● Change all-day parking restriction to allow three metered, 8:00 a.m. to 3:30 p.m., 15-minute restricted parking spaces	$ 600	City of Oconomowoc	1
	27	West Side of S. Cross Street from E. Collins Street to E. Wisconsin Avenue (STH 16)	● Remove all-day parking restriction to allow all-day unrestricted parking south of South parking facility entrance	$ 100	City of Oconomowoc	2
	28	Fowler public parking facility	● Change 10 of the eight-hour parking stall restrictions to two-hour restrictions	$ 300	City of Oconomowoc	5
	29	South or Fowler public parking facility	● Construct a parking structure	$ 1,200,000	City of Oconomowoc	6
			Total	$27,014,900 to $27,714,900	--	

[a] *Implementation of this traffic management action should occur only if the other recommendations for this location do not effectively mitigate or solve the problem.*

[b] *Interconnection of traffic signals in the Oconomowoc central business district area has a total capital cost of approximately $10,500 for all five signalized intersections.*

[c] *The capital cost of constructing the proposed east-west arterial bypass and the north-south STH 16 freeway bypass--which would be approximately $2.4 million to $3.1 million and $23 million, respectively--has been included in the arterial street spacing deficiency problem costs.*

[d] *A contract in the amount of $31,100 was signed by the State of Wisconsin for the installation of traffic signals at this intersection prior to completion of this study.*

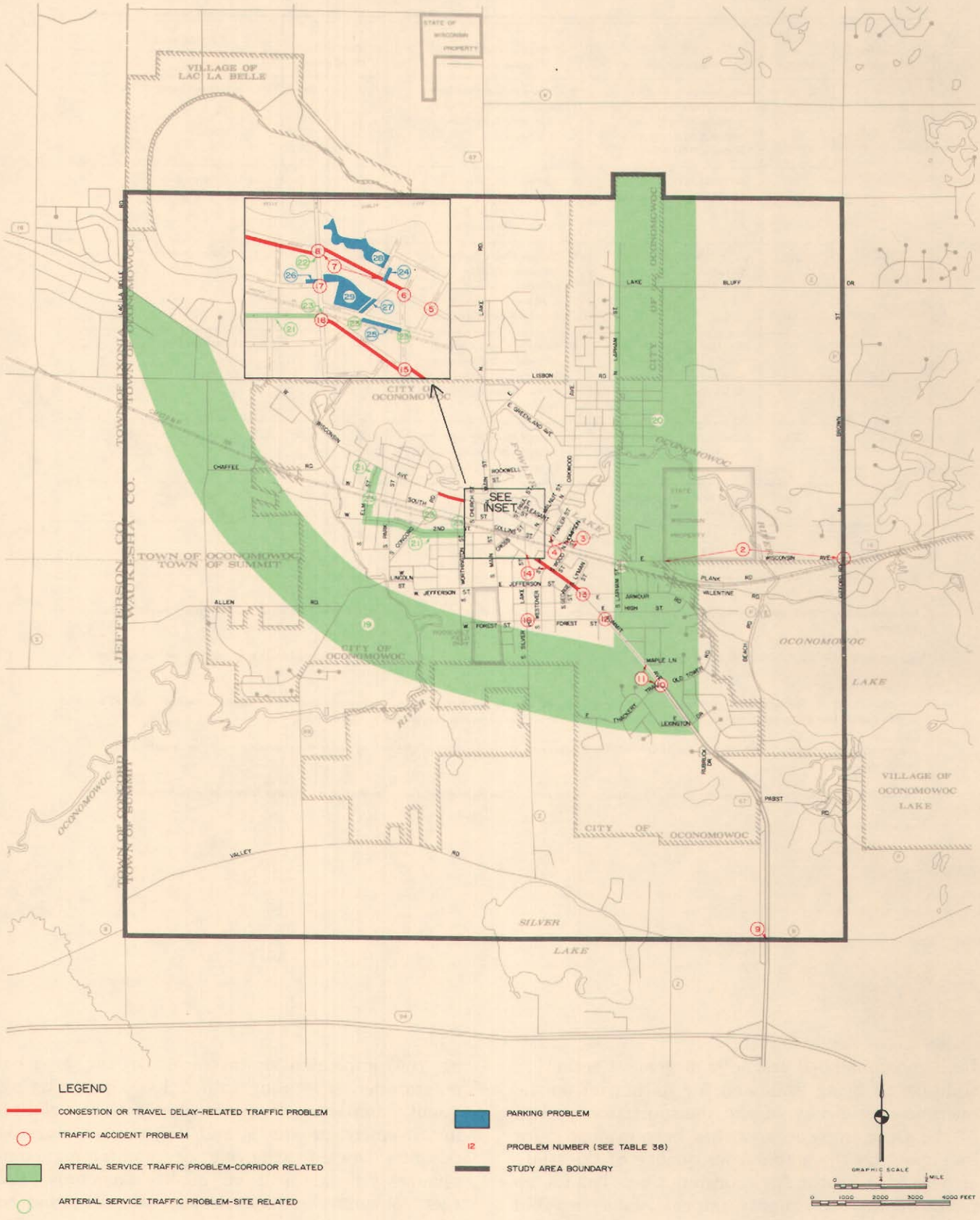
[e] *The westbound approach to this intersection was reconstructed with an exclusive right-turn lane and opened to traffic prior to completion of this study.*

Source: SEWRPC.

Each recommended traffic management action, in addition to being evaluated for its impact on the operating efficiency of the transportation system of the Oconomowoc area, has been evaluated for its impact on the ambient air quality of the study area and on motor fuel consumption. The assessment of this air quality impact has a two-fold purpose: 1) to promote an awareness on the part of the implementing agencies of the environmental benefits to be gained by considering air quality impacts when developing transportation improvement programs; and 2) to aid in assessing progress toward achieving or maintaining compliance with ambient air quality standards. The fuel consumption analysis has been included to demonstrate the motor fuel conservation benefits

Map 26

LOCATION OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO MITIGATE OR SOLVE TRANSPORTATION SYSTEM PROBLEMS IN THE OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA: 1979



Source: SEWRPC.

that can be expected to be attendant to the recommended actions. The results of the air quality and fuel consumption assessments are presented in Appendix H.

The Oconomowoc area traffic management plan recommends that 60 traffic management actions be implemented to solve or mitigate the traffic problems at 29 locations in the study area. The total capital investment required to implement the recommendations contained in the plan is estimated at $27.7 million (1979 dollars)—$294,900 in short-range, low-capital solutions, and $27.4 million in high-capital, long-range solutions.

PLAN ADOPTION AND IMPLEMENTATION

Adoption or endorsement of the Oconomowoc area transportation management plan by the U. S. Department of Transportation, Federal Highway Administration; the Wisconsin Department of Transportation; the Waukesha County Board; and the City of Oconomowoc Common Council—the four major plan implementation agencies—is essential to assure a common understanding among the several governmental agencies and to enable their staffs to program the necessary implementation work in a coordinated fashion.

The Oconomowoc traffic management plan sets forth a recommended implementation priority for the recommended traffic management actions within each transportation system problem category, as shown in Table 38. This prioritization is based on the anticipated degree of improvement in operating conditions on the existing arterial street and highway system that may be expected to be achieved by implementation of each traffic management action. In addition, the governmental agency responsible for the implementation of each recommended traffic management action is set forth in Table 38. Of the 60 traffic management actions recommended in the plan, the Wisconsin Department of Transportation is responsible for the implementation of 9 actions; Waukesha County for 3 actions; and the City of Oconomowoc for the remaining 48 actions. Close coordination with the Wisconsin Department of Transportation must be maintained by each local implementing agency to ensure the satisfactory and timely completion of project requests and approvals.

A review of each recommended traffic management action was also made to determine its eligibility for participation in federal aid highway funding programs. That review established that 30 actions, or 50 percent of all of the recommended actions, are eligible for federal funding. Assuming that adequate funds will be available in each federal aid program concerned, and that the Wisconsin Department of Transportation will approve each recommended action for funding, the federal funds could pay up to $19.8 million, or about 71 percent, of the total $27.7 million—expressed in 1979 dollars—required to implement all of the recommendations contained in the plan. The Wisconsin Department of Transportation could, similarly, be expected to fund approximately $5.7 million, or about 21 percent of the total plan cost; Waukesha County about $0.4 million, or 1 percent; and the City of Oconomowoc about $1.8 million, or 7 percent. It is important to note that the funding recommendations contained in the plan are subject to specific program limitations and statewide transportation improvement priorities.

SUMMARY

If adopted, the traffic management plan for the Oconomowoc area can provide a valuable guide for optimizing the operating efficiency of the existing arterial street and highway system in the Oconomowoc area. The plan is based on extensive inventories and analyses of the land uses in the area, as well as of the physical and operating characteristics of the existing arterial street and highway system.

The plan identifies existing transportation system problems as evidenced by accidents and congestion, and by parking and arterial service deficiencies. The plan recommends specific traffic management actions designed to solve or mitigate the identified problems of the existing transportation system, emphasizing low-capital, short-range solutions. The plan also makes some recommendations requiring extensive capital investment—recommendations designed to solve existing problems as well as potential future problems. Implementation of the traffic management actions recommended in this plan should result in the marked improvement in the level of overall transportation service in the Oconomowoc area. Implementation should also result in improved air quality and reduced motor fuel consumption. Action taken now will eliminate or at least ameliorate existing traffic problems, and will provide the direction required to ensure that future transportation needs are readily and economically met.

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APPENDICES

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Appendix A

OCONOMOWOC TRAFFIC MANAGEMENT STUDY ORGANIZING COMMITTEE

Florence G. Whalen ..... Mayor, City of Oconomowoc
Chairman
Douglas B. Brown ..... Editor, Oconomowoc Enterprise
John J. Foust ..... Citizen Member, Town of Oconomowoc
Joseph F. Mangiamale ..... Planning Consultant, City of Oconomowoc
Richard P. Mercier ..... Administrator-Treasurer, City of Oconomowoc
Leonard L. Schacht ..... Police Chief, City of Oconomowoc
Marjorie L. Stemper ..... Citizen Member, City of Oconomowoc
Floyd W. Usher ..... City Engineer, City of Oconomowoc

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Appendix B

RESOLUTION

WHEREAS, the Southeastern Wisconsin Regional Planning Commission staff has met with representatives of the City of Oconomowoc to gain an understanding of traffic congestion problems in the City and to enable the Commission staff to determine the time and financial requirements of a traffic management study; and

WHEREAS, the Commission staff has considered the problems and determined the cost; and

WHEREAS, the Regional Planning Commission has submitted a proposal under date of September 20, 1978, entitled City of Oconomowoc, Wisconsin Traffic Management Study, wherein the Commission outlines the proposed study to be undertaken; and

WHEREAS, there will be no cost to the City for the study.

NOW, THEREFORE, BE IT RESOLVED that the Common Council of the City of Oconomowoc do hereby authorize and request the Southeastern Wisconsin Regional Planning Commission to undertake the Traffic Management Study as outlined in the September 20, 1978, memorandum, a copy of which is attached hereto.

Florence Whalen

Florence Whalen, Mayor

Date: October 3, 1978

Gary L. Rasmussen

Gary L. Rasmussen, Clerk

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Appendix C

CITIZENS AND TECHNICAL ADVISORY COMMITTEE FOR THE OCONOMOWOC AREA TRAFFIC MANAGEMENT STUDY

Marjorie L. Stemper, Chairman	Member, City of Oconomowoc Plan Commission
John M. Alberts	Citizen Member, City of Oconomowoc
Nancy M. Baker	Citizen Member, City of Oconomowoc
Grace M. Blaska	Alderman, City of Oconomowoc
Douglas B. Brown	Editor, Oconomowoc Enterprise
J. Thomas Foti	Alderman, City of Oconomowoc
John J. Foust	Citizen Member, Town of Oconomowoc
Roger J. Heathcote	Citizen Member, City of Oconomowoc
Carlyle Holtan	Administrator, Oconomowoc Public Schools
Walter T. Johnson	Member, City of Oconomowoc Plan Commission
Kay M. Kosma	Citizen Member, Town of Oconomowoc
Patricia Kruger	Member, City of Oconomowoc Plan Commission
Kenton M. Marti	Alderman, City of Oconomowoc
Richard P. Mercier	Administrator-Treasurer, City of Oconomowoc
James J. Pihringer	Citizen Member, City of Oconomowoc
Robert G. Santo	Oconomowoc Transport Company, Inc.
Leonard L. Schacht	Police Chief, City of Oconomowoc
Ronald W. Schneider	Citizen Member, City of Oconomowoc
Russell W. Schumacher	Citizen Member, City of Oconomowoc
Albert R. Sells	Member, City of Oconomowoc Plan Commission
Floyd W. Usher	City Engineer, City of Oconomowoc
Florence G. Whalen	Mayor, City of Oconomowoc
James Zahradka	Associate Administrator, Memorial Hospital, Oconomowoc

Acknowledgement is also given to Mr. Richard W. Scheife, former Committee Chairman and Citizen Member from the Town of Oconomowoc; Mr. Donald H. Jorgensen, former Chief Traffic Engineer, District 2, Wisconsin Department of Transportation; and Mr. Gary P. Knerr, Traffic Project Engineer, District 2, Wisconsin Department of Transportation for their contributions to this report. Mr. James A. Marsho, Senior Engineer, SEWRPC, although not a member of the Committee, served as its Secretary.

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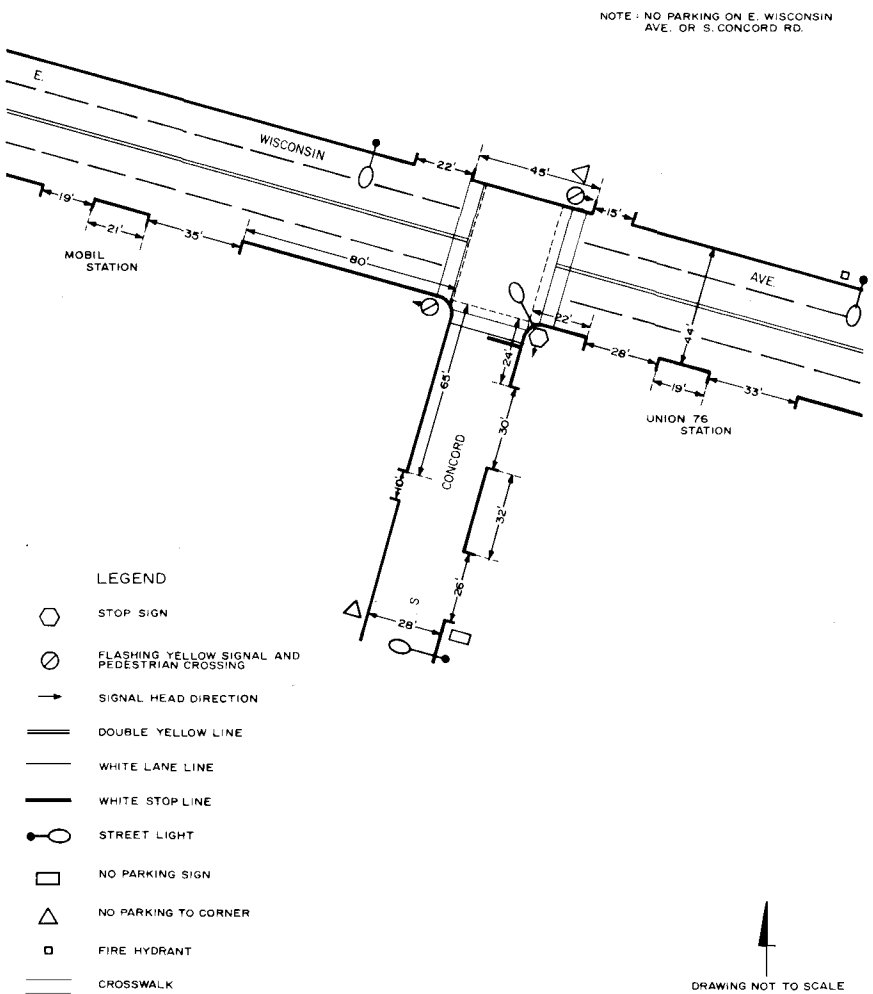
Appendix D

DETAILED GEOMETRIC INTERSECTION FIGURES: OCONOMOWOC TRAFFIC MANAGEMENT STUDY AREA

Figure D-1

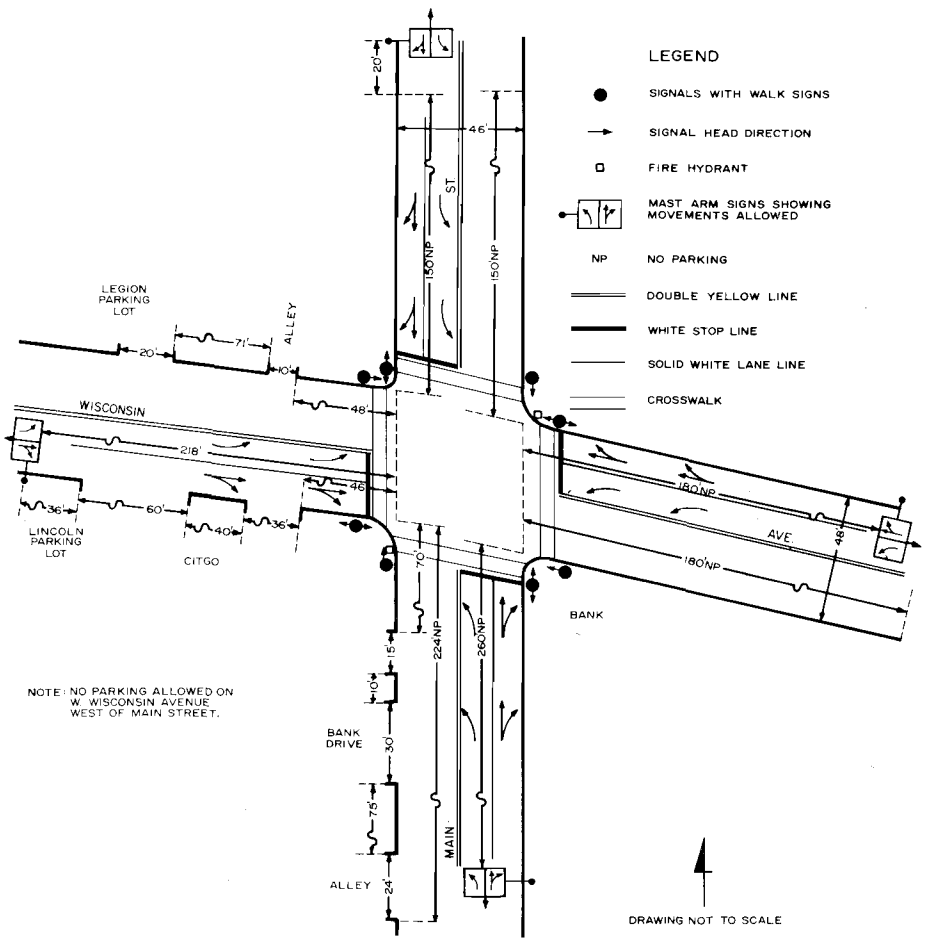
E. WISCONSIN AVENUE AND S. CONCORD ROAD



Source: SEWRPC.

Figure D-2

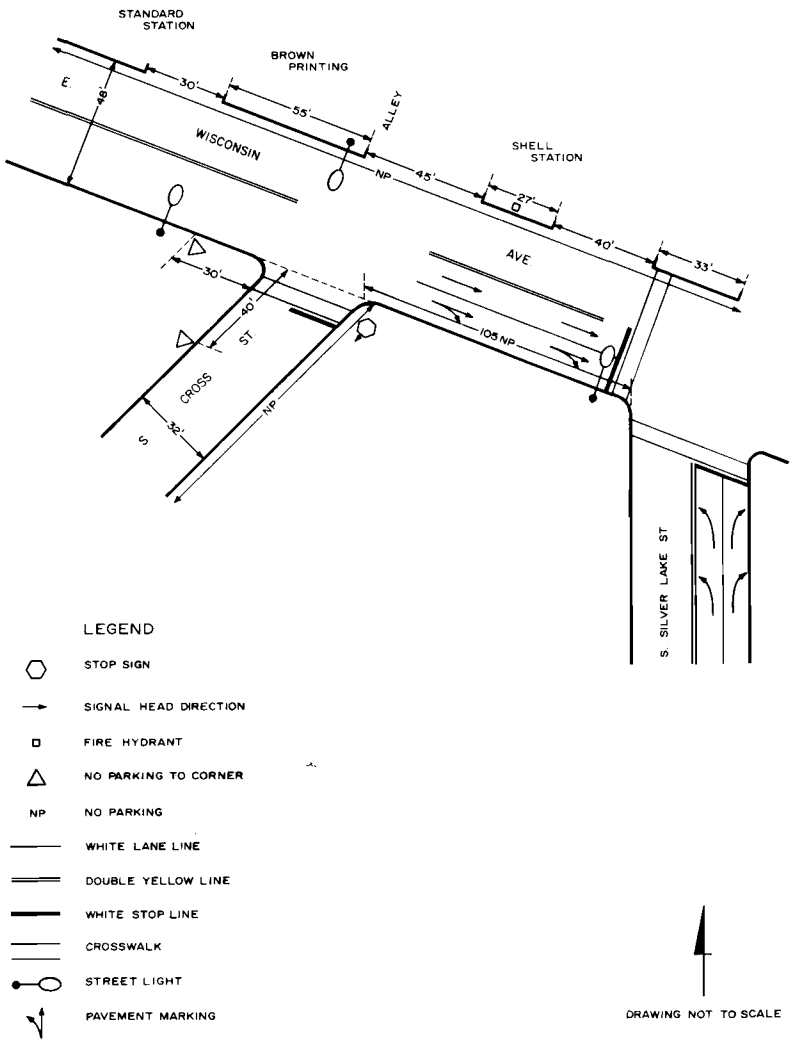
WISCONSIN AVENUE AND MAIN STREET



Source: SEWRPC.

Figure D-3

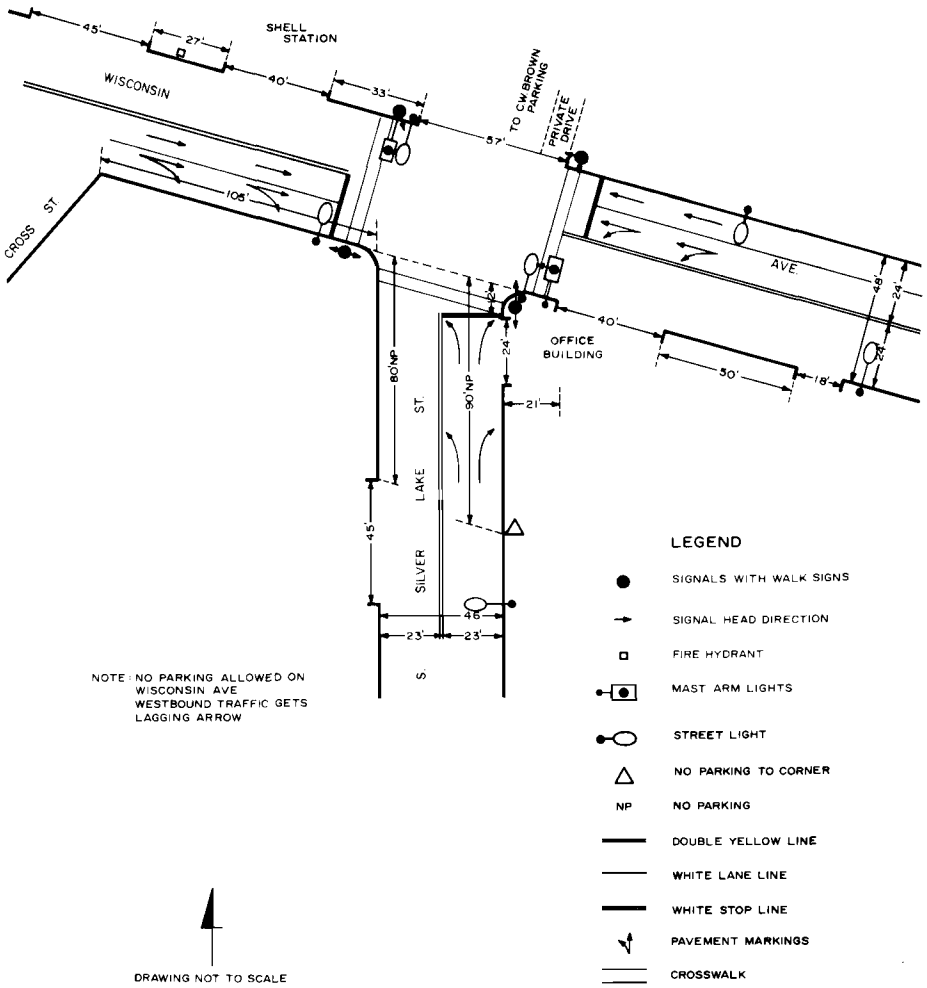
E. WISCONSIN AVENUE AND S. CROSS STREET



Source: SEWRPC.

Figure D-4

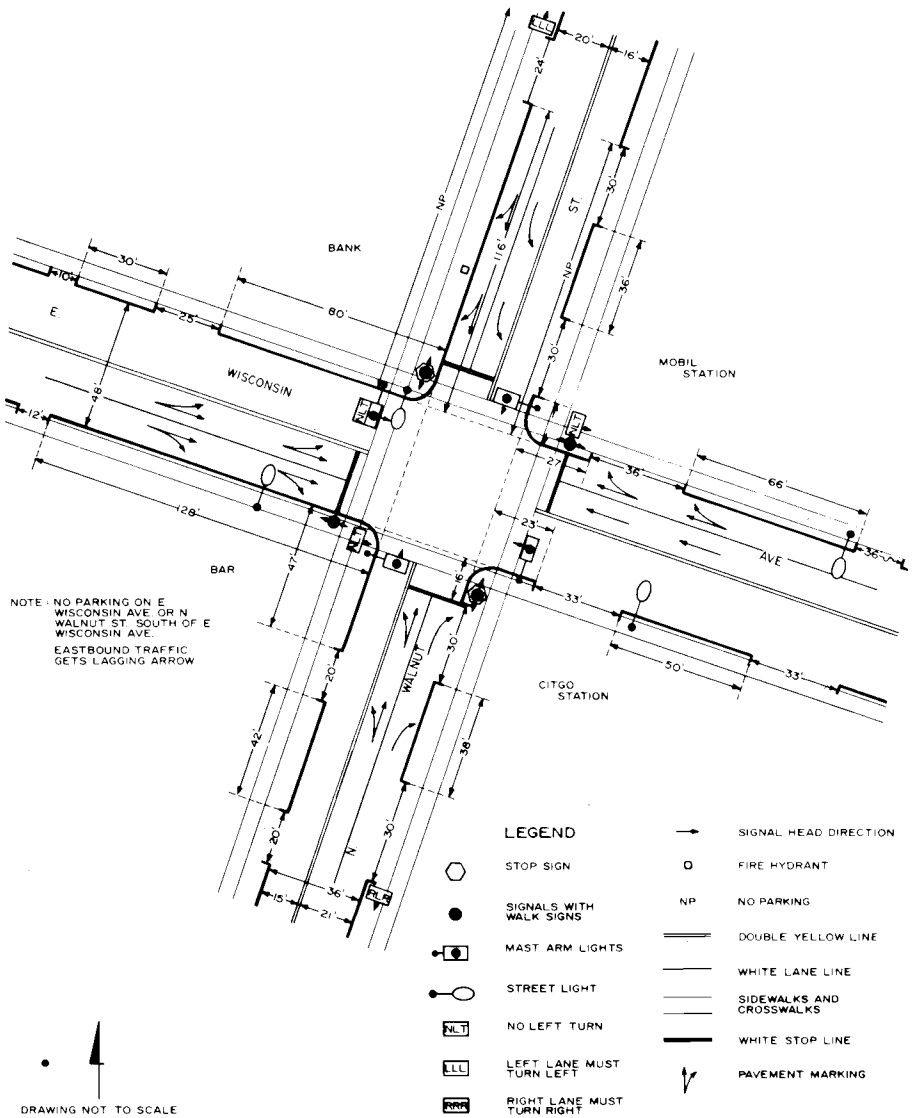
E. WISCONSIN AVENUE AND S. SILVER LAKE STREET



Source: SEWRPC.

Figure D-5

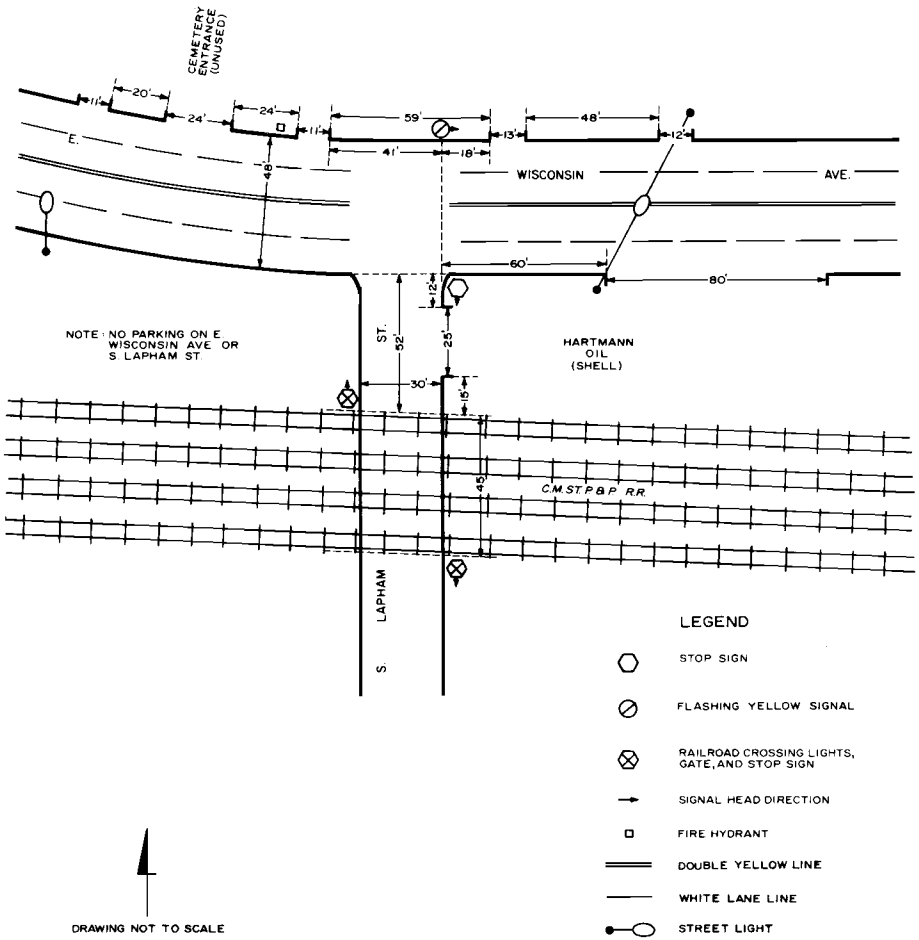
E. WISCONSIN AVENUE AND N. WALNUT STREET



Source: SEWRPC.

Figure D-6

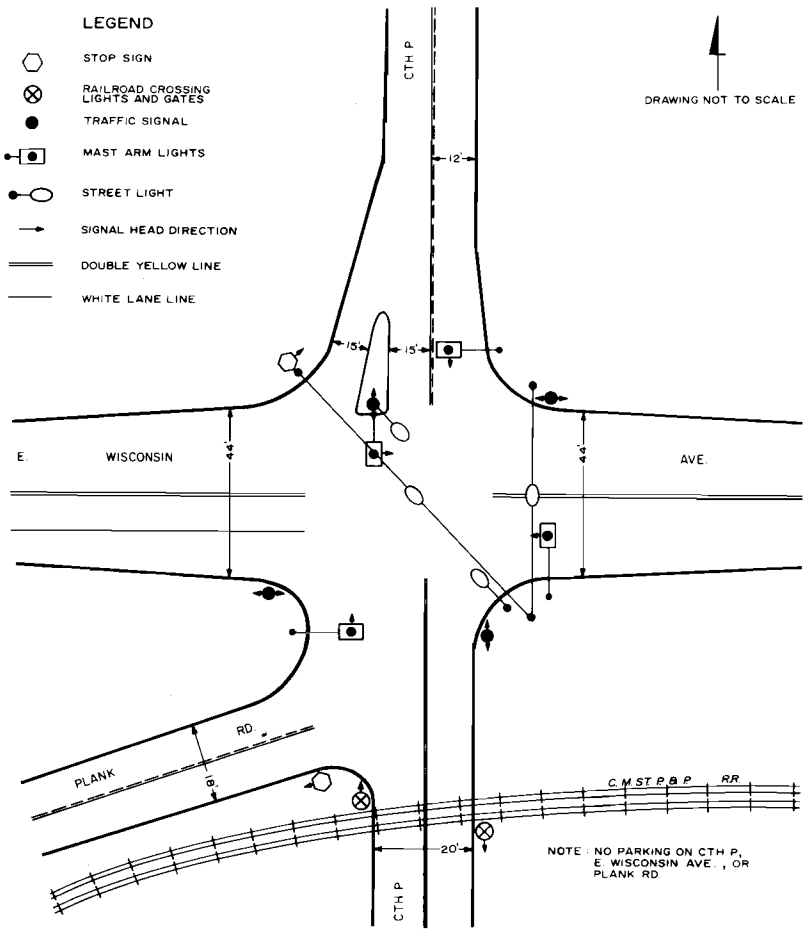
E. WISCONSIN AVENUE AND S. LAPHAM STREET



Source: SEWRPC.

Figure D-7

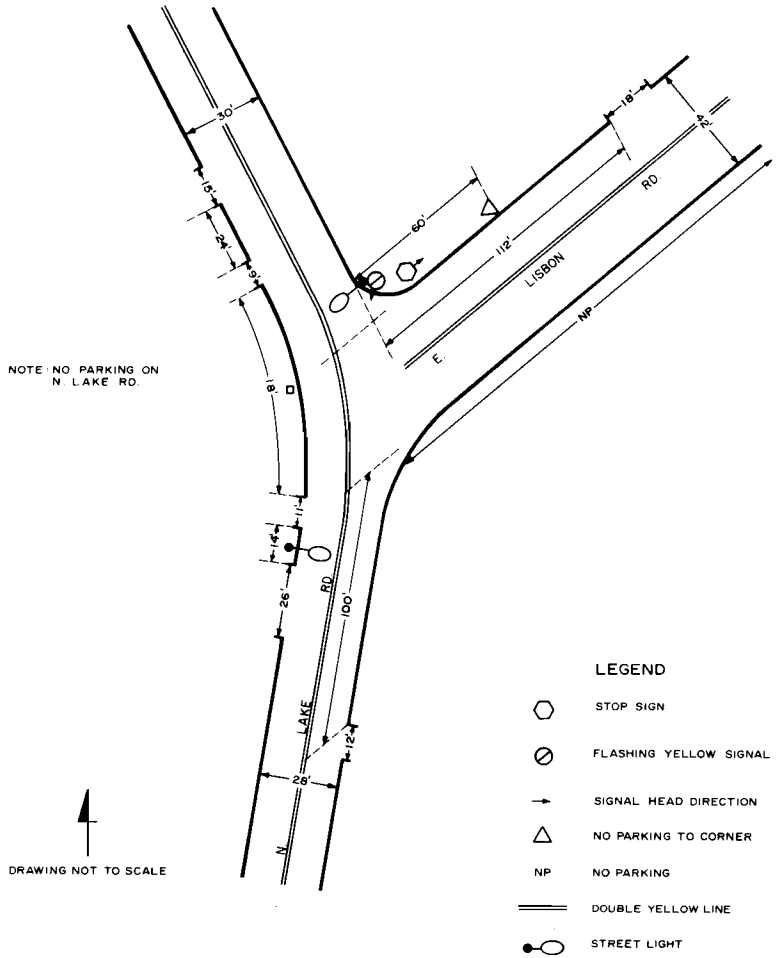
E. WISCONSIN AVENUE AND CTH P



Source: SEWRPC.

Figure D-8

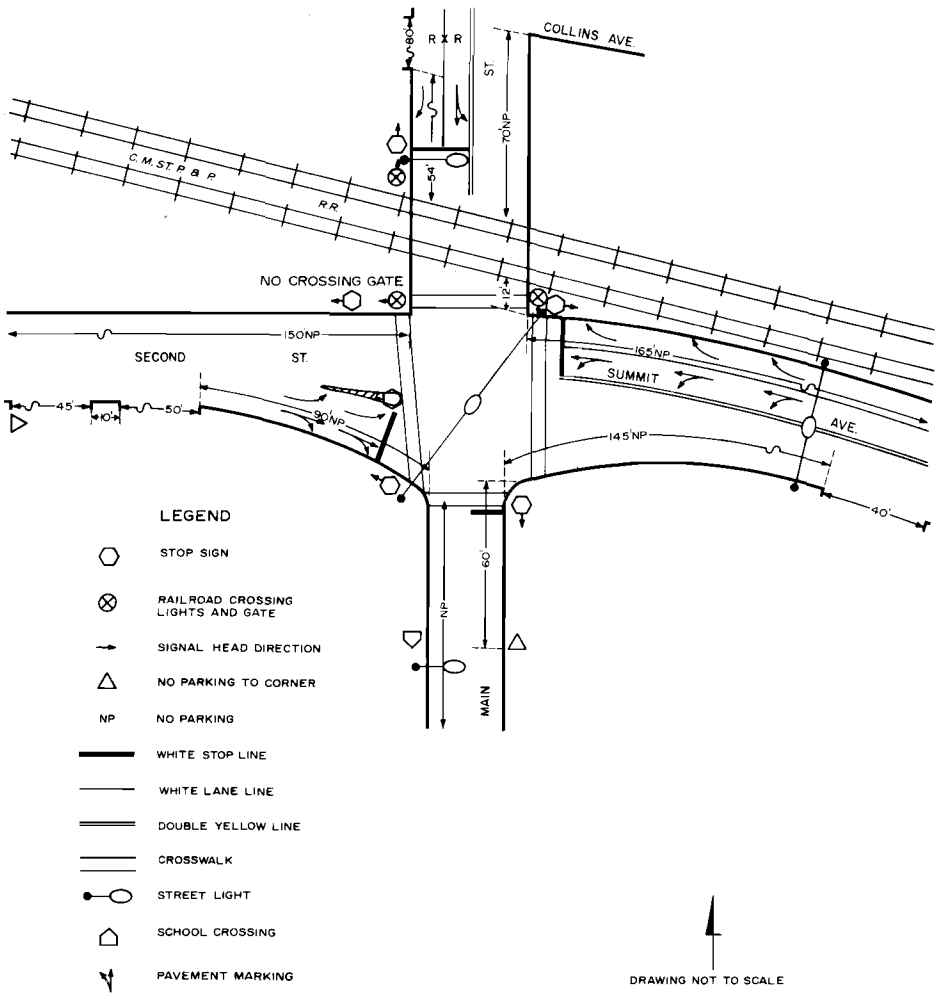
N. LAKE ROAD AND E. LISBON ROAD



Source: SEWRPC.

Figure D-9

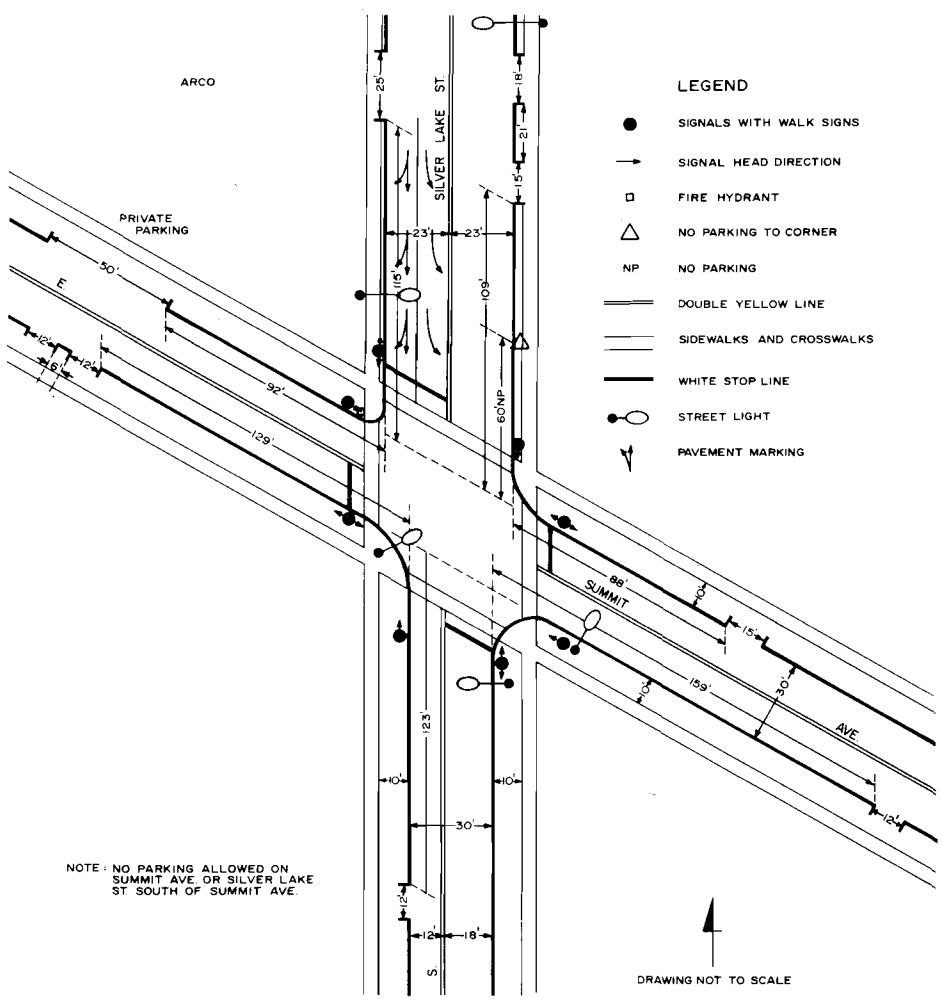
S. MAIN STREET AND W. SECOND STREET



Source: SEWRPC.

Figure D-10

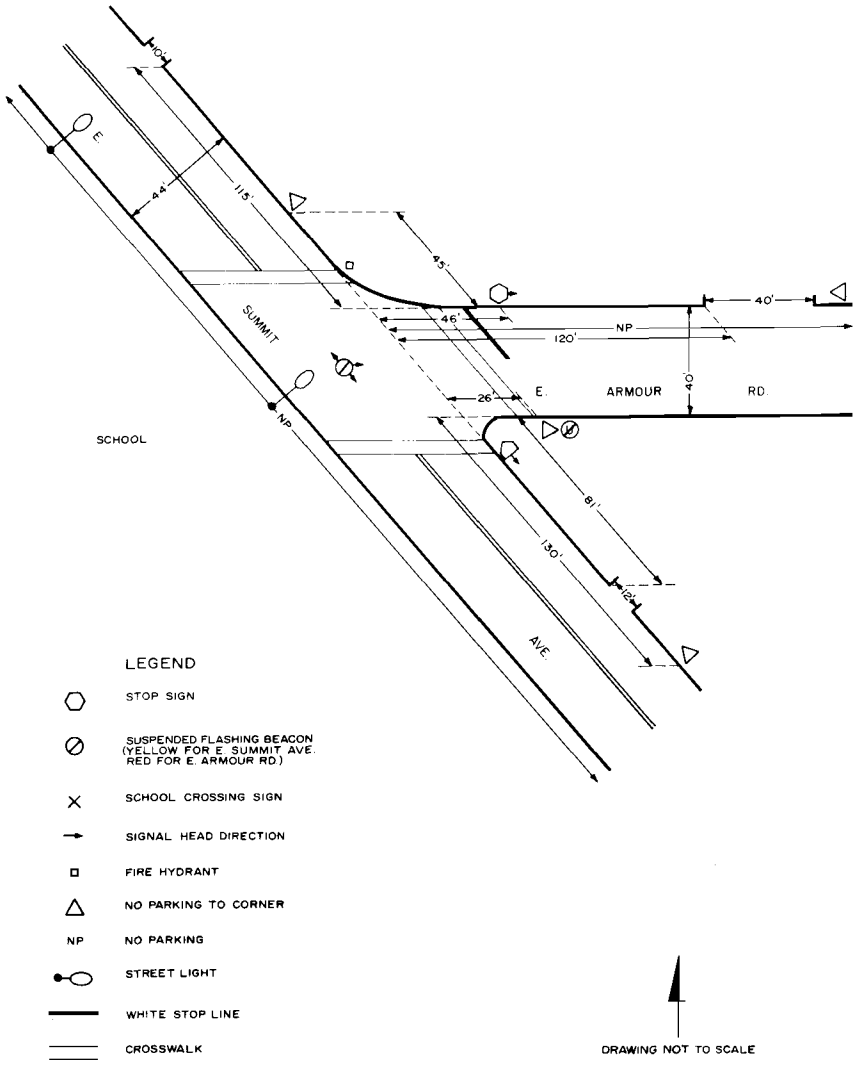
E. SUMMIT AVENUE AND S. SILVER LAKE STREET



Source: SEWRPC.

Figure D-11

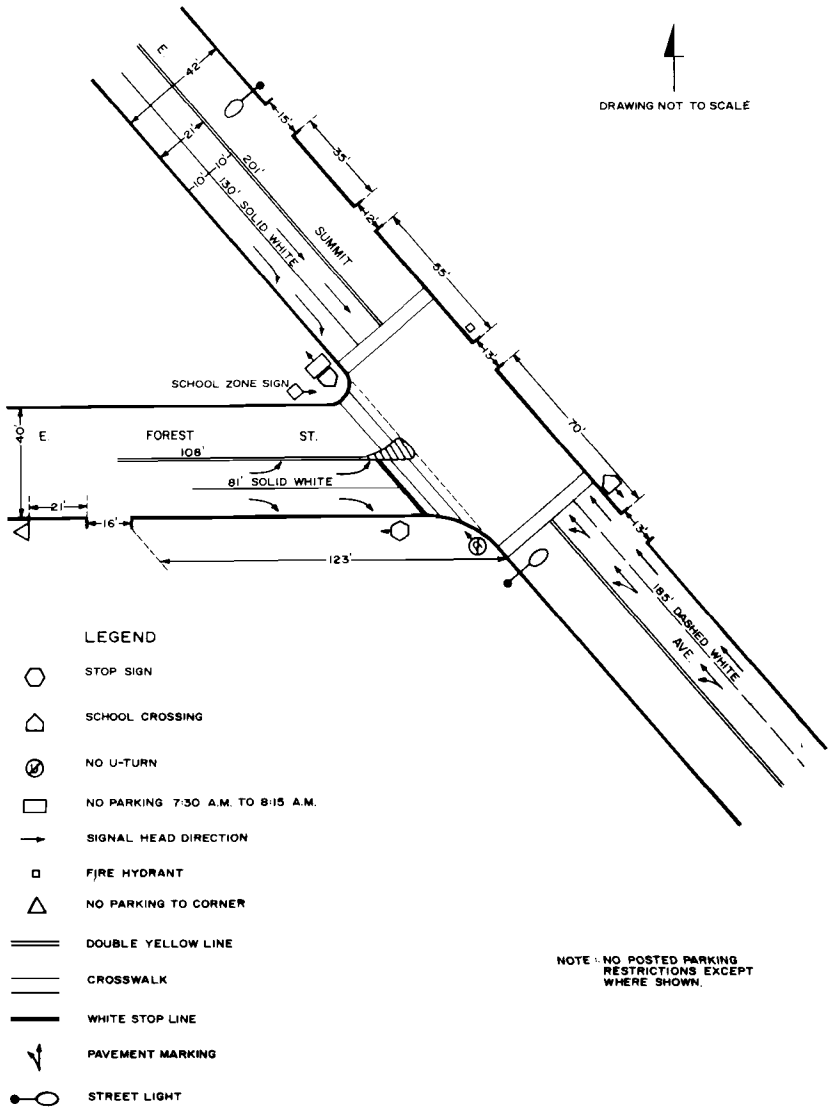
E. SUMMIT AVENUE AND E. ARMOUR ROAD



Source: SEWRPC.

Figure D-12

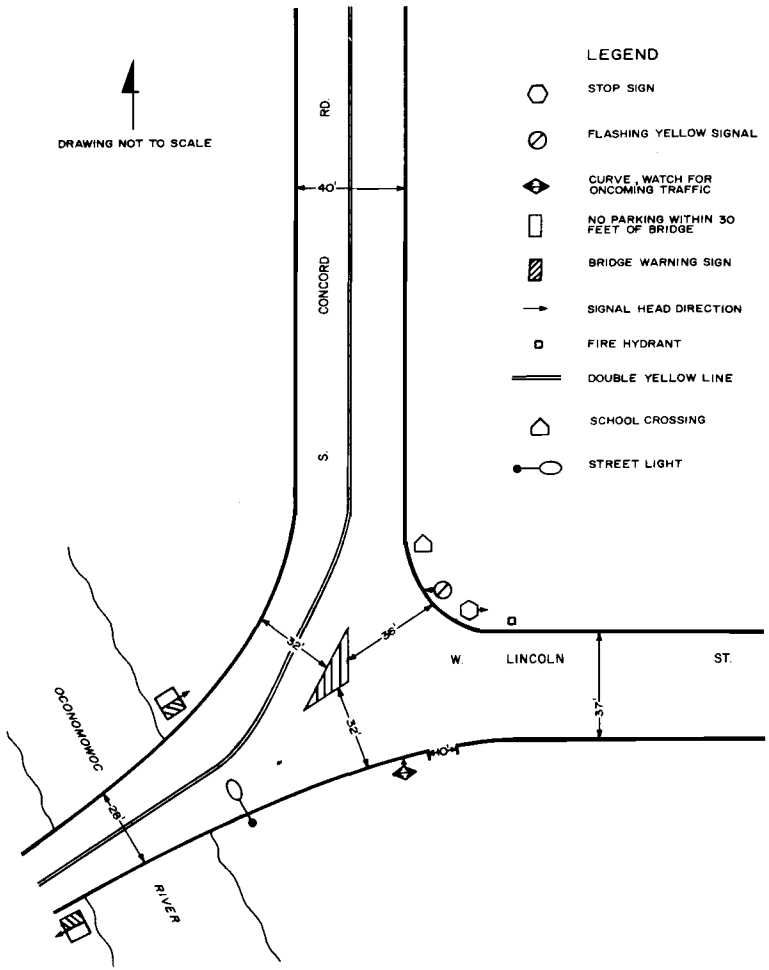
E. SUMMIT AVENUE AND E. FOREST STREET



Source: SEWRPC.

Figure D-13

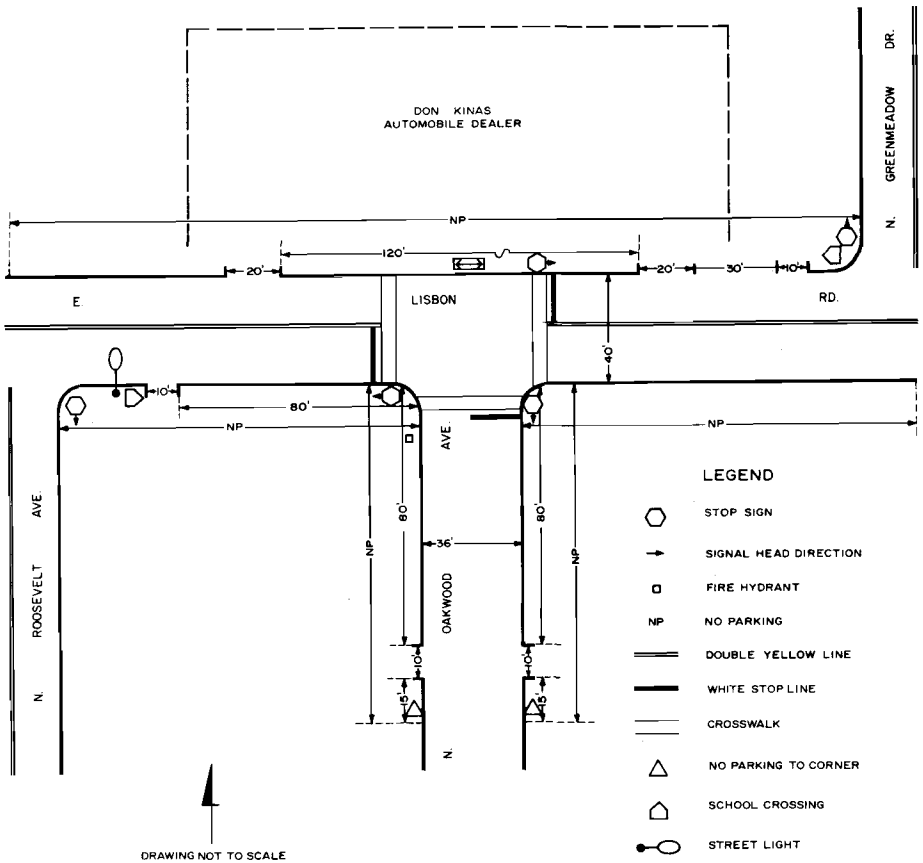
S. CONCORD ROAD AND W. LINCOLN STREET



Source: SEWRPC.

Figure D-14

E. LISBON ROAD AND N. OAKWOOD AVENUE



Source: SEWRPC.

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Appendix E

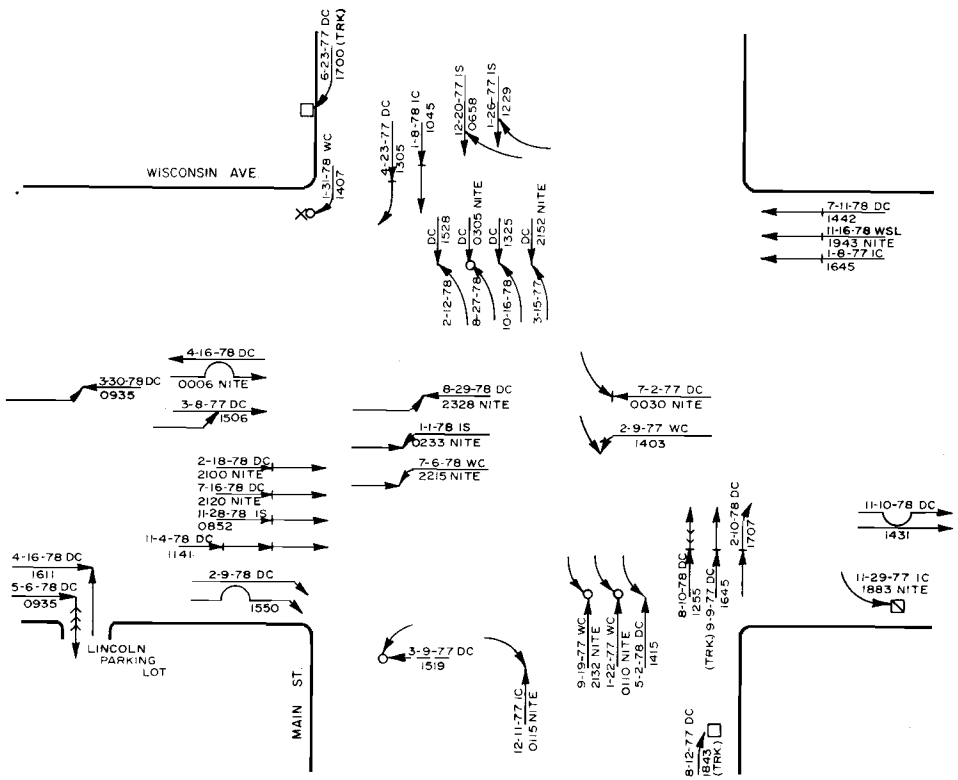
MOTOR VEHICLE COLLISION DIAGRAMS

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION Main Street and Wisconsin Avenue

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	2	0	2
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	3	3
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	22	12	34
	PARKED VEHICLE	LEFT TURN	TOTAL	24	15	39
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

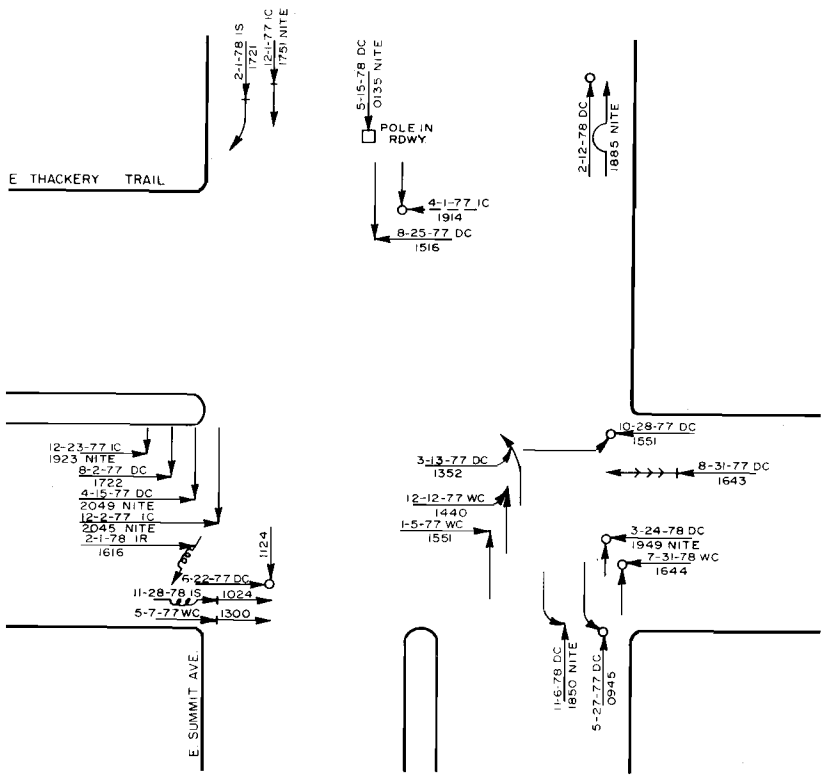
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and E. Thackery Trail

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	1	0	1
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	4	2	6
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	10	6	16
	PARKED VEHICLE	LEFT TURN	TOTAL	15	8	23
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

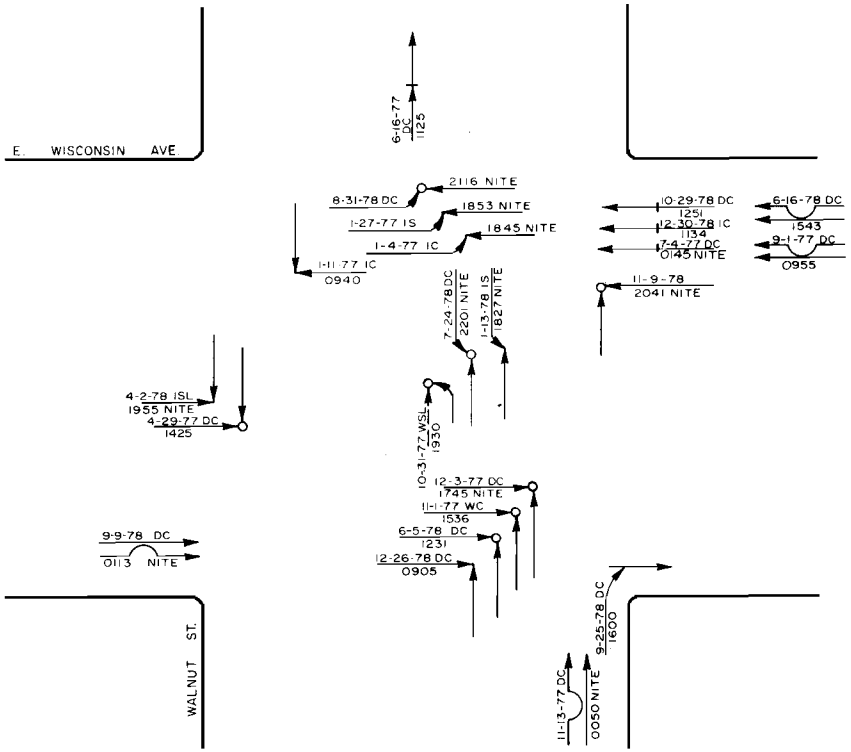
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Wisconsin Avenue and Walnut Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	0	0	0
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	1	0	1
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	3	4	7
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	8	7	15
	PARKED VEHICLE	LEFT TURN	TOTAL	12	11	23
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

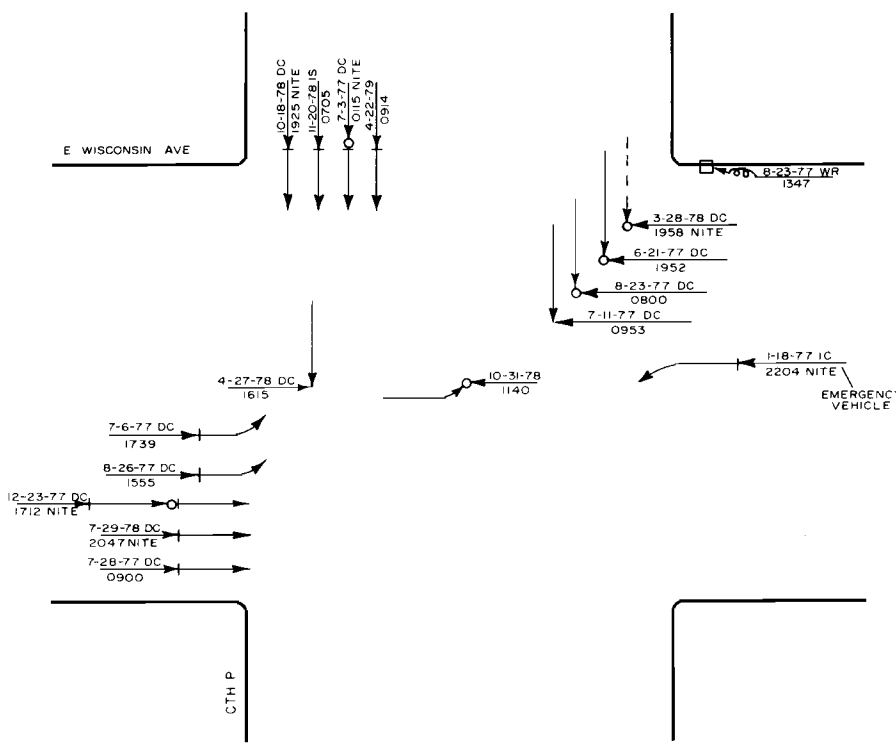
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Wisconsin Avenue (STH 16) and Brown (CTH P)

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by David A. Schilling and Terrance Brown Sheet 1



SHOW FOR, EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	0	0	0
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	1	1
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	3	2	5
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	8	3	11
	PARKED VEHICLE	LEFT TURN	TOTAL	11	6	17
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

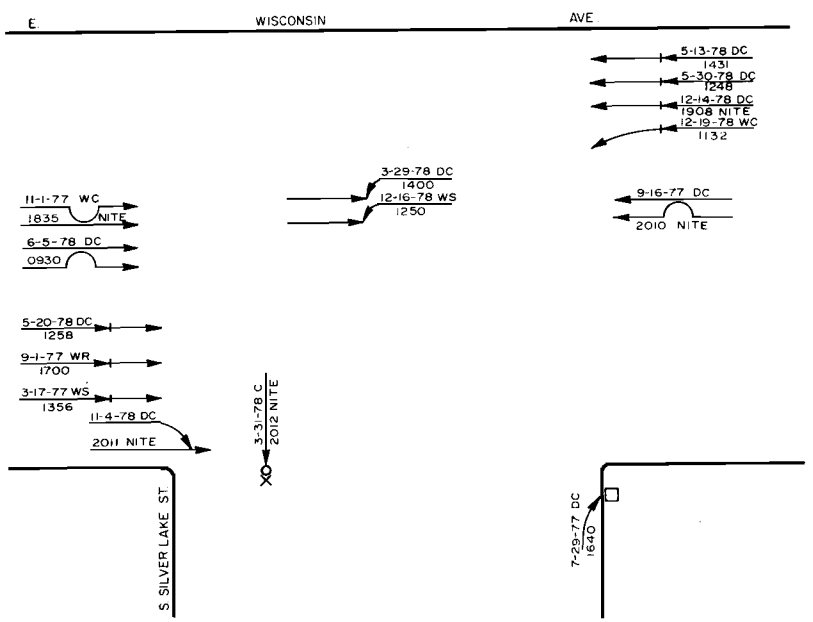
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Wisconsin Avenue and S. Silver Lake Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	0	0	0
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	1	1
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	10	4	14
	PARKED VEHICLE	LEFT TURN	TOTAL	10	5	15
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

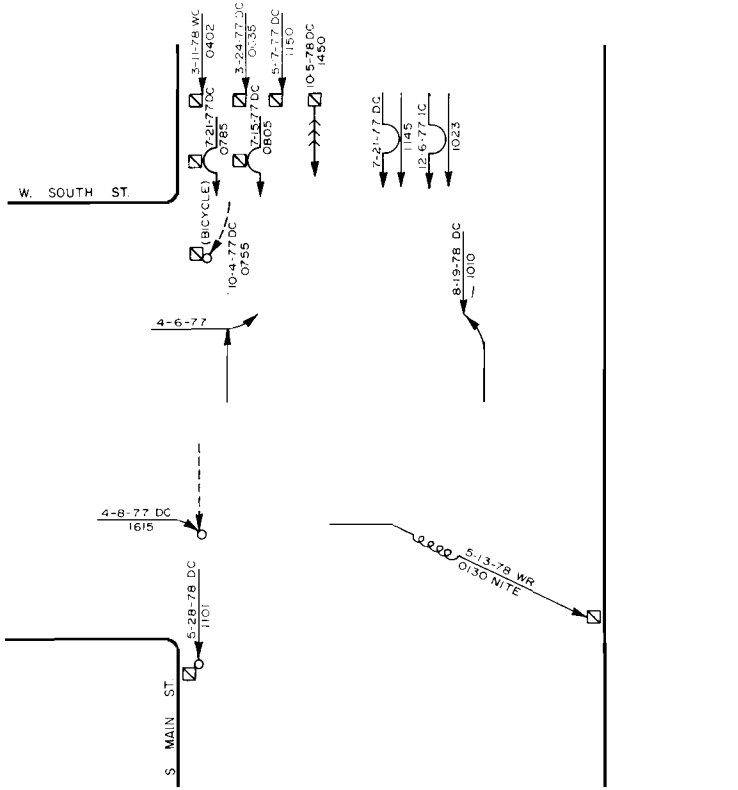
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION S. Main Street and W. South Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	0	0	0
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	1	0	1
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	2	0	2
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	9	2	11
	PARKED VEHICLE	LEFT TURN	TOTAL	12	2	14
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

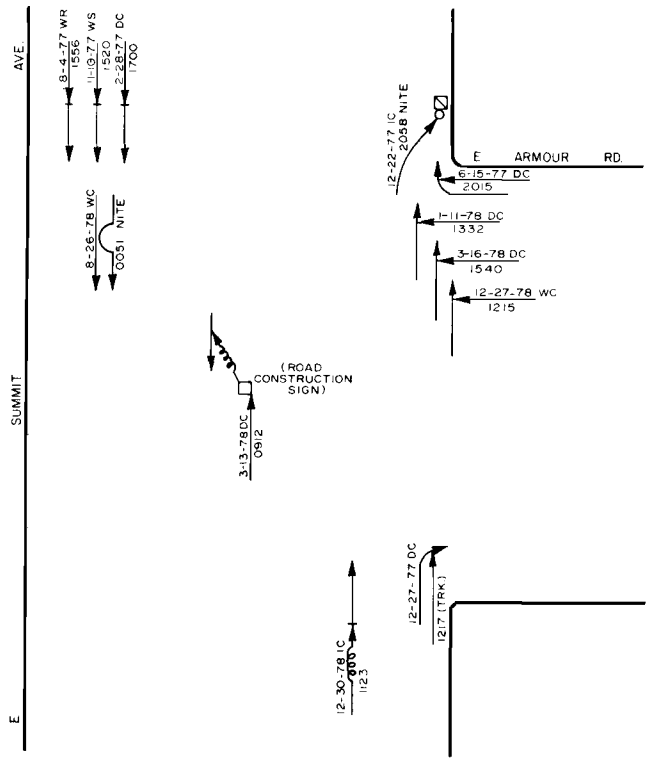
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and E. Armour Road

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by David A. Schilling and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	1	1
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	10	1	11
	PARKED VEHICLE	LEFT TURN	TOTAL	10	2	12
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

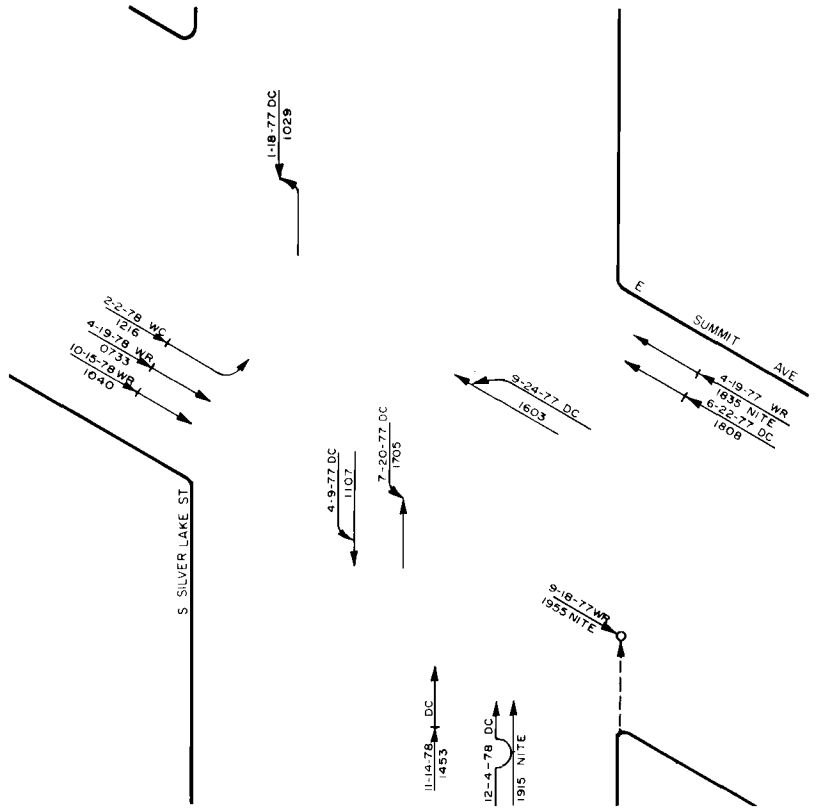
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and Silver Lake Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	1	1
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	9	2	11
	PARKED VEHICLE	LEFT TURN	TOTAL	9	3	12
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

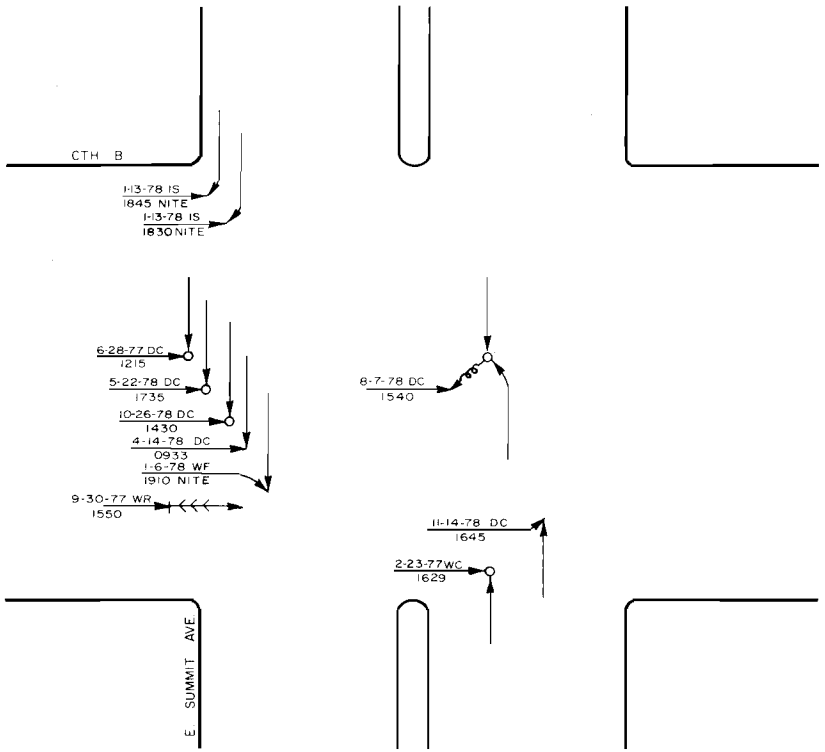
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue (STH 67) and CTH B

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by David A. Schilling and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	5	0	5
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	3	6
	PARKED VEHICLE	LEFT TURN	TOTAL	8	3	11
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

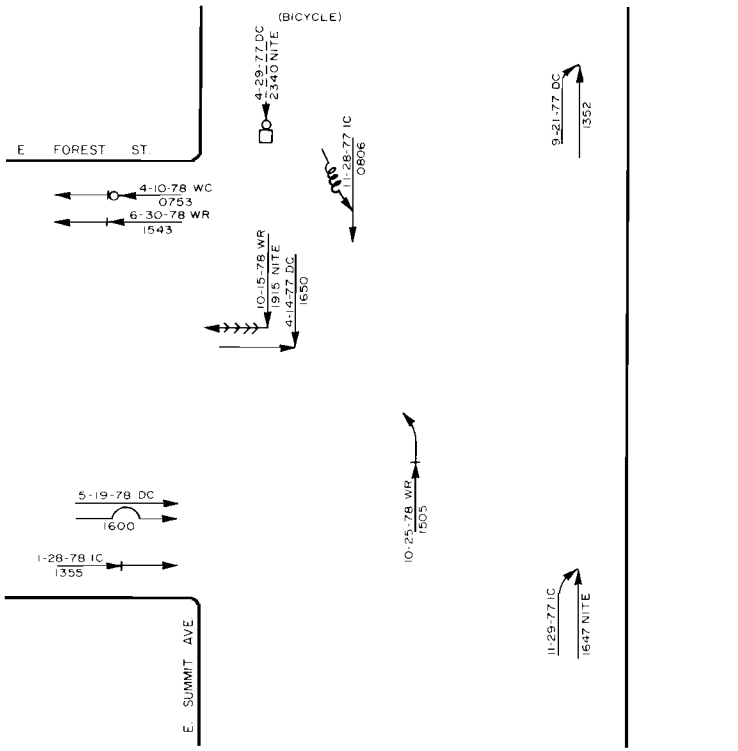
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and E. Forest Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	1	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	7	2	9
	PARKED VEHICLE	LEFT TURN	TOTAL	8	3	11
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

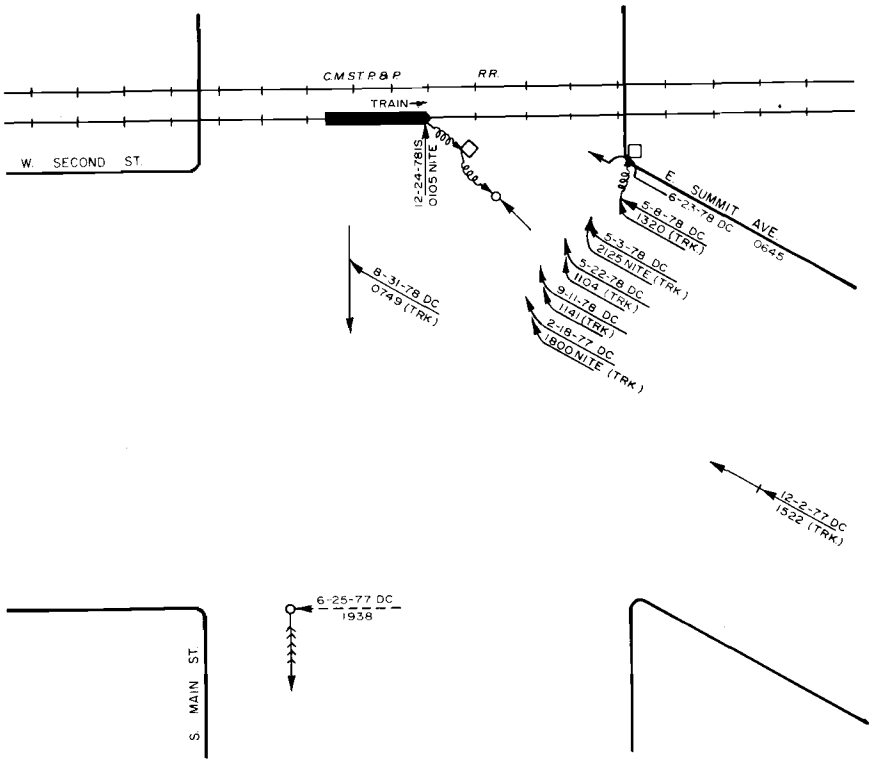
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION S. Main Street, E. Summit Avenue, and W. Second Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	0	0	0
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	1	0	1
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	1	1
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	6	2	8
	PARKED VEHICLE	LEFT TURN	TOTAL	7	3	10
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

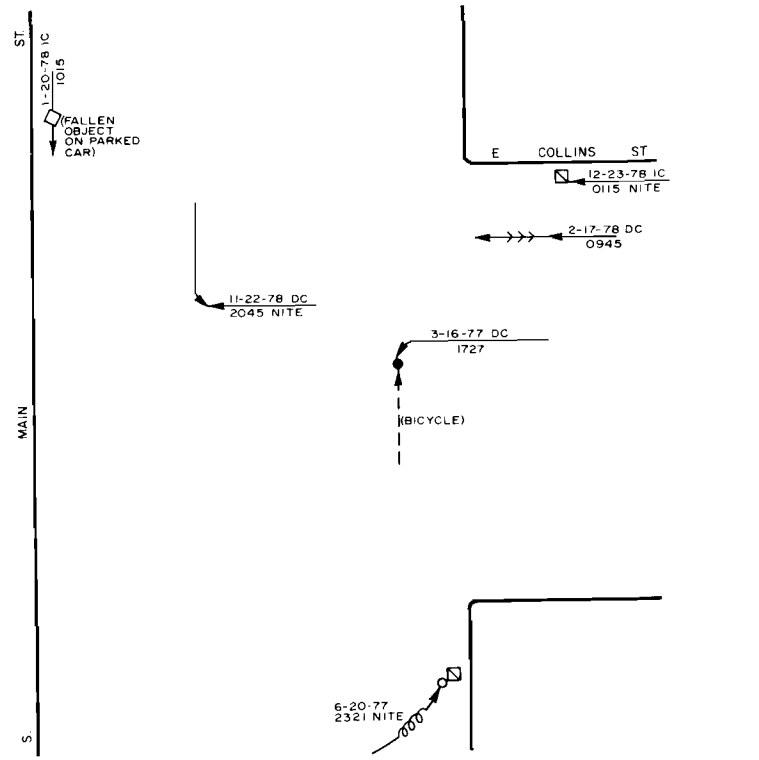
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION S. Main Street and E. Collins Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
1. TIME, DAY, AND DATE.	MOVING VEHICLE	REAR END	FATAL	1	0	1
2. WEATHER: D = DRY; I = ICY; W = WET.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	1	1
4. NITE - IF BETWEEN DUSK AND DAWN.	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	2	4
	PARKED VEHICLE	LEFT TURN	TOTAL	3	3	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

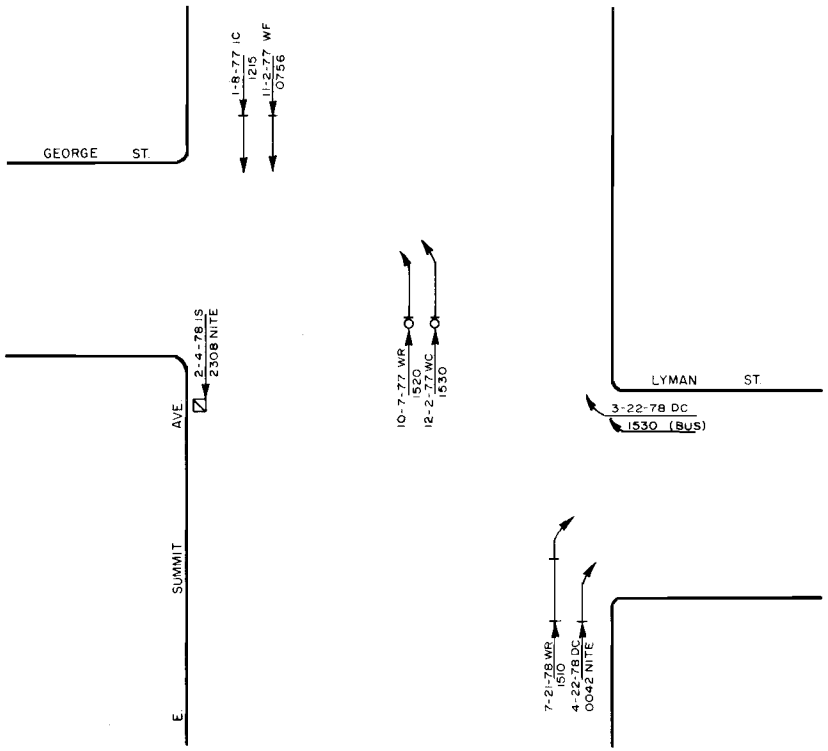
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue, S. Lyman Street, and S. George Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho, David A. Schilling, and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	2	0	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	4	2	6
	PARKED VEHICLE	LEFT TURN	TOTAL	6	2	8
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

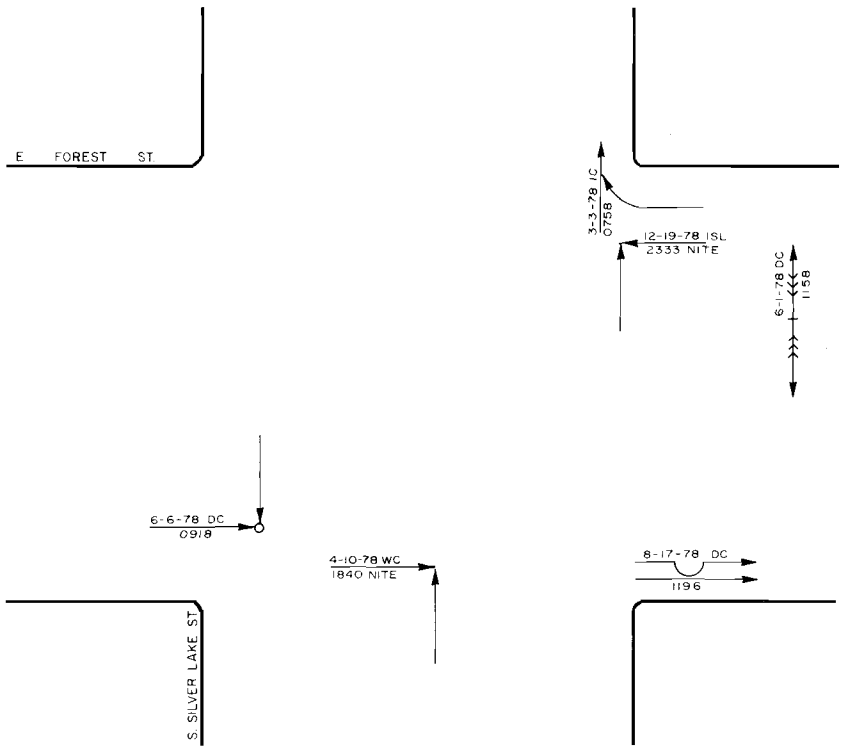
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Forest Street and S. Silver Lake Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	0	1
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	2	5
	PARKED VEHICLE	LEFT TURN	TOTAL	4	2	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

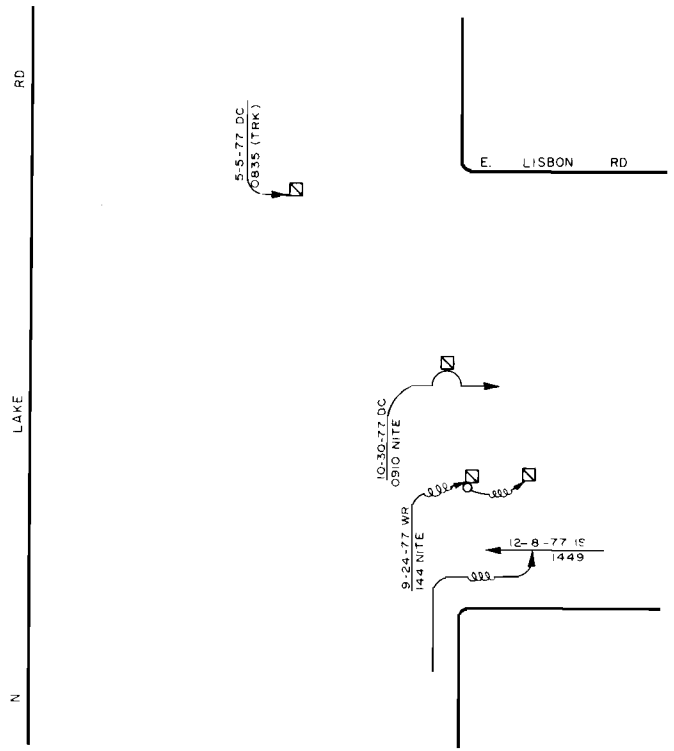
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Lake Road and E. Lisbon Road

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	1	1
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	1	3
	PARKED VEHICLE	LEFT TURN	TOTAL	2	2	4
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

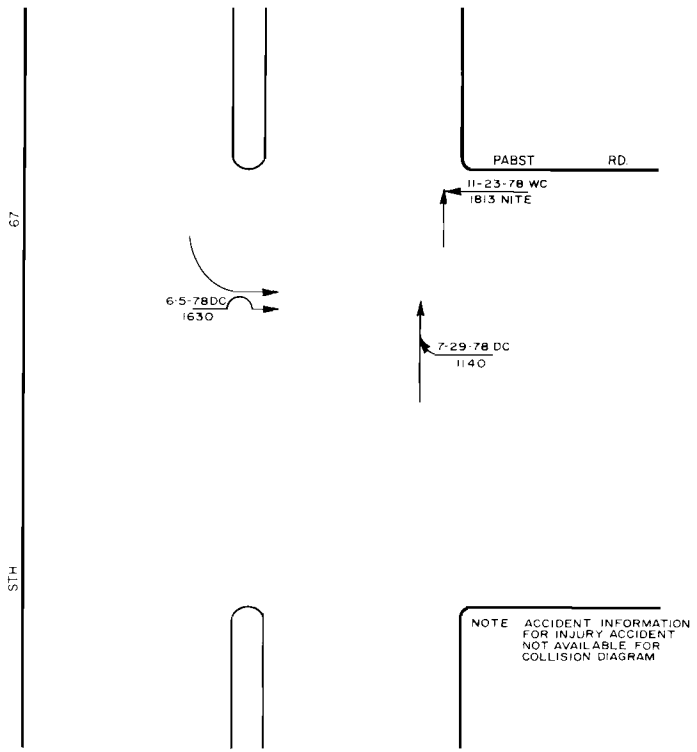
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and Pabst Road

PERIOD Two Years From 1-1-78 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Mark Mueller Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	0	1
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	1	3
	PARKED VEHICLE	LEFT TURN	TOTAL	3	1	4
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

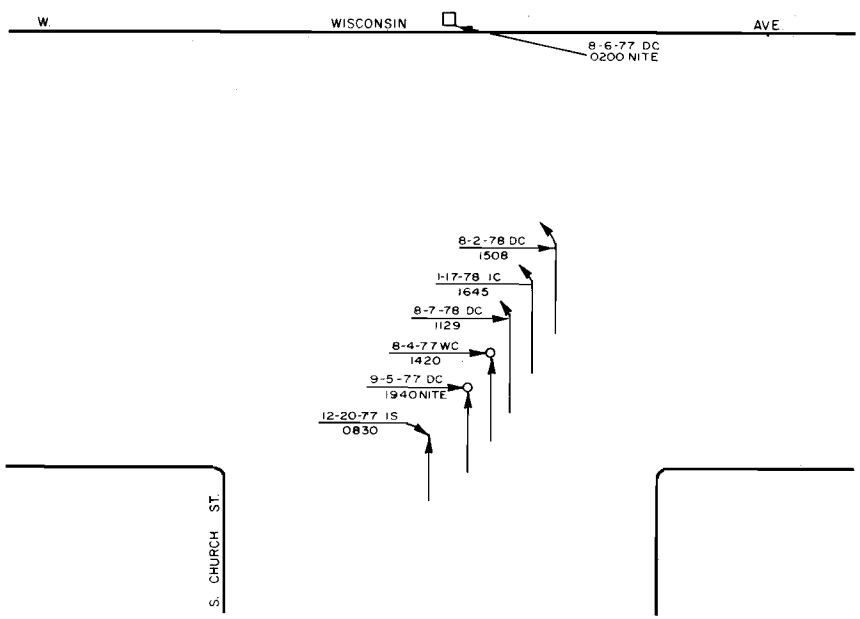
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION W. Wisconsin Avneue and S. Church Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	1	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	4	0	4
	PARKED VEHICLE	LEFT TURN	TOTAL	5	1	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

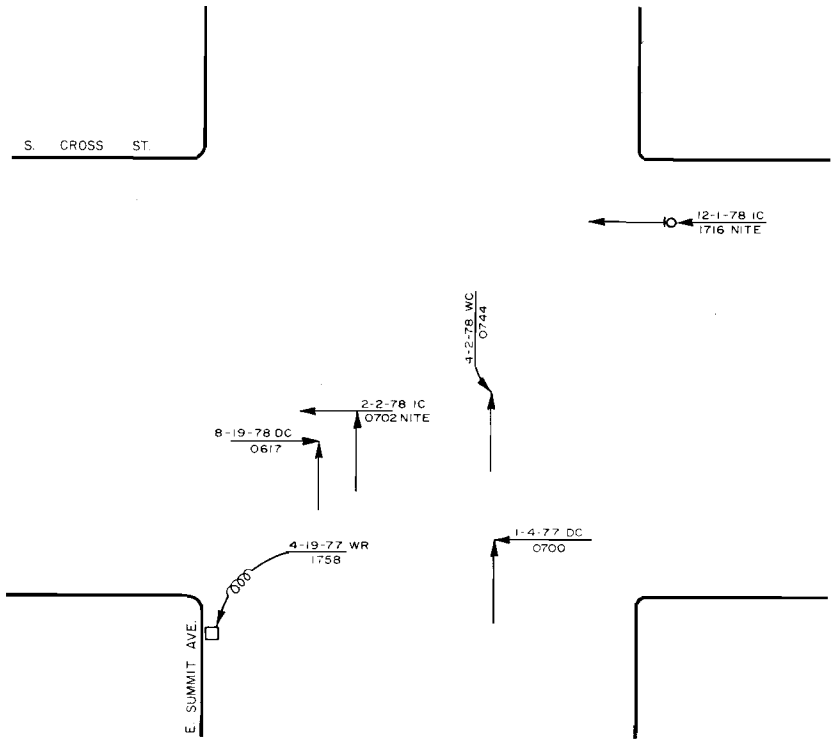
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Summit Avenue and S. Cross Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	1	1
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	4	1	5
	PARKED VEHICLE	LEFT TURN	TOTAL	4	2	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

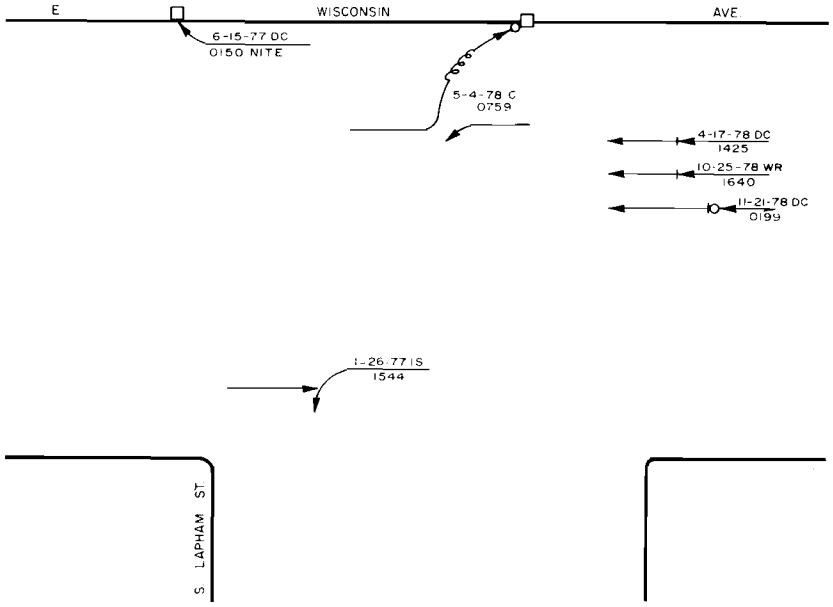
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Wisconsin Avenue and S. Lapham Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	2	0	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	1	4
	PARKED VEHICLE	LEFT TURN	TOTAL	5	1	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

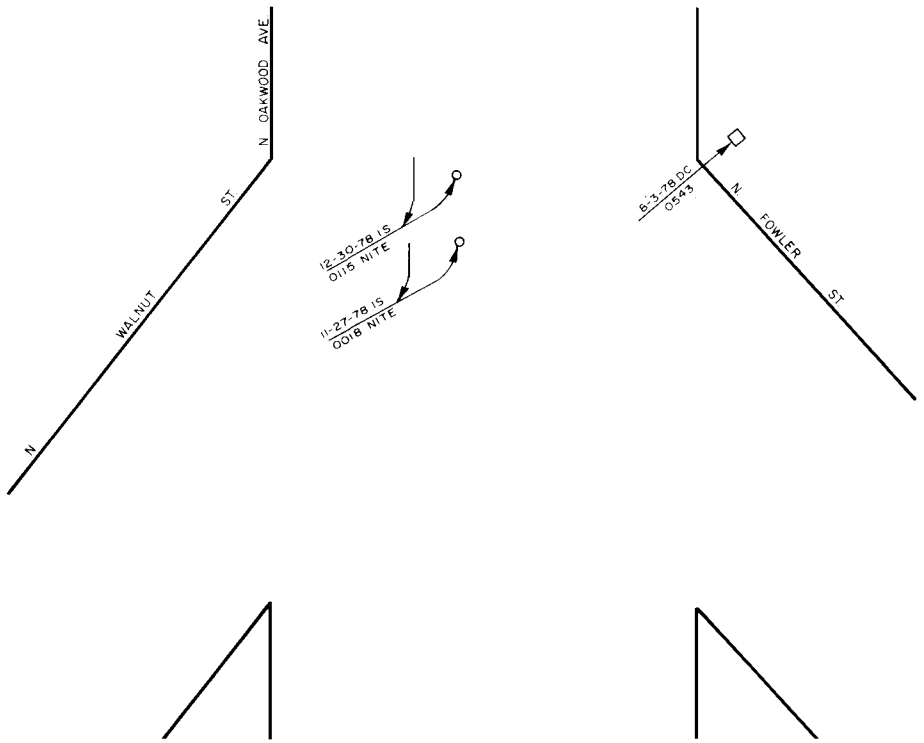
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION N. Walnut Street, Oakwood Avenue, and N. Fowler Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	2	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	1	0	1
	PARKED VEHICLE	LEFT TURN	TOTAL	1	2	3
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

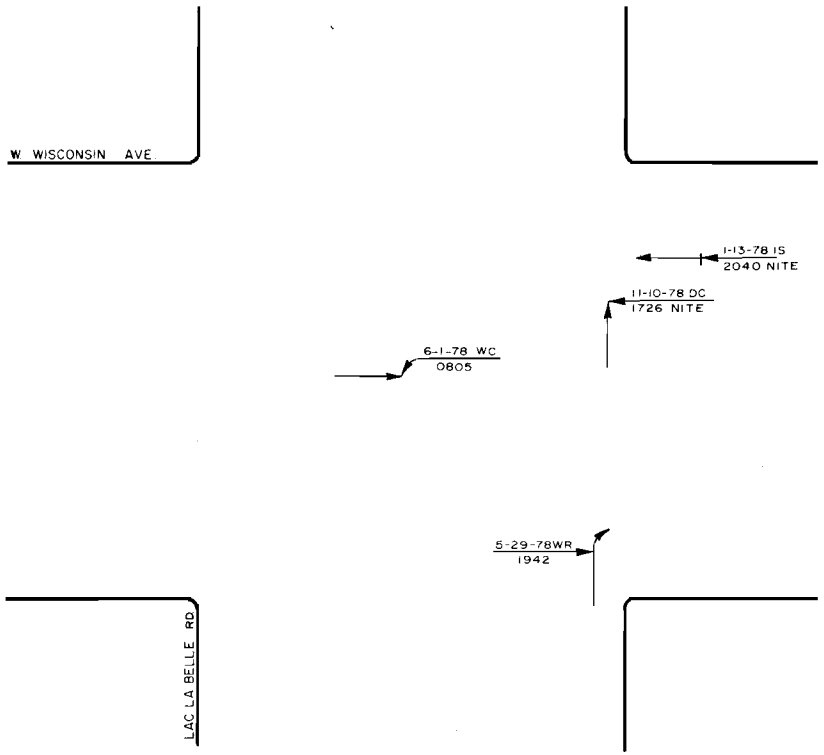
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Wisconsin Avenue (STH 16) and Lac La Belle Road

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by David A. Schilling and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	2	4
	PARKED VEHICLE	LEFT TURN	TOTAL	2	2	4
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

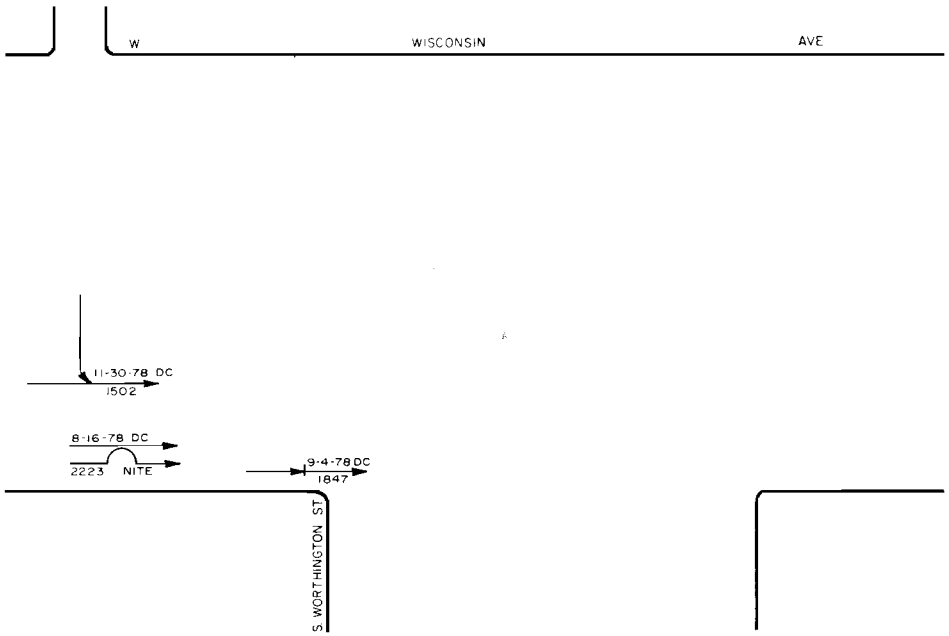
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION W. Wisconsin Avenue and S. Worthington Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	1	3
	PARKED VEHICLE	LEFT TURN	TOTAL	2	1	3
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

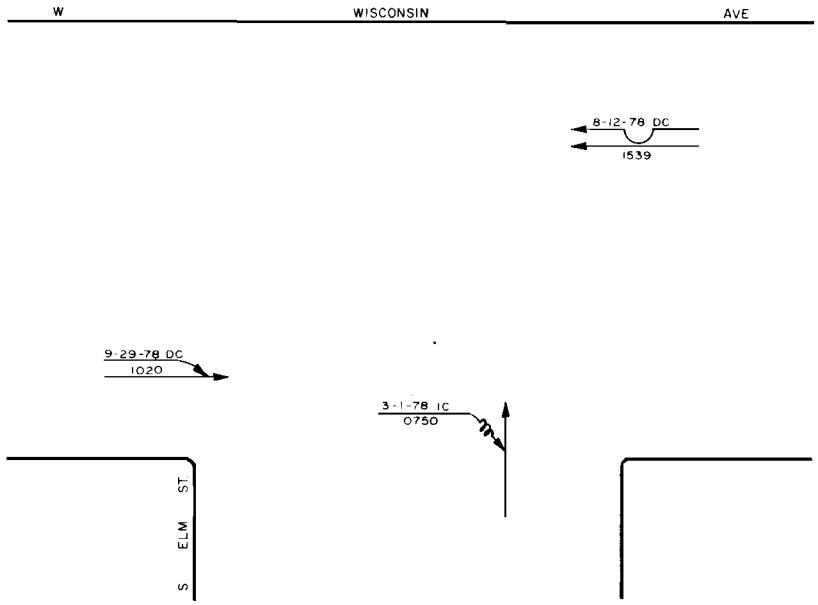
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION E. Plank Road and E. Wisconsin Avenue

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by David A. Schilling Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	0	3
	PARKED VEHICLE	LEFT TURN	TOTAL	3	0	3
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

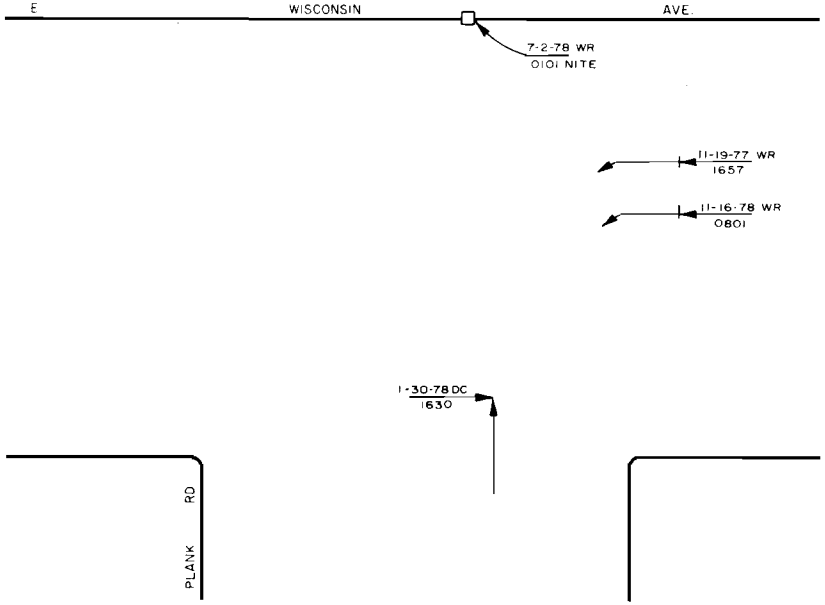
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

INTERSECTION W. Wisconsin Avenue and S. Elm Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by James A. Marsho and Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	1	4
	PARKED VEHICLE	LEFT TURN	TOTAL	4	1	4
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

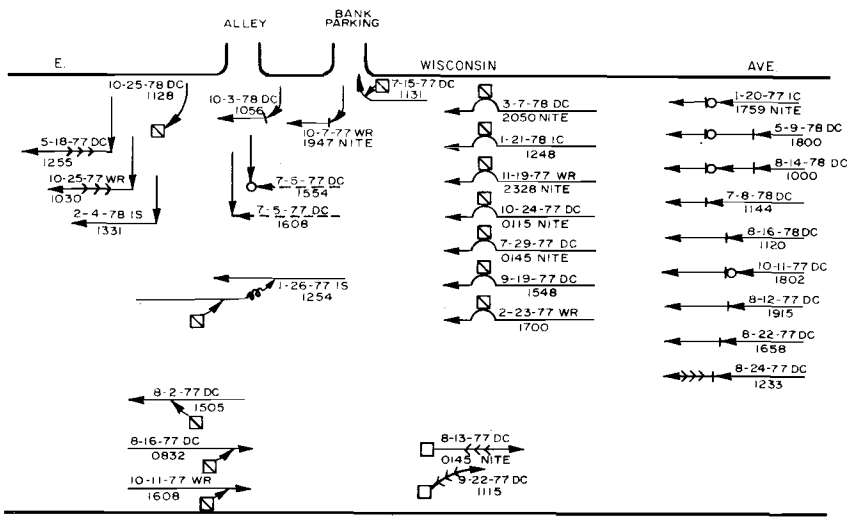
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Wisconsin Avenue between Main Street and N. St. Paul Avenue

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	1	0	1
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	3	1	4
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	20	6	26
	PARKED VEHICLE	LEFT TURN	TOTAL	24	7	31
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

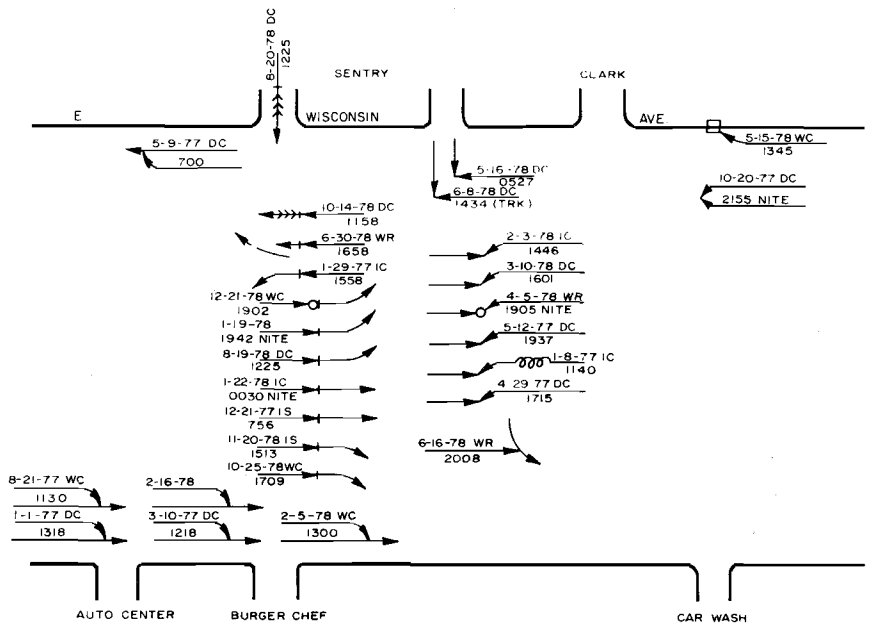
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Wisconsin Avenue between N. Fowler Street and N. Thompson Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	1	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	22	3	25
	PARKED VEHICLE	LEFT TURN	TOTAL	23	4	27
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

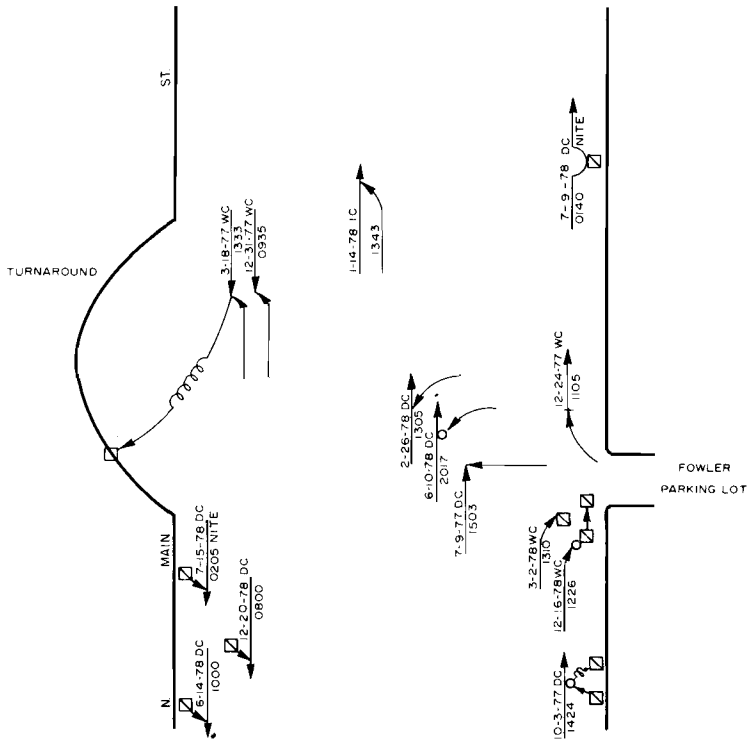
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK N. Main Street between Wisconsin Avenue and E. Rockwell Street

PERIOD Two Years From 1-1-77 To 12-31-77

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	3	0	3
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	9	2	11
	PARKED VEHICLE	LEFT TURN	TOTAL	12	12	14
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

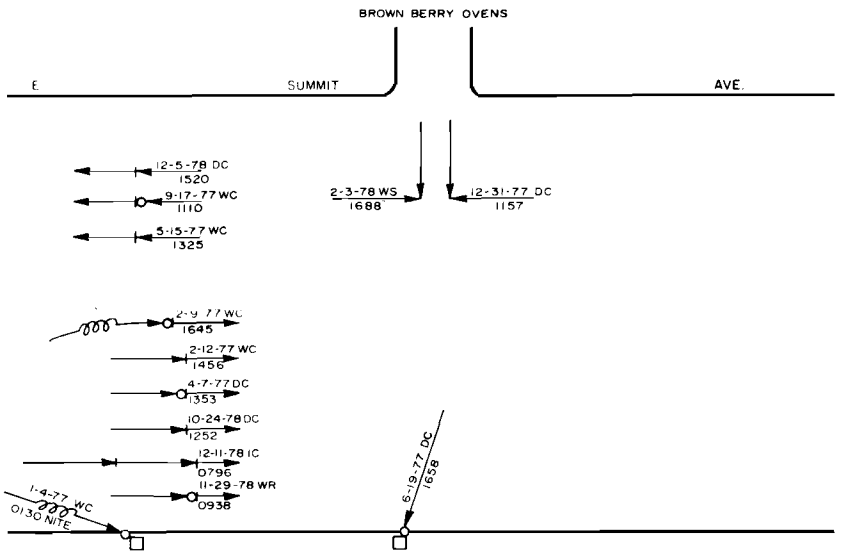
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Summit Avenue between S. Silver Lake Street and S. Westover Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	5	1	6
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	7	0	7
	PARKED VEHICLE	LEFT TURN	TOTAL	12	1	13
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

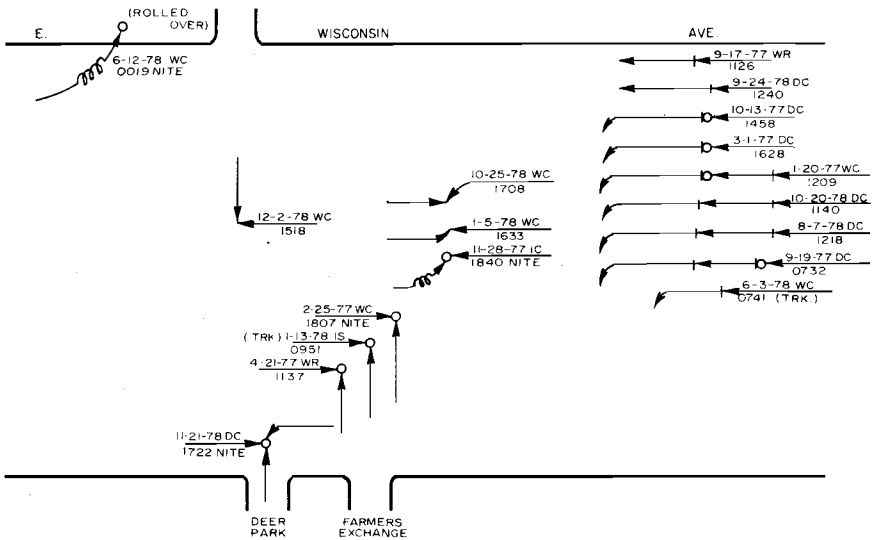
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Wisconsin Avenue between E. Plank Road and CTH P

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	6	4	10
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	8	0	8
	PARKED VEHICLE	LEFT TURN	TOTAL	14	4	18
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

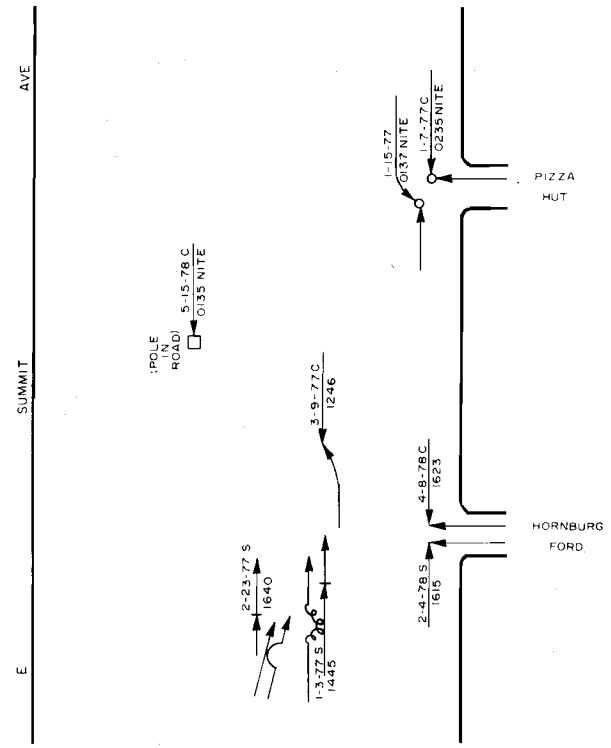
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Summit Avenue between E. Maple Street and E. Thackeray Trail

PERIOD Two Years From 1-1-77 To 12-31-77

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	2	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	5	1	6
	PARKED VEHICLE	LEFT TURN	TOTAL	5	3	8
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

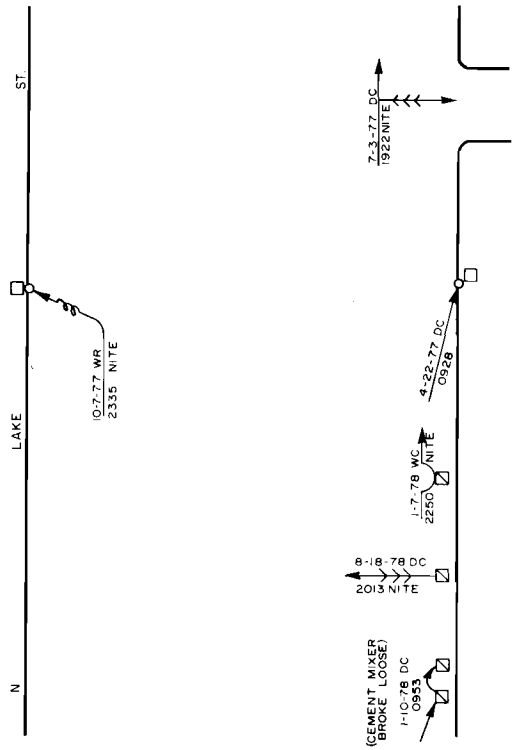
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK N. Lake Road between E. Rockwell Street and E. Lisbon Road

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	1	1	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	1	3	4
	PARKED VEHICLE	LEFT TURN	TOTAL	2	4	6
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

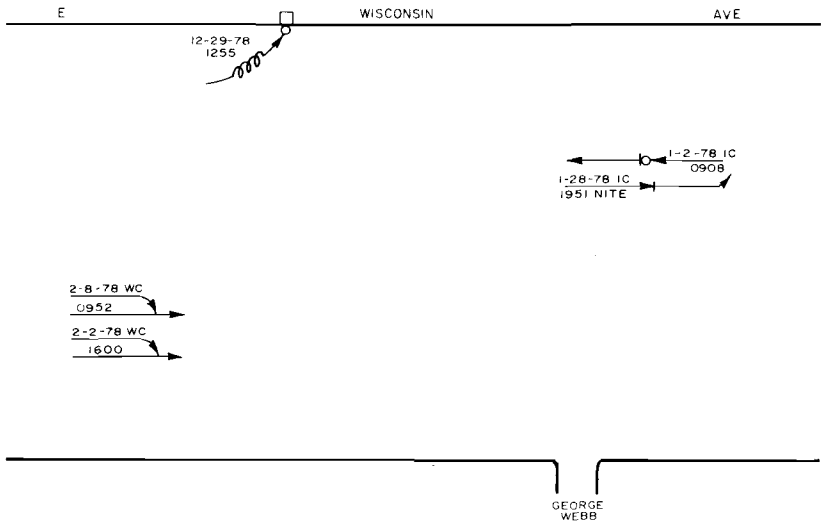
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Wisconsin Avenue between N. Thompson Street and S. Wood Street

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	2	0	2
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	2	1	3
	PARKED VEHICLE	LEFT TURN	TOTAL	4	1	5
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

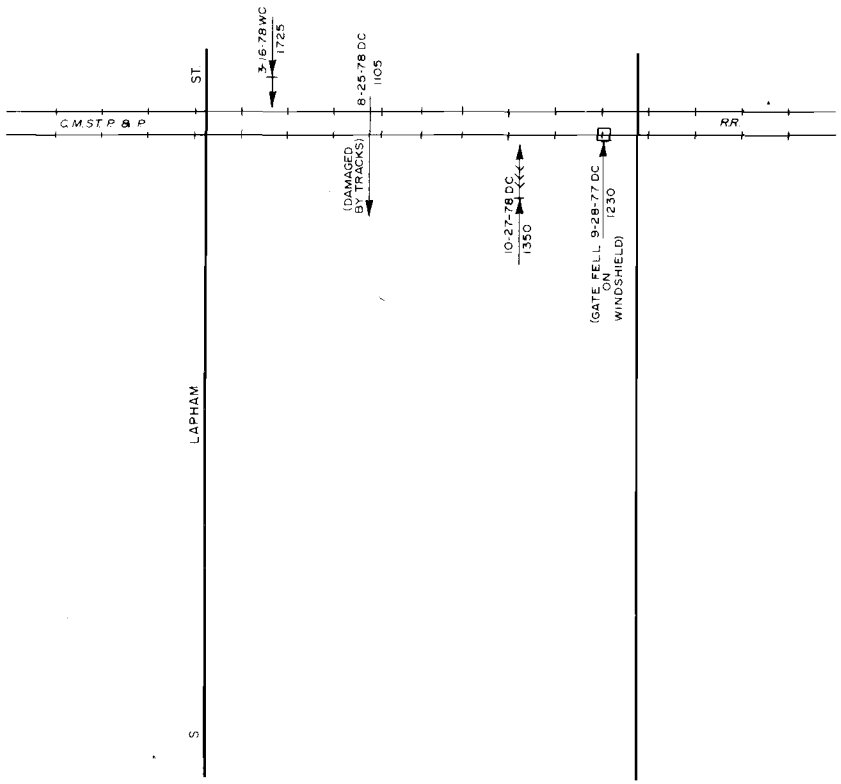
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK S. Lapham Street between E. Armour Road and E. Wisconsin Avenue

PERIOD Two Years From 1-1-77 To 12-31-77

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	4	0	4
	PARKED VEHICLE	LEFT TURN	TOTAL	4	0	4
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

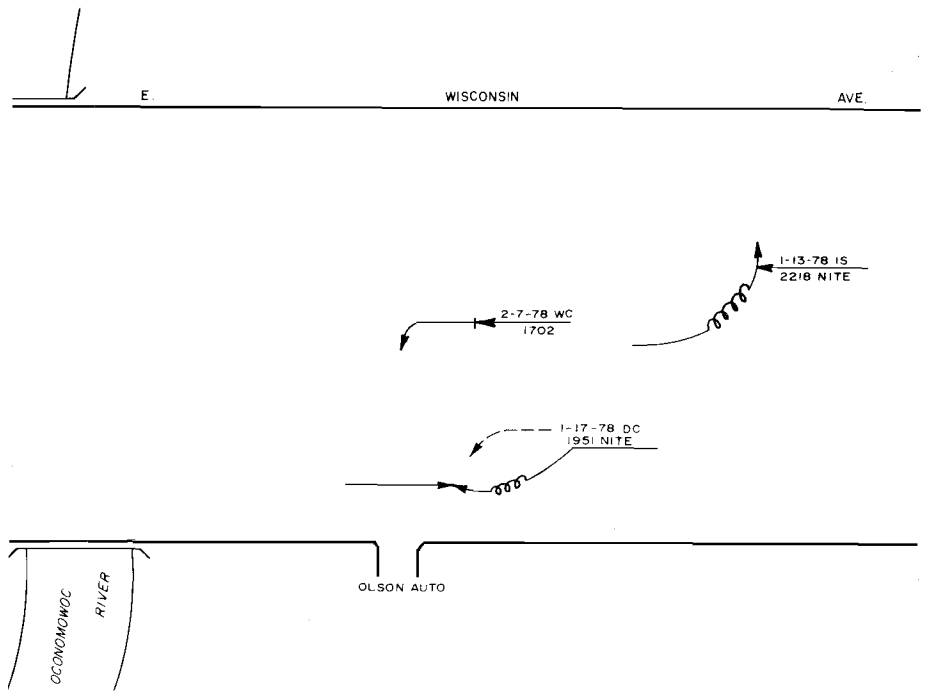
Source: SEWRPC.

COLLISION DIAGRAM
Southeastern Wisconsin Regional Planning Commission

MIDBLOCK E. Wisconsin Avenue between Oconomowoc River and CTH P

PERIOD Two Years From 1-1-77 To 12-31-78

MUNICIPALITY Oconomowoc Prepared by Terrance Brown Sheet 1



SHOW FOR EACH ACCIDENT	LEGEND		SUMMARY			
1. TIME, DAY, AND DATE.	SYMBOLS	TYPES OF COLLISION	TYPE	DAY	NIGHT	TOTAL
2. WEATHER: D = DRY; I = ICY; W = WET.	MOVING VEHICLE	REAR END	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.	BACKING VEHICLE	HEAD ON	PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	0	0	0
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	1	2	3
	PARKED VEHICLE	LEFT TURN	TOTAL	1	2	3
	FIXED OBJECT	RIGHT ANGLE				
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

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Appendix F

OCONOMOWOC POLICE DEPARTMENT

RR CROSSING GATE PROBLEMS 05-31-79

01-04-79	0713	Called to check faulty railroad gates on Elm St. Checked and they were alright. Earlier all gates would pulsate down & up a short distance.
03-06-79	0750	Call railroad gates down Concord Rd and also Elm St. Took care of it.
03-19-79	1040	Had powerhouse contact Milwaukee Road with regard to reoccuring problems with gates being down and no engines in sight and no flag persons at intersections. Problem taking place up and down the line most of the morning. Also complaint taken from citizen that there was nothing preventing pedestrians, blind especially, from crossing tracks when the gates are down. The South Main crossings and most other ones have bells silent once the gates are down. Powerhouse relayed this to Milwaukee Road.
03-28-79	1705	Report of the RR gates at the S. Main crossing acting up. Called Watertown and they will have the crew on the Switch engine check same out.
03-29-79	0714	Had powerhouse operator,"Duke", notify railroad of gates moving up and down on S. Main crossing without train in sight.
04-02-79	2022	Notified railroad again about gates being down on Lapham St. Was advised that they had a short in block and were working on it. Later the gates did release.
04-02-79	1630	Advised Watertown RR in ref. to gates on Laoham St. being down without a train in the area.
04-02-79	1830	Recontacted Watertown RR in ref. to gate still being down. Advised same to either get same fixed or place a man at the crossing to take care of traffic in the area. They advised they would take care of same.
04-05-79	0749	Call from Milwaukee Raod that they are having problems with Westbound train and several would be tied up until problem corrected. Gave info to Squads.
04-09-79	1450	Report of gates down at S. Main and Cross St. Switching tracks.
05-03-79	0824	RR gates down. 10-22, corrected itself.

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Appendix G

A SUGGESTED MODEL RESOLUTION FOR THE ENDORSEMENT OF THE OCONOMOWOC AREA TRAFFIC MANAGEMENT PLAN BY THE COMMON COUNCIL OF THE CITY OF OCONOMOWOC

WHEREAS, the City of Oconomowoc Plan Commission, which has the function and duty of making and adopting a master plan for the physical development of the City, has considered, adopted as an element of that master plan, and recommended to the Common Council of the City of Oconomowoc the endorsement of SEWRPC Community Assistance Planning Report No. 28, A Traffic Management Plan for the Oconomowoc Area, published in December of 1979; and

WHEREAS, the City of Oconomowoc Board of Public Works, which has the function and duty to superintend all public works and keep the streets of the City in good repair, has considered the said traffic management plan and recommended to the Common Council the endorsement of that plan as a guide to arterial street and highway system development and management within the City; and

WHEREAS, a Citizens and Technical Advisory Committee was established in October 1978 to advise and assist the City of Oconomowoc in the development of a plan to increase the operating efficiency and safety of the existing transportation system in the Oconomowoc area through the implementation of low-cost, short-range traffic management actions, as documented in SEWRPC Community Assistance Planning Report No. 28; and

WHEREAS, the aforementioned SEWRPC Community Assistance Planning Report No. 28 contains specific recommendations as to traffic management actions and to the level and agency of government which should assume responsibility for the implementation of each specific recommended traffic management action; and

WHEREAS, upon notice of the formal endorsement of the aforementioned SEWRPC Community Assistance Planning Report No. 28 by the City of Oconomowoc Common Council, the Southeastern Wisconsin Regional Planning Commission will act to incorporate the traffic management plan recommendations into the transportation systems management plan for the Southeastern Wisconsin Region.

NOW, THEREFORE, BE IT HEREBY RESOLVED that the City of Oconomowoc Common Council, on the_____day of_____, 1980, hereby endorses the traffic management plan set forth in SEWRPC Community Assistance Planning Report No. 28 as a guide for the arterial street and highway system development and management within the City of Oconomowoc and directs that the City Engineer, working with the City Plan Commission and the Board of Public Works, take appropriate steps to program the implementation of those recommendations identified in the report as the responsibility of the City of Oconomowoc.

BE IT FURTHER RESOLVED that the Oconomowoc City Clerk transmit a copy of this resolution to the Southeastern Wisconsin Regional Planning Commission.

_____
Mayor, City of Oconomowoc

ATTESTATION:

_____
Oconomowoc City Clerk

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Appendix H

IMPACT OF RECOMMENDED TRANSPORTATION MANAGEMENT ACTIONS ON AIR QUALITY AND MOTOR FUEL CONSUMPTION IN THE OCONOMOWOC AREA

INTRODUCTION

The primary purpose of the Oconomowoc area traffic management plan is to improve the operating efficiency and safety of the arterial streets and highways in the Oconomowoc area. Each alternative traffic management action analyzed as a part of the plan was therefore evaluated and recommended on the basis of its ability to improve vehicular operating conditions and safety on the existing arterial streets and highways in the study area. In keeping with the regional objectives of improving ambient air quality and minimizing motor fuel consumption, an additional analysis was made of the recommended traffic management actions to determine the impact of those recommendations on air quality, principally with respect to carbon monoxide and hydrocarbon pollutant emissions from motor vehicles, and on motor fuel consumption.

A review of the 60 recommended traffic management actions summarized in Tables 25, 26, and 29 of Chapter VI indicated that 14 actions, or about 23 percent of the total recommendations in the plan, should have a measurable impact on air quality and motor fuel consumption. These actions were further analyzed to quantify those impacts.

VEHICULAR EMISSIONS

The impact of the recommended traffic management actions on vehicular emissions was determined in accordance with 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 analysis of air quality impacts resulting from changes in vehicle operating conditions involves many factors and variables, including 1) vehicle age and model year; 2) vehicle type—light- or heavy-duty gasoline or diesel engine; 3) operating mode—stop-and-go versus steady speed; and 4) travel speed and miles of travel. For the purposes of this analysis, the vehicular emission rates for carbon monoxide and hydrocarbons are based on the distribution of the vehicle fleet in the Region by vehicle age, model year, and type. The principal factors directly affected by the implementation of the recommended traffic management actions are operating mode, travel speed, and miles of travel. The changes in stop-and-go driving conditions and travel speeds which would result from the implementation of the recommended traffic management actions were used to quantify the effect of each action on vehicular emissions.

As shown on Table H-1, the analyses indicated that 12, or about 86 percent, of the 14 recommended traffic management actions would effectively reduce carbon monoxide and hydrocarbon pollutant emissions in the study area. Together, these 12 actions may be expected to reduce such emissions by approximately 351.98 tons and 29.93 tons per year, respectively. The only actions which would increase vehicular emissions are the installation of traffic signals at the intersection of E. Summit Avenue and E. Thackery Trail, which would result in an increase of approximately 9.93 tons and 1.07 tons per year, respectively, of carbon monoxide and hydrocarbon pollutants, and the reduction of the posted speed limit on the segment of E. Summit Avenue from E. Thackery Trail to E. Lexington Avenue, which would result in an increase of 11.05 tons and 1.02 tons per year, respectively, of carbon monoxide and hydrocarbon pollutant emissions. Both of these actions are recommended as efforts to reduce the number and severity of traffic accidents at the intersection at E. Summit Avenue and E. Thackery Trail, the second highest traffic accident location in the study area. This intersection experienced a total of 23 traffic accidents during the two-year period between 1977 and 1979. The two recommended traffic management actions which indicate the greatest reductions in carbon monoxide and hydrocarbon vehicular emissions in the study area are the construction of the proposed north-south STH 16 freeway bypass, which would result in reductions of 172.70 tons and 15.46 tons per year, respectively, and the construction of the proposed east-west arterial bypass, which

would result in reductions of 131.30 tons and 9.69 tons per year, respectively. For direct comparison purposes, the vehicular emission reductions attributed to all of the recommended actions, including these two proposed high-capital, long-range recommendations, are based on a 1980 operating condition. It is recognized that neither of these bypass facilities will be constructed in the near future, but their impact on air quality within the study area should continue to show a reduction in vehicular emissions at their time of implementation.

In conclusion, the total impact of the 14 recommended traffic management actions on air quality in the study area, if implemented in 1980, would be an approximate reduction of 331 tons per year in carbon monoxide emissions and 27.84 tons per year in hydrocarbon emissions. Excluding the impact on air quality of the two high-capital, long-range recommendations—the construction of the proposed north-south STH 16 freeway bypass and the proposed east-west arterial bypass—the short-range, low-cost traffic management actions recommended in the plan would reduce carbon monoxide emissions by about 27 tons per year and hydrocarbon emissions by 2.69 tons per year.

MOTOR FUEL CONSUMPTION

The impact of the recommended traffic management actions on motor fuel consumption was determined from the data presented in the National Cooperative Highway Research Program Report III entitled, Running Costs of Motor Vehicles as Affected by Road Design and Traffic, 1971. The same factors and variables which affect vehicular air quality emissions affect motor fuel consumption—principally, vehicle operating mode, travel speed, and miles of travel. Therefore, the changes in stop-and-go driving conditions and travel speeds were also used to quantify the effect on motor fuel consumption of the implementation of the traffic management actions recommended in the Oconomowoc area traffic management plan.

As shown in Table H-1, 13, or about 93 percent, of the 14 recommended traffic management actions would effectively reduce motor fuel consumption in the study area. Together, these 13 actions may be expected to reduce motor fuel consumption by approximately 54,510 gallons per year. The only action which would increase motor fuel consumption is the installation of traffic signals at the intersection of E. Summit Avenue and E. Thackery Trail, which would result in an increase in consumption of approximately 13,470 gallons of motor fuel per year. This increase would result from the interruptive effect that the traffic signal would have on the continuous movement of vehicular traffic on E. Summit Avenue. This increased motor fuel consumption may be expected to be partially offset by the reduction of the existing speed limit in the area of the E. Summit Avenue and E. Thackery Trail intersection, which would result in a reduction in consumption of approximately 6,570 gallons of motor fuel per year. The net effect of these two actions, which are recommended as efforts to reduce the number and severity of motor vehicle accidents at the intersection, is an increased consumption of approximately 6,900 gallons of motor fuel per year. The two traffic management actions which should serve to most greatly reduce motor fuel consumption in the study area are the construction of the proposed east-west arterial bypass, which would result in a reduction in consumption of approximately 27,600 gallons of motor fuel per year, and the removal of stop signs at selected Milwaukee Road at-grade street crossings, which would result in a reduction in consumption of approximately 21,890 gallons of motor fuel per year. The construction of the proposed north-south STH 16 freeway bypass, which would have the greatest impact on air quality of all 14 actions, should reduce motor fuel consumption by approximately 4,930 gallons per year. The reason this reduction is not greater is because vehicle operating speeds on the STH 16 freeway bypass were assumed to be 55 miles per hour, whereas the optimum fuel consumption speed is 35 to 40 miles per hour.

In conclusion, the total impact of the 14 recommended traffic management actions on motor fuel consumption in the study area, if implemented in 1980, would be a reduction of approximately 41,040 gallons in motor fuel consumption per year. Excluding the impact on motor fuel consumption of the two high-capital, long-range recommendations—the construction of the proposed north-south STH 16 freeway bypass and the proposed east-west arterial bypass—the short-range, low-cost traffic management actions recommended in the plan would reduce motor fuel consumption by approximately 8,510 gallons per year.

Table H-1

IMPACT OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS ON AIR QUALITY AND MOTOR FUEL CONSUMPTION IN THE OCONOMOWOC AREA

Problem or Problem Location	Recommended Traffic Management Actions	Effect on Vehicular Emissions (tons per year)		Effect on Vehicular Fuel Consumption (gallons per year)
		Carbon Monoxide	Hydrocarbons	
Main Street and Wisconsin Avenue	● Retime traffic signal sequence	- 0.65	- 0.32	- 120
E. Summit Avenue and E. Thackery Trail	● Install traffic signals ● Reduce speed limit	9.93 11.05	1.07 1.02	13,470 - 6,570
E. Wisconsin Avenue and S. Silver Lake Street	● Retime traffic signal sequence	- 0.48	- 0.05	- 290
E. Summit Avenue and S. Silver Lake Street	● Retime traffic signal sequence ● Reconstruct westbound approach to intersection to provide for an exclusive right-turn lane	- 0.82 - 1.90	- 0.09 - 0.20	- 320 - 670
E. Wisconsin Avenue— Plank Road to CTH P	● Install channelization	- 1.96	- 0.17	- 1,450
East-West Arterial Street Spacing Deficiency	● Construct east-west arterial bypass	- 131.30	- 9.69	- 27,600
North-South Arterial Street Spacing Deficiency	● Construct north-south STH 16 freeway bypass	- 172.70	- 15.46	- 4,930
Truck Traffic on Land Access Streets	● Construct a new land access street from Oconomowoc industrial park to proposed east-west arterial bypass	- 1.07	- 0.09	- 840
Railroad Crossing Vehicle Delays	● Install constant time warning devices at S. Main Street and S. Silver Lake Street crossings of the Milwaukee Road tracks ● Remove stop signs at selected Milwaukee Road at-grade street crossings	- 1.13 - 6.06	- 0.12 - 0.93	- 100 - 21,890
Arterial Streets and Highways in the Oconomowoc CBD	● Interconnect traffic signals	- 32.50	- 2.73	- 9,370
All Arterial Streets and Highways in the Oconomowoc Study Area	● Reschedule the work time starting and quitting times of approximately 250 employees of the major public and private employers in the study area	- 1.41	- 0.08	- 360
Total		- 331.00	- 27.84	- 41,040

SUMMARY

Implementation of the traffic management actions recommended in the Oconomowoc area traffic management plan may be expected to result in improved air quality and reduced motor fuel consumption in the Oconomowoc area. Of the 60 traffic management actions recommended in the plan, 14 actions were determined to have a measurable effect on air quality and motor fuel consumption. The only action which would increase both vehicular carbon monoxide and hydrocarbon emissions and motor fuel consumption is the installation of traffic signals at the intersection of E. Summit Avenue and E. Thackery Trail. An additional action, reduction of the speed limit on the segment of E. Summit Avenue from E. Thackery Trail to E. Lexington Avenue, would also increase vehicular carbon monoxide and hydrocarbon emissions. These two actions are recommended as efforts to decrease the number and severity of traffic accidents at the intersection of E. Summit Avenue and E. Thackery Trail.

The low-cost, short-range traffic management actions contained in the plan would reduce vehicular carbon monoxide emissions by approximately 27 tons per year and hydrocarbon emissions by approximately 2.69 tons per year, while reducing motor fuel consumption by 8,510 gallons per year. The two high-capital, long-range traffic management actions recommended in the plan—the construction of the proposed north-south STH 16 freeway bypass and the proposed east-west arterial bypass—if implemented in 1980, would reduce vehicular carbon monoxide emissions by approximately 304 tons per year and hydrocarbon emissions by approximately 25.15 tons per year, while reducing motor fuel consumption by approximately 32,530 gallons per year.

The total impact of the traffic management actions recommended in the Oconomowoc area traffic management plan on air quality and motor fuel consumption is a reduction of approximately 331 tons per year in carbon monoxide emissions, 28 tons per year in hydrocarbon emissions, and 41,000 gallons per year in motor fuel consumption in the Oconomowoc study area.