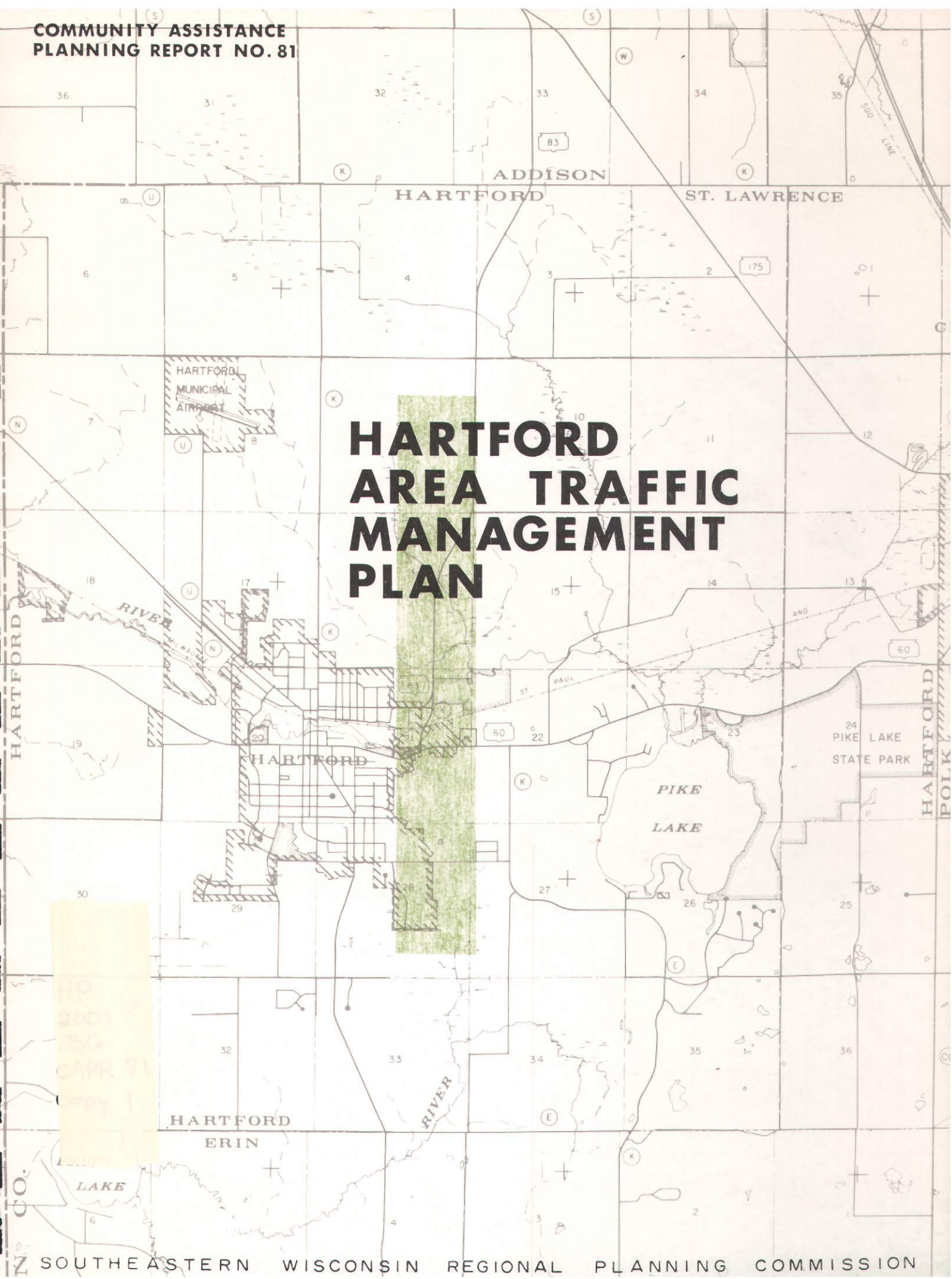
COMMUNITY ASSISTANCE
PLANNING REPORT NO. 81



HARTFORD AREA TRAFFIC MANAGEMENT PLAN

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

CITY OF HARTFORD OFFICIALS

Mayor
Richard W. Witt

City Aldermen

James H. Core
Oscar W. Deutsh
William R. Gee
Alexander G. Jastrab
Howard J. Luebke
Richard J. Mroczynski
John J. Reis
Cyril J. Richter
Joan A. Russell

City Engineer
William G. Ripp

City Planner
Harlan E. Clinkenbeard

CITIZENS AND TECHNICAL ADVISORY COMMITTEE FOR THE HARTFORD AREA TRAFFIC MANAGEMENT PLAN

Arthur C. Snyder, Chairman

Robert H. Bates
Howard Black
Dennis A. Carroll
Lucian M. Darin
John A. Frey
David C. Henry
Daniel J. Hiller
Dyson A. Hunt
Thomas Kennelly
James J. King
Donald H. Lieven
Donald Margelowsky
James McLoone
Richard J. Mroczynski
Dorothy Pierce
Richard H. Roggenbauer
Joan A. Russell
Edward F. Rzepka
Clyde Schluessel
Frederic C. Thome
Floyd S. Tinder
Ronald R. Verstrate
Nancy C. Wangles
Richard W. Witt
David W. Wolbrink

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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

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

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

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

WALWORTH COUNTY
John D. Ames
Anthony F. Balestrieri
Allen L. Morrison

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

WAUKESHA COUNTY
Robert F. Hamilton
William D. Rogan, Treasurer
Paul G. Vrakas

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION STAFF

Kurt W. Bauer, PE, AICP, RLS. . . . . Executive Director
Philip C. Evenson . . . . . Assistant Director
Kenneth R. Yunker, PE . . . . . Assistant Director
Robert P. Biebel, PE . . . . . Chief Environmental Engineer
John W. Ernst. . . . . Data Processing Manager
Leland H. Kreblin . . . . . Chief Planning Illustrator
Donald R. Martinson . . . . . Chief Transportation Engineer
Thomas D. Patterson . . . . . Chief of Planning Research
Bruce P. Rubin . . . . . Chief Land Use Planner
Roland O. Tonn, AICP . . . . . Chief Community Assistance Planner
Joan A. Zenk . . . . . Administrative Officer

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 81

HARTFORD AREA TRAFFIC MANAGEMENT PLAN
City of Hartford
Washington County, Wisconsin

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

The preparation of this report was financed in part through a grant from the Wisconsin Department of Transportation, Highway Safety Office.

June 1983

Inside Region: $2.50
Outside Region: $5.00

(This page intentionally left blank)

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

916 NO. EAST AVENUE • P.O. BOX 769 • WAUKESHA, WISCONSIN 53187-1607 • TELEPHONE (414) 547-6721

Serving the Counties of: KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA

June 6, 1983

The Honorable Richard W. Witt, Mayor
and Members of the Common Council
of the City of Hartford
City Hall
109 N. Main Street
Hartford, Wisconsin 53027

Dear Mayor Witt:

In February 1982, at the request of the Common Council of the City of Hartford, the Regional Planning Commission undertook a study looking to the abatement of the traffic 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 existing arterial street and highway system.

The Committee and Commission staff have now completed the requested study, and are pleased to provide to you herewith this report setting forth a traffic management plan for the Hartford 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 Hartford 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 over 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 Hartford 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 Hartford 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 Hartford 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 Hartford area, and to pursue acquisition of the right-of-way required for the improvements already set forth in the Official Map of the City of Hartford.

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 over time.

Respectfully submitted,

Kurt W. Bauer
Executive Director

(This page intentionally left blank)

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

Chapter VIII

Chapter IX

LIST OF FIGURES

Figure Page

Chapter III

LIST OF MAPS

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 safe and 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. 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 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 reconstruction of existing facilities or in the construction of new 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 Hartford have become increasingly concerned about the level of traffic congestion, operating efficiency, and motor vehicle accident problems on the arterial street and highway system within the City, and the impact on traffic volumes and patterns which may be expected from the construction in 1982 of an additional north-south arterial crossing of the Rubicon River, located immediately east of the Hartford central business district. Concern over these traffic problems has been increased by the impacts on traffic flows of a tax incremental financing district and historic revitalization development project in the Hartford central business district.

The majority of the existing problems are reported by the city engineer to occur during the morning and evening peak travel periods along much of the length of both Main Street (STH 83) and Sumner Street (STH 60). These two highways comprise the principal north-south and east-west arterial routes traversing the City and, as such, serve a major portion of through, as well as local, traffic in the City.

To help resolve these perceived existing and anticipated future traffic operation problems, city officials decided to seek professional assistance in the development of a comprehensive traffic management plan for the City. On July 9, 1980, the City Plan Commission met with staff of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) to discuss the perceived traffic problems currently affecting the City, and to request the Commission's assistance in undertaking a study to improve traffic operations. Following this meeting, a resolution was adopted by the City of Hartford Common Council on March 3, 1981, formally requesting the Commission to assist the City in the conduct of a traffic management planning study (see Appendix A) and to help the City apply for a federal grant through the Wisconsin Department of Transportation, Office of Highway Safety (WisOHS) to defray up to 90 percent of the cost of the desired study. An agreement was entered into on October 2, 1981, between the City of Hartford and the Commission to prepare a traffic management plan for the Hartford area, contingent upon approval of the city's grant application to the Office for Highway Safety (see Appendix B). On February 1, 1982, the Office for Highway Safety formally approved the City's request for a grant in partial support of the conduct of a traffic management study (see Appendix C). The study was carried out from February 1, 1982 to May 24, 1983.

STUDY PURPOSE

The traffic management planning study for the Hartford area has five interrelated purposes. These are:

1. To formulate a set of objectives, supporting principles, and standards by which existing traffic problems can be identified and alternative solutions formulated;

2. To identify the location and the severity of existing traffic problems in the Hartford area;

3. To determine the causes of these problems;

4. To develop a set of improvements that could be made to the existing transportation system, to resolve the identified problems and thereby improve the safety and efficiency of the system; and

5. To provide a framework within which a continuing traffic management program can 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 major reconstruction of existing, or the construction of new, transportation facilities, as

recommended for the Hartford area in the adopted regional transportation system plan for southeastern Wisconsin. Traffic volumes may be expected to continue to increase in the City of Hartford area as the area grows. Consequently, the traffic management actions recommended in this planning report cannot be expected to serve as long-term substitutes for providing the additional traffic capacity ultimately required. The traffic management plan set forth herein provides a series of recommended improvements that are intended to make the most efficient use practicable of the capacity of the existing street and highway system until such time as additional warranted capacity can be provided through capital-intensive reconstruction or new construction projects.

STUDY AREA

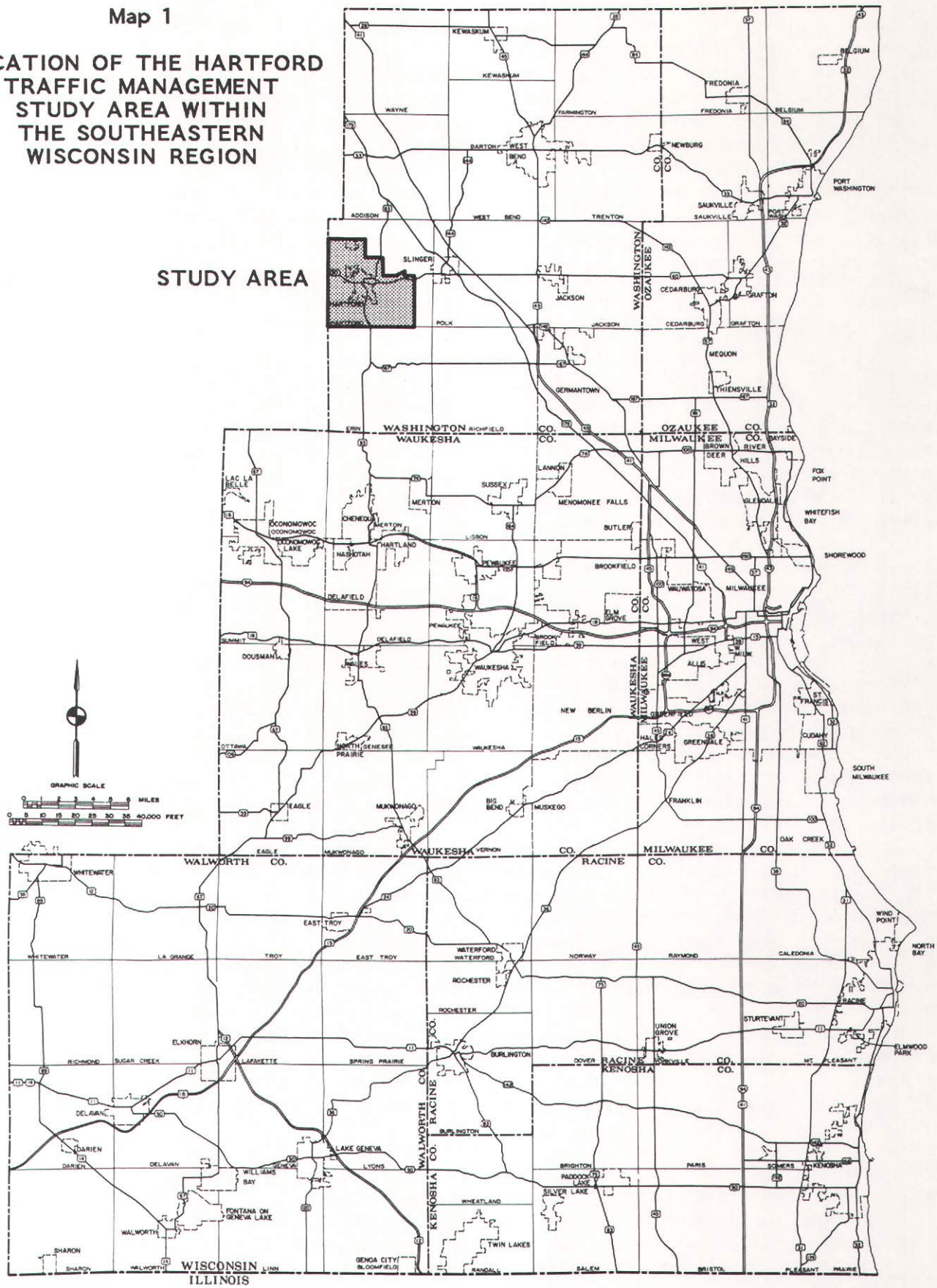
The City of Hartford is located in western Washington County (see Map 1) approximately 12 miles northwest of the northwesterly fringe of the Milwaukee urbanized area. The geographic area covered in this study includes all of the 2.97-square-mile area within the corporate boundaries of the City of Hartford and an additional 17.12 square miles of the immediate environs (see Map 2). The central business district of the City is situated along Main Street, a principal north-south arterial, just north of its intersection with Sumner Street, a principal east-west arterial. The Rubicon River, which flows through the City from east to west, and the Wisconsin and Southern Railroad, which is located to the north of the river, bisect the central business district.

In 1980, the resident population of the City of Hartford was estimated at 7,180 persons. This was about 680 persons, or 10 percent, more than the 1970 population. The geographic area adjacent to the City has also experienced a substantial population growth and urbanization. This growth is evidenced by the increase in resident population of the Town of Hartford, which encompasses the City of Hartford. The 1980 population of the Town was 3,400 persons, an increase of about 1,000 persons, or 43 percent, over the 1970 population level.

As of January 1, 1982, the existing transportation system of the City of Hartford consisted of 34.97 miles of streets of which 8.52 miles, or 24 percent, functioned as arterial streets; 2.56 miles, or about 7 percent, functioned as collector streets; and 23.89 miles, or about 69 percent, functioned as land access streets. The City of Hartford is served by a shared-ride taxicab service, initiated on January 1, 1981, and provided by the City of Hartford Municipal Recreation Department. The taxicab service is provided to the general public seven days a week for local trips within the City of Hartford and for trips of up to 50 miles in one-way length that either originate in, or are destined for, the City of Hartford. Greyhound Lines, Inc., provides regularly scheduled intercity bus service between the Cities of Milwaukee and Eau Claire, with a stop in the City of Hartford. Freight rail service is provided to the City of Hartford by the Wisconsin and Southern Railroad, which traverses through the study area on the north side of the Rubicon River and serves the industries located on the east and west sides of the City. The City of Hartford is served by its own municipal airport which is classified as a general utility airport and is located approximately one mile north of the northern corporate limits of the City.

Map 1

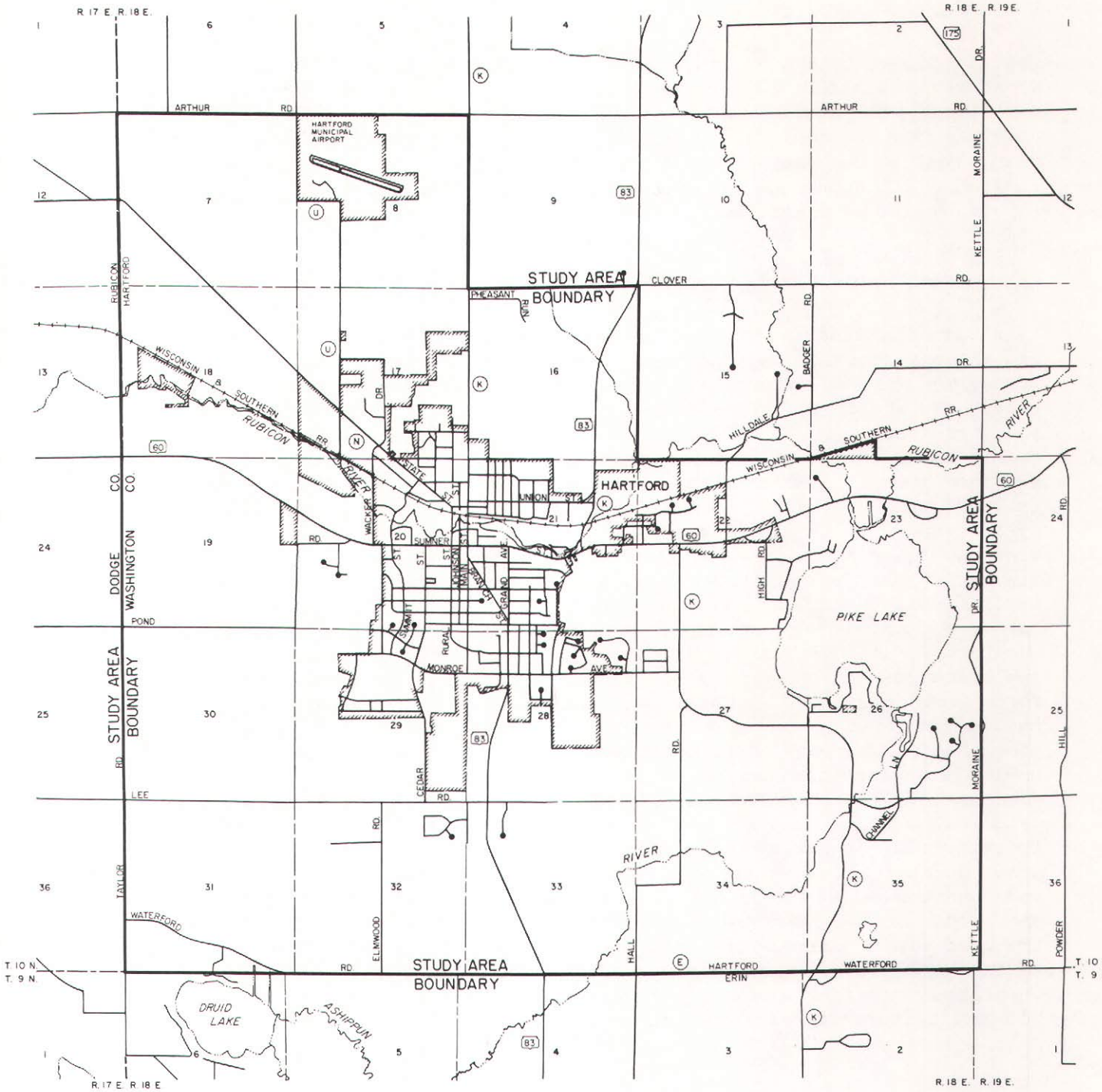
LOCATION OF THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA WITHIN THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Map 2

HARTFORD AREA TRAFFIC MANAGEMENT STUDY AREA



Source: SEWRPC.

STUDY ORGANIZATION

The study was conducted cooperatively by the City of Hartford Engineering Department, Wisconsin Department of Transportation, and Commission staffs. Assisting these staffs in the conduct of the study was a 26-member advisory committee appointed by the Mayor of the City of Hartford. 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 list of the committee members is provided in Appendix D.

FORMAT OF REPORT PRESENTATION

This planning report consists of nine chapters. Chapter I briefly discusses the actions that led to the conduct of the City of Hartford traffic management study, the intended purpose of the study, the geographic area covered by the study, and the organization of the study. Chapter II 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 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 sets forth a set of objectives along with the supporting principles and standards to be used to identify existing traffic problems in the Hartford study area and to evaluate recommended traffic management actions to be applied to the existing transportation system. Chapter V identifies and describes the various traffic problems affecting the study area and the impact on the transportation system that may be expected from future planned land development in the study area. Chapter VI identifies land development projects proposed to be carried out within the study area by the year 1985 and analyzes the potential impact of these developments on traffic conditions in the study area. Chapter VII 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 VIII sets forth the procedures, responsible agencies, and potential funding sources for implementing the traffic management actions recommended in Chapter VII. Finally, Chapter IX provides a summary of the significant findings and recommendations of the transportation system management study.

Chapter II

EXISTING STREET AND HIGHWAY SYSTEM

INTRODUCTION

Reliable traffic engineering data are essential to the analysis and formulation of sound traffic management plans. Consequently, a definitive inventory of the capacity and use of the existing arterial 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 arterial street and highway system and about those factors which directly affect the use and operation of that system. These factors include land use, topography, street and highway use and classification, and the physical characteristics of each of the facilities comprising the total arterial street and highway system, as well as the 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

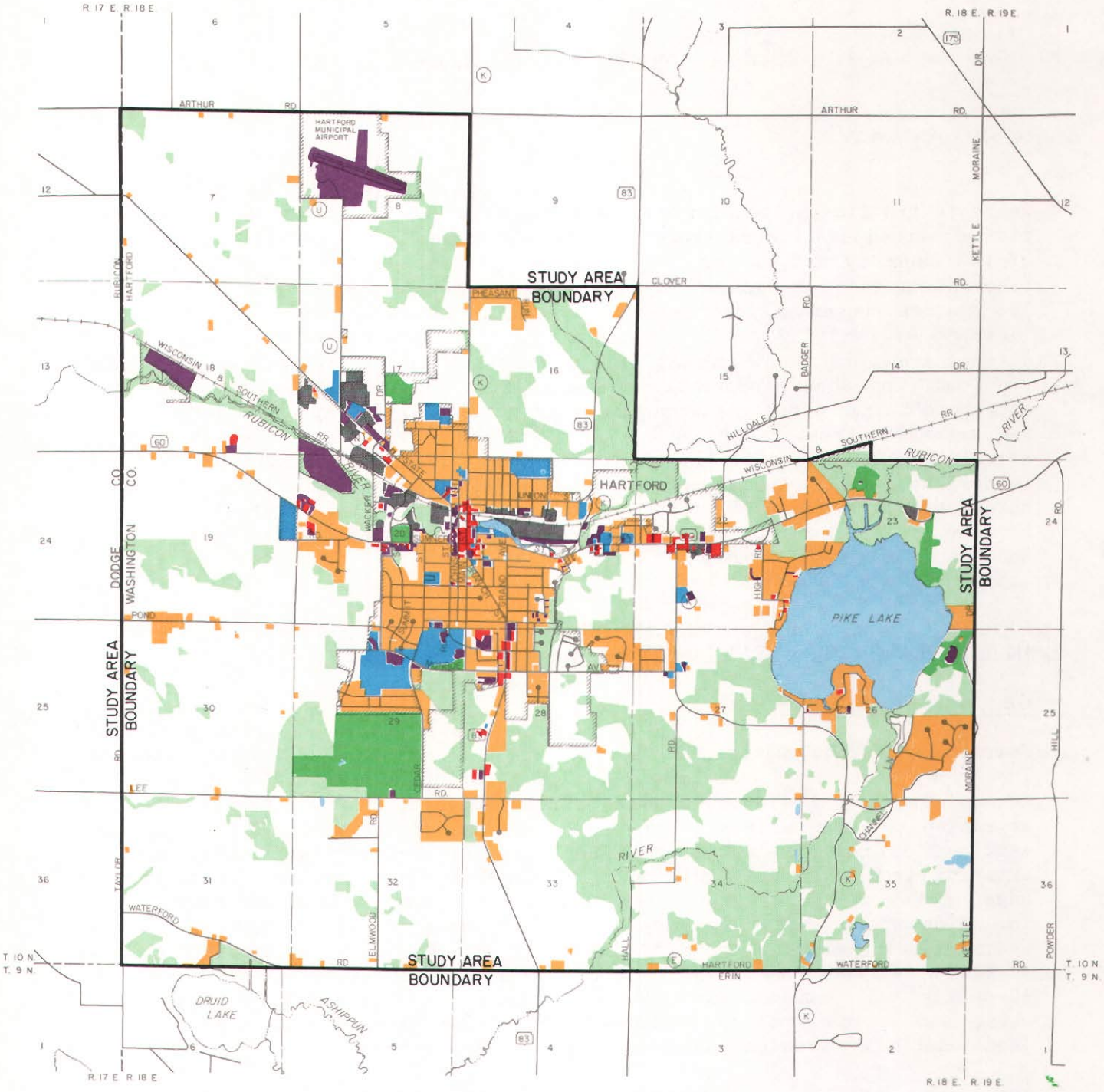
Generalized Land Use

Traffic generation and traffic patterns are, in part, a function of land use. The type, intensity, and location of the various land uses 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 use, including areas under development for such use; commercial use; industrial use, including manufacturing, wholesaling, and storage; transportation uses, including streets and highways and off-street parking areas of more than 10 spaces and 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 pattern of the Hartford study area as identified by the Commission's 1980 land use inventory. The Hartford study area encompasses about 12,900 acres, or about 20 square miles, including about 500 acres of surface water area. Urban land uses account for four square miles, or about 20 percent (see Table 1), of the total study area. Of this four square miles, residential land uses comprise the major portion, accounting for approximately three square miles, or about 45 percent of the total urban land uses, and about 9 percent of the total study area. Combined, commercial, industrial, and governmental and institutional uses total only 0.5 square mile, or about

Map 3

LAND USE IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1980



LEGEND

- RESIDENTIAL
- RETAIL AND SERVICES
- WHOLESALE, STORAGE, MANUFACTURING AND STORAGE
- TRANSPORTATION, COMMUNICATION, AND UTILITY
- WATER
- GOVERNMENTAL AND INSTITUTIONAL
- WOODLAND, WETLAND, UNUSED LAND
- PARK AND RECREATIONAL
- AGRICULTURAL AND AGRICULTURAL-RELATED

GRAPHIC SCALE
0 1 MILE
0 2000 4000 6000 FEET

Source: SEWRPC.

Table 1

DISTRIBUTION OF LAND USE IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1980

Major Land Use Category	Acres	Percent	
		Land Use Category	Total Study Area
Urban			
Residential	1,143	45.4	8.9
Commercial	58	2.3	0.5
Industrial	108	4.3	0.8
Governmental/Institutional	154	6.1	1.2
Transportation	794	31.5	6.2
Recreational	261	10.4	2.0
Subtotal	2,518	100.0	19.6
Rural			
Agricultural and Other Open Lands[a]	7,378	71.4	57.4
Woodlands and Wetlands	2,444	23.6	19.0
Surface Water	517	5.0	4.0
Subtotal	10,339	100.0	80.4
Total	12,857	100.0	100.0

[a]Includes extractive uses.

Source: SEWRPC.

13 percent of the total urban land uses, and about 2.5 percent of the total study area. The rural land uses within the study area, excluding surface water area, constitute approximately 15 square miles, or about 76 percent of the total study area.

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

Major Traffic Generators: The major traffic generators in the Hartford area consist of concentrations of commercial, governmental and institutional, and industrial land uses, which together account for a total of about 320 acres, or about 13 percent, of the total developed urban land in the Hartford study area. Table 2 lists, and Map 4 shows, the location of the major public and private employment centers and the elementary, junior, and senior high schools in the study area. Table 2 includes the name of the employer or school, the

Table 2

MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTERS AND SCHOOLS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Land Use Type	Map 4 Identification Number	Employer/School	Number of Employees/ Students	Operation Schedule
Industrial	1	Chrysler Outboard Corporation	197 90	7:00 a.m.-3:30 p.m. 8:00 a.m.-4:30 p.m.
		Total Employment	287	
	2	Seneca Foods	159 159 10	7:00 a.m.-3:48 p.m. 4:18 p.m.-1:06 a.m. 8:00 a.m.-4:30 p.m.
		Total Employment	328	
	3	Broan Manufacturing Company, Inc.	300 200	7:00 a.m.-3:30 p.m. 8:00 a.m.-4:30 p.m.
		Total Employment	500	
	4	Micro Design-Division of Bell & Howell Company	165 150 10	7:00 a.m.-3:30 p.m. 8:00 a.m.-4:30 p.m. 3:30 p.m.-12:00 a.m.
		Total Employment	325	
	5	Wacker Corporation	78 18 44	6:50 a.m.-3:20 p.m. 3:20 p.m.-11:50 p.m. 8:00 a.m.-4:45 p.m.[a]
		Total Employment	140	
	6	Menasha Corporation-Hartford Container Plant	60 40 30	7:00 a.m.-3:00 p.m. 3:00 a.m.-11:00 p.m. 7:30 a.m.-3:30 p.m.
		Total Employment	130	
	7	International Stamping Company, Inc. Plant No. 1 - Grand Street Plant No. 2 - Union Street Plant No. 3 - Madison Street	 300 50 30 20	 7:00 a.m.-3:35 p.m.[b] 8:00 a.m.-4:30 p.m. 7:00 a.m.-3:35 p.m.[b] 7:00 a.m.-3:35 p.m.[b]
		Total Employment	400	
Retail and Services	8	Hartford Central Business District	200[c]	Varied
		Total Employment	200	
Governmental/ Institutional	9	Hartford Memorial Hospital	287	7:00 a.m.-3:30 p.m.[d]
		Total Employment	287	
	10	Peace Lutheran Elementary School	7 staff/ 153 students	7:15 a.m.-3:30 p.m. 8:30 a.m.-3:15 p.m.
	11	St. Kilian Elementary School	15 staff/ 270 students	8:00 a.m.-3:30 p.m. 8:20 a.m.-3:00 p.m.
	12	Rossman Elementary School	33 staff/ 292 students	8:00 a.m.-4:00 p.m. 8:30 a.m.-3:20 p.m.
	13	Lincoln Elementary School	40 staff/ 493 students	8:00 a.m.-4:00 p.m. 8:30 a.m.-3:20 p.m.
	14	Central Middle School	34 staff/ 415 students	8:00 a.m.-4:00 p.m. 8:30 a.m.-3:20 p.m.
	15	Hartford Union High School	150 staff/ 1,800 students	8:00 a.m.-4:00 p.m. 8:00 a.m.-2:58 p.m.
		Total Staff/Students	279 staff/ 3,423 students	

[a] Friday operation schedule is 8:00 a.m.-3:30 p.m.

[b] Existing overtime operation schedule is 7:00 a.m.-4:25 p.m.

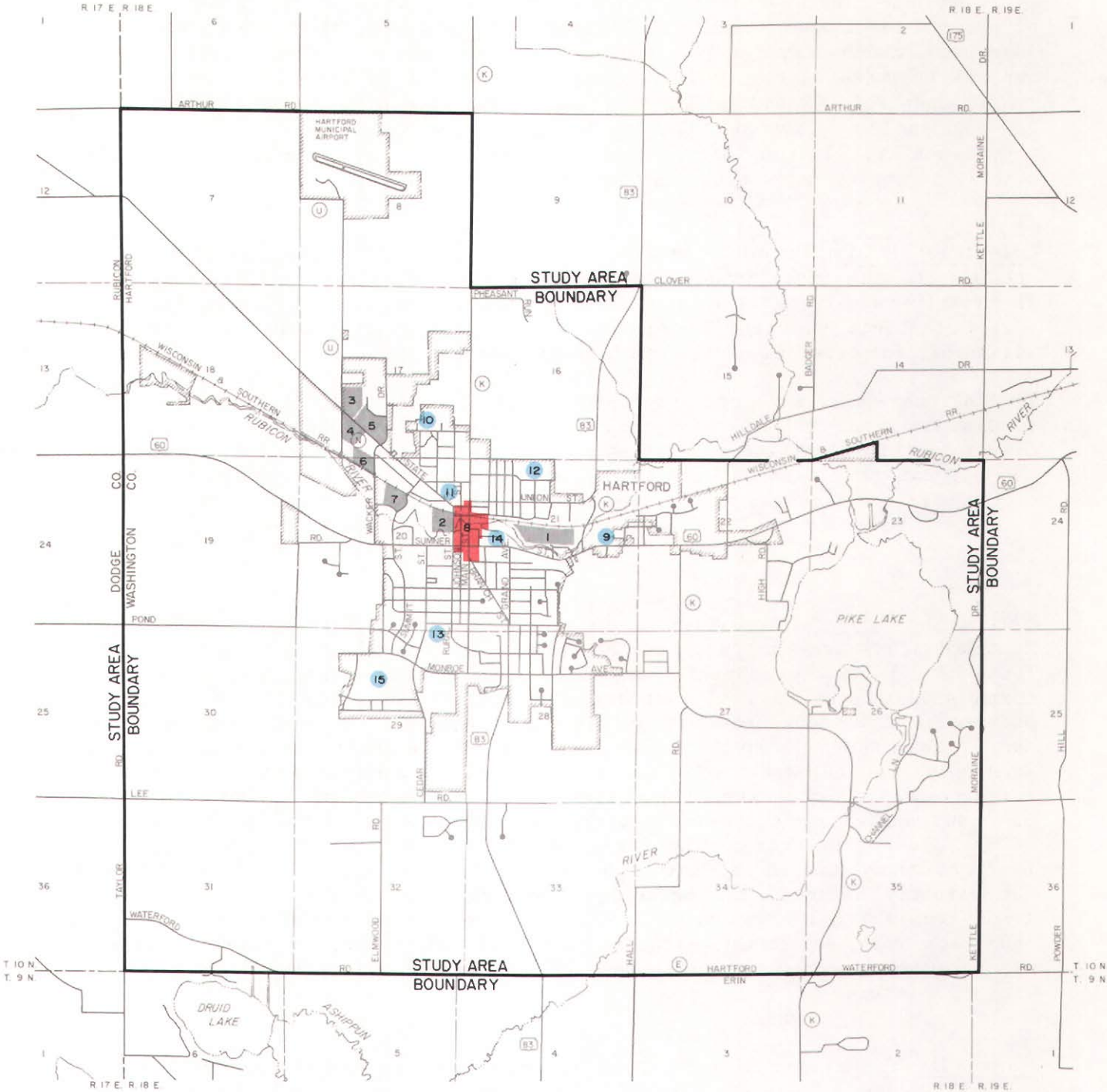
[c] Includes 30 City of Hartford employees who report to City Hall and work an 8:00 a.m.-5:00 p.m. schedule.

[d] Three shifts are operated on the schedule of 7:00 a.m.-3:30 p.m.; 3:30 p.m.-11:00 p.m.; and 11:00 p.m.-7:00 a.m. Number of employees per shift not available.

Source: SEWRPC.

Map 4

MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTERS AND SCHOOLS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

EMPLOYMENT CENTERS

- INDUSTRIAL
- RETAIL AND SERVICE
- GOVERNMENTAL AND INSTITUTIONAL
- 5 SEE TABLE 2 FOR EMPLOYER NUMBER AND NAME

GRAPHIC SCALE

0 1 MILE

0 2000 4000 6000 FEET

Source: SEWRPC.

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 was defined as a land use, or a concentration of land uses, which provides 100 jobs or more. The entire area encompassed by the central business district of the City of Hartford is classified as a major traffic generator based on the types and intensity of land use in this area. As shown on Map 4, in addition to the Hartford central business district and the elementary, junior, and senior high schools, there are eight major public or private employment centers in the Hartford study area.

Off-Street Public Parking: Another land use which is directly related to, and affects the operation of, the existing arterial 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.

In 1982 there were nine off-street public parking lot facilities in the Hartford study area. All of these facilities serve the downtown central business district. A total of 248 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.

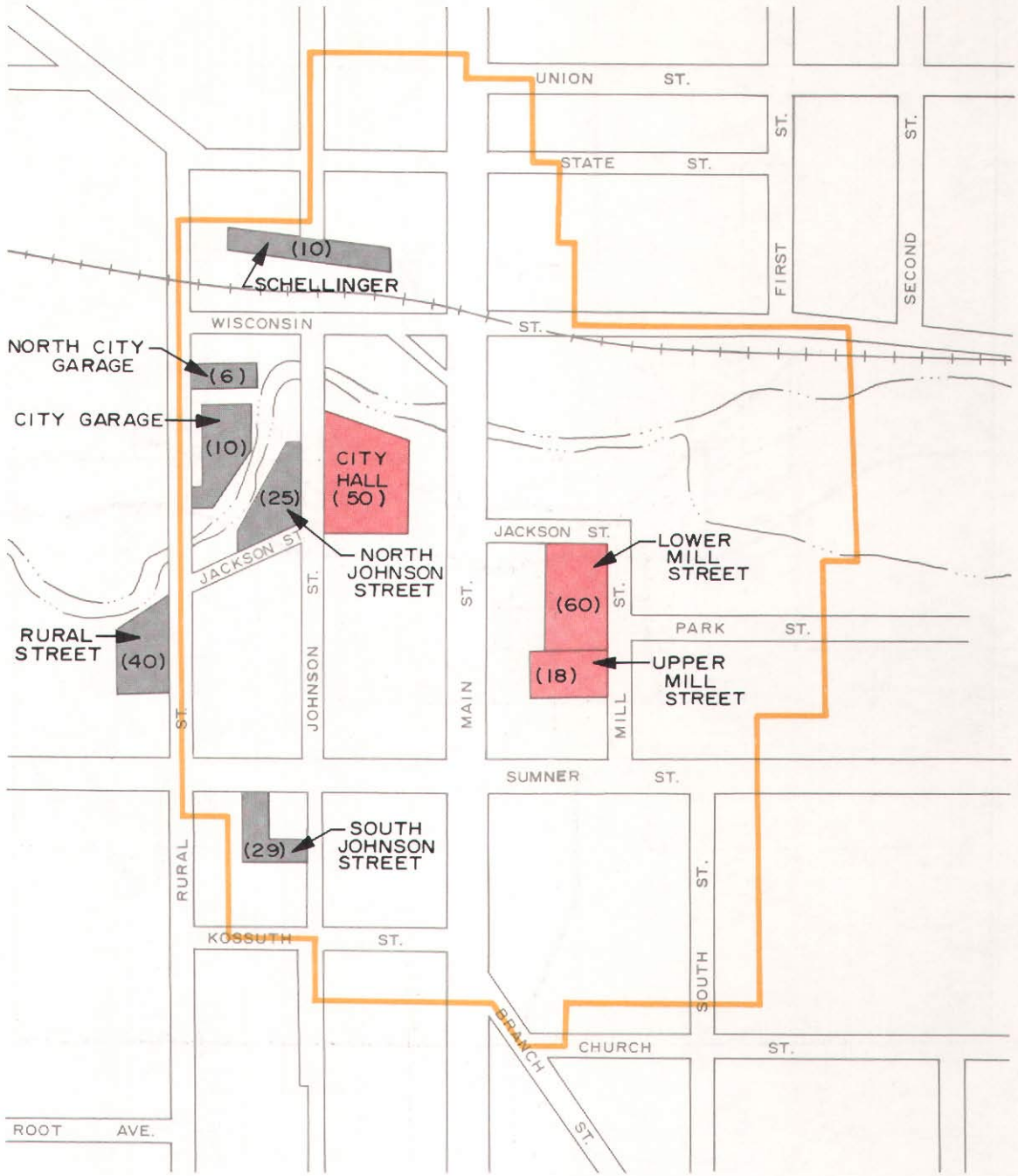
Topography

Natural Features: The existing arterial street and highway system in the Hartford study area has not been noticeably influenced by natural topographic features. It does not appear that the Rubicon River, which flows through the north side of the City of Hartford, has significantly influenced the street pattern in the study area. It is apparent, however, from an examination of Map 6, that the Mill Pond, which is a part of the Rubicon River and which is located on the northeast side of the Hartford central business district, has influenced the continuity of the street system in that area, and the directness and number of north-south arterial routes within the eastern section of the City of Hartford. Pike Lake, located to the east of the City of Hartford, as shown on Map 6, although influencing the location of STH 60, has not directly affected the existing street pattern in the City of Hartford. Aside from the Mill Pond and Pike Lake, there are no other features of the landscape such as large wetlands or significant areas of rough topography which have influenced the development of the street and highway system in the City of Hartford.

Railroads: The Wisconsin & Southern Railroad line (formerly part of the Chicago, Milwaukee, St. Paul & Pacific Railroad) has influenced the number and directness of the north-south arterial traffic routes in the Hartford area. This railroad operates over a single-track main line which bisects the study area in a generally east-west direction, approximately parallel to and north of STH 60, passing through the northern portion of the Hartford central business district. These tracks, as shown on Map 6, are crossed by seven north-south streets in the study area, of which only three are arterial streets.

Map 5

OFF-STREET PUBLIC PARKING FACILITIES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982



LEGEND

PARKING TIME RESTRICTIONS

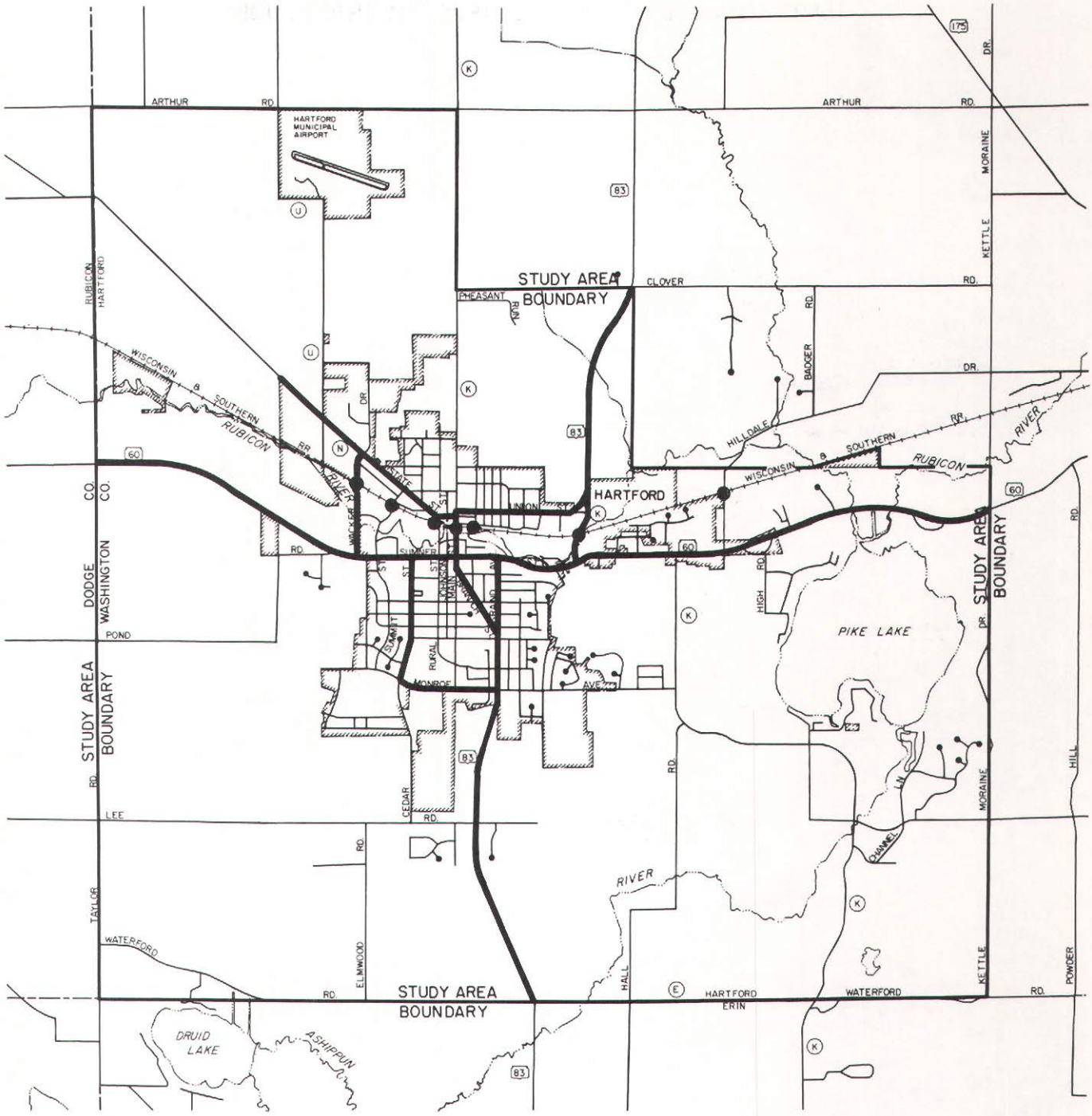
- TWO HOUR LIMIT
- NO RESTRICTIONS
- (18) NUMBER OF PARKING STALLS
- CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE
0 200 400 FEET

Source: SEWRPC.

Map 6

NATURAL AND CULTURAL FEATURES INFLUENCING THE STREET AND HIGHWAY SYSTEM IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

- ARTERIAL STREET OR HIGHWAY
- RAILROAD
- RAILROAD/STREET CROSSING
- WATER

Source: SEWRPC.

EXISTING STREET AND HIGHWAY SYSTEM CLASSIFICATION

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

Functional Classification

Functional classification is defined as the grouping of streets and highways into classes according to the principal function served, ranging from a high degree of travel mobility and limited degree of access to adjacent land uses to a very low degree of travel mobility and high degree of 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. 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 Tranportation, 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 indicates the distribution of the street and highway system mileage as identified in the Wisconsin Department of Transportation functional classification system for each municipality within the study area. As indicated in Table 3, there are 77.02 miles of existing streets and highways in the Hartford study area, of which 34.97 miles, or 45 percent, are in the City of Hartford. Of the total, 14.47 miles, or 19 percent, are classified as arterial streets; 10.03 miles, or 13 percent, are classified as collector streets; and the remaining 52.52 miles, or 68 percent, are classified as land access streets. Map 7 shows the existing street and highway system serving the City of Hartford 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: state trunk highways, county trunk highways, or local trunk highways. A subcategory of state trunk highways is the connecting street. Connecting streets 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 street.

Table 3

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY FUNCTIONAL CLASSIFICATION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Municipality	Functional Classification (miles)					Total
	Arterial[a]			Collector[a]	Land Access	
	Principal	Minor	Total			
City of Hartford...	4.23	4.29	7.82	2.56	24.59	34.97
Town of Hartford...	0.70	5.95	6.65	7.47	27.93	42.05
Total	4.93	10.24	14.47	10.03	52.52	77.02

[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 arterials and collectors.

Source: SEWRPC.

Map 8 shows the jurisdictional classification of the streets and highways in the Hartford study area. Table 4, which shows the distribution of street and highway system mileage by jurisdictional classification in the Hartford study area, indicates that 7.25 miles, or 9 percent of the total street and highway mileage, are classified as state trunk highways; 2.73 miles, or 4 percent, as connecting streets; 11.41 miles, or 15 percent, as county trunk highways; and the remaining 55.63 miles, or 72 percent, as local trunk highways.

The City has primary jurisdictional responsibility over all connecting streets and over all local trunk highways within its corporate limits. Together, these street classifications total 32.05 miles, representing 42 percent of the existing arterial street and highway system, and 92 percent of the total street and highway system in the City. However, since the connecting streets are intended to provide continuity on the state trunk highway system, the State provides financial aids to the City for the maintenance and operation of these facilities in a manner that is consistent with their functional classification as arterials. Therefore, while the City has primary jurisdictional responsibility over the connecting streets, that jurisdiction is exercised cooperatively with the Wisconsin Department of Transportation. Accordingly, the approval of the state agency is required before any actions can be taken by the City which would substantially alter the use or capacity of a connecting street. This would include the implementation of such traffic management actions as installing traffic control devices (signals and signs), designating a facility as a one-way street, prohibiting turning movements, restricting truck traffic, and changing intersection geometrics. About 5 percent of the street and highway mileage in the City of Hartford, or 1.62 miles, is under the jurisdiction of Washington County. An additional 4 percent, or 1.30 miles, is under the jurisdiction of the State of Wisconsin.

Table 4

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY JURISDICTIONAL CLASSIFICATION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Municipality	Jurisdictional Classification (miles)				Total
	State Trunk Highway	Connecting Street	County Trunk Highway	Local Street	
City of Hartford.....	1.30	2.73	1.62	29.32	34.97
Town of Hartford.....	5.95	--	9.79	26.31	42.05
Total	7.25	2.73	11.41	55.63	77.02

Source: SEWRPC.

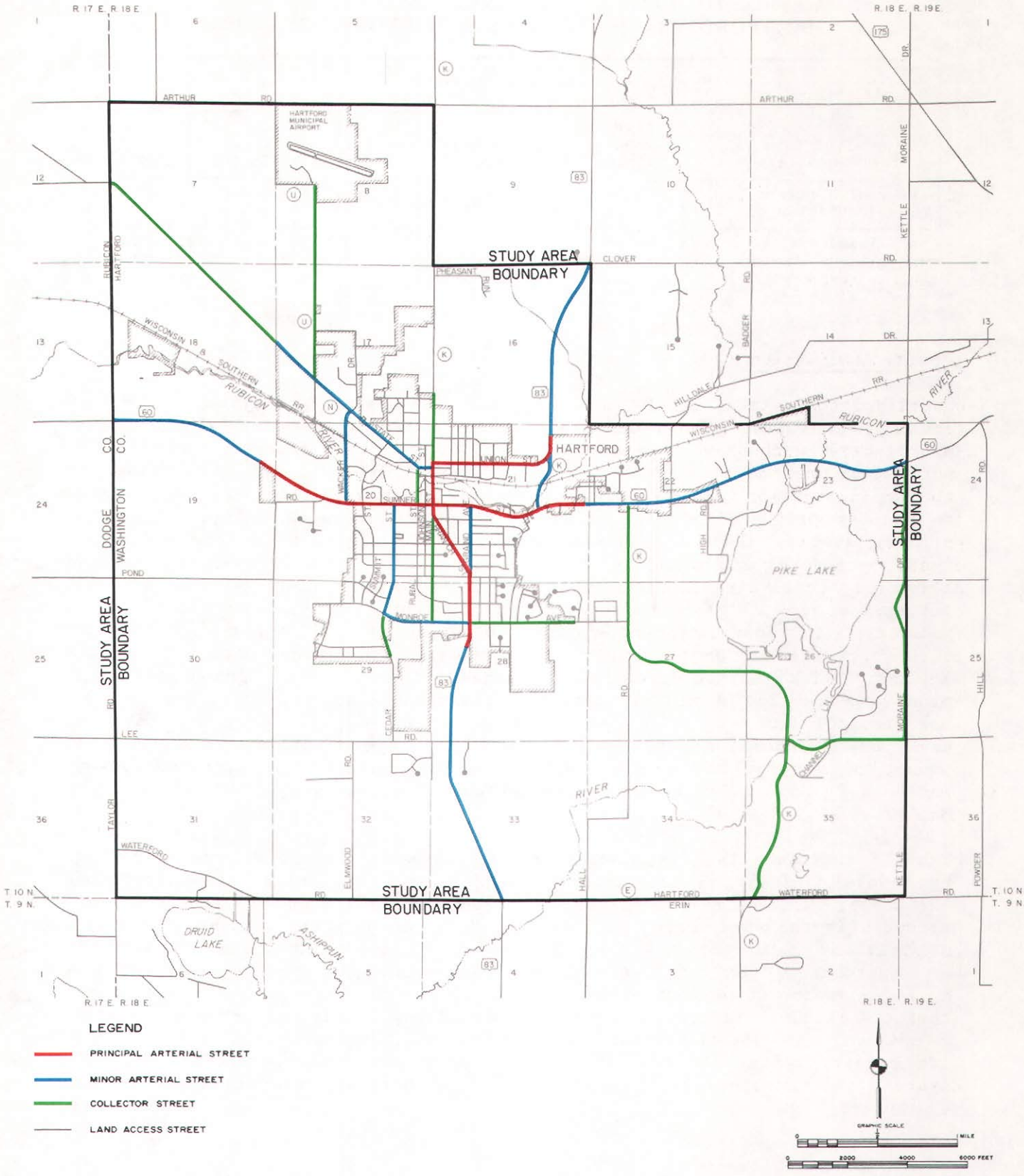
Federal Aid System

Underlying the state, county, and local trunk highway is a system of federal aid highway routes. 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 arterial street and highway improvements and the administration and financing of traffic management measures. As related to the City of Hartford, 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 a 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 expended 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 Hartford study area are shown on Map 9.

Table 5 indicates the distribution of the street and highway system mileage by federal aid system category in the Hartford study area. As indicated in the table, 10.12 miles, or 13 percent of the total 77.02 miles of streets and highways in the study area, are on the federal aid primary system; 1.44 miles, or 2 percent of the total, are on the federal aid secondary system; 3.72 miles, or 5 percent of the total, are on the federal aid urban system. The remaining 61.74 miles, or 80 percent of the total, are not on a federal aid system. Furthermore, Table 5 indicates that of the total 34.97 miles of streets and highways within the City of Hartford, 4.17 miles, or 12 percent, are on the federal aid primary system; 3.72 miles, or 11 percent, are on the federal aid urban system; and the remaining 27.08 miles, or 77 percent, are not on a federal aid system.

Map 7

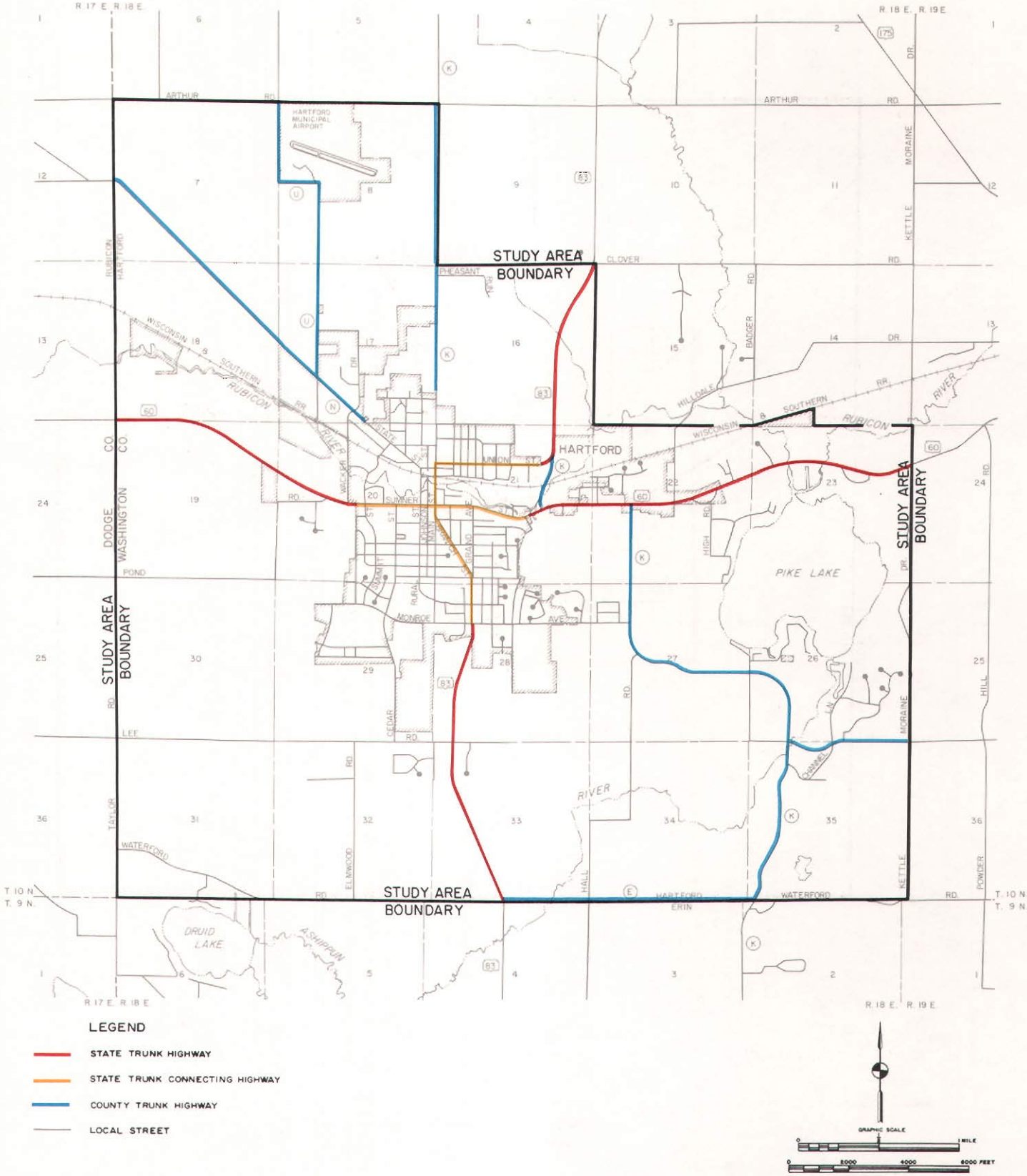
CLASSIFICATION OF FUNCTIONAL STREETS AND HIGHWAYS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: Wisconsin Department of Transportation and SEWRPC.

Map 8

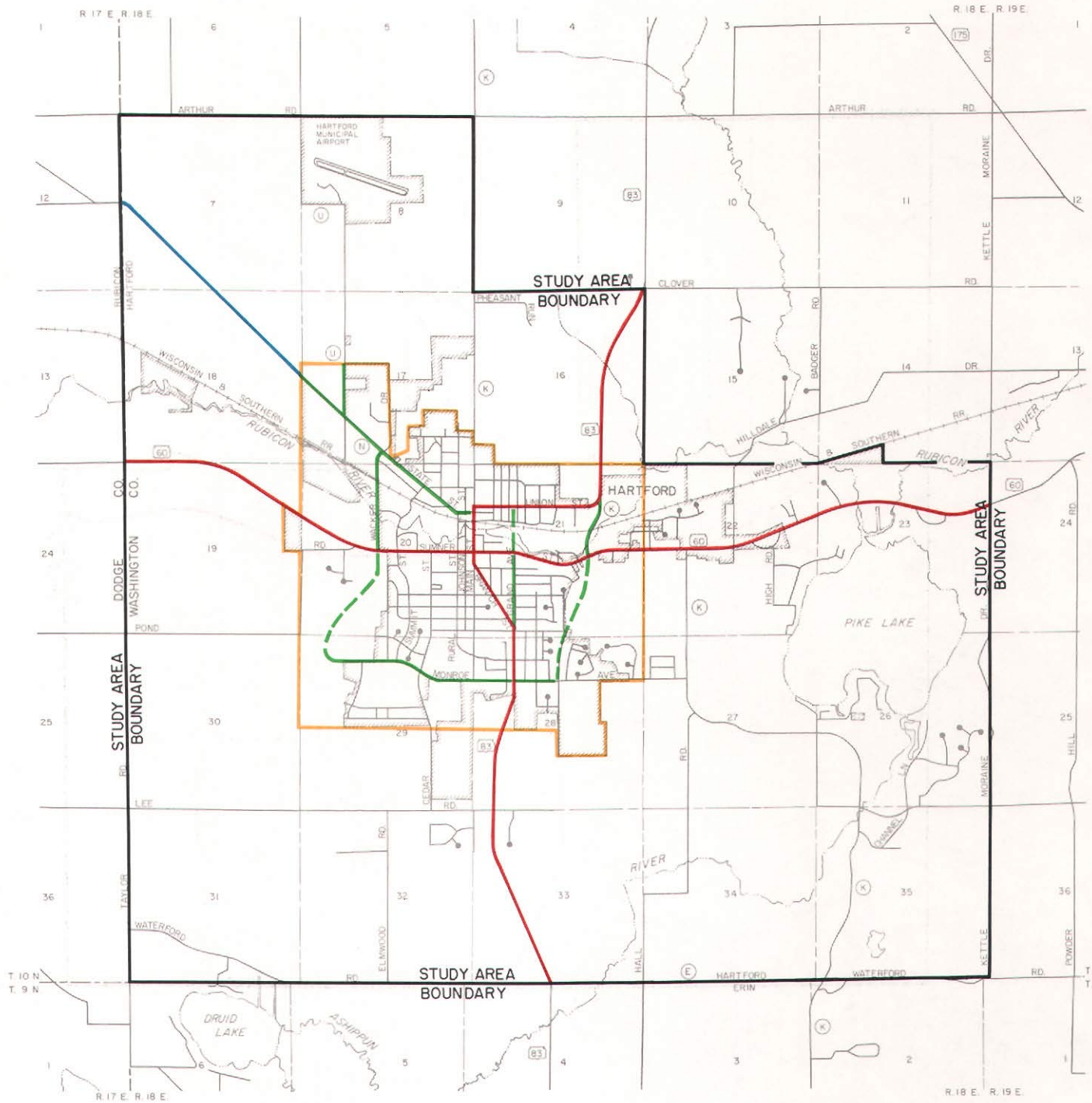
JURISDICTIONAL CLASSIFICATION OF STREETS AND HIGHWAYS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: SEWRPC.

Map 9

FEDERAL AID HIGHWAY SYSTEM IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: SEWRPC.

Table 5

DISTRIBUTION OF STREET AND HIGHWAY SYSTEM MILEAGE BY FEDERAL AID CATEGORY IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Municipality	Functional Classification	Federal Aid System (miles)					Not on Federal Aid System (miles)	Total (miles)
		Primary	Secondary	Urban	Subtotal	Percent of Total		
City of Hartford	Principal Arterial..	3.53	--	--	3.53	4.6	--	3.53
	Minor Arterial.....	0.64	--	2.98	3.62	4.7	0.67	4.29
	Collector.....	--	--	0.43	0.43	0.6	2.13	2.56
	Local.....	--	--	0.31	0.31	0.4	24.28	24.59
	Subtotal	4.17	--	3.72	7.89	10.3	27.08	34.97
Town of Hartford	Principal Arterial..	0.70	--	--	0.70	0.9	--	0.70
	Minor Arterial.....	5.25	--	--	5.25	6.8	0.70	5.95
	Collector.....	--	1.44	--	1.44	1.9	6.03	7.47
	Local.....	--	--	--	--	--	27.93	27.93
	Subtotal	5.95	1.44	--	7.39	9.6	34.66	42.05
	Total	10.12	1.44	3.72	15.28	19.9	61.74	77.02

Source: SEWRPC.

PHYSICAL CHARACTERISTICS OF THE EXISTING STREET AND HIGHWAY SYSTEM

The physical characteristics of the existing street and highway system determine 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 facility.

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

In urban areas such as the City of Hartford, 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, 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 E.

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

Table 6

RIGHT-OF-WAY AND PAVEMENT WIDTHS FOR THE ARTERIAL AND COLLECTOR STREET AND HIGHWAY SYSTEM IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Facility	Termini	Pavement Width (feet)	Right-of-Way Width (feet)
STH 83.....	Waterford Road-Monroe Avenue	24	66
Grand Avenue.....	Monroe Avenue-Branch Street	36	50
Branch Street....	Grand Avenue-Main Street	30	50
Main Street.....	Branch Street-Union Street	40	66
Union Street.....	Main Street-Eighth Street	44	66
STH 83.....	Eighth Street-Clover Road	24	85-100
Sumner Street (STH 60).....	Kettle Moraine Drive-Sell Drive	22	120
	Sell Drive-One mile east of Dodge county line	44	66
	One Mile east of Dodge county line-Dodge county line	24	120
W. State Street..	Main Street-Rural Street	30	50
	Rural Street-Forest Street	40	60
	Forest Street-300 feet west of W. Rossman Street	36	60
	300 feet west of W. Rossman Street-Airport Road	48	100
N. Wacker Drive..	E. Sumner Street-Wisconsin & Southern Railroad	24	80
	Wisconsin & Southern Railroad-W. State Street	48	80
Grand Avenue.....	Branch Street-E. Sumner Street	27	50
Monroe Avenue....	Cedar Street-Grand Avenue	48	80
Cedar Street.....	Monroe Avenue-W. Lincoln Street	36	66
	W. Lincoln Street-W. Sumner Street	30	50
Wilson Avenue....	E. Sumner Street-STH 83	22	66

Source: City of Hartford and SEWRPC.

TRAFFIC CONTROL MEASURES ON THE EXISTING STREET AND HIGHWAY SYSTEM

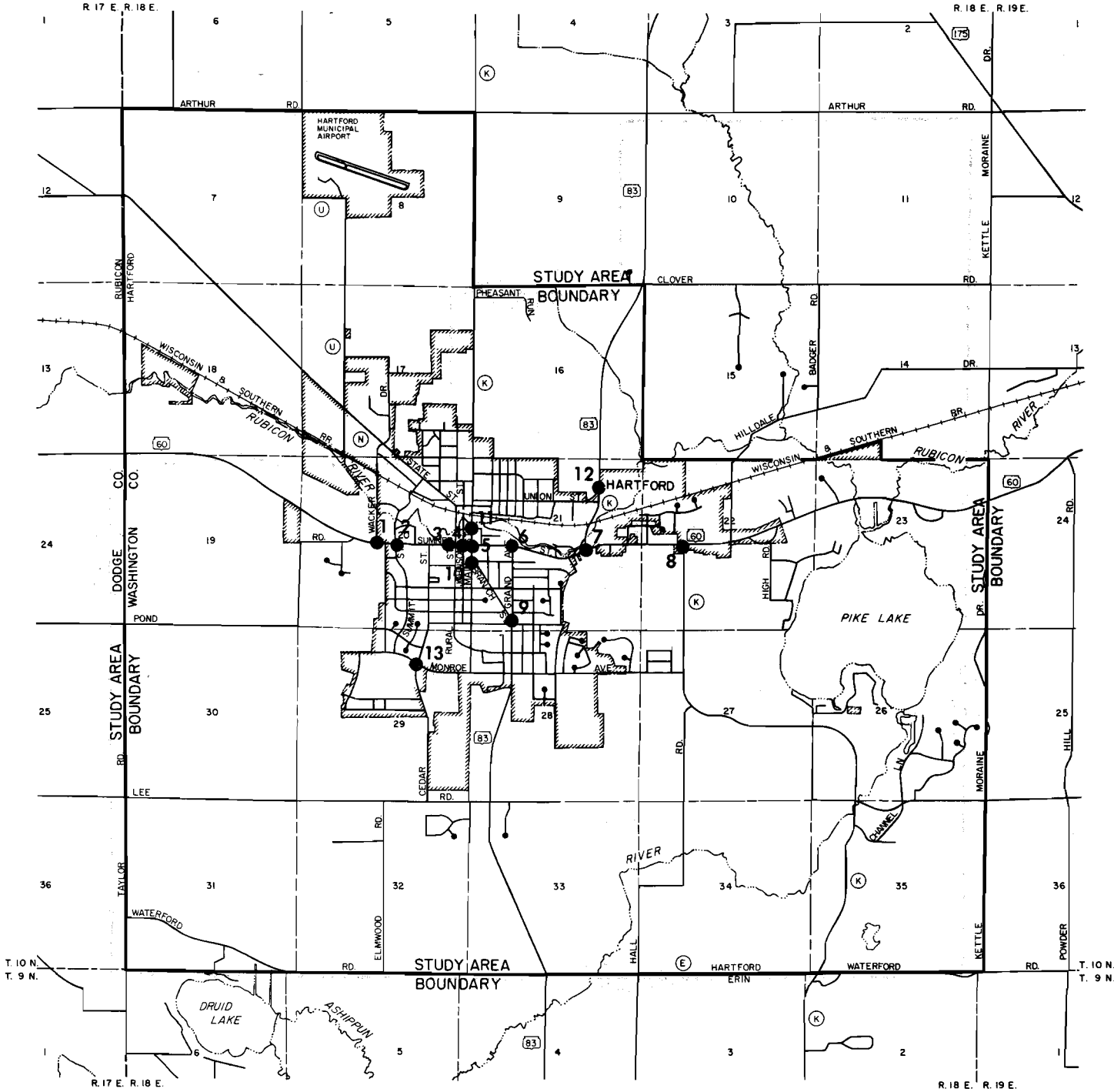
Traffic control measures have a direct effect on the capacity, operating characteristics, and safety of a roadway facility. The principal traffic control measures inventoried as a part of any traffic management planning effort include traffic signals and signs, railroad and school crossing protection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

Signals

In 1982 there were two pretimed interconnected traffic signals in operation in the Hartford study area. Table 7 indicates the location, phasing, timing, and total cycle length for each of these signals. In addition to these signals, the City makes extensive use of stop signs. Map 12 shows the location of the two existing traffic signals and of the 245 stop signs in the Hartford study area.

Map 10

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



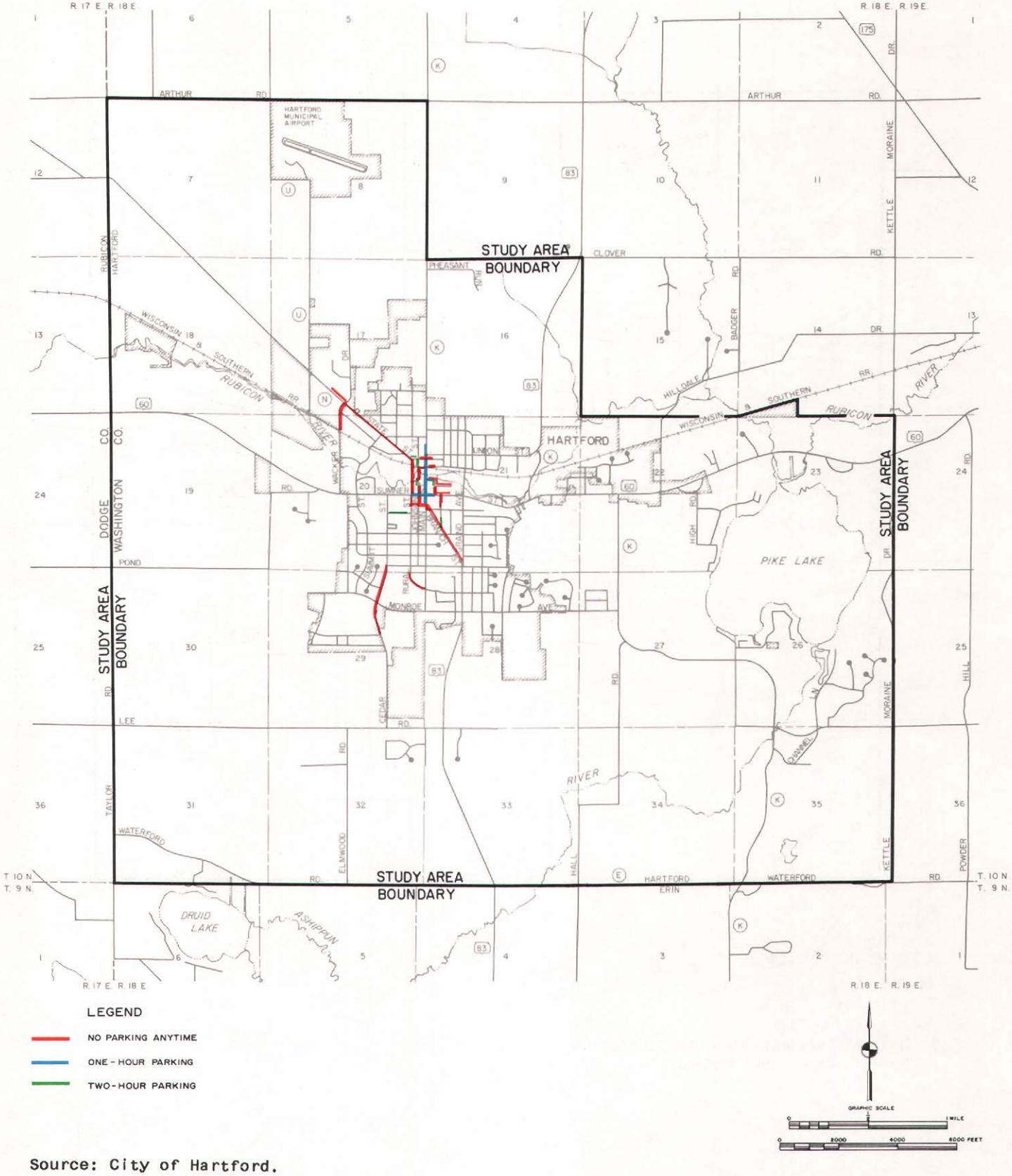
LEGEND

●2 DETAILED GEOMETRICS AND INTERSECTION FIGURE NUMBER (SEE APPENDIX E)

Source: SEWRPC.

Map 11

ON-STREET CURB PARKING RESTRICTIONS FOR SELECTED STREETS AND HIGHWAYS IN THE CITY OF HARTFORD: 1982



Source: City of Hartford.

Railroad Crossing Protection

As previously noted, the main line of the Wisconsin & Southern Railroad traverses the City at grade. Seven streets, of which three are arterials, intersect and cross the railway tracks in the Hartford study area. As indicated on Map 13, vehicular and pedestrian traffic is protected at each street intersection with the tracks by either flashing signals or crossbuck signs. The crossings of the Wisconsin & Southern Railroad trackage by Rural Street, Main Street, and Wilson Avenue are protected with flashing lights, while the Wacker Drive, Grant Street, Wisconsin Street, and Hilldale Drive crossings are protected with crossbuck signs. The arterial street intersections with the Wisconsin & Southern Railroad trackage at Main Street and at Wilson Avenue are protected with flashing lights and the Wacker Drive intersection is protected with crossbuck signs.

Table 7

TRAFFIC SIGNAL OPERATION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982 (in seconds)

Phase	Intersection	
	Main Street[a]	Sumner Street[a]
Green	23.1	26.6
Yellow	4.2	4.2
Red	42.7	39.2
Green Left-Turn Arrow	7.0	--
Yellow Left-Turn Arrow	3.5	--
Total	70.0	70.0

Phase	Intersection		
	Main Street[b]		Jackson Street[b]
	Northbound	Southbound	
Green	29.4	40.6	21.0
Yellow	4.2	4.2	4.2
Red	36.4	36.4	44.8
Green Left-Turn Arrow	--	7.7	--
Yellow Left-Turn Arrow	--	3.5	--
Total	70.0	70.0	70.0

[a] Signal operates on flashing mode during the hours of 11:30 p.m. to 7:00 a.m., with red indication controlling Main Street and yellow indication controlling Sumner Street.

[b] Signal operates on flashing mode during the hours of 10:00 p.m. to 7:00 a.m., with red indication controlling Jackson Street and yellow indication controlling Main Street.

Source: City of Hartford.

School Crossing Protection

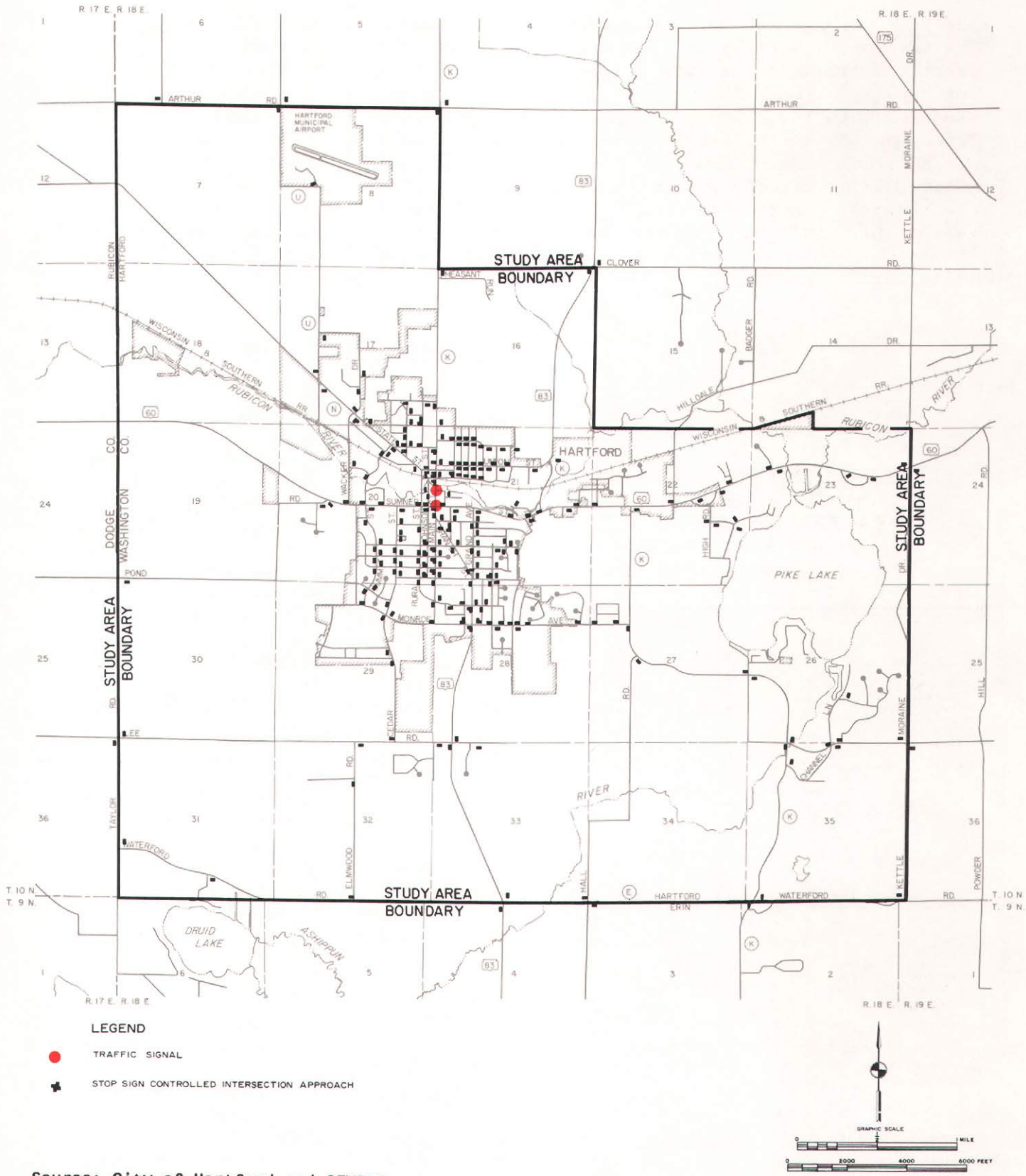
Table 8 lists, and Map 13 identifies, the locations of the elementary, junior, and senior high schools in the Hartford study area. There are six locations within the area where some form of school crossing protection is provided. Map 13 shows the location and type of school crossing protection provided in the study area. All streets adjacent to the public and private schools in the Hartford study area are posted with school zone signs, except those streets adjacent to St. Kilian Elementary and Central Middle Schools. The intersection of Grand Avenue with Lincoln Street and Jefferson Street is protected by the stationing of adult crossing guards during school start and dismissal times. In addition to the adult crossing guard stationed at the intersection of Grand Avenue and Jefferson Street, portable stop signs are utilized to control vehicular traffic on Grand Avenue during school start and dismissal times.

Speed Limits

Except for relatively short stretches of the arterial streets and highways entering and leaving the City of Hartford, the existing arterial street and highway system in the City, in 1982, was posted for a 25-mile-per-hour (mph)

Map 12

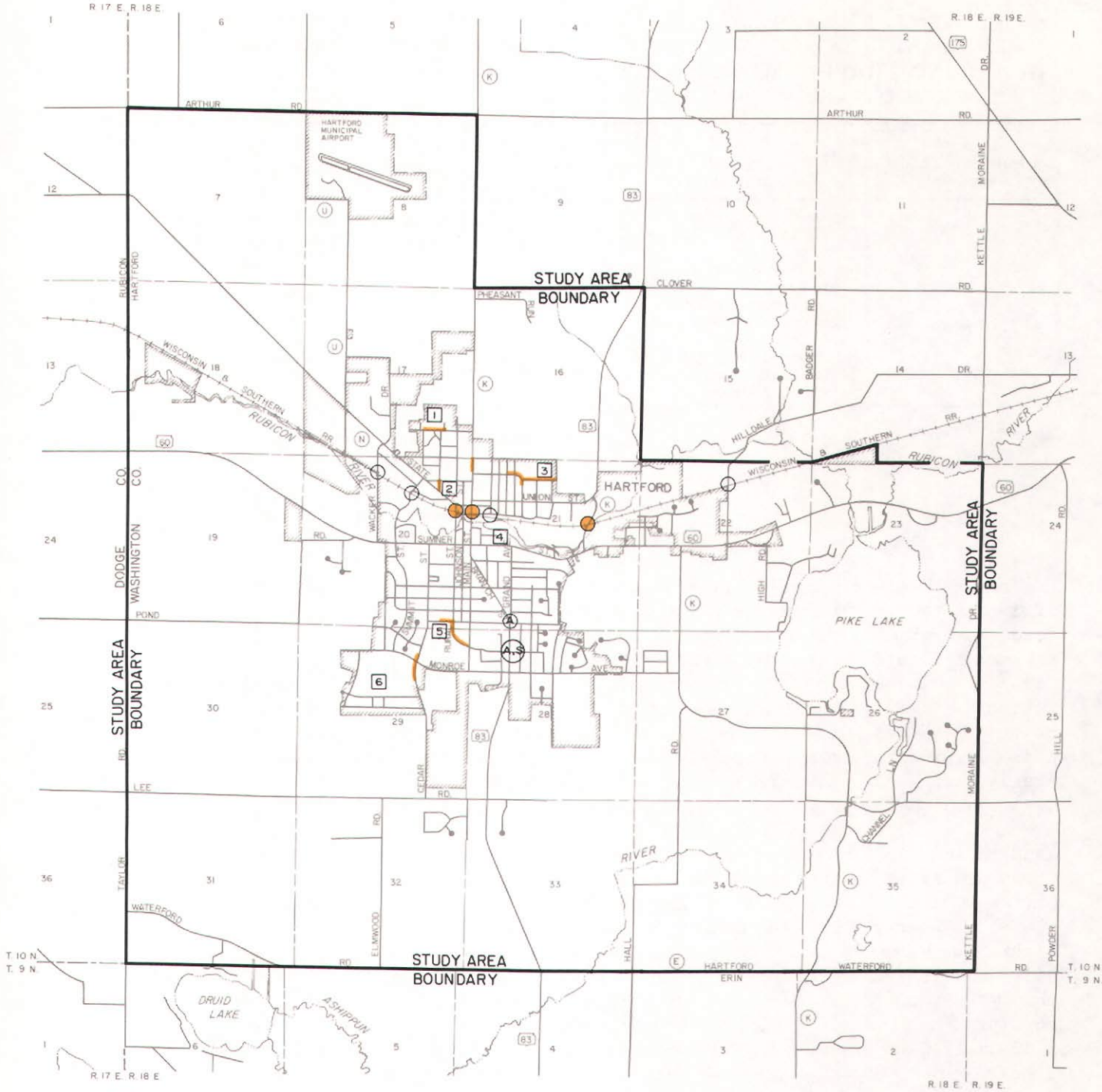
TRAFFIC SIGNAL AND STOP SIGN LOCATIONS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: City of Hartford and SEWRPC.

Map 13

RAILROAD AND SCHOOL CROSSING PROTECTION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

RAILROAD CROSSING PROTECTION

- ○ CROSSBUCK SIGNS
- ● FLASHING LIGHTS

SCHOOL CROSSING PROTECTION

- Ⓐ ADULT CROSSING GUARD
- Ⓢ PORTABLE STOP SIGNS
- ▬ 15-MPH SPEED LIMIT WHEN CHILDREN ARE PRESENT
- [1] SCHOOL (SEE TABLE 8 FOR SCHOOL NUMBER AND NAME)

GRAPHIC SCALE

0 1 MILE

0 2000 4000 6000 FEET

Source: SEWRPC.

Table 8

ELEMENTARY, JUNIOR, AND SENIOR HIGH SCHOOLS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Map 13 Identification Number	School Name
1	Peace Lutheran Elementary School
2	St. Kilian Elementary School
3	Rossman Elementary School
4	Central Middle School
5	Lincoln Elementary School
6	Hartford Union High School

Source: SEWRPC.

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, except those roadways adjacent to St. Kilian Elementary and Central Middle Schools. These 15-mph restrictions are in effect only during the hours when children are present and serve as the principal school crossing protection measure utilized in the Hartford study area.

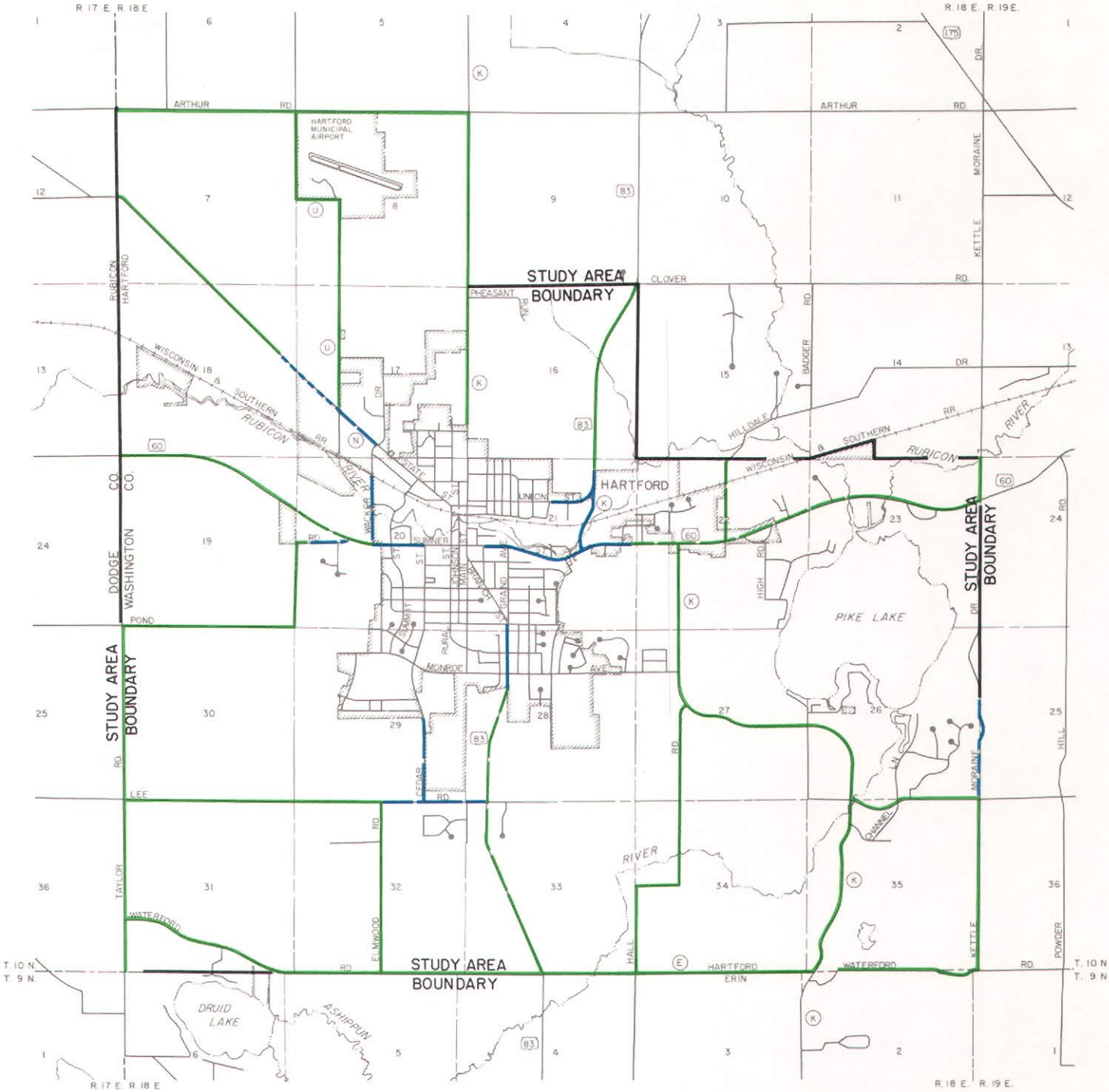
SUMMARY

This chapter has presented information on the existing street and highway system in the Hartford 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 Hartford, around and outward from the intersection of STH 60 and STH 83. Of a total of about 12,900 acres of land in the study area, only about 11 percent is occupied by residential, commercial, industrial, and governmental and institutional development. Because of their importance as trip generators, all major employers in the study area were identified and located. The effect of these major trip generators, as well as the existing land use patterns generally, and the associated tripmaking activity on the arterial street and highway system of the study area will be analyzed in subsequent chapters.

A total of 77.02 miles of streets and highways are located within the Hartford study area, of which 34.97 miles, or 45 percent, are located within the corporate limits of the City of Hartford. These streets and highways have been classified according to function and jurisdiction. Of the total street and highway mileage in the study area, 14.47 miles, or 19 percent, are functionally classified as arterials; 10.03 miles, or 13 percent, as collectors; and the remaining 52.52 miles, or 68 percent, as land access streets. With respect to jurisdiction, the City of Hartford has maintenance responsibility for 2.73 miles of connecting streets and 29.32 miles of local trunk highways, a total of 32.05 miles, or 42 percent of the total existing street and highway system in the study area. These 32.05 miles comprise 92 percent of the total street and highway mileage within the City of Hartford. Of the remaining 8 percent, 1.62 miles, or 4 percent, are under Washington County's jurisdiction, and 1.30 miles, or 4 percent, are under the State of Wisconsin's jurisdiction. Furthermore, of the total street and highway mileage in the study area, 15.28 miles, or 20 percent, are on the federal aid highway system. Of these 15.62 miles, 7.89 miles, or 10 percent of the total street and highway mileage, are within the corporate limits of the City of Hartford.

Map 14

POSTED SPEED LIMITS ON THE STREET AND HIGHWAY SYSTEM IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

SPEED LIMIT

- 25 MPH
- 30 MPH
- 35 MPH
- 40 MPH
- 45 MPH
- 55 MPH

GRAPHIC SCALE

0 1 MILE

0 2000 4000 6000 FEET

Source: City of Hartford and SEWRPC.

A detailed description of the right-of-way and pavement widths of the arterial 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 arterial street and highway system that alternative actions can be designed and evaluated to determine the most effective traffic engineering improvements to that system.

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 those problems. A comprehensive assessment of the operating conditions of an existing transportation system requires the collection and analysis of definite data on: 1) the composition and volume of traffic utilizing the system; 2) the traffic operating conditions on the system; and 3) the trip purposes and travel patterns served by the system. 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 traffic operating conditions, including volume-to-capacity ratios; traffic signal load factors; average vehicle speeds and average hourly vehicle delays at intersections; public parking facility occupancy and turnover rates; and motor vehicle accident patterns. The identification of existing trip purposes and travel patterns within a community is required to understand the basic factors underlying the existing traffic volumes and conditions, 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 Hartford area are described in Chapter V of this report, and were determined by a comparative evaluation of the existing conditions 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 an important 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 into the demand for travel within a community and are essential to any 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 Wisconsin Department of Transportation (WisDOT) on a periodic basis since 1968, the latest such systemwide counts being taken by the WisDOT in 1980. These counts were updated to 1982 by the application of factors derived from special traffic counts taken by the Engineering Department of the City of Hartford at locations selected specifically for the traffic management study. The historic growth trends exhibited by traffic on key arterials in the study area since 1968 are indicated 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 steadily since 1968 at an average annual rate of about 4.3 percent. The highest rate of traffic volume growth, 12.3 percent per year, has been exhibited on CTH K (N. Main Street), south of Pleasant Run. The lowest rate of growth has been exhibited by STH 83 south of Monroe Avenue--3.0 percent per year. Traffic growth rates on key arterials as those arterials enter the City of Hartford central business district (CBD) have been somewhat lower than such rates on the same arterials as those arterials enter the study area. The annual traffic growth rates on the arterial streets and highways entering the CBD have approximated 2.4 percent per year. Traffic growth rates on these arterials have ranged from a high of 3.3 percent on STH 60, E. Sumner Street, west of STH 83, Main Street, to a low of 1.5 percent on STH 83 (S. Main Street), south of STH 60 (Sumner Street). The variance in traffic growth rates between the arterial streets and highways entering the study area and those entering the central business district may be attributed to the growth in travel associated with the urban land development, both residential and commercial, which has occurred 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.

Table 9

AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUME ON THE ARTERIAL STREETS AND HIGHWAYS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1968 THROUGH 1982

Location	Year						Annual Growth Rate (percent)
	1968	1971	1974	1977	1980	1982	
Arterial Streets and Highways Entering the Hartford Study Area:							
STH 60 - East of Dodge County Line....	2,340	3,520	3,710	3,520	4,040	4,100	4.1
STH 60 - West of Kettle Moraine Drive.	4,070	7,040	7,790	7,790	7,560	7,700	4.6
STH 83 - South of Clover Road.....	1,490	1,480	1,670	2,480	2,170	2,300	3.1
STH 83 - South of Monroe Avenue.....	2,440	2,660	2,660	2,950	3,630	3,700	3.0
CTH N - East of Dodge County Line.....	660	930	790	1,170	1,120	1,200	4.4
CTH K - South of Pleasant Run.....	330	420	450	1,200	1,520	1,550	12.3
Subtotal	11,380	16,050	17,070	19,110	20,040	20,500	4.3
Arterial Streets and Highways Entering the Hartford Central Business District							
STH 60 - West of STH 83.....	6,580	5,440	8,740	8,850	10,230	10,300	3.3
STH 60 - East of STH 83.....	7,000	8,320	10,840	9,590	9,830	9,900	2.5
STH 83 - South of STH 60.....	5,500	6,690	6,690	6,700	6,760	6,800	1.5
STH 83 - North of State Street.....	4,340	5,630	6,200	6,290	5,030	5,600	1.8
State Street - West of STH 83.....	2,280	2,790	2,990	2,990	2,910	3,000	2.0
Subtotal	25,700	28,870	35,460	34,420	34,760	35,600	2.4
Total	31,080	44,920	52,530	53,530	54,800	56,150	3.0

Source: Wisconsin Department of Transportation and SEWRPC.

Map 15 shows the estimated 1982 24-hour average annual weekday traffic volumes on the arterial and collector streets in the Hartford study area. As shown on the map, STH 60 and STH 83 are carrying the highest traffic volumes in the study area, with traffic volumes on STH 60 ranging from 4,100 to 10,300 vehicles per average weekday, and on STH 83 ranging from 2,300 to 6,900 vehicles per average weekday. The remaining arterial and collector streets in the study area have volumes ranging from 950 to 3,000 vehicles per average weekday.

The traffic volumes shown in Table 9 and on Map 15 represent average annual weekday conditions. Such conditions are approximated by traffic on an average weekday 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 by the WisDOT on STH 60 east of CTH K. As shown in Figure 1, the traffic volumes at this location range from a high of 110 percent of the average annual volume in July to a low of 86 percent of the average annual volume in January, with the months of March-April and October-November approximating average annual weekday traffic volumes. This is a typical pattern of the variation in monthly average weekday traffic volume.

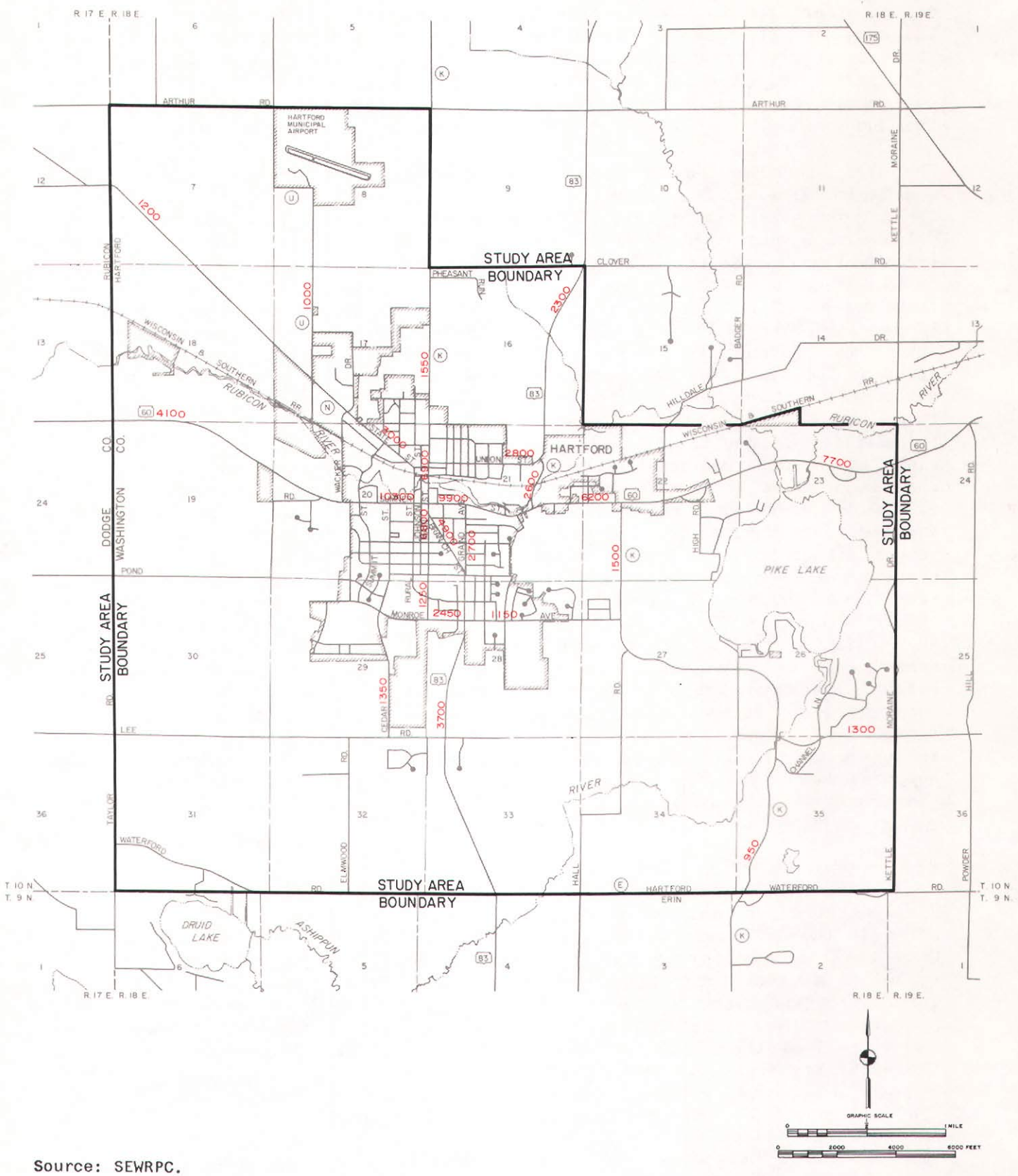
In addition to monitoring the seasonal variations in traffic on STH 60, the WisDOT also monitors the daily variation in traffic volumes to determine changes in weekday and weekend traffic flow. Daily traffic volumes normally follow a consistent pattern of change over a week, exhibiting a gradual increase from Monday through Friday and, depending upon the type of travel route, either increasing on the weekend--as is typical of a route carrying recreational traffic--or decreasing--as is typical of a route carrying commuter traffic. As shown in Figure 2, the daily variation in traffic volume exhibited on STH 60 east of CTH K reflects a typical commuter route. The daily variation in traffic volume on STH 60 exhibits a general increase during the week--starting at a low on Monday equal to the average daily volume, to a high on Friday, 9 percent greater than the average daily volume, with Saturday and Sunday traffic volumes approximately 10 percent below the average daily traffic volume. The daily variation in vehicular travel may be attributed to the increased trip-making for social-recreational, personal business, and shopping purposes which typically occur on Fridays, while the reduced weekend vehicular travel may be attributed to reduced work-oriented trip-making.

PEAK-HOUR TRAFFIC VOLUMES

Hourly traffic volumes obtained in 1980 by the WisDOT were analyzed and compared to the 1982 morning and evening peak-hour traffic counts taken by the City of Hartford to determine the existing hourly distribution of vehicular travel in the Hartford study area. As shown in Figure 3, this traffic count information indicates that hourly traffic volumes on the arterial street and highway system in the Hartford study area exhibit a general increase from a low of less than 1 percent of the average weekday 24-hour volume during the early morning hours between 12:00 a.m. and 6:00 a.m. to a high of about 9 percent of the average weekday 24-hour volume during the hours between 3:00 p.m. and 5:00 p.m. This distribution of hourly traffic volumes, as shown in Figure 3, is typical of the traffic flow pattern identified on other arterial streets and highways in the Southeastern Wisconsin Region except for the

Map 15

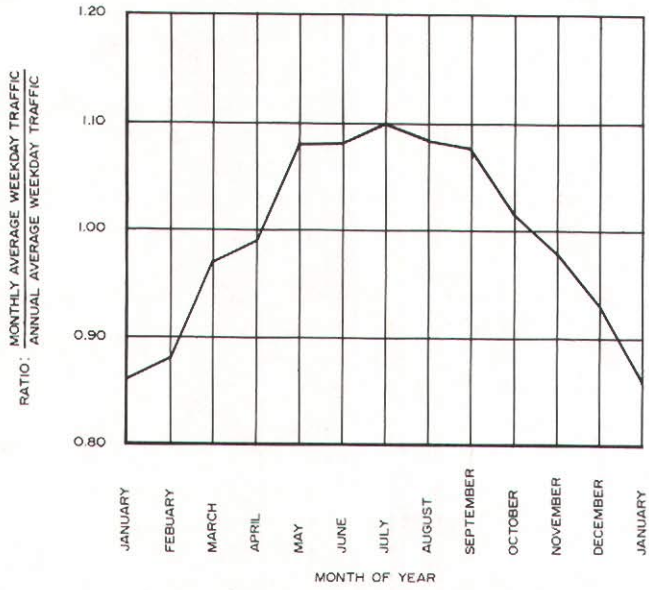
AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUME ON THE ARTERIAL AND COLLECTOR STREET SYSTEM IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: SEWRPC.

Figure 1

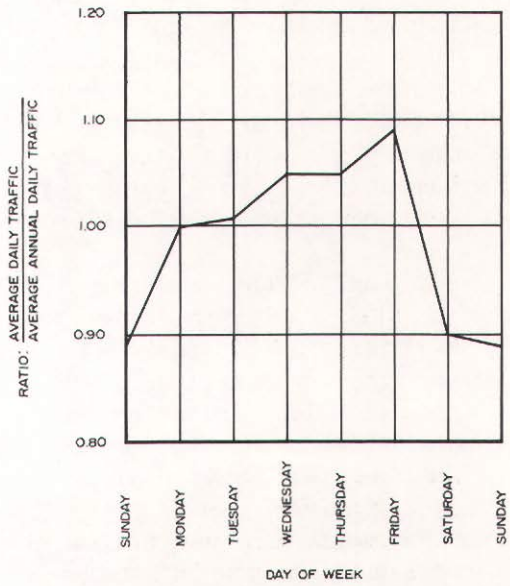
AVERAGE MONTHLY VARIATION IN WEEKDAY TRAFFIC VOLUMES IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 2

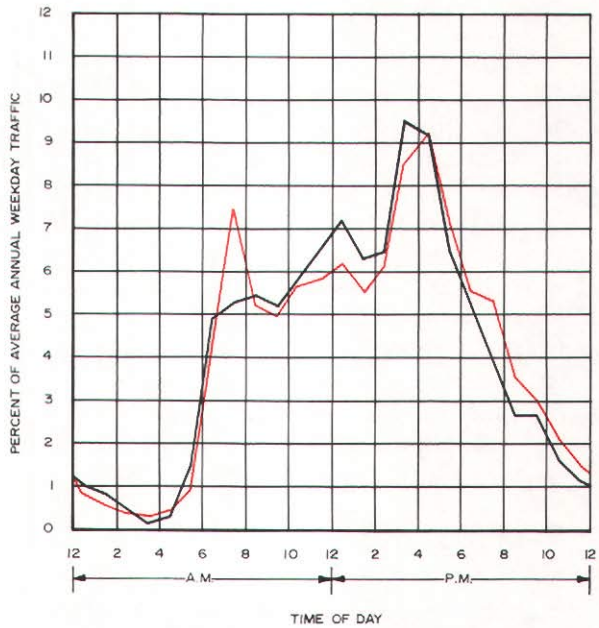
DAILY VARIATION IN ANNUAL AVERAGE WEEKDAY TRAFFIC IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 3

HOURLY VARIATION IN ANNUAL AVERAGE WEEKDAY TRAFFIC IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: Wisconsin Department of Transportation and SEWRPC.

lack of a noticeable increase in morning peak-hour traffic volumes during the 7:00 a.m. to 8:00 a.m. time period. Morning peak-hour volumes normally constitute approximately 7.5 percent of the average weekday traffic volume on the arterial streets and highways of the Southeastern Wisconsin Region, in comparison to the approximate 5.5 percent exhibited on the arterial streets and highways in the Hartford study area. An analysis of Table 2 indicates that this variance in the distribution of hourly traffic volumes may be attributed to the fact that the Hartford Memorial Hospital and all of the major employers identified in the study area have the majority of their employees, approximately 64 percent, report to work at 7:00 a.m., which serves to spread out and dampen the normal 7:00 a.m. to 8:00 a.m. morning peak-period vehicular traffic demand on the arterial streets and highways in the Hartford study area.

Similarly, the evening traffic demand on the arterial streets and highways in the study area reaches a peak of about 9.5 percent of average weekday 24-hour traffic volume during the 3:00 p.m. to 4:00 p.m. time period and remains approximately at that level during the 4:00 p.m. to 5:00 p.m. time period. This is a somewhat different pattern from the typical evening peak-hour traffic demand identified on other arterial streets and highways in the Southeastern Wisconsin Region, where the 3:00 p.m. to 4:00 p.m. traffic demand is about 8.5 percent of the average weekday 24-hour traffic volume increasing to almost 9.5 percent during the 4:00 p.m. to 5:00 p.m. time period. This variance in the distribution of evening peak-hour traffic volumes may also be attributed to the starting and dismissal times of the major manufacturing employers in the Hartford study area, where most employees are dismissed from their jobs at about 3:30 p.m. Therefore, the hourly traffic count data obtained by the City of Hartford indicates that instead of a one-hour evening peak travel period, there is an extended two-hour peak demand period on the arterial streets and highways in the Hartford study area. For traffic management purposes, the evening peak period is of primary concern since it is at this time that traffic demand normally approaches the capacity of the arterial facilities.

The 1982 hourly traffic volumes for the morning 7:00 a.m. to 8:00 a.m. and the evening 3:30 p.m. to 4:30 p.m. time periods at selected intersections in the City of Hartford are shown on Map 16 and in Table 10. The traffic volume for the 3:30 p.m.to 4:30 p.m. time period is shown on Map 16 and given in Table 10 as it represents the one-hour time period during the 3:00 p.m. to 5:00 p.m. peak period with the highest vehicular traffic flow as substantiated by the manual intersection counts taken by the City of Hartford. Hourly traffic count data were not obtained 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 in special cases on the major summer holiday weekends. Such weekend, recreation travel-related volumes are not normally used for system design or evaluation purposes.

VOLUME-TO-CAPACITY RATIOS

The relationship between the traffic volume on a particular segment of the arterial street and highway system to the capacity of that segment is referred to as the volume-to-capacity (V/C) ratio. This ratio is a measure of the degree

Table 10

DISTRIBUTION OF PEAK-HOUR TURN MOVEMENTS, TRUCKS AND BUSES, AND PEAK-HOUR FACTORS AT SELECTED LOCATIONS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

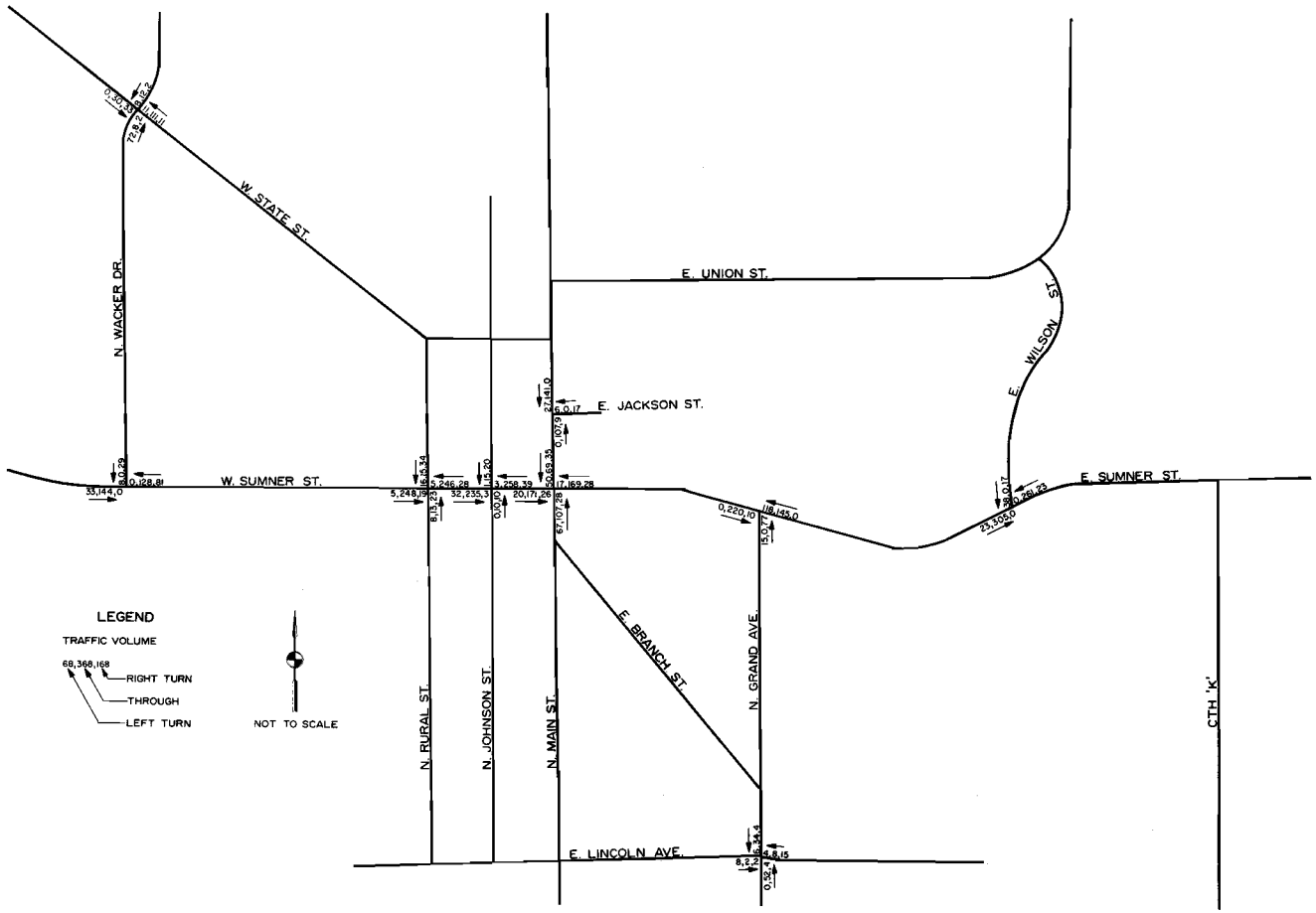
Intersection	Approach Direction	7:00 a.m. to 8:00 a.m.					3:30 p.m. to 4:30 p.m.				
		Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Peak-Hour Factor	Volume (vehicles per hour)	Turns		Percent Trucks and Buses	Peak-Hour Factor
			Percent Left	Percent Right				Percent Left	Percent Right		
STH 60 and STH 83	Southbound	164	31	21	10	0.73	405	32	19	4	0.84
	Northbound	202	33	14	3	0.54	339	34	18	1	0.77
	Westbound	214	8	13	12	0.69	411	8	17	6	0.82
	Eastbound	217	9	12	16	0.73	380	12	16	6	0.79
STH 60 and Grand Avenue	Northbound	92	16	84	13	0.92	107	21	79	4	0.81
	Westbound	263	45	--	14	0.95	593	26	--	5	0.91
	Eastbound	230	--	4	10	0.78	460	--	10	7	0.79
STH 60 and Johnson Street	Southbound	36	3	56	3	0.53	71	--	58	--	0.81
	Northbound	20	--	50	--	0.45	34	--	47	--	0.53
	Westbound	300	1	13	8	0.64	494	4	20	6	0.88
	Eastbound	270	12	1	8	0.75	492	13	6	6	0.74
STH 60 and Rural Street	Southbound	65	25	52	9	0.56	159	45	34	2	0.76
	Northbound	44	18	52	--	0.61	28	21	57	--	0.70
	Westbound	279	2	10	8	0.70	433	7	7	5	0.83
	Eastbound	272	2	7	11	0.70	490	7	7	5	0.76
STH 60 and Wacker Drive	Southbound	37	22	78	27	0.77	214	26	74	7	0.54
	Westbound	209	--	39	12	0.71	330	--	16	8	0.82
	Eastbound	177	19	--	10	0.67	236	10	--	15	0.89
STH 60 and Wilson Avenue	Southbound	55	69	31	9	0.69	112	48	52	4	0.68
	Westbound	284	--	8	6	0.83	576	--	10	6	0.83
	Eastbound	328	7	--	5	0.84	544	11	--	4	0.84
STH 83 and Jackson Street	Southbound	168	16	--	6	0.81	387	15	--	2	0.85
	Northbound	116	--	8	6	0.60	331	--	20	4	0.83
	Westbound	23	26	74	22	0.48	160	38	62	2	0.83
State Street and Wacker Drive	Southbound	22	36	9	32	0.69	52	46	8	4	0.65
	Northbound	82	88	2	8	0.44	62	52	24	10	0.70
	Northwest-bound	133	8	8	4	0.48	115	14	15	4	0.78
	Southeast-bound	63	--	52	11	0.58	233	2	47	4	0.41
Grand Avenue and Lincoln Avenue	Southbound	44	14	9	4	0.50	104	17	7	1	0.72
	Northbound	56	--	7	--	0.78	87	8	4	1	0.78
	Westbound	27	15	56	7	0.56	82	13	68	5	0.68
	Eastbound	12	67	16	8	0.60	15	13	33	33	0.62

Source: SEWRPC.

Map 16

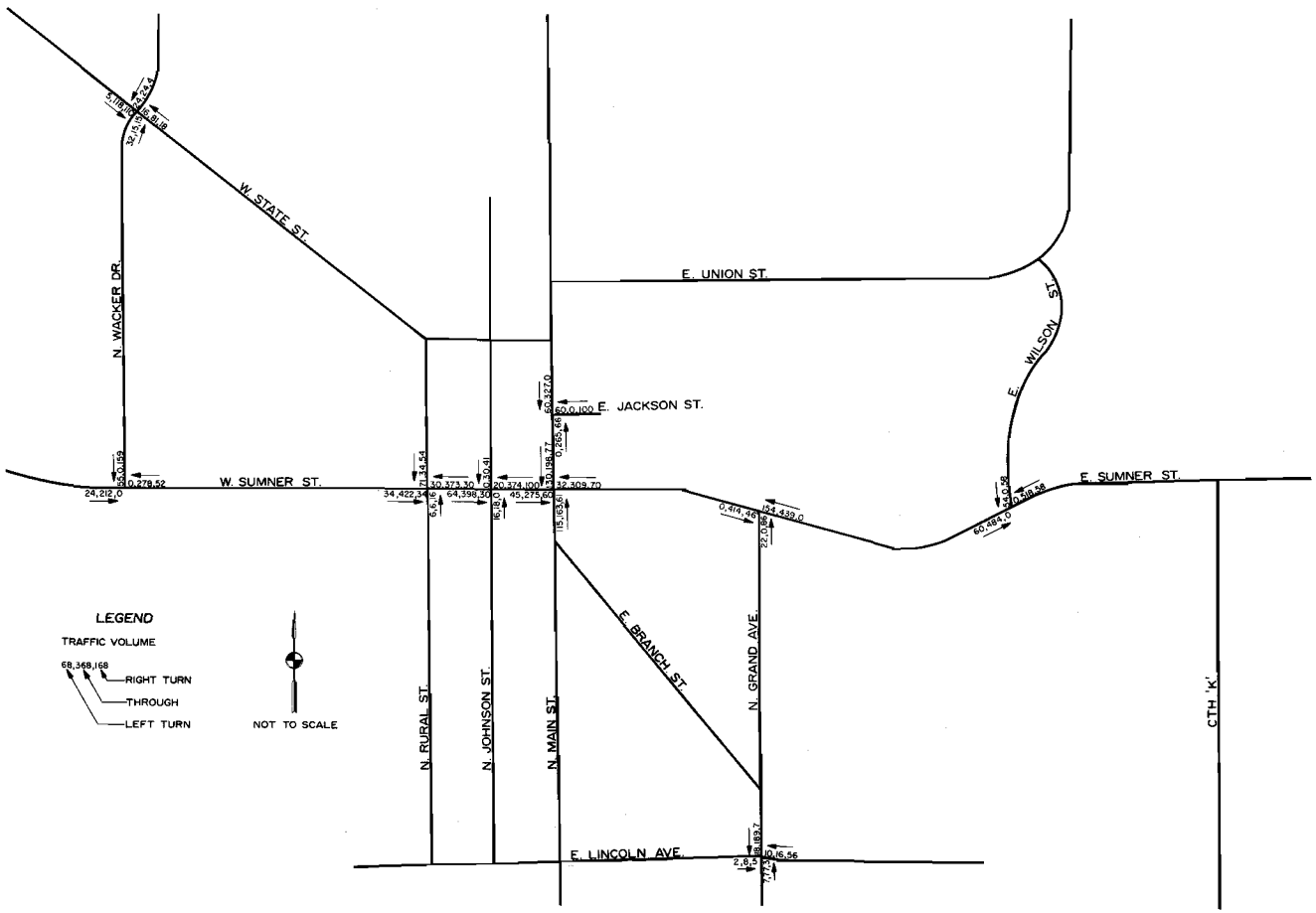
PEAK-HOUR TRAFFIC VOLUMES AT SELECTED LOCATIONS ON THE STREET AND HIGHWAY SYSTEM IN THE CITY OF HARTFORD: 1982

7:00 A.M. TO 8:00 A.M.



Map 16 (continued)

3:30 P.M. TO 4:30 P.M.



Source: City of Hartford and SEWRPC.

of traffic congestion on an arterial facility. When determined for the entire arterial system, this relationship 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 in the Hartford 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 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 Hartford study area. Table 10 indicates the peak-hour distribution of right- and left-turning vehicles and the percentage of trucks and buses in the traffic stream at two signalized and at seven nonsignalized arterial intersections in the City of Hartford. 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 two signalized intersections and seven nonsignalized intersections listed in Table 10. 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 10 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 found in the Hartford area, as indicated in Table 10 ranged from a low of 0.44 to a high of 0.95, with an average 7:00 a.m. to 8:00 a.m. peak-hour factor of 0.66 and an average 3:30 p.m. to 4:30 p.m. peak-hour factor of 0.75. This difference between the morning and evening average peak-hour factors is typical of urban traffic and reflects the increased evening traffic volumes resulting from the coincidence of work-to-home trips with other social, recreational, medical/dental, and shopping

[1]Transportation Research Board Special Report No. 87, Highway Capacity Manual--1965, National Academy of Sciences, National Research Council, Washington, D.C.

trips which normally are not made during the morning peak-hour period. A peak-hour factor of 0.75 was assumed for all other arterial intersections in the study area.

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 "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 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.

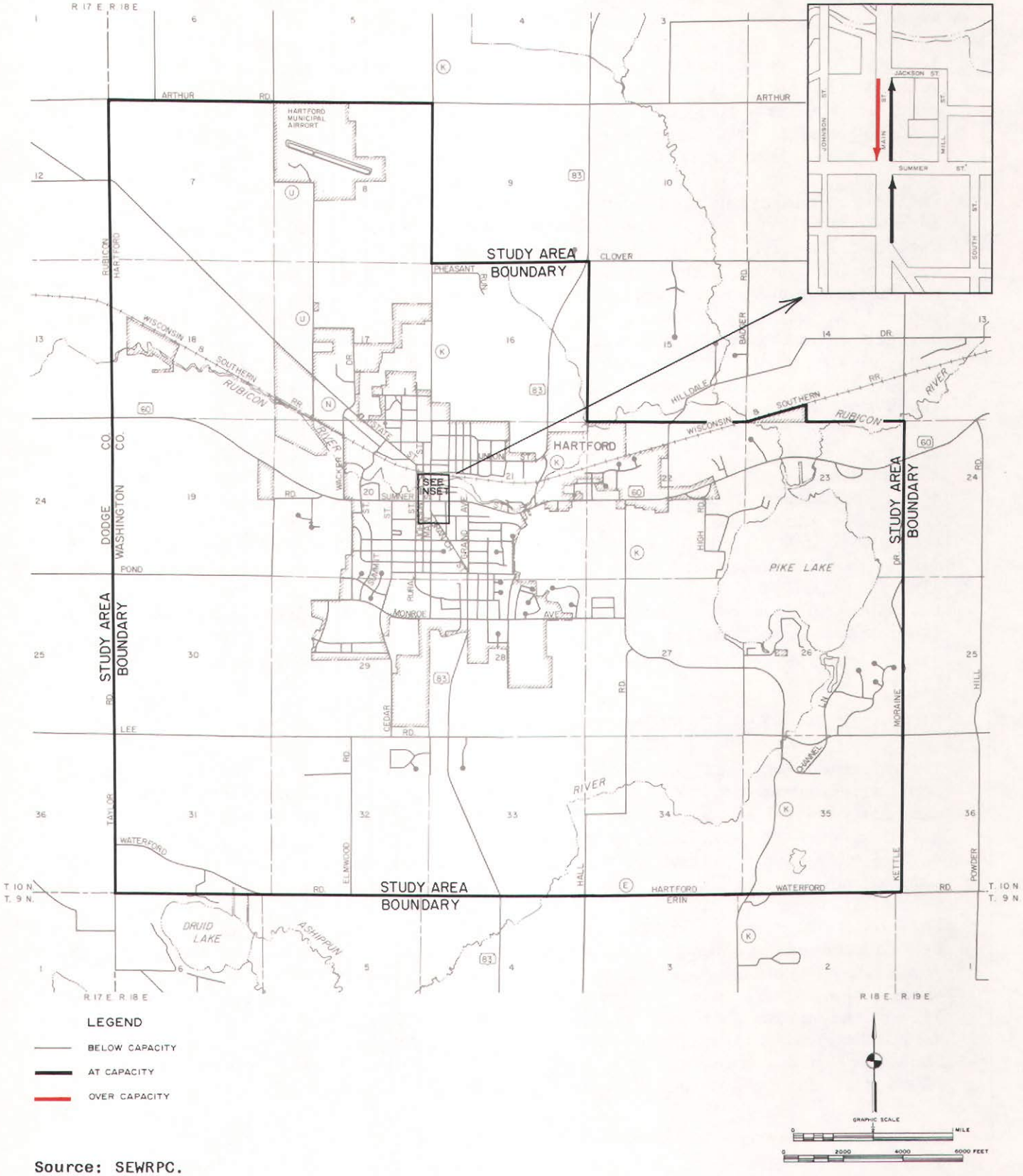
As shown on Map 17, STH 83 (Main Street) is the only arterial street in the Hartford study area currently operating at or over design capacity; the northbound approaches of STH 83 at its intersection with STH 60 (Sumner Street) and E. Jackson Street are both operating at design capacity levels and the southbound approach of STH 83 at STH 60 is currently operating over design capacity levels. A detailed examination of the northbound and southbound approaches of STH 83 to STH 60 indicates that the exclusive left-turn lanes are operating below design capacity and that the single combined through and right-turn lanes on the northbound and southbound approaches are operating at and over design capacity, respectively.

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 11 indicates the load factors for each roadway approach to the two signalized intersections in the study area during the morning and evening peak hours. As indicated in the table, almost all of the approaches to the signalized intersections are operating with a load factor of zero. Only one intersection approach in the study area exceeds a load factor of 0.30: the northbound approach of STH 83 (Main Street) at STH 60 (Sumner Street) has a load factor of 0.38 from 3:30 p.m. to 4:30 p.m.

Map 17

ARTERIAL AND COLLECTOR STREETS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA OPERATING BELOW, AT, AND OVER DESIGN CAPACITY: 1982



LEGEND

- BELOW CAPACITY
- AT CAPACITY
- OVER CAPACITY

GRAPHIC SCALE
0 1 MILE
0 2000 4000 6000 FEET

Source: SEWRPC.

Table 11

VEHICLE DELAY AND LOAD FACTORS AT THE SIGNALIZED INTERSECTIONS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Intersection	Approach Direction	7:00 a.m. to 8:00 a.m.			3:30 p.m. to 4:30 p.m.		
		Average Delay per Approach (seconds per vehicle)	Percent Vehicles Stopped	Load Factor	Average Delay per Approach (seconds per vehicle)	Percent Vehicles Stopped	Load Factor
STH 60 and STH 83	Southbound	11.9	62	--	12.2	58	0.25
	Northbound	15.0	93	--	19.2	81	0.38
	Westbound	13.4	67	--	19.5	83	0.12
	Eastbound	11.4	66	--	18.0	74	0.12
STH 83 and Jackson Street	Southbound	4.0	33	--	3.7	39	--
	Northbound	9.5	50	--	10.4	64	--
	Westbound	15.0	80	--	13.0	70	--

Source: City of Hartford and SEWRPC.

ARTERIAL SYSTEM OPERATING SPEEDS

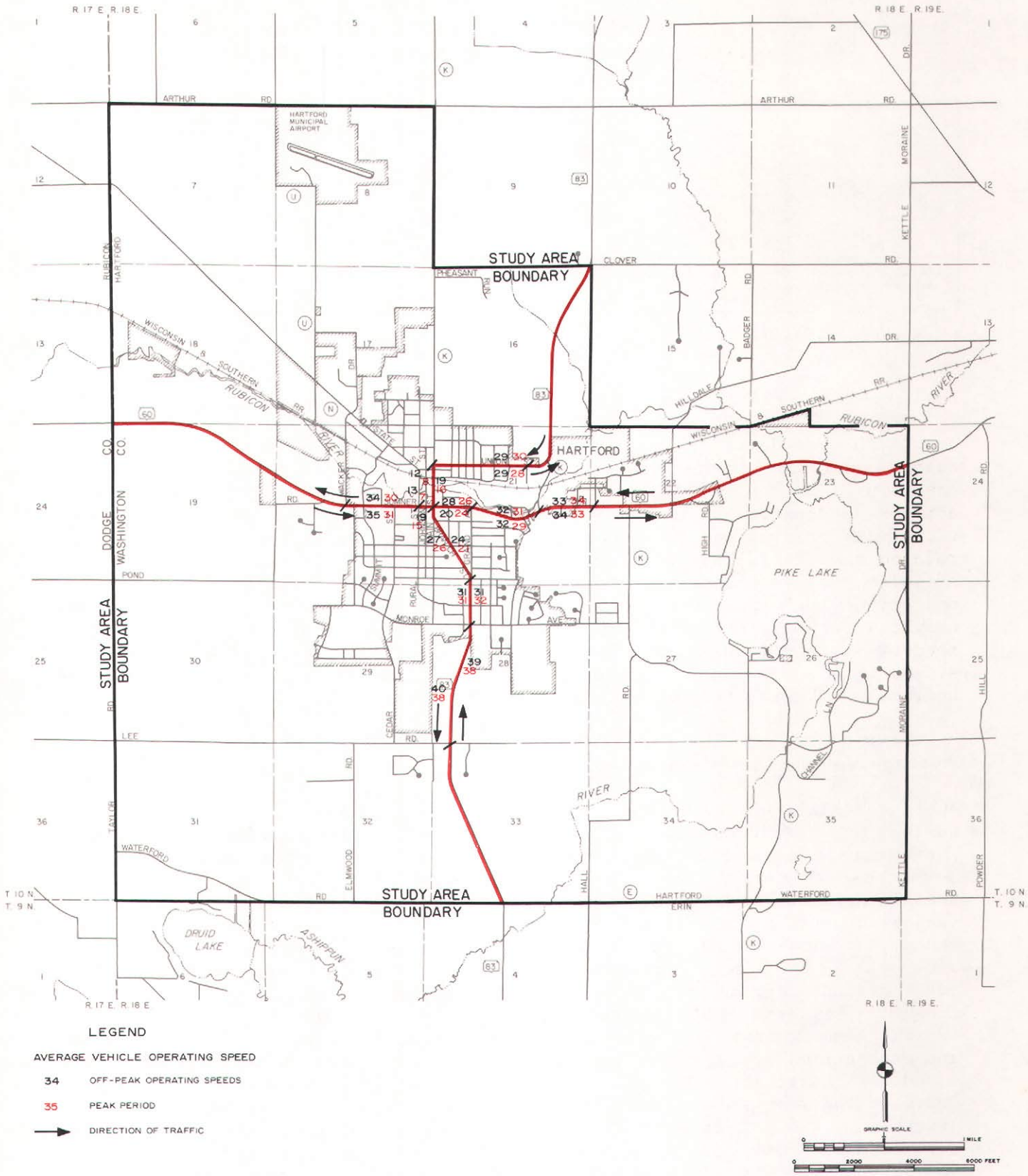
Travel time and delay information on an arterial street system are useful indicators of arterial system operating efficiency. Intersection delay information can be used to identify traffic congestion and the need for traffic management actions to improve arterial intersection operations. In addition 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 facility concerned warrants consideration for the application of traffic management actions to produce a more uniform speed consistent with posted speeds.

Average Vehicle Operating Speeds

Average vehicle operating speeds were measured during both off-peak and peak periods of traffic demand on STH 60 and STH 83 in the Hartford study area. 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 60 and STH 83 were divided into five segments, as shown on Map 18. Over a period of several weeks in the month of June 1982, five travel time runs were made in each direction on these arterials during off-peak periods of traffic demand between 9:00 a.m. and 3:00 p.m. and six runs were made in each direction during afternoon peak periods of traffic demand from 3:00 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 12, the average travel time on STH 60 from Wacker Drive on the west side of the study area to Sell Drive on the east side of the study area, a distance of 1.53 miles, was approximately 3.2 minutes in either direction of travel during off-peak traffic demand periods, and increased to approximately 3.7 minutes traveling eastbound and 3.4 minutes traveling west-

Map 18

AVERAGE OFF-PEAK AND PEAK PERIOD VEHICLE OPERATING SPEEDS ON STH 60 AND STH 83 IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: City of Hartford and SEWRPC.

Table 12

AVERAGE OFF-PEAK-HOUR AND PEAK-HOUR WEEKDAY TRAVEL TIMES AND OPERATING SPEEDS ON STH 60 AND STH 83 IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

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 60 Eastbound	Wacker Drive - Rural Street.....	0.47	30-25	0.84	34	0.93	30
	Rural Street - Main Street.....	0.11	25	0.52	13	0.89	7
	Main Street - Grand Avenue.....	0.25	25	0.53	28	0.57	26
	Grand Avenue - Wilson Avenue....	0.45	30	0.83	32	0.86	31
	Wilson Avenue - Sell Drive.....	0.25	30	0.45	33	0.44	34
	Total	1.53	--	3.17	29	3.69	25
STH 60 Westbound	Sell Drive - Wilson Avenue.....	0.25	30	0.44	34	0.46	33
	Wilson Avenue - Grand Avenue....	0.45	30	0.85	32	0.94	29
	Grand Avenue - Main Street.....	0.25	25	0.77	20	0.63	24
	Main Street - Rural Street.....	0.11	25	0.35	19	0.45	15
	Rural Street - Wacker Drive.....	0.47	25-30	0.80	35	0.92	31
	Total	1.53	--	3.21	28	3.40	27
STH 83 Northbound	Lee Road - Monroe Avenue.....	0.77	45	1.19	39	1.23	38
	Monroe Avenue - Branch Street...	0.31	30	0.61	31	0.57	32
	Grand Avenue - Sumner Street....	0.52	25	1.31	24	1.50	21
	Sumner Street - Union Street....	0.25	25	0.81	19	0.93	16
	Main Street - Eighth Street.....	0.59	25-30	1.21	29	1.25	28
	Total	2.44	--	5.13	28	5.48	27
STH 83 Southbound	Eighth Street - Main Street.....	0.59	30-25	1.22	29	1.17	30
	Union Street - Sumner Street....	0.25	25	1.24	12	1.92	8
	Sumner Street - Grand Avenue....	0.52	25	1.14	27	1.18	26
	Branch Street - Monroe Avenue...	0.31	30	0.61	31	0.60	31
	Monroe Avenue - Lee Road.....	0.77	45	1.17	40	1.22	38
	Total	2.44	--	5.96	25	6.09	24

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

Source: City of Hartford and SEWRPC.

bound during the evening peak-hour traffic demand period. This results in an average vehicle travel speed during the off-peak period of between 28 and 29 miles per hour (mph) in the eastbound and westbound directions, as compared to evening peak-hour speeds of 25 mph in the eastbound direction and 27 mph in the westbound direction.

As STH 60 enters the central business district (CBD) of the City of Hartford, average vehicle operating speeds in the eastbound direction are reduced to approximately 13 mph during the off-peak periods and 7 mph during the evening peak hour. A similar reduction in operating speed is exhibited in the westbound direction as off-peak-period speeds are reduced to 19 mph and evening peak-hour speeds are reduced to 15 mph. 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 83. Travel times on STH 83 during off-peak travel demand periods average about 5.13 and 5.96 minutes in the northbound and southbound directions, respectively, from Lee Road to Eighth Street, a distance of 2.44 miles. The peak-hour travel times increased to 5.5 minutes in the northbound direction and 6.09 minutes in the southbound direction for the same 2.44-mile segment of STH 83. Vehicle operating speeds thus averaged 28 and

25 mph in the northbound and southbound directions, respectively, during off-peak periods and about 27 mph in the northbound direction and 24 mph in the southbound direction during the evening peak-hour period. STH 83 traffic also experienced reduced average vehicle operating speeds as it enters the Hartford CBD area with speeds averaging 19 and 12 mph in the northbound and southbound directions, respectively, during the off-peak periods, and a further reduction to 16 and 8 mph, respectively, during the evening peak-hour period.

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 two signalized intersections in the study area for the 7:00 a.m. to 8:00 a.m. and 3:30 p.m. to 4:30 p.m. time periods. As shown in Table 11, the average delay per vehicle approaching these intersections during these time periods ranged from a low of four seconds between 7:00 a.m. and 8:00 a.m. for vehicles southbound on STH 83 at the intersection with Jackson Street, to a high of 19.5 seconds between 3:30 p.m. and 4:30 p.m. for vehicles westbound on STH 60 at the intersection with STH 83. Of the seven approaches to the two signalized intersections in the study area, five exhibited an average delay of 15 seconds or less per vehicle during the 7:00 a.m. to 8:00 a.m. peak hour and four approaches exhibited an average delay of 15 seconds or less per vehicle during the 3:30 p.m. to 4:30 p.m. peak hour. The average delay per vehicle for all intersection approaches was 14.4 seconds and 13.7 seconds during the morning and evening peak hours, respectively. These data are corroborated by the hourly traffic count information, shown in Figure 2, which indicates the 3:30 p.m. to 4:30 p.m. peak-hour volumes to be higher than the 7:00 a.m. to 8:00 a.m. peak-hour volumes.

The percent of vehicles stopped during the peak hour at each approach to the two signalized intersections in the Hartford study area ranged from a low of 33 percent between 7:00 a.m. and 8:00 a.m. for the southbound approach of STH 83 at its intersection with Jackson Street to a high of 93 percent between 7:00 a.m. and 8:00 a.m. for the northbound approach of STH 83 at its intersection with STH 60 (see Table 11). For the peak hour at both signalized intersections, an average of approximately 64 percent of all vehicles were stopped during the morning peak period and 67 percent 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 60 percent of the time.

TRAFFIC PATTERNS

In order to properly analyze vehicular traffic conditions in the study area, it is essential to determine the type and pattern of traffic entering and passing through the study area. This is of particular concern in the City of

Hartford, which is a relatively small, urban center located in an as yet largely rural area, and which is located approximately 30 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 current trip purposes in the study area. As indicated in Table 13, an estimated 40,400 person trips were made on an average weekday in 1982 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 home-based 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 estimated person trips made in the study area on an average weekday in 1982, approximately 29 percent were classified as home-based work, a proportion about 4 percent higher than that for Washington County as a whole, and about 6 percent higher than that for the Region as a whole; 13 percent as home-based shopping trips, compared to 14 percent for Washington County and 15 percent for the Region; and 10 percent as school trips, compared to 11 percent for Washington County and 9 percent for the Region. Another 48 percent of the trips were classified as home-based other and nonhome-based trips, compared to an average of 49 percent for Washington County and 52 percent for the Region as a whole. The comparisons to the Washington County and regional trip purpose percentages indicate that the study area experiences a lower percentage of shopping trips and trips which do not originate at home, but which are made after the initial trip from home has been completed. This comparison also indicates that the study area experiences a higher percentage of school trips than that made in Washington County or the Region as a whole.

Table 13

DISTRIBUTION OF TOTAL PERSON TRIPS WITHIN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA ON AN AVERAGE WEEKDAY: 1982

Trip Purpose	Person Trips	Percent of Total	Percent	
			Washington County	Region
Home-Based Work.....	11,700	29.0	25.3	23.7
Home-Based Shopping...	5,300	13.1	14.3	15.1
Home-Based Other.....	15,600	38.6	37.5	34.3
Nonhome-Based.....	3,700	9.2	11.4	17.5
School.....	4,100	10.2	11.0	9.4
Total	40,400	100.0	100.0	100.0

Source: SEWRPC.

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 14, a total of 31,600 vehicle trips were made in the study area on an average weekday in 1982. Of this total, approximately 15,400, or 49 percent, were internal trips; 13,200, or 42 percent, were internal/external trips; and the remaining 3,000, or 9 percent, were through trips. Therefore, about 91 percent of the vehicular traffic using the arterial street and highway system in the study area on an average weekday in 1982 either originated within or were destined for the study area.

Figure 4 indicates the pattern of movement within the study area as derived from the Commission's 1972 origin-destination survey data. About 14,600, or 95 percent of the total 15,400 internal vehicle trips made within the study area on an average weekday in 1982, are shown in Figure 4. Of this total, 5,200 vehicle trips, about 34 percent of the total of 15,400 vehicle trips, passed through the CBD area in a north-south direction. An additional 8 percent, or 1,300 vehicles, passed through the CBD area in an east-west direction.

Figure 5 indicates the pattern of movement of about 12,900, or 98 percent, of the total 13,200 internal/external trips made in the study area on an average weekday in 1982. Of this total, 5,500 vehicle trips, or about 42 percent, entered or exited the east side of the study area on STH 60. About 2,150 trips, or about 39 percent of the 5,500 trips, ended within the Hartford CBD or in areas to the west of that district. Another 2,200 vehicle trips, or about 17 percent of the total trips, entered or exited the south side of the study area on STH 83. About 500 of these vehicle trips, or about 23 percent, ended in the Hartford CBD or in areas to the north of that district. Of the 1,300 vehicle trips which entered or exited the north side of the study area, about 1,100 trips, or 85 percent, ended in the Hartford CBD or in areas to the south of that district. Of the 2,600 vehicle trips which entered or exited the west side of the study area, about 1,200 trips, or 46 percent, ended in the Hartford CBD or in areas to the east of that district.

Table 14

DISTRIBUTION OF TOTAL VEHICLE TRIPS OCCURRING IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA ON AN AVERAGE WEEKDAY: 1982

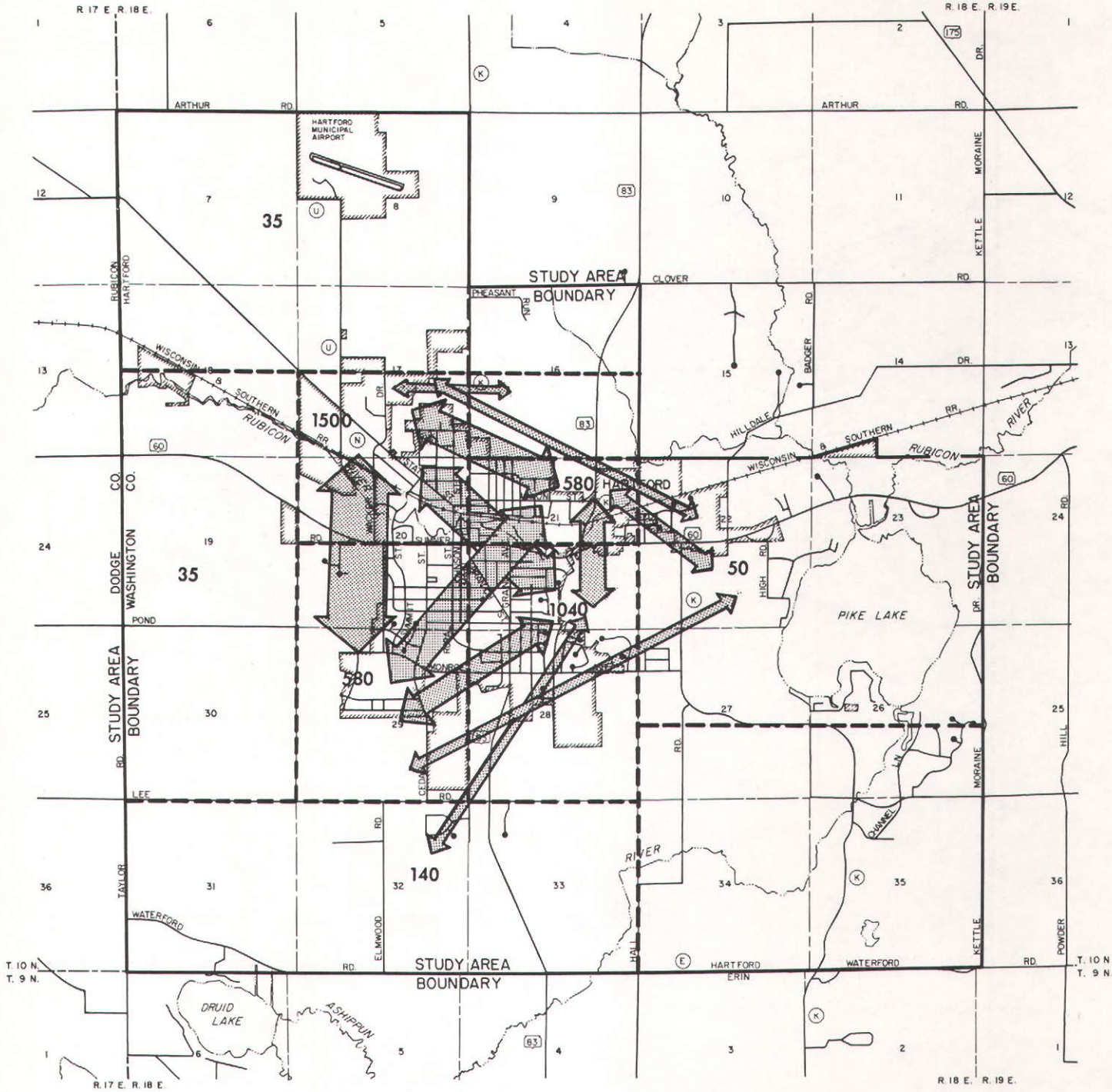
Trip Type	1982	
	Vehicle Trips	Percent of Total
Internal.....	15,400	48.7
Internal/External...	13,200	41.8
Through.....	3,000	9.5
Total	31,600	100.0

Source: SEWRPC.

Figure 6 indicates the pattern of movement of about 1,100, or 92 percent, of the total 3,000 vehicle trips made through the study area on an average weekday in 1982. As indicated in the figure, the major vehicular through trip pattern across the study area was from STH 60 west of the study area to STH 60 east of the study area. Of the 4,100 vehicles on STH 60 crossing the western boundary of the study area, 1,700 vehicles, or about 42 percent, did not stop in the study area, but originated and were destined for areas east of the study area. Of the 3,500

Figure 4

MAJOR AVERAGE WEEKDAY INTERNAL TRIP INTERCHANGES IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

- TRAFFIC ANALYSIS ZONE BOUNDARY
- 500 INTRAZONAL TRIPS

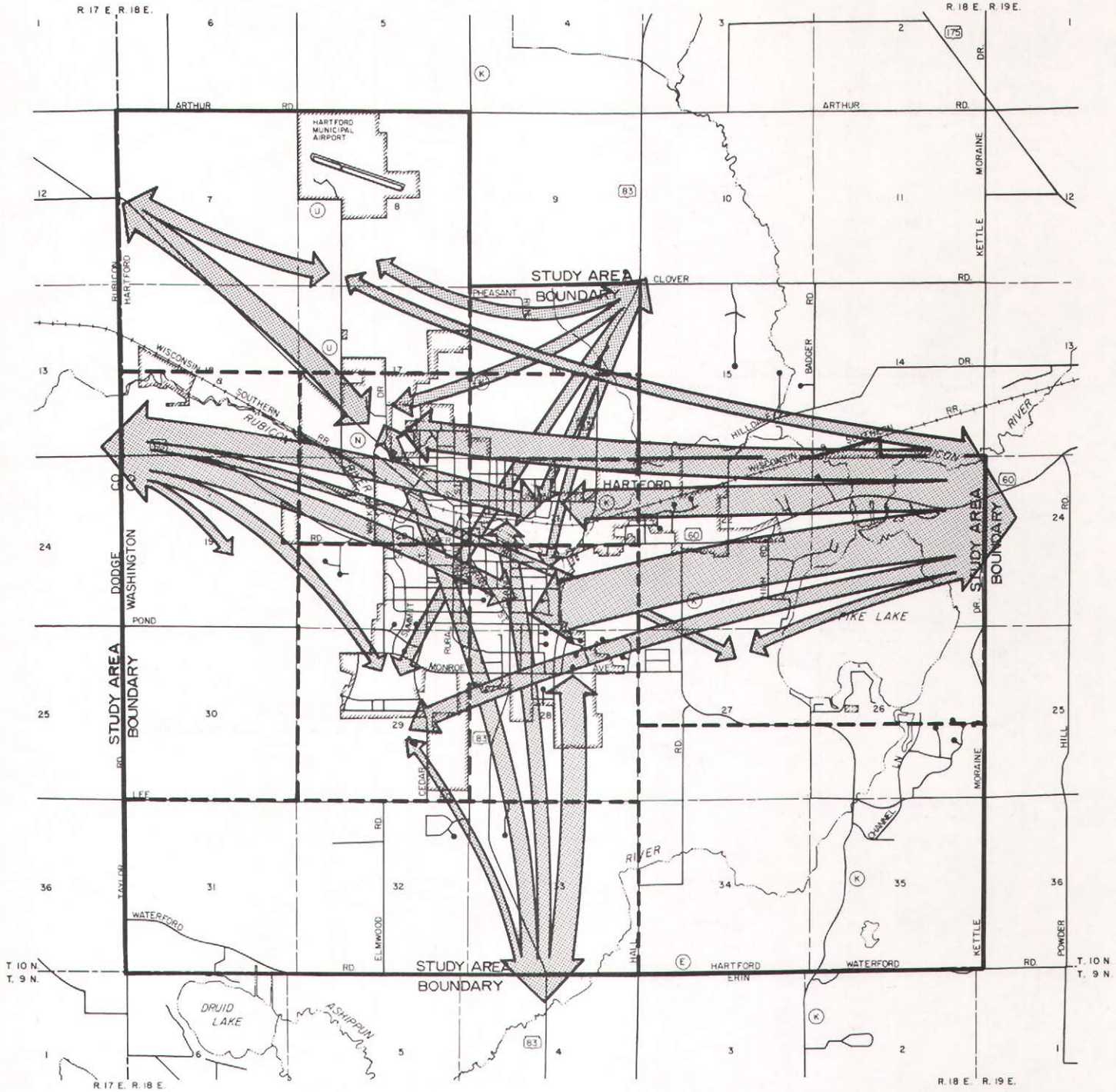
VEHICLE TRIPS

1000
2000
3000
4000

Source: SEWRPC.

Figure 5

MAJOR AVERAGE WEEKDAY INTERNAL/EXTERNAL TRIP INTERCHANGES IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

TRAFFIC ANALYSIS ZONE BOUNDARY

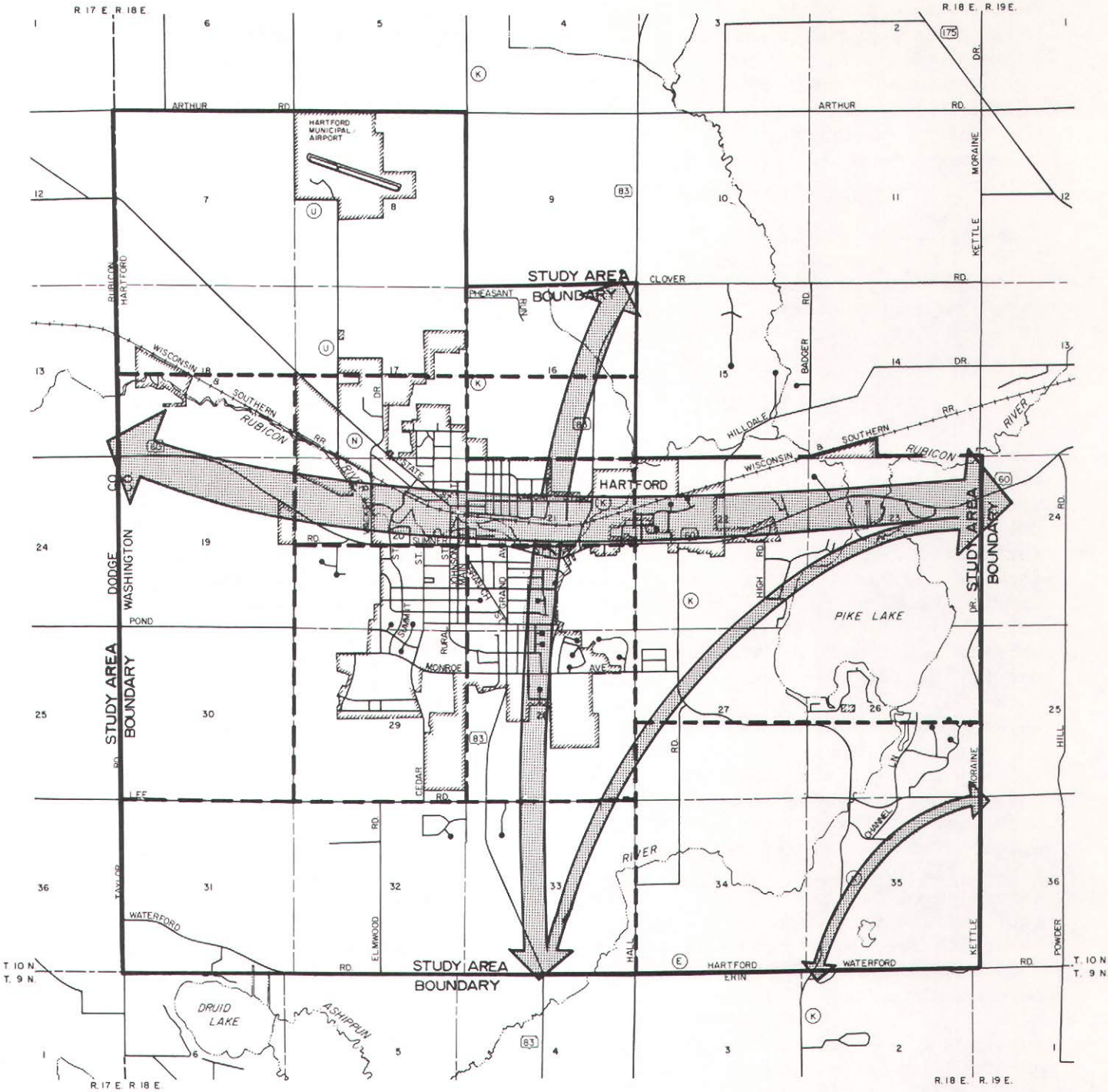
VEHICLE TRIPS

1000
2000
3000
4000

Source: SEWRPC.

Figure 6

MAJOR AVERAGE WEEKDAY THROUGH TRIP INTERCHANGES IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

TRAFFIC ANALYSIS ZONE BOUNDARY

VEHICLE TRIPS

1000
2000
3000
4000

Source: SEWRPC.

vehicles on STH 83 crossing the southern boundary of the study area, 1,100 vehicles, or about 31 percent, did not stay in the study area. Approximately 900 of these through trips, or 82 percent, used STH 83 at the northern boundary of the study area, with the remaining 200 through trips, or 18 percent, using STH 60 at the eastern boundary of the study area. Figure 6 also indicates that of the 2,000 vehicle through trips which used STH 60 on an average weekday at the eastern boundary of the study area, 1,800 vehicles, or about 90 percent, traversed the study area in an east-west direction and also used STH 60 at the western boundary of the study area.

Thus, approximately 6,500, or 42 percent, of the 15,400 internal vehicle trips; 4,950, or 38 percent, of the 13,200 internal/external vehicle trips; and 1,600, or 87 percent, of the 3,000 vehicle through trips--14,050 vehicle trips, or 44 percent of the total of 31,600 vehicle trips made within the study area on an average weekday in 1982--entered or passed through the Hartford CBD.

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 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 nine off-street public parking lots in or adjacent to the Hartford central business district in order to determine the adequacy of the public parking facilities. The parking survey was conducted by City of Hartford personnel between the hours of 9:00 a.m. and 12:00 p.m. and 1:00 p.m. and 5:00 p.m. on Thursday, June 3, 1982. The time period chosen for the survey was based on the findings of a parking study conducted by the Wisconsin Department of Local Affairs and Development during 1976, wherein the period from 9:00 a.m. to 3:30 p.m. on a Thursday was found to represent the period of high weekday utilization of public parking facilities in the Hartford CBD. The parking survey time period was extended from 3:30 p.m. to

5:00 p.m. to identify any changes in parking demand that may have coincided with the evening peak-hour traffic volume time period which was previously identified as occurring between the hours of 3:00 p.m. and 5:00 p.m.

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 15, the public parking occupancy rates averaged 58 percent for the on-street facilities and 52 percent for the nine off-street lots. The parking occupancy rates ranged from 38 percent to 89 percent along Main Street, from 23 percent to 81 percent along Sumner Street, and was surveyed at 100 percent for the two on-street stalls located on E. Jackson Street east of Main Street.

The eight public parking lots within the CBD exhibited a parking occupancy rate ranging from 7 percent at the North City Garage lot to 81 percent at the Lower Mill Street lot. The Rural Street lot--located adjacent to the western boundary of the CBD--exhibited an average occupancy rate of approximately 37 percent. Occupancy rates for total on-street and off-street parking lots appear to be slightly higher than those set forth in the Wisconsin Department of Local Affairs and Development report for 1976, with an average occupancy rate of 54 percent compared to the report's average occupancy rate of 46 percent. This indicates that utilization of public parking facilities in the CBD has increased somewhat since 1976.

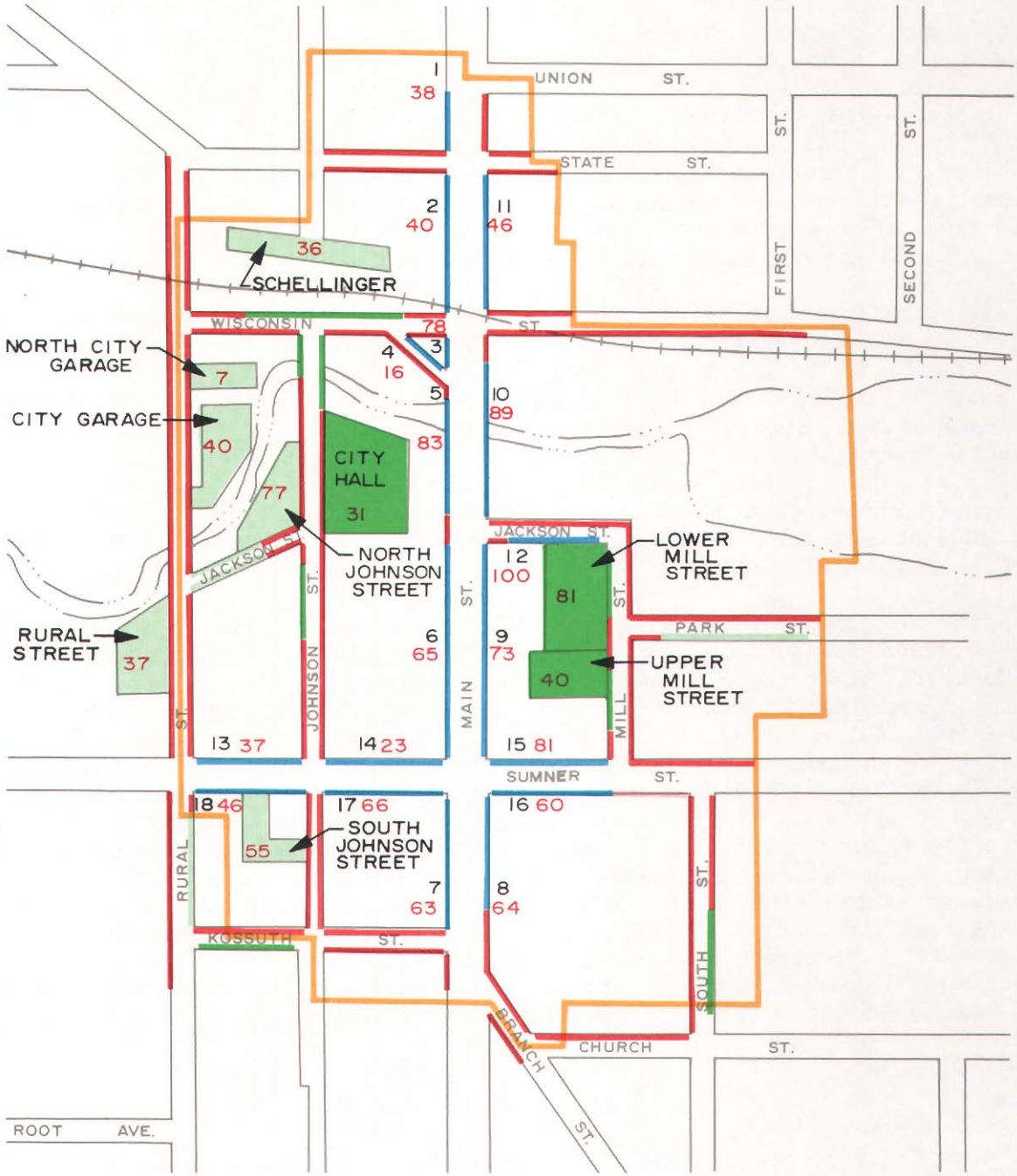
In addition to the parking stall occupancy rates, parking stall turnover rates were obtained for the on-street and off-street public parking facilities in the Hartford CBD based on a one-hour time interval. As shown on Map 20 and in Tables 16 and 17, the turnover rates for the public on-street parking facilities in the CBD averaged 3.6 vehicles per stall, and for the eight off-street public parking facilities in the CBD averaged 2.3 vehicles per stall. The Rural Street lot exhibited an average turnover rate of 0.7 vehicle 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, Sumner Street, and E. Jackson Street result in turnover rates ranging from 1.1 to 6.5 vehicles per stall. The two-hour parking restriction at the City Hall, Lower Mill Street, and Upper Mill Street lots result in turnover rates ranging from 2.1 to 5.1 vehicles per stall, compared to the unlimited parking restrictions at the other six public parking lots, which exhibit a parking turnover rate ranging from 0.4 to 1.8 vehicles per stall.

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.

Map 19

PUBLIC PARKING FACILITY OCCUPANCY RATES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982



LEGEND

- NO PARKING ANYTIME
- 10-MINUTE PARKING
- ONE HOUR PARKING
- TWO HOUR PARKING
- UNLIMITED PARKING
- 2 BLOCK FACE NUMBER
- 83 PARKING OCCUPANCY RATE (PERCENT) 9:00 A.M. TO 12:00 P.M. AND 1:00 P.M. TO 5:00 P.M.
- CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE
0 200 400 FEET

Source: SEWRPC.

Table 15

PUBLIC PARKING OCCUPANCY RATES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982

Facility	Number of Parking Stalls	Occupancy Rate (percent)							
		9:00 a.m. to 10:00 a.m.	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.	3:00 p.m. to 4:00 p.m.	4:00 p.m. to 5:00 p.m.	Average
On-Street[a]									
1	3	67	33	33	33	67	33	--	38
2	5	20	20	80	40	60	20	40	40
3	2	50	100	100	50	100	100	50	78
4	10	30	20	30	20	--	--	10	16
5	6	67	100	67	83	100	100	67	83
6	14	71	78	64	71	78	64	28	65
7	5	40	60	100	60	60	80	40	63
8	2	100	50	50	50	100	50	50	64
9	12	83	67	92	67	92	67	42	73
10	10	90	90	100	90	90	100	60	89
11	8	50	50	25	50	62	38	50	46
12	2	100	100	100	100	100	100	100	100
13	5	--	40	40	60	60	40	20	37
14	5	--	40	80	40	--	--	--	23
15	3	100	100	67	67	100	100	33	81
16	5	80	80	60	40	60	80	20	60
17	5	100	60	80	40	60	80	40	66
18	5	40	80	80	60	20	40	--	46
Subtotal	107	61[b]	64[b]	68[b]	59[b]	64[b]	58[b]	34[b]	58
Off-Street									
Lower Mill Street	60	88	95	97	80	92	70	47	81
Upper Mill Street	18	67	50	56	28	39	28	11	40
N. Johnson Street	25	84	92	92	56	88	80	48	77
S. Johnson Street	29	97	69	62	66	62	10	17	55
Rural Street	40	38	38	42	45	38	45	12	37
City Hall	50	28	32	44	36	20	38	24	31
North City Garage	6	16	16	16	--	--	--	--	7
City Garage	10	30	30	30	50	60	60	20	40
Schellinger	10	40	40	40	40	40	20	30	36
Subtotal	248	61[b]	60[b]	63[b]	52[b]	55[b]	46[b]	28[b]	52
Total	355	61[b]	61[b]	64[b]	62[b]	58[b]	50[b]	30[b]	54

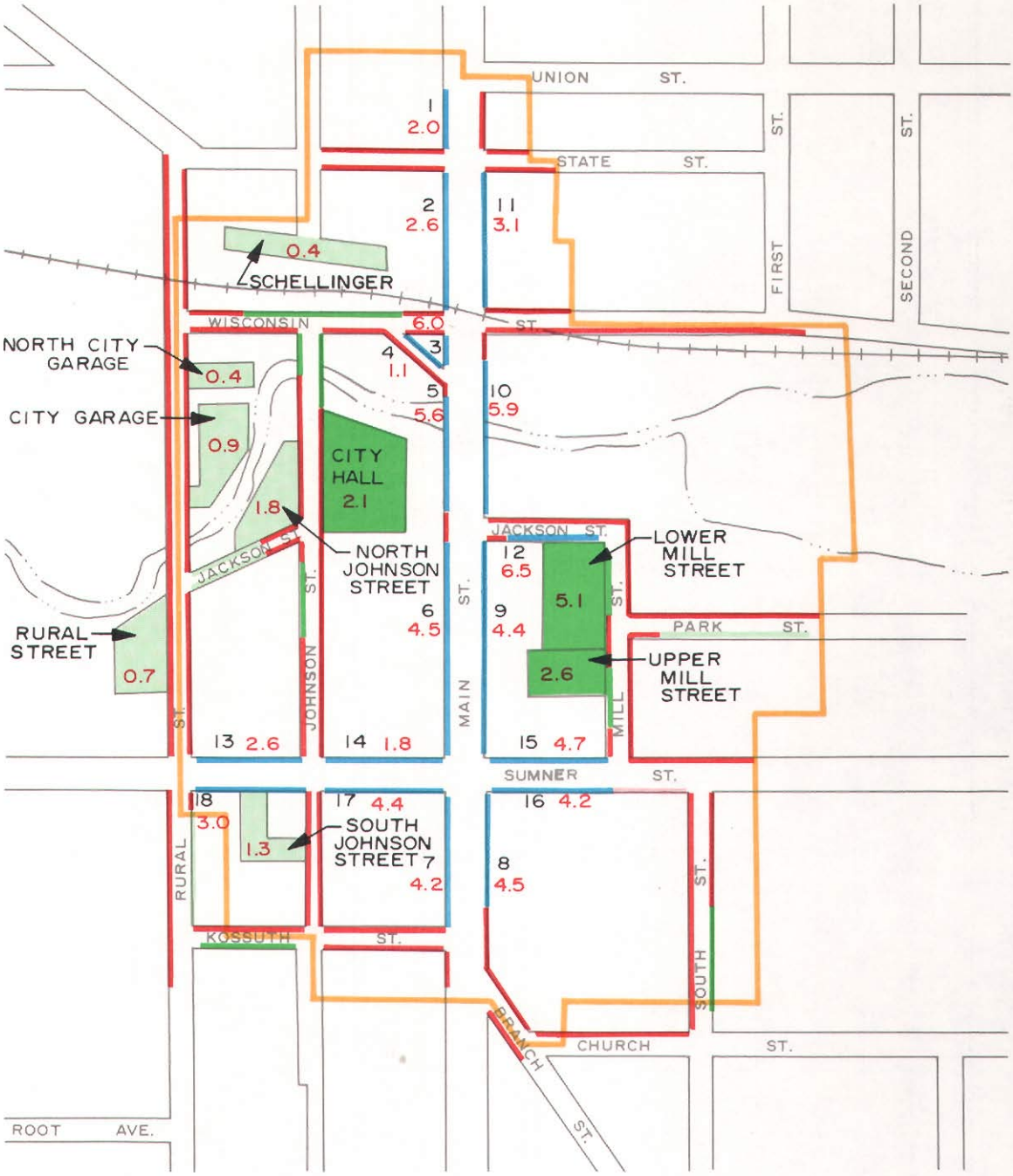
[a] On-street block face numbers are indicated on Map 19.

[b] Average.

Source: SEWRPC.

Map 20

PUBLIC PARKING FACILITY TURNOVER RATES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982



LEGEND

- NO PARKING ANYTIME
- 10-MINUTE PARKING
- ONE HOUR PARKING
- TWO HOUR PARKING
- UNLIMITED PARKING
- 2 BLOCK FACE NUMBER
- 8.1 TURNOVER RATE (VEHICLES PER STALL) (9:00 A.M. TO 12:00 P.M. AND 1:00 P.M. TO 5:00 P.M.)
- CENTRAL BUSINESS DISTRICT BOUNDARY

GRAPHIC SCALE 0 200 400 FEET

Source: SEWRPC.

Table 16

ON-STREET PUBLIC PARKING TURNOVER RATES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982

Facility (block face number)[a]	Number of Parking Stalls[b]	Turnover Rate (vehicles per stall)		
		9:00 a.m. to 12:00 p.m.	1:00 p.m. to 5:00 p.m.	Total
1	3	1.0	1.0	2.0
2	5	1.2	1.4	2.6
3	2	3.0	3.0	6.0
4	10	0.8	0.3	1.1
5	6	2.3	3.3	5.6
6	14	2.1	2.4	4.5
7	5	2.0	2.2	4.2
8	2	2.0	2.5	4.5
9	12	2.2	2.2	4.4
10	10	2.6	3.3	5.9
11	8	1.2	1.9	3.1
12	2	3.0	3.5	6.5
13	5	0.8	1.8	2.6
14	5	1.2	0.6	1.8
15	3	1.7	3.0	4.7
16	5	2.2	2.0	4.2
17	5	2.2	2.2	4.4
18	5	1.8	1.2	3.0
Total	107	1.7[c]	1.9[c]	3.6[c]

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

[b]All CBD on-street parking stalls have a one-hour time regulation.

[c]Average.

Source: SEWRPC.

Table 17

OFF-STREET PUBLIC PARKING TURNOVER RATES IN THE HARTFORD CENTRAL BUSINESS DISTRICT: 1982

Facility	Number of Parking Stalls	Parking Restrictions	Turnover Rate (vehicles per stall)		
			9:00 a.m. to 12:00 p.m.	1:00 p.m. to 5:00 p.m.	Total
Lower Mill Street...	60	2-Hour	2.4	2.7	5.1
Upper Mill Street...	18	2-Hour	1.6	1.0	2.6
N. Johnson Street...	25	None	1.2	0.6	1.8
S. Johnson Street...	29	None	1.0	0.3	1.3
Rural Street.....	40	None	0.5	0.2	0.7
City Hall.....	50	2-Hour	1.0	1.1	2.1
North City Garage...	6	None	0.2	0.0	0.4
City Garage.....	10	None	0.3	0.6	0.9
Schellinger.....	10	None	0.4	0.0	0.4
Total	248	--	1.2[a]	1.1[a]	2.3[a]

[a]Average.

Source: SEWRPC.

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 1979, 1980, and 1981. 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 232 on-street accidents in 1979, 229 on-street accidents in 1980, and 202 on-street accidents in 1981 within the study area. There were no fatal accidents during 1979, three fatal accidents during 1980, and three fatal accidents during 1981. The majority of these accidents--70 percent in 1979, 67 percent in 1980, and 54 percent in 1981-resulted in property damage only.

All locations with three or more motor vehicle accidents per year are shown on Maps 21 through 23 and in Tables 18 and 19 for the years 1979, 1980, and 1981, respectively.

There were 20 separate locations on the arterial system in 1979, 24 locations in 1980, and 16 separate locations in 1981 where three or more motor vehicle traffic accidents occurred. The highest accident location in the study area was the intersection of STH 60 (Sumner Street) and STH 83 (Main Street), with 21 accidents reported in 1979, 10 accidents reported in 1980, and eight accidents reported in 1981. The three-year average accident rate for this intersection was 2.4 accidents per million vehicles entering the intersection.

The next highest accident location in the study area during the three-year time period from 1979 to 1981 was located at the intersection of STH 60 (Sumner Street) and CTH K with 13 accidents reported in 1979, eight accidents in 1980, and four accidents reported in 1981. The three-year average accident rate for this intersection was 3.3 accidents per million vehicles entering the intersection.

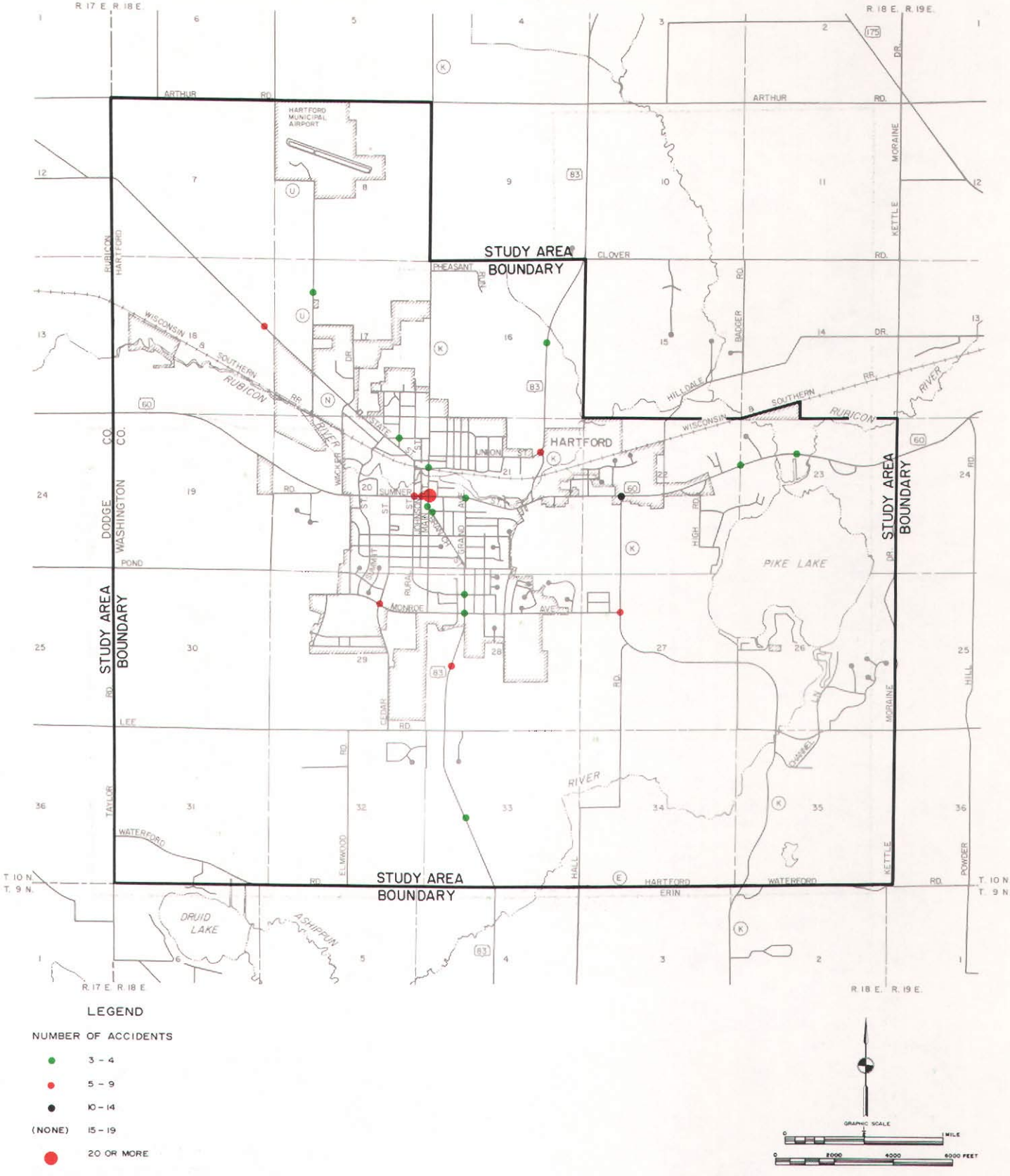
After these two high accident locations, there were four different locations in the study area with a three-year average of five accidents per year. These locations were the intersections of STH 60 (Sumner Street) with Johnson Street and Rural Street and the midblock segments of STH 83 extending from its intersection with CTH E to Lee Road and STH 60 from its intersection with the Dodge county line to Pond Road. The intersections of STH 60 with Johnson Street and Rural Street both exhibited an average accident rate of about 1.3 accidents per million vehicles entering the intersections. Accident rates for roadway segments in the study area were not calculated because of the variation in distance between individual segments. The variation in roadway segment distances yields accident rate data which are not directly comparable, particularly along segments of roadway with short distances between intersections. Collision diagrams, which indicate accident type--i.e., rear end, right angle--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 which exhibited a three-year average of three or more accidents per year are included in Appendix F.

RAILROAD TRAFFIC

A major transportation facility traversing the study area is the railway trackage over which the Wisconsin & Southern Railroad operates. As stated in Chapter II of this report, this railway trackage bisects the study area in an

Map 21

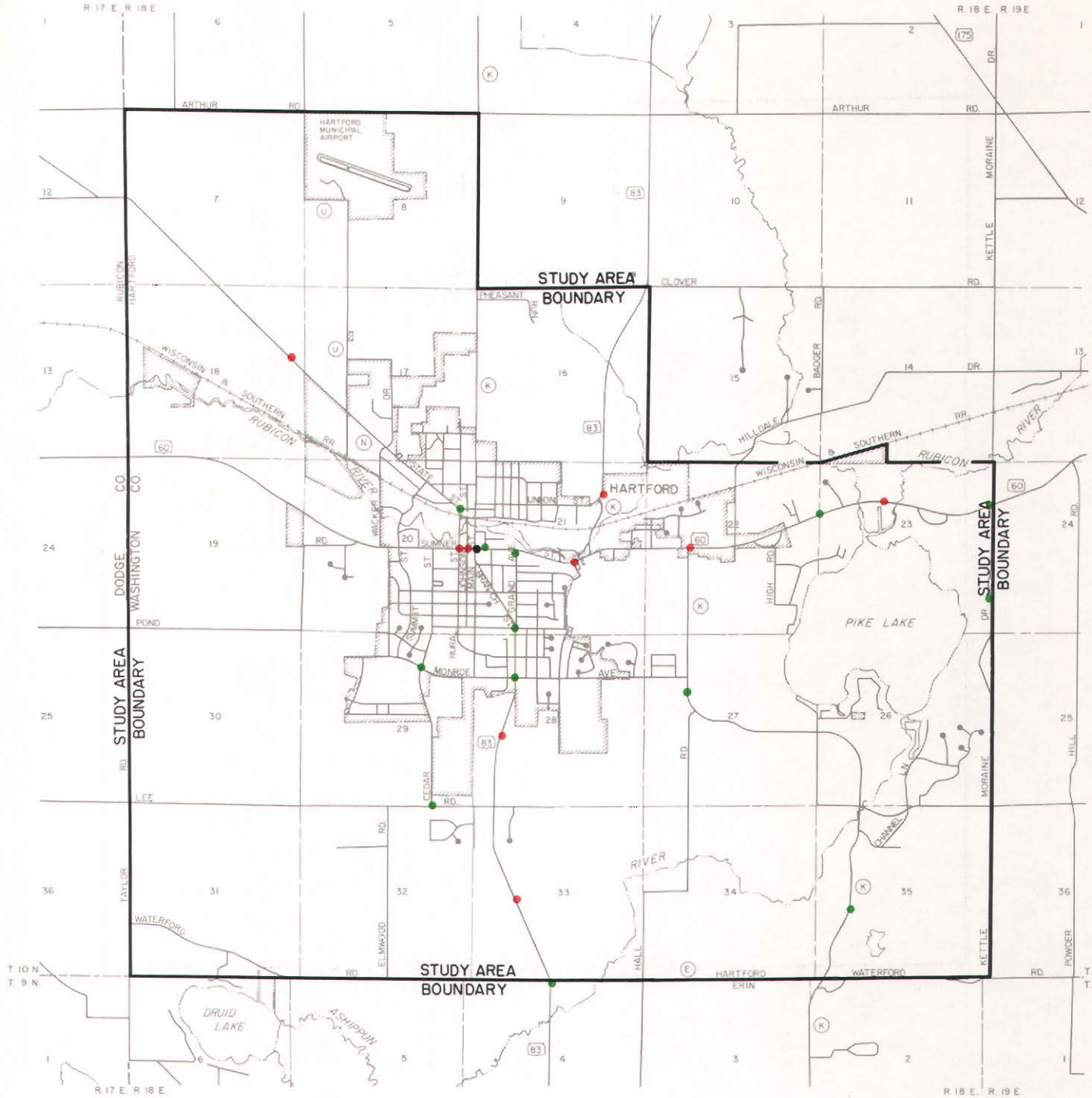
ON-STREET MOTOR VEHICLE ACCIDENT LOCATIONS WITH THREE OR MORE ACCIDENTS PER YEAR IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1979



Source: SEWRPC.

Map 22

ON-STREET MOTOR VEHICLE ACCIDENT LOCATIONS WITH THREE OR MORE ACCIDENTS PER YEAR IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1980



LEGEND

NUMBER OF ACCIDENTS

- 3 - 4
- 5 - 9
- 10 - 14

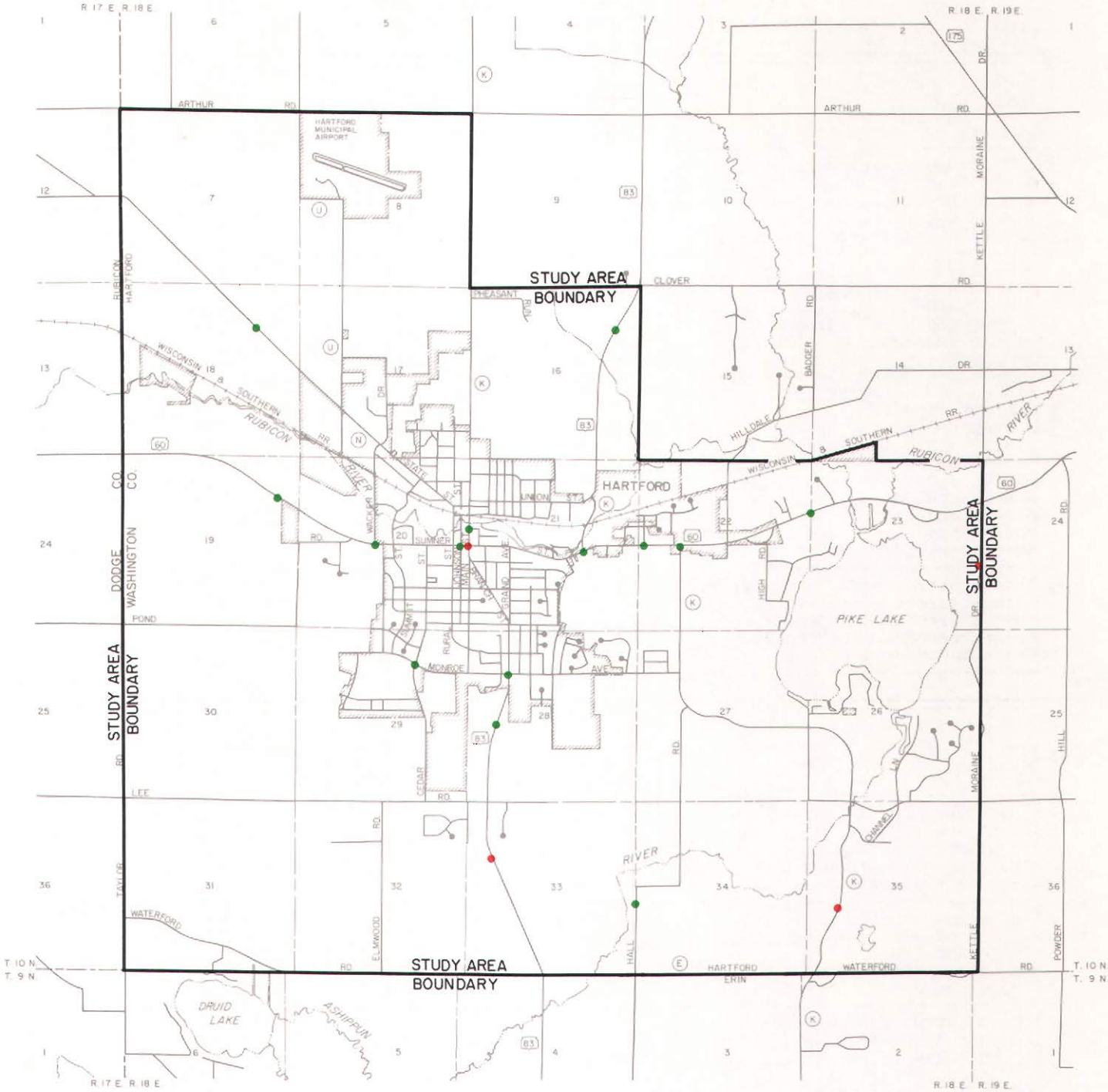
(NONE) 15 - 19

(NONE) 20 OR MORE

Source: SEWRPC.

Map 23

ON-STREET MOTOR VEHICLE ACCIDENT LOCATIONS WITH THREE OR MORE ACCIDENTS PER YEAR IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1981



Source: SEWRPC.

Table 18

TRAFFIC ACCIDENTS AND ACCIDENT RATES AT SELECTED INTERSECTIONS WITHIN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1979, 1980, AND 1981

Intersection	1979				
	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]
STH 83 and Monroe Avenue	2	2	--	4	1.70
STH 83 and STH 60	18	3	--	21	3.90
STH 83 and Jackson Street	--	--	--	--	--
STH 83 and Lincoln Avenue	1	1	--	2	0.82
STH 83 and Jefferson Avenue	2	2	--	4	1.64
STH 83 and CTH E	1	--	--	1	0.67
STH 83 and Wilson Avenue	5	1	--	6	5.02
STH 60 and CTH K	10	3	--	13	5.34
STH 60 and Wilson Avenue	1	--	--	1	0.32
STH 60 and Johnson Street	5	--	--	5	1.28
STH 60 and Wacker Drive	--	--	--	--	--
STH 60 and Rural Street	5	3	--	8	2.05
STH 60 and Mill Street	1	--	--	1	0.30
STH 60 and Brault Street	2	--	--	2	0.74
STH 60 and Grant Street	1	--	--	1	0.30
STH 60 and Grand Avenue	3	--	--	3	1.01
STH 60 and Sell Drive	--	1	--	1	0.48
STH 60 and Kettle Moraine Drive	1	1	--	2	0.81
Monroe Avenue and Cedar Street	3	3	--	6	4.92
State Street and Rural Street	1	--	--	1	0.69
Branch Street and Church Street	2	1	--	3	1.52
Branch Street and Kussuth	3	--	--	3	1.32
Forest Street and High Street	2	1	--	3	2.68
Cedar Street and Lee Road	--	--	--	--	--
CTH K and Monroe Avenue	5	--	--	5	8.20

Intersection	1980				
	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]
STH 83 and Monroe Avenue	3	--	--	3	1.27
STH 83 and STH 60	8	2	--	10	1.86
STH 83 and Jackson Street	1	--	--	1	0.40
STH 83 and Lincoln Avenue	2	1	--	3	1.24
STH 83 and Jefferson Avenue	1	--	--	1	0.41
STH 83 and CTH E	3	1	--	4	2.70
STH 83 and Wilson Avenue	3	2	--	5	4.19
STH 60 and CTH K	3	4	1	8	3.28
STH 60 and Wilson Avenue	2	--	--	2	0.64
STH 60 and Johnson Street	4	2	--	6	1.54
STH 60 and Wacker Drive	1	--	--	1	0.40
STH 60 and Rural Street	6	--	--	6	1.54
STH 60 and Mill Street	3	1	--	4	1.20
STH 60 and Brault Street	4	1	--	5	1.84
STH 60 and Grant Street	5	--	--	5	1.51
STH 60 and Grand Avenue	4	--	--	4	1.34
STH 60 and Sell Drive	--	--	--	--	--
STH 60 and Kettle Moraine Drive	2	1	1	4	1.62
Monroe Avenue and Cedar Street	2	2	--	4	3.28
State Street and Rural Street	3	--	--	3	2.08
Branch Street and Church Street	1	--	--	1	0.51
Branch Street and Kussuth	1	--	--	1	0.44
Forest Street and High Street	--	--	--	--	--
Cedar Street and Lee Road	3	--	--	3	5.35
CTH K and Monroe Avenue	2	--	--	2	3.28

Table 18 (continued)

Intersection	1981				
	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]
STH 83 and Monroe Avenue	1	2	--	3	1.27
STH 83 and STH 60	7	1	--	8	1.48
STH 83 and Jackson Street	2	1	--	3	1.19
STH 83 and Lincoln Avenue	1	--	--	1	0.41
STH 83 and Jefferson Avenue	2	--	--	2	0.82
STH 83 and CTH E	1	--	--	1	0.67
STH 83 and Wilson Avenue	1	--	--	1	0.84
STH 60 and CTH K	--	3	1	4	1.64
STH 60 and Wilson Avenue	2	1	--	3	0.96
STH 60 and Johnson Street	2	2	--	4	1.03
STH 60 and Wacker Drive	3	1	--	4	1.61
STH 60 and Rural Street	1	--	--	1	0.26
STH 60 and Mill Street	--	--	--	--	--
STH 60 and Brault Street	1	1	--	2	0.74
STH 60 and Grant Street	2	--	--	2	0.60
STH 60 and Grand Avenue	1	1	--	2	0.67
STH 60 and Sell Drive	3	--	--	3	1.45
STH 60 and Kettle Moraine Drive	--	1	--	1	0.40
Monroe Avenue and Cedar Street	--	2	--	2	1.64
State Street and Rural Street	2	--	--	2	1.39
Branch Street and Church Street	1	--	--	1	0.51
Branch Street and Kussuth	1	--	--	1	0.44
Forest Street and High Street	1	--	--	1	0.89
Cedar Street and Lee Road	--	--	--	--	--
CTH K and Monroe Avenue	1	--	--	1	1.64

Intersection	Three-Year Average				
	Property Damage	Personal Injury	Fatalities	Total Accidents	Rate[a]
STH 83 and Monroe Avenue	2	1	--	3	1.27
STH 83 and STH 60	11	2	--	13	2.41
STH 83 and Jackson Street	1	--	--	1	0.40
STH 83 and Lincoln Avenue	1	1	--	2	0.82
STH 83 and Jefferson Avenue	2	--	--	2	0.82
STH 83 and CTH E	2	--	--	2	1.35
STH 83 and Wilson Avenue	3	1	--	4	3.35
STH 60 and CTH K	4	3	1	8	3.28
STH 60 and Wilson Avenue	2	--	--	2	0.64
STH 60 and Johnson Street	4	1	--	5	1.28
STH 60 and Wacker Drive	1	--	--	1	1.61
STH 60 and Rural Street	4	1	--	5	1.28
STH 60 and Mill Street	1	--	--	1	0.30
STH 60 and Brault Street	2	1	--	3	1.10
STH 60 and Grant Street	3	--	--	3	0.91
STH 60 and Grand Avenue	3	--	--	3	1.01
STH 60 and Sell Drive	1	--	--	1	0.48
STH 60 and Kettle Moraine Drive	1	1	--	2	0.81
Monroe Avenue and Cedar Street	2	2	--	4	3.28
State Street and Rural Street	2	--	--	2	1.39
Branch Street and Church Street	1	--	--	1	0.51
Branch Street and Kussuth	2	--	--	2	0.88
Forest Street and High Street	1	--	--	1	0.89
Cedar Street and Lee Road	1	--	--	1	1.78
CTH K and Monroe Avenue	3	--	--	3	4.92

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

Source: SEWRPC.

Table 19

TRAFFIC ACCIDENTS AT SELECTED NONINTERSECTION LOCATIONS WITHIN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1979, 1980, AND 1981

Route and Section	1979			
	Property Damage	Personal Injury	Fatalities	Total Accidents
CTH K				
Waterford Road to CTH E....	1	--	--	1
Monroe Avenue to Hall Road.....	2	--	--	2
CTH E				
Hall Road to CTH K.....	2	--	--	2
CTH U				
State Street to Hartford Municipal Airport.....	2	2	--	4
Kettle Moraine Drive				
STH 60 to Pike Lake State Park.....	--	--	--	--
Hall Road				
CTH E to Ashippun River....	1	--	--	1
STH 83				
CTH E to Lee Road.....	1	2	--	3
Lee Road to Monroe Avenue..	3	2	--	5
Wilson Avenue to Clover Road.....	2	1	--	3
STH 60				
Dodge county line to Pond Road.....	1	4	--	5
Wayside Drive to Teri Drive.....	2	2	--	4
Teri Drive to Franklin Lane.....	2	1	--	3

Route and Section	1980			
	Property Damage	Personal Injury	Fatalities	Total Accidents
CTH K				
Waterford Road to CTH E....	1	2	--	3
Monroe Avenue to Hall Road.....	4	--	--	4
CTH E				
Hall Road to CTH K.....	2	--	--	2
CTH U				
State Street to Hartford Municipal Airport.....	1	--	--	1
Kettle Moraine Drive				
STH 60 to Pike Lake State Park.....	3	--	--	3
Hall Road				
CTH E to Ashippun River....	2	--	--	2
STH 83				
CTH E to Lee Road.....	3	2	--	5
Lee Road to Monroe Avenue..	1	4	--	5
Wilson Avenue to Clover Road.....	--	1	--	1
STH 60				
Dodge county line to Pond Road.....	1	4	--	5
Wayside Drive to Teri Drive.....	2	1	--	3
Teri Drive to Franklin Lane.....	4	3	--	7

Table 19 (continued)

Route and Section	1981			
	Property Damage	Personal Injury	Fatalities	Total Accidents
CTH K				
Waterford Road to CTH E....	4	--	--	4
Monroe Avenue to Hall Road.....	1	1	--	2
CTH E				
Hall Road to CTH K.....	1	--	--	1
CTH U				
State Street to Hartford Municipal Airport.....	--	--	--	--
Kettle Moraine Drive				
STH 60 to Pike Lake State Park.....	4	3	--	7
Hall Road				
CTH E to Ashippun River....	1	1	--	2
STH 83				
CTH E to Lee Road.....	5	2	--	7
Lee Road to Monroe Avenue..	2	1	--	3
Wilson Avenue to Clover Road.....	2	1	--	3
STH 60				
Dodge county line to Pond Road.....	3	--	--	3
Wayside Drive to Teri Drive.....	3	--	--	3
Teri Drive to Franklin Lane.....	--	1	--	1

Route and Section	Three-Year Average			
	Property Damage	Personal Injury	Fatalities	Total Accidents
CTH K				
Waterford Road to CTH E....	2	1	--	3
Monroe Avenue to Hall Road.....	2	--	--	2
CTH E				
Hall Road to CTH K.....	2	--	--	2
CTH U				
State Street to Hartford Municipal Airport.....	1	1	--	2
Kettle Moraine Drive				
STH 60 to Pike Lake State Park.....	2	1	--	3
Hall Road				
CTH E to Ashippun River....	1	--	--	1
STH 83				
CTH E to Lee Road.....	3	2	--	5
Lee Road to Monroe Avenue..	2	2	--	4
Wilson Avenue to Clover Road.....	1	1	--	2
STH 60				
Dodge county line to Pond Road.....	2	3	--	5
Wayside Drive to Teri Drive.....	2	1	--	3
Teri Drive to Franklin Lane.....	2	2	--	4

Source: SEWRPC.

east-west direction and passes through the northern boundary of the City of Hartford central business district. Seven streets cross this railway trackage at-grade, of which three are arterial streets and highways. Since none of these crossings are grade-separated, railway traffic may have a significant impact on the operation of the arterial street and highway system of the study area.

Accordingly, information was obtained relating to the volume of train traffic on the Wisconsin & Southern Railroad trackage on a typical weekday in 1982. Rail service to or through the Hartford study area is devoted solely to freight service. The current schedule of service indicates that one through freight train passes through the study area in the eastbound direction approximately during the 7:00 p.m. to 9:00 p.m. time period and one through freight train in the westbound direction approximately during the 11:00 p.m. to 1:00 a.m. time period. Local freight service is also provided to commercial and industrial establishments in the study area on a Monday, Wednesday, and Friday schedule, resulting in an eastbound and westbound train traveling on the trackage through the study area during the 7:00 a.m. to 4:00 p.m. time period. The low volumes of railway traffic during the 7:00 a.m. to 4:00 p.m. average weekday time period made it unnecessary to obtain railway-attributed delay information at the seven street and highway crossings of the trackage of the Wisconsin & Southern Railroad.

CITIZEN COMPLAINTS

A valuable source of information in identifying transportation-related problems is the citizen who regularly uses, and is therefore intimately 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 26 members of the Citizens and Technical Advisory Committee for the Hartford 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 noncommittee 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 31 perceived traffic-related problems was compiled for the study area. A summary of this list is contained in Table 20 and shown on Map 24. The perceived traffic problems listed in Table 20 have been grouped into six principal categories including: inadequate sight distance; congestion or delay; inadequate turning capacity; difficulty in entering the traffic stream; motor vehicle accidents; and inadequate roadway lighting. The majority of perceived traffic problems listed in Table 20 pertain directly to the two principal arterial streets in the study area--Sumner Street (STH 60), and Main Street (STH 83).

In addition to the perceived traffic problems summarized in Table 20, the following generalized transportation system inadequacies were included in the list of traffic-related problems for the study area: 1) excessive truck traffic on Grand Avenue, which is functionally classified as a collector street; 2) excessive vehicle delays when school buses stop to pick up or discharge students;

Table 20

SUMMARY OF TRAFFIC PROBLEMS AS PERCEIVED BY CITIZENS WITHIN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Facility	Location	Traffic Problem					
		Inadequate Sight Distance	Congestion or Delay	Inadequate Turning Capacity	Difficulty in Entering Traffic Stream	Motor Vehicle Accidents	Inadequate Roadway Lighting
STH 50	Teri Lane.....	X					
	CTH K.....					X	
	Wilson Street.....	X				X	X
	Grand Avenue.....		X	X			
	STH 83.....		X	X			
	Grant Street.....	X	X	X			
	Rural Street.....		X		X	X	
	Cedar Street.....		X	X			
	Wacker Drive.....		X	X			
	Pond Road.....					X	X
STH 83	S. Branch Street/ Lincoln Street...	X			X		
	Loos Street.....	X					
	S. Main Street/ W. Kossuth Street		X			X	
	Wisconsin Street...	X					
	State Street.....	X			X		
Monroe Avenue	CTH K.....					X	X
	S. Cedar Street....		X				

Source: City of Hartford and SEWRPC.

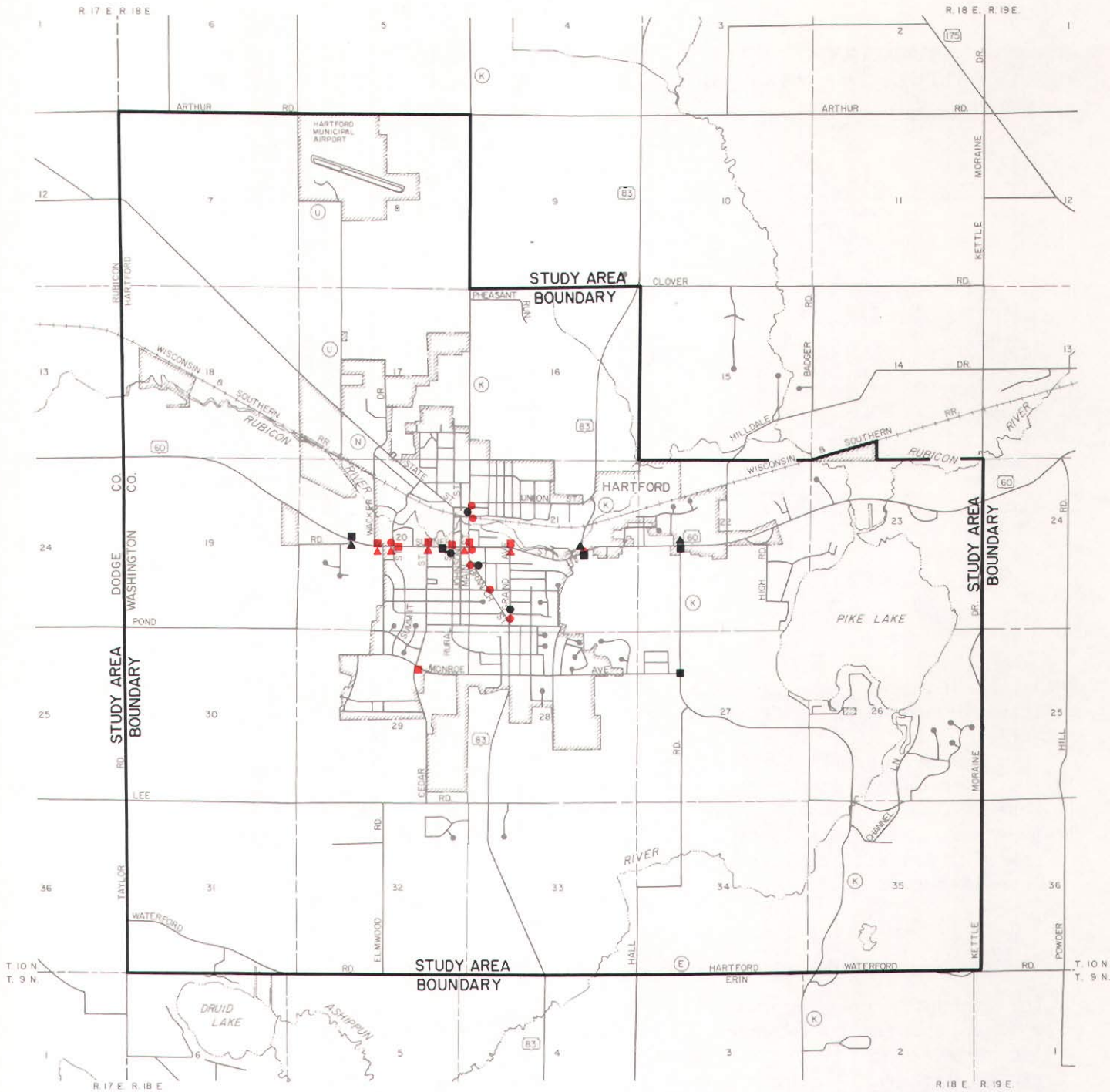
3) inadequate sight distance for right-turn-on-red movements at signalized intersections; 4) insufficient number of north-south arterials between Sumner Street and Union Street east of STH 83; 5) too many north-south arterial streets on the south side of the City; 6) mailboxes located in front of the Post Office on Sumner Street cause traffic congestion and increase accident potential; 7) need for and construction timing of proposed Wilson Avenue bypass, Clover Road extension and Wacker Drive extension; and 8) need to restrict on-street parking to improve traffic flow on Branch Street and Grand Avenue.

SUMMARY

This chapter has presented information on the existing vehicular traffic volumes utilizing the arterial street and highway system of the Hartford 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 Hartford traffic management study area. Those problems are discussed in Chapter V.

Map 24

CITIZEN-PERCEIVED TRAFFIC-RELATED PROBLEM AREAS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

- INADEQUATE SIGHT DISTANCE
- CONGESTION OR DELAY
- INADEQUATE TURNING CAPACITY
- DIFFICULTY IN ENTERING THE TRAFFIC STREAM
- MOTOR VEHICLE ACCIDENTS
- INADEQUATE ROADWAY LIGHTING

GRAPHIC SCALE
0 1 MILE
0 2000 4000 6000 FEET

Source: SEWRPC.

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 60, and range from 4,100 to 10,300 vehicles per annual average weekday. The second highest volumes occur on STH 83, and range from 2,300 to 6,900 vehicles per annual average weekday. The remaining arterial and collector streets in the study area have annual average weekday traffic volumes ranging from 950 to 3,000 vehicles per day.

Those months during which the highest traffic volumes occur are May through September, which exhibit an increase of 8 percent over the annual average weekday volumes, with July exhibiting the highest increase of 10 percent 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 16 percent lower than the annual average weekday volumes.

The daily variation in weekly traffic volumes exhibits a general increase during the week with a high on Friday, about 9 percent greater than the average annual weekday volumes. Average Saturday traffic volumes are about 10 percent less than average annual weekday volumes, while average Sunday traffic volumes are about 11 percent lower than average annual weekday traffic volumes. The morning peak-hour traffic volume during the 7:00 a.m. to 8:00 a.m. time period comprises approximately 5.5 percent of the average weekday traffic volume and the evening peak-hour traffic volumes between the 3:00 p.m. and 4:00 p.m. time period comprise approximately 9.5 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 equal or exceed design capacity on only three roadway segments in the study area--the southbound approach of STH 83 at its intersection with STH 60 and on the northbound approaches of STH 83 at its intersections with STH 60 and E. Jackson Street. All of the high volume-to-capacity ratios occur within the central business district of the City of Hartford.

The majority of the signalized intersection approach load factors were determined to be zero, with only the STH 83 northbound approach at STH 60 exceeding a value of 0.30. Average off-peak-hour vehicle operating speeds on STH 60 and STH 83, the two principal arterials in the study area, are 25 to 29 mph with a low of 12 mph exhibited on the southbound segment of STH 83 extending between Union Street and Sumner Street. During the evening peak hour, the average speed is reduced to approximately 24 to 27 mph with a low of 7 mph on the eastbound segment of STH 60 extending between Rural Street and Main Street. Average vehicle delays at the two signalized intersections in the study exceed 15 seconds at three approaches during the evening peak hour.

An analysis of the trip purposes in the Hartford study area indicates that 40,400 person trips were made on an average weekday in 1982 within and through the study area. The analysis further indicated that these 40,400 person trips resulted in 31,600 vehicle trips, and that of the 31,600 vehicle trips within or through the study area on an average weekday in 1982, approximately 15,400,

or 49 percent, were internal trips, 13,200, or 42 percent, were internal/external trips, and the remaining 3,000, or 9 percent, were through trips. Approximately 44 percent of the total of 31,600 vehicle trips were required to travel through the Hartford central business district. About 91 percent of the vehicular traffic currently using the arterial street and highway system in the Hartford study area either originates within or is destined for the study area.

In 1982, off-street public parking facilities in the Hartford central business district (CBD) exhibited an average occupancy rate of approximately 52 percent, while on-street facilities exhibited a 58 percent occupancy rate. This results in a 54 percent occupancy rate for the public parking facilities in the CBD area. The average turnover rate for the on-street curb parking in the CBD in 1982 was 3.6 vehicles per stall during the peak hours of parking demand between 9:00 a.m. and 12:00 p.m. and 1:00 p.m. and 5:00 p.m., while the off-street parking turnover rate was 2.3 vehicles per stall.

There was a total of 232 on-street motor vehicle accidents in the study area in 1979, 229 on-street motor vehicle accidents in 1980, and 202 in 1981. There were no fatal accidents in 1979, and three fatal accidents in 1980 and in 1981. The majority of these accidents--70 percent in 1979, 67 percent in 1980, and 54 percent in 1981--resulted in property damage only. The highest traffic accident locations in the study area occurred at the intersections of STH 60 (Sumner Street) with STH 83 (Main Street), and with CTH K, followed by the intersections of STH 60 with Johnson Street and Rural Street, and the midblock segments of STH 83 extending from its intersection with CTH E to Lee Road and STH 60 from its intersection with the Dodge county line to Pond Road.

A major transportation facility traversing the study area which interfaces with the operation of the existing arterial street and highway system is the Wisconsin & Southern Railroad. Train traffic on this railway line averages between two to four trains per weekday. Local freight service to the manufacturing firms in the Hartford study area occurs on a Monday, Wednesday, and Friday schedule and constitutes the only train traffic which conflicts with vehicular traffic during the 7:00 a.m. to 4:00 p.m. time period.

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 from the Advisory Committee for the study. A list of 31 perceived problems was compiled to assist in identifying traffic management system problems. This list resulted in the identification of 18 locations of possible traffic-related problems in the study area, with the majority of these locations being on STH 60 and STH 83.

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 the 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 26-member advisory committee was to assist the staff involved 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 Hartford 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 assess the validity of an objective and to guide the preparation of supporting standards and plans.

3. Standard: a criterion used as a basis of comparison to determine the adequacy of alternative and recommended plan proposals to attain agreed-upon 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 of the foregoing definitions and of 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 Hartford, 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, these basic needs should not be expected to change 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 approved the following seven transportation system management and development objectives:

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

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 21. 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 Hartford area 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 the needs of the more detailed and localized planning effort for Hartford 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 expressed 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 21. 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 Hartford study area, certain overriding considerations must be recognized:

1. That the proposed traffic management plan for the Hartford area 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 21

HARTFORD 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.

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 one-half mile in each direction in urban high-density areas (7.0 to 17.9 dwelling units per net residential acre), no more than one mile in each direction in urban medium-density areas (2.3 to 6.9 dwelling units per net residential acre), and no more than two 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 80 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 mininum of 150 parking spaces per 1,000 population, with 30 percent of those spaces comprised of on-street curb parking and the remaining 70 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 necesarily 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.

---

[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.

Chapter V

EXISTING TRAFFIC PROBLEMS

INTRODUCTION

This chapter identifies and describes the traffic problems which existed on the arterial streets and highways of the Hartford area in 1982. These traffic problems are symptoms of deficiencies in the existing arterial system as measured by a comparison of the performance of that system against the traffic management objectives and standards adopted by the Citizens and Technical Advisory Committee for the Hartford Area Traffic Management Study.

In order to identify the existing traffic problems in the Hartford study area, the existing traffic conditions presented in Chapter III 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 did not meet the objectives and standards, a transportation system deficiency was identified.

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

Included in the identification of the traffic problems of the area is a discussion of citizen complaints with respect to such problems. This discussion includes 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 whether the complaint merely reflects a perceived, as opposed to an actual, traffic problem.

In identifying the traffic problems, an attempt was made to identify the problems by facility or route. This was intended to help identify interrelated traffic problems--a particularly important identification, as the implementation of a traffic management action designed to alleviate one type of traffic problem may, at the same time, also serve to abate or, conversely, intensify other interrelated 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 vehicular accident problems. 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 impacts of those actions on the remainder of the system. This analysis of the interrelationship of individual traffic problems is also helpful in identifying the most critical traffic problems in the study area. The information obtained from this analysis is utilized in Chapter VIII of this report to establish priorities for implementation of the recommended traffic management actions, as well

as to identify the level of government--state, county, or local--which should properly assume responsibility for the necessary action implementation. Implementation of the recommended actions should result in the achievement of a safer and more efficient transportation system in the Hartford area.

VEHICULAR TRAFFIC CONGESTION PROBLEMS

One of the principal problems experienced by vehicular traffic on arterial streets and highways in urban areas is traffic congestion. Traffic congestion can be detrimental to the economic vitality of a community, resulting in increased motor vehicle operating costs and air and noise pollution. The Citizens and Technical Advisory Committee for the Hartford Area Traffic Management Study, accordingly, adopted several traffic management objectives and supporting standards related to the abatement of traffic congestion. These include Objective 1, Standard 1, which calls for a reduction of vehicular and pedestrian travel times; Objective 2, Standard 3, which calls for a reduction of direct transportation system user costs; Objective 5, Standards 1 and 2, which call for a reduction of vehicle hours and vehicle miles of travel; and Objective 5, Standards 4 through 7, which specify desirable levels for roadway 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 particularly 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 shown on Map 17 and in Chapter III of this report, the only arterial street in the study area currently operating at design capacity--that is, at a volume-to-capacity ratio of 0.80--is Main Street, more specifically the northbound approaches of Main Street at its intersections with Sumner Street and Jackson Street, and the southbound approach of Main Street at its intersection with Sumner Street.

Objective 5, Standard 5, states that, "Peak-hour load factors for signalized intersections should not exceed 0.30."

As indicated in Table 11 of Chapter III, in 1982 the only intersection approach in the study area exhibiting a load factor of more than 0.30 was the northbound approach of Main Street at its intersection with Sumner Street at a value of 0.38 during the 3:30 p.m. to 4:30 p.m. time period. The load factor for the southbound approach of Main Street at its intersection with Sumner Street at a value of 0.25 was approaching the congestion standard value of 0.30. All of the other intersection approaches have a load factor of less than or equal to 0.12.

Objective 5, Standard 6, states that, "Average vehicle delays at signalized intersections during peak hours should not exceed 28 seconds per vehicle." The data presented in Table 11 of Chapter III indicate that in 1982 none of the signalized intersections in the study area exhibited average vehicle delays greater than 28 seconds during the morning or evening peak hour. The highest average vehicle delays in the study area were measured during the evening peak

period on the northbound, westbound, and eastbound approaches to the intersection of Main Street and Sumner Street, with values of 19.2, 19.5, and 18.0 seconds of delay per vehicle, respectively.

In summary, none of the signalized intersections in the Hartford area exceed the standards for volume-to-capacity ratio, load factor, and average vehicle delay. The northbound approach of Main Street at Sumner Street is operating at design capacity and exceeds the load factor standard of 0.30 while experiencing an acceptable average vehicle delay of about 19 seconds per vehicle. The southbound approach of Main Street at Sumner Street is also operating at design capacity and is approaching the load factor standard of 0.30 while experiencing relatively low average vehicle delays of about 12 seconds per vehicle. The northbound approach of Main Street at Jackson Street is the only other signalized intersection approach in the study area identified as operating at design capacity levels; however, coordination with the traffic signals located at the intersection of Main Street and Sumner Street reduces the approach load factor to zero and the average vehicle delay to about 10 seconds per vehicle. Accordingly, vehicular congestion in the Hartford study area is not a problem, and improvements to the signalization programs at the intersections of Main Street with Sumner Street and Jackson Street or implementation of other traffic management actions may be expected to produce only minor improvements in vehicular travel through the Hartford area.

ARTERIAL SERVICE PROBLEMS

One of the principal functions of the transportation system of a community is to provide good arterial service to all of the land uses within the community, meeting the travel demand generated by those 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 routes--thereby properly interconnecting the various land uses that comprise the community.

The Citizens and Technical Advisory Committee for the Hartford Area Traffic Management Study was especially concerned about the provision of good arterial service to land uses throughout the study area and 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 quantitatively. 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, Standard 3, were particularly useful in identifying the existing arterial service problems in the study area. The remaining arte-

rial 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 1982 there were 4.93 miles of principal arterial streets and 10.24 miles of minor arterial streets within the study area. This 14.47 miles of arterial streets comprised approximately 19 percent of the total of 77.02 miles of streets and highways in the study area. Table 3 further indicates that all of the 4.23 miles of principal arterial streets in the study area were within the City of Hartford, together with 4.29 miles of the total of 10.24 miles of the minor arterial streets in the study area. This total of 8.52 miles of arterial streets comprised approximately 24 percent of the total of 34.97 miles of streets and highways within the City. Therefore, the existing arterial street and highway system within both the City of Hartford and the traffic management study area fully met Objective 3, Standard 1.

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 one mile in each direction in urban medium-density areas (2.3 to 6.9 dwelling units per net residential acre), and no more than two miles in each direction in urban low-density areas (0.2 to 2.2 dwelling units per net residential acre).

Analysis of the data presented in this report indicates that the arterial street and highway system in the study area is adequate. The study area, which encompasses about 20 square miles, consists of a centrally located concentration of urban development surrounded by rural land uses. The approximately two square miles of urban development in the study area is generally medium density in nature. Traffic management Objective 3, Standard 2, calls for a minimum one-mile arterial street spacing throughout such areas. As indicated on Map 7, this arterial spacing criterion is basically met within the City of Hartford, as the combination of State Street/Union Street, STH 60 (Sumner Street), and Monroe Avenue provide a network of east-west arterial streets spaced less than one mile apart, and the combination of Cedar Street/Wacker Drive, STH 83 (Branch Street and Main Street), and Grand Avenue/Wilson Avenue provide a network of north-south arterial streets spaced less than one mile apart through urban land development in the study area. However, in order for an arterial street system to function satisfactorily, it should provide a network of continuous routes to efficiently serve travel demands to and through the urban development within the study area. On the west side of the City of Hartford, there is a significant separation of about 1,600 feet along STH 60 between the continuous north-south routing of Cedar Street and Wacker Drive, and on the east side of the City of Hartford there is a similar separation of about 2,300 feet along STH 60 between the continuous north-south arterial routing of Branch Street and Wilson Avenue. Although the existing arterial street system meets the spacing criterion, it does not provide the desirable continuity in routing.

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 special traffic volume counts made under the study, Grand Avenue south of STH 60 is currently being used as a truck route from STH 60 to Branch Street. A manual traffic count was taken at the intersection of Church Street and Grand Avenue from 7:00 a.m. to 7:00 p.m. on Thursday, September 23, 1982. The proportion of truck traffic on this segment of Grand Avenue, which is functionally classified as a minor arterial street, was found to approximate 7 percent, relatively high for a street traversing a residential neighborhood. In comparison, trucks comprise about 3 percent of the traffic stream on STH 83 in the vicinity of STH 60, and about 8.5 percent of the traffic stream on STH 60 in the vicinity of Rural Street. It may be concluded, therefore, that there is a conflict between the designation of Grand Avenue as a minor arterial facility and the residential land uses located adjacent to Grand Avenue, resulting in an excessively high proportion of truck traffic penetrating the residential neighborhood along Grand Avenue.

Objective 5, Standard 3, states that, "The conflict between the movement of through traffic and local traffic within a community should be minimized."

The pattern of vehicle trip movements in the study area for 1982 is discussed in Chapter III of this report. As shown in Figure 6, in 1982 about 2,600 through vehicular trips, or nearly 87 percent of all such trips in the study area, were made on STH 83 or STH 60. Figure 6 further indicates that of these through trips, 1,700 vehicles per day, or about 65 percent, traveled across the study area in an east-west direction on STH 60. Of the approximately 1,100 vehicles per day that crossed the southern boundary of the study area on STH 83, 900 vehicles, or 82 percent, continued across the study area in a north-south direction on STH 83, crossing the northern boundary of the study area. These 900 vehicle trips comprised about 13 percent of the total average weekday traffic on STH 83, the majority of which must travel through the Hartford central business district due to the limited number of continuous north-south arterial routes available to serve travel through the study area. It is noted that the construction of Grand Avenue northward to Union Street would serve to alleviate the north-south arterial route deficiency problem, but not without exacerbating the previously described problem of arterial traffic penetrating a residential neighborhood.

In summary, based upon the analysis of the travel pattern data presented in Chapter III, it may be concluded that there is a north-south arterial service problem in the Hartford traffic management study area, as evidenced by the lack of continuous north-south arterial routes, the penetration of residential areas by an arterial street, and the conflict between the movement of through and local traffic within the community.

VEHICULAR PARKING SUPPLY PROBLEMS

An adequate supply of vehicular on-street and off-street parking spaces, especially in the central business district (CBD), is an important part of the total transportation system of a community, and a factor contributing to the economic vitality of the community. The Citizens and Technical Advisory Committee for the Hartford Traffic Management Study adopted traffic management Objective 3, Standards 3, 4, and 5 with regard to the provision of parking in the CBD of the City of Hartford. These three standards are:

- Sufficient automobile parking spaces should be provided in the CBD so that the average annual weekday peak parking demand does not exceed 80 percent of the combined automobile on-street curb parking and off-street parking spaces.

- The number and distribution of automobile parking spaces serving the CBD should be distributed between on-street curb and off-street parking facilities so that there is a minimum of 150 parking spaces per 1,000 population, with 30 percent of these spaces made up of on-street curb parking and the remaining 70 percent of off-street parking spaces.

- In the central business district, sufficient time-related 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 destinations.

On-Street Parking Supply Problems

There are 150 on-street curb parking spaces in the downtown CBD of the City of Hartford. Those 150 parking spaces make up 37 percent of the total of 398 CBD public parking spaces and are distributed throughout the CBD in varying concentrations that range from two to 14 parking spaces per block face, with three on-street parking spaces restricted to a 10-minute time limit, 107 on-street parking spaces restricted to a one-hour time limit, 31 on-street parking spaces restricted to a two-hour time limit, and nine unrestricted spaces. Map 19 and Table 15 in Chapter III provide information on the location of the existing on-street parking supply in the Hartford CBD. The survey of existing one-hour time restricted, on-street parking conditions, as noted in Chapter III, found that the peak demand for short-term, on-street parking on an average weekday exceeded the 80 percent parking occupancy rate standard, adopted by the Committee, during at least one hour of the seven-hour parking survey period in nine of the 18 block faces in the CBD. As shown on Map 19 and in Table 15, these nine block faces were: block face 3, the west side of N. Main Street (STH 83) immediately south of W. Wisconsin Street; block faces 5 and 10, the west and east sides, respectively, of N. Main Street north of Jackson Street; block faces 7 and 8, the west and east sides, respectively, of S. Main Street between Sumner Street (STH 60) and Kossuth Street; block face 9, the east side of N. Main Street between Jackson Street and Sumner Street; block face 12, the south side of Jackson Street between N. Main Street and Mill Street; block face 15, the north side of Sumner Street between Main Street and Mill Street; and block face 17, the south side of Sumner Street between Main Street and Johnson Street.

Block face 3 is occupied by two one-hour, time-restricted, on-street parking spaces located along the west side of N. Main Street between W. Wisconsin Street and the exclusive eastbound right turn lane from W. Wisconsin Street to N. Main Street. The demand for these two parking spaces exceeded the 80 percent parking occupancy rate standard during four of the seven hours for which the survey was conducted. Block face 3 had an average parking occupancy rate for the seven-hour survey period of 78 percent, which is almost equal to the parking rate standard of 80 percent. It is noted, however, that an additional 10 on-street parking spaces are available along the adjacent exclusive eastbound right turn lane from W. Wisconsin Street to N. Main Street (block

face 4). Demand for on-street parking along block face 4 did not exceed a 30 percent occupancy rate at any time during the seven-hour survey period. From this parking survey data, it may be concluded that the 10 parking stalls located along block face 4 are not well utilized, which may be attributed to their limited accessibility which is restricted primarily to access from eastbound W. Wisconsin Street.

Block faces 5 and 10 together have 16 one-hour, time-restricted, on-street parking spaces located along the east and west sides of N. Main Street between E. Jackson Street and W. Wisconsin Street. The demand for these 16 parking spaces exceeded the 80 percent parking occupancy rate standard during six of the seven hours for which the survey was conducted. These 16 parking spaces had an average occupancy rate for the entire seven-hour survey period of 88 percent. Additional on-street parking, totaling 16 short-term spaces, however, is available immediately north of these spaces, however, since they are further removed from the heart of the CBD, they are currently not being fully utilized. This additional short-term on-street parking is available along block face 1--three parking spaces--on the west side of N. Main Street between E. Union Street and W. State Street, and along block faces 2 and 11--five and eight parking spaces--on the west and east sides of N. Main Street, respectively, between State Street and Wisconsin Street. None of these three block faces exceeded the 80 percent parking occupancy rate standard at any time during the seven-hour survey period, with the average parking occupancy rate for these three block faces together over the entire seven-hour survey period equaling 43 percent. However, in total, these 32 short-term parking spaces exhibited an average occupancy rate of 66 percent during the entire seven-hour survey period and a peak occupancy rate of 79 percent during the 2:00 p.m. to 3:00 p.m. time period. It may be concluded, therefore, that the total supply of short-term, on-street parking located along N. Main Street north of E. Jackson Street is barely adequate to accommodate the existing on-street parking demand.

Block faces 6 and 9 together have 26 one-hour, time-restricted parking spaces located along the west and east sides of N. Main Street between Sumner Street and E. Jackson Street. The demand for the 14 parking spaces on the west side of N. Main Street reached a high of 70 percent during both the 10:00 a.m. to 11:00 a.m. and the 2:00 p.m. to 3:00 p.m. survey time periods, while the 12 parking spaces on the east side of N. Main Street exceeded the 80 percent parking rate occupancy standard during the 9:00 a.m. to 10:00 a.m., 11:00 a.m. to 12:00 p.m., and the 2:00 p.m. to 3:00 p.m. survey time periods, with occupancy rates of 83, 92, and 92 percent, respectively. In total, the demand for these 26 parking spaces exceeded the 80 percent standard during only one hour of the day--2:00 p.m. to 3:00 p.m.--of the seven hours for which the parking survey was conducted and exhibited an average seven-hour parking space occupancy rate of 69 percent.

Block faces 7 and 8 together have seven one-hour, time restricted, on-street parking spaces located along the west and east sides of S. Main Street between W. Kossuth Street and Sumner Street. The demand for the five parking spaces along the west side of S. Main Street exceeded the 80 percent parking rate occupancy standard during only the 11:00 a.m. to 12:00 p.m. survey time period, and the two parking spaces along the east side of S. Main Street exceeded the 80 percent standard during both the 9:00 a.m. to 10:00 a.m. and the 2:00 p.m. to 3:00 p.m. survey time periods. In total, the demand for these seven parking

spaces exceeded the 80 percent parking occupancy standard during only the 11:00 a.m. to 12:00 p.m. survey time period, and exhibited an average seven-hour parking space occupancy rate of 63 percent.

Block face 12 consists of two one-hour, time-restricted, on-street parking spaces located along the south side of E. Jackson Street between N. Main Street and N. Mill Street. The demand for these two parking spaces was measured at 100 percent during the seven-hour parking survey time period.

In total, parking demand for the 35 on-street parking spaces located along N. Main Street south of E. Jackson Street and along E. Jackson Street east of N. Main Street, identified in the parking study as block faces 6, 7, 8, 9, and 12, exceeded the 80 percent parking occupancy rate standard during only one hour of the day--2:00 p.m. to 3:00 p.m.--of the seven hours for which the parking survey was conducted, with an average occupancy rate of 69 percent during the entire seven-hour survey period. This time period of peak parking occupancy on Main Street south of E. Jackson Street coincides with the previously noted peak demand period for on-street parking along block faces 1, 2, 5, 10, and 11, which are located on N. Main Street north of E. Jackson Street.

Block faces 14 and 17 together have 10 one-hour, time-restricted, on-street parking spaces located along the north and south sides of W. Sumner Street between Johnson Street and Main Street. The demand for the five parking spaces on the north side of W. Sumner Street reached a high of 80 percent during the 11:00 a.m. to 12:00 p.m. survey time period and the five parking spaces on the south side of W. Sumner Street exceeded the 80 percent parking rate occupancy standard during only the 9:00 a.m. to 10.00 a.m. time period. In total, the demand for these 10 parking spaces reached a high of 80 percent during the 11:00 a.m. to 12:00 p.m. time period with an average seven-hour occupancy rate of 44 percent. It is noted that an additional 10 one-hour, time-restricted, on-street parking spaces identified as block faces 13 and 18 are available along the adjacent block of W. Sumner Street immediately west of block faces 14 and 17. Demand for on-street parking along block faces 13 and 18 did not exceed the 80 percent occupancy rate standard, reaching a high of 60 percent during the hours of 10:00 a.m. to 11:00 a.m., 11:00 a.m. to 12:00 p.m., and 1:00 p.m. to 2:00 p.m. of the seven-hour parking survey and averaging 44 percent over the seven-hour survey period.

In total, the parking demand for the 20 on-street parking spaces located along W. Sumner Street between Main Street and Rural Street identified in the parking study as block faces 13, 14, 17, and 18 reached a high of 70 percent occupancy during the 11:00 a.m. to 12:00 p.m. time period, with an average occupancy rate of 43 percent for the seven hours for which the survey was conducted. Therefore, it may be concluded that the supply of short-term parking on W. Sumner Street west of Main Street is adequate to accommodate the existing parking demand in that area of the CBD.

Finally, block faces 15 and 16 together have eight one-hour, time-restricted, parking spaces located along the north and south sides of E. Sumner Street between Main Street and South Street. The demand for the three parking spaces on the north side of E. Sumner Street exceeded the 80 percent occupancy rate standard during four of the seven hours for which the parking survey was conducted, with an average seven-hour occupancy rate of 81 percent. Demand for the five parking spaces on the south side of E. Sumner Street did not exceed

the 80 percent occupancy rate standard but equaled the standard for three of the seven hours for which the parking survey was conducted, with an average seven-hour occupancy rate of 60 percent. In total, the demand for these eight parking spaces exceeded the 80 percent parking occupancy rate standard during three hours (9:00 a.m. to 10:00 a.m., 10:00 a.m. to 11:00 a.m., and 3:00 p.m. to 4:00 p.m.) of the seven-hour parking survey with an average occupancy rate of 66 percent over the entire seven-hour time period.

In addition to those block faces which were identified as experiencing parking rates exceeding the 80 pecent occupancy rate standard during certain time periods of the day, five block faces are approaching an occupancy rate exceeding 70 percent, or are at the limit of 80 percent during specific time periods of the day. These conditions exist along block face 2, which consists of five one-hour, time-restricted parking spaces located along the west side of N. Main Street between State Street and W. Wisconsin Street, with an occupancy rate of 80 percent during the 11:00 a.m. to 12:00 p.m. time period; block face 6, which consists of 14 one-hour, time-restricted parking spaces located along the west side of N. Main Street between E. Jackson Street and Sumner Street, with an occupancy rate exceeding 70 percent during four of the seven hours for which the parking survey was conducted; block face 14, which consists of five one-hour, time-restricted parking spaces located along the north side of W. Sumner Street between Johnson Street and Main Street, with an occupancy rate of 80 percent during the 11:00 a.m. to 12:00 p.m. time period; block face 16, which consists of five one-hour, time-restricted parking spaces located along the south side of E. Sumner Street between Main Street and South Street, with an occupancy rate of 80 percent during three of the seven hours for which the survey was conducted; and block face 18, which consists of five one-hour, time-restricted parking stalls along the south side of W. Sumner Street between Rural Street and Johnson Street, with an occupancy rate of 80 percent during the 10:00 a.m. to 11:00 a.m. and 11:00 a.m. to 12:00 p.m. survey time periods.

From the survey of existing parking conditions, the rates of parking turnover for each of the 18 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 16 in Chapter III, the parking turnover rates in the CBD ranged from a high of 6.5 vehicles during the seven-hour survey period along block face 12, which exhibited a 100 percent average seven-hour occupancy rate, to a low of 1.1 vehicles along block face 4, which exhibited a 16 percent occupancy rate. In analyzing the parking turnover rate data presented in Table 16, it is apparent that the short-term, one-hour, time-restricted parking spaces along Main Street between W. Wisconsin Street and W. Kossuth Street (block faces 3, 5, 6, 7, 8, 9, and 10) along E. Jackson Street between N. Main Street and N. Mill Street (block face 12), and except for the north side of W. Sumner Street west of Main Street (block face 14) along Sumner Street between Johnson Street and South Street (block faces 15, 16, and 17) are being well utilized with all parking spaces experiencing a turnover rate exceeding at least four vehicles per parking space over the seven-hour survey time period. The two lowest parking space turnover rates

measured during the seven hours for which the survey was conducted, occurred along block face 4 (W. Wisconsin Street west of N. Main Street), 10 parking spaces with a turnover rate of 1.1 vehicles during the seven-hour survey period, and block face 14 (the north side of W. Sumner Street between Johnson Street and Main Street), 5 parking spaces with a turnover rate of 1.8 vehicles during the seven-hour survey period. The remaining block faces in the CBD have a parking space turnover rate between two and three vehicles during the seven-hour survey period.

In summary, the survey and analysis of the 107 short-term, one-hour restricted, on-street parking spaces in the Hartford CBD indicated that the existing parking demand during various time periods of the day exceeds or meets the existing on-street parking supply along 14 of the 18, or 78 percent, block faces surveyed. This does not mean that all 107 on-street parking spaces exceeded the standard occupancy rate of 80 percent, but only that certain block faces within the CBD exceeded the standard parking space occupancy rate, as demand for these spaces was greater than the number of available spaces during certain time periods of the day. From this analysis, it may be concluded that the limited supply of on-street parking spaces in the CBD, although well utilized as evidenced by parking occupancy and turnover rates, is not adequate to accommodate the existing parking demand along portions of Main Street, Sumner Street, and E. Jackson Street within the downtown CBD area.

Off-Street Public Parking Supply Problems

There are nine off-street public parking lots, with a total of 248 parking spaces, located in and adjacent to the CBD of the City of Hartford. These nine lots are referred to locally as: 1) the Lower Mill Street lot; 2) the Upper Mill Street lot; 3) the N. Johnson Street lot; 4) the S. Johnson Street lot; 5) the Rural Street lot; 6) the City Hall lot; 7) the North City Garage lot; 8) the City Garage lot; and 9) the North Side lot. The locations and parking time restrictions of these off-street lots are shown on Map 19 in Chapter III. Three of these off-street public parking lots--Lower Mill Street, Upper Mill Street, and City Hall--have two-hour parking time restrictions, with a total of 128 parking spaces, while the remaining six off-street lots have a total of 120 unrestricted parking spaces.

Lower Mill Street Lot: The Lower Mill Street public parking lot is located on the eastern edge of the CBD, as shown on Map 19 in Chapter III, and contains a total of 60 short-term, two-hour, time-restricted public parking spaces. As shown in Table 15, these 60 parking spaces met or exceeded the 80 percent occupancy rate standard during five of the seven hours for which the parking survey was conducted, and approached the standard with an occupancy rate of 70 percent during another hour of the survey. In total, the demand for these 60 parking spaces was 81 percent during the entire seven-hour survey period. As shown in Table 17, these 60 parking spaces were well utilized with a turnover rate of 5.1 vehicles per two-hour, time-restricted parking stall during the seven-hour survey period. Based upon these survey findings, it may be concluded that the available supply of short-term parking spaces is inadequate to accommodate the current parking demand in the lot; and, based upon the parking space turnover rate, a need exists to decrease the time restrictions or to increase the capacity of this lot.

Upper Mill Street Lot: The Upper Mill Street public parking lot is located immediately north of and adjacent to the Lower Mill Street lot on the eastern edge of the CBD, as shown on Map 19, and contains a total of 18 short-term, two-hour, time-restricted public parking spaces. As shown in Table 15, at no time during the seven-hour field survey of existing parking conditions did the actual parking occupancy rate in the lot approach or exceed the 80 percent parking occupancy rate standard. The 18 parking spaces exhibited a maximum total occupancy of 67 percent during the 9:00 a.m. to 10:00 a.m. time period, with an average seven-hour occupancy rate of 40 percent. As shown in Table 17, the turnover rate for the 18 parking spaces in the lot was 2.6 vehicles per parking space during the seven-hour survey time period.

Based upon these survey findings, it may be concluded that the present parking supply in the Upper Mill Street lot is adequate to accommodate the demand for space in this lot. However, since the under-utilized Upper Mill Street lot is immediately adjacent to the over-utilized Lower Mill Street lot, consideration should be given in the analysis of alternative traffic management measures of the total 68 combined parking spaces available in the two public off-street lots to correct the parking supply deficiency problem in the Lower Mill Street lot. In total, the 68 parking spaces in the Upper and Lower Mill Street lots exceeded the 80 percent occupancy rate standard during three of the seven hours for which the parking survey was conducted, and approached the standard with an occupancy rate of 79 percent during the 2:00 p.m. to 3:00 p.m. time period. Therefore, it may be concluded that in total there is an insufficient number of off-street spaces in the combined Upper and Lower Mill Street parking lots to accommodate the total parking demand in that area of the Hartford CBD.

City Hall Lot: The City Hall parking lot is located along the west side of City Hall adjacent to N. Johnson Street, as shown on Map 19, and contains a total of 50 short-term, two-hour, time-restricted public parking spaces. As shown in Table 15, at no time during the seven-hour survey of existing parking conditions did the parking occupancy rate in this lot approach or exceed the 80 percent parking occupancy rate standard. The 50 parking spaces exhibited a maximum hourly occupancy rate of 44 percent during the 11:00 a.m. to 12:00 p.m. time period, with an average seven-hour occupancy rate of 31 percent. As shown in Table 17, the turnover rate for the 50 parking spaces in this lot was 2.1 vehicles per parking space during the seven-hour survey time period. Thus, it may be concluded that the present available parking supply in the City Hall lot is adequate to accommodate the existing peak parking demand for space in the lot.

N. Johnson Street Lot: The N. Johnson Street public parking lot is located at the northeast corner of the intersection of W. Jackson Street and N. Johnson Street, as shown on Map 19, and contains a total of 25 long-term parking spaces with all-day, unrestricted parking. As shown in Table 15, these 25 parking spaces met or exceeded the 80 percent parking occupancy rate standard during five of the seven hours for which the survey was conducted. In total, the demand for these 25 spaces approached the 80 percent standard, with an average seven-hour occupancy rate of 77 percent. As shown in Table 17, the turnover rate for the 25 parking spaces in this lot was 1.8 vehicles per parking space during the seven-hour survey time period. Based upon these parking survey

findings, it may be concluded that the present parking supply in the N. Johnson Street Lot is inadequate to meet the demand for long-term parking space in the lot.

S. Johnson Street Lot: The S. Johnson Street public parking lot is located on the southwest corner of the intersection of W. Sumner Street and S. Johnson Street, as shown on Map 19, and contains a total of 29 long-term parking spaces with all-day unrestricted parking. As shown in Table 15, the demand for these 25 parking spaces exceeded the 80 percent parking occupancy rate standard during only one hour--9:00 a.m. to 10:00 a.m.--of the seven hours for which the survey was conducted, with an average seven-hour occupancy rate of 55 percent. As shown in Table 17, the turnover rate for the 29 parking spaces in this lot was 1.3 vehicles per parking space during the seven-hour survey time period. Based upon these parking survey findings, it may be concluded that the present parking supply in the S. Johnson Street lot is inadequate to accommodate the demand for long-term parking in the lot.

North City Garage Lot: The North City Garage public parking lot is located east of N. Rural Street between W. Jackson Street and W. Wisconsin Street, as shown on Map 19, and contains a total of six long-term parking spaces with all-day, unrestricted parking. As shown in Table 15, at no time during the seven-hour survey of existing parking conditions did the parking occupancy rate in this lot approach or exceed the 80 percent parking occupancy rate standard. The six parking spaces exhibited a maximum hourly occupancy rate of 16 percent during three of the seven hours for which the parking survey was conducted, with an average seven-hour occupancy rate of 7 percent. As shown in Table 17, the turnover rate for the six parking spaces in this lot was 0.4, or less than one vehicle per parking space, during the seven-hour survey time period. Thus, it may be concluded that the present available parking supply in the North City Garage lot is adequate to accommodate the existing peak parking demand for space in this lot.

City Garage: The City Garage public parking lot is located south of the old city garage off-street lot east of N. Rural Street between W. Jackson Street and W. Wisconsin Street, as shown on Map 19, and contains a total of 10 long-term parking spaces with all-day, unrestricted parking. As shown in Table 15, at no time during the seven-hour survey of existing parking conditions did the parking occupancy rate in this lot approach or exceed the 80 percent parking occupancy rate standard. The 10 parking spaces exhibited a maximum hourly occupancy rate of 60 percent during two of the seven hours for which the survey was conducted, with an average seven-hour occupancy rate of 40 percent. As shown in Table 17, the turnover rate for the 10 parking spaces in the lot was 0.9, or less than one vehicle per parking space during the seven-hour survey time period. Thus, it may be concluded that present available parking supply in the City Garage lot is adequate to accommodate the existing peak parking demand for space in this lot.

North Side Lot: The North Side public parking lot is located north of the Wisconsin & Southern Railroad Company tracks between N. Rural Street and N. Main Street, and contains a total of 10 long-term parking spaces with

all-day, unrestricted parking. As shown in Table 15, at no time during the seven-hour survey of existing parking conditions did the parking occupancy rate in this lot approach or exceed the 80 percent parking occupancy rate standard. The 10 parking spaces exhibited a maximum hourly occupancy rate of 40 percent during five of the seven hours for which the survey was conducted, with an average seven-hour occupancy rate of 36 percent. As shown in Table 17, the turnover rate for the 10 parking spaces in this lot was 0.4, or less than one vehicle per parking space, during the seven-hour survey time period. Thus, it may be concluded that the present available parking supply in the North Side lot is adequate to accommodate the existing peak parking demand for space in the lot.

Rural Street Lot: The Rural Street public parking lot is located adjacent to the western edge of the Hartford CBD along N. Rural Street between W. Sumner Street and W. Jackson Street, as shown on Map 19, and contains a total of 40 long-term parking spaces with all-day, unrestricted parking. As shown in Table 15, at no time during the seven-hour survey of existing parking conditions did the parking occupancy rate in this lot approach or exceed the 80 percent parking occupancy rate standard. The 40 parking spaces exhibited a maximum hourly occupancy rate of 45 percent during two--1:00 p.m. to 2:00 p.m. and 3:00 p.m. to 4:00 p.m.--of the seven hours for which the parking survey was conducted, with an average seven-hour occupancy rate of 37 percent. As shown in Table 17, the turnover rate for the 40 parking spaces in this lot was 0.7, or less than one vehicle per parking space, during the seven-hour survey time period. Thus, it may be concluded that the present available parking supply in the Rural Street lot is adequate to accommodate the existing peak parking demand for space in the lot.

In summary, the survey and analysis of off-street public parking conditions revealed that there is an inadequate supply of short-term public parking spaces in the Lower Mill Street lot and an inadequate supply of long-term public parking spaces in the N. and S. Johnson Street lots in the Hartford CBD. The short-term parking spaces in the Lower Mill Street lot experience periods of 80 percent or greater parking space occupancy during five of the seven hours for which the parking survey was conducted, reaching a high of 97 percent occupancy during the 11:00 a.m. to 12:00 p.m. time period, with an average seven-hour occupancy rate of 81 percent and an average parking space turnover rate of 5.1 vehicles per parking space during the seven-hour survey time period. The long-term parking spaces in the N. and S. Johnson Street lots experience periods of 80 percent or greater parking space occupancy during four hours and one hour respectively of the seven hours for which the parking survey was conducted, reaching a high of 92 percent during the 11:00 a.m. to 12:00 p.m. time period, and 97 percent during the 9:00 a.m. to 10:00 a.m. time period, respectively. The N. Johnson Street parking lot experienced an average seven-hour occupancy rate of 77 percent and an average turnover rate of 1.8 vehicles per parking space, while the S. Johnson Street parking lot experienced a lower average seven-hour occupancy rate of 55 percent and an average turnover rate of 1.3 vehicles per parking space.

The remaining seven off-street public parking lots do not approach or exceed the 80 percent parking space occupancy standard and currently have an adequate supply of public parking space.

As noted in Chapter I of this report, the 1980 resident population of the City of Hartford was 7,181 persons. Accordingly, based upon traffic management Objective 3, Standard 4, a total of 1,080 public parking spaces should be provided in the Hartford CBD, with 30 percent, or about 325 of this total, consisting of on-street curb parking and 70 percent, or about 755, consisting of off-street parking. As previously noted, there are a total of 925 parking spaces in the Hartford CBD, of which 527 spaces are private, off-street facilities, with the remaining 398 public spaces consisting of 150 on-street curb parking spaces and 248 off-street parking spaces. Accordingly, based upon these survey findings, it may be concluded that there is a shortage of at least 155 on- and off-street parking spaces in the Hartford 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 Hartford 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 motor vehicle accident inventory data presented in Chapter III of this report indicated that there were 232 on-street accidents in 1979, 229 on-street accidents in 1980, and 202 on-street accidents in 1981 within the study area. This inventory further indicated that there were 11 intersection locations and seven midblock segments on the existing arterial street and highway system that have averaged three or more traffic accidents over the three-year time period from January 1, 1979 to December 31, 1981. Tables 18 and 19 in Chapter III identify each of these locations.

Based upon those initial inventory findings, a more detailed investigation of the circumstances surrounding each accident was conducted. Using the information provided on the motor vehicle accident report forms, a series of collision diagrams were prepared, indicating the type and severity of each accident, as well as the date, day of 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 F of this report. This detailed information 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 problem that could be solved or mitigated by traffic management actions.

Accident locations in the study area which did not have at least four accidents in 1981 or an average of four accidents over the three-year time period from 1979 to 1981 were not included in this analysis because of the random accident pattern normally associated with such locations. Based upon this initial screening of the 11 intersection and seven midblock segment motor vehicle accident locations, a total of 13 high-accident locations were analyzed.

Intersection--STH 83 and STH 60

This signalized intersection experienced a three-year total of 39 traffic accidents--21 accidents in 1979, 10 accidents in 1980, and eight accidents in 1981--for an annual accident rate of 3.90, 1.86, and 1.48 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 12 involved rear-end collisions, nine involved vehicles making right turns, five involved vehicles making left turns, five involved right-angle collisions, five involved pedestrians who were struck by vehicles while crossing the roadway, and three involved vehicles that sideswiped each other while traveling in the same direction. Eight of the accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in 10 of the 39 accidents--five involving rear-end collisions, four involving pedestrians who were struck by motor vehicles while crossing the roadway, and one involving two vehicles which collided head-on. The accidents were randomly distributed throughout the days of the week. Fifteen, or 38 percent of these accidents, occurred during the winter time period of the year, with the remaining accidents distributed randomly throughout the year, with 11 accidents occurring in summer, eight accidents in the fall, and five accidents in the spring. In 13 of these accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--STH 60 and CTH K

This nonsignalized intersection experienced a three-year total of 25 traffic accidents--13 accidents in 1979, eight accidents in 1980, and four accidents in 1981--for an annual accident rate of 5.34, 3.28, and 1.64 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 10 involved vehicles which went out of control, five involved rear-end collisions, three involved vehicles making left turns, two involved head-on collisions, two involved vehicles that sideswiped each other, one involved a right-angle collision, one involved a vehicle traveling in the opposite direction, one involved a pedestrian who was struck by a vehicle while crossing the roadway, and one involved a vehicle striking a deer crossing the roadway. Eighteen of the accidents occurred after dark. Two of the accidents resulted in fatalities and another nine accidents resulted in personal injuries. One of the fatal accidents involved a vehicle which went out of control, and the other fatal accident involved a pedestrian who was struck by a vehicle while crossing the roadway. Of the nine personal injury accidents, two accidents involved vehicles that went out of control, two involved vehicles making left turns, two involved rear-end collisions, one involved a right-angle collision, and one involved a head-on collision. The accidents were randomly distributed throughout the days of the week. Thirteen accidents, or 52 percent, occurred during the fall, with eight accidents occurring during the summer, two during the spring, and two during the winter. In seven of the accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--STH 60 Street and Johnson Street

This nonsignalized intersection experienced a three-year total of 15 traffic accidents--five accidents in 1979, six accidents in 1980, and four accidents

in 1981--for an annual accident rate of 1.28, 1.54, and 1.03 accidents per million vehicles entering the intersection, respectively. Of the total accidents, 11 involved right-angle collisions, two involved vehicles backing out of driveways in proximity to the intersection, one involved a rear-end collision, and one involved a vehicle making a right turn. Only two of the accidents involved a fatality. Personal injuries occurred in six of the 15 accidents--five involving right-angle collisions and one involving a rear-end collision. Seven, or about 47 percent of the accidents, occurred on a Friday, with the remaining eight accidents distributed randomly throughout the other days of the week. Eight, or 53 percent of these accidents, occurred during the spring, with the remaining accidents distributed randomly throughout the year--one accident in the summer, three accidents in the fall, and three accidents in the winter. In three of the accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--STH 60 and Rural Street

This nonsignalized intersection experienced a three-year total of 15 traffic accidents--eight accidents in 1979, six accidents in 1980, and one accident in 1981--for an annual accident rate of 2.05, 1.54, and 0.26 per million vehicles entering the intersection, respectively. Of the total accidents, five involved vehicles making left turns, four involved right-angle collisions, three involved vehicles that sideswiped another vehicle, two involved vehicles making right turns, and one involved a vehicle that went out of control and hit a fixed object. None of the accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in only three of the 15 accidents--two involving vehicles making a left turn and one involving a vehicle making a right turn. Six, or 40 percent of the accidents, occurred on a Friday with the remaining nine accidents distributed randomly throughout the other days of the week. These accidents were randomly distributed throughout the year, with five accidents occurring in the fall, four accidents occurring in the winter and spring, and two accidents occurring in the summer. In eight of the accidents, weather and/or roadway conditions, i.e. wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--STH 83 and Wilson Avenue

This nonsignalized intersection experienced a three-year total of 12 traffic accidents--six accidents in 1979, five accidents in 1980, and one accident in 1981--for an annual accident rate of 5.02, 4.19, and 0.84 accidents per million vehicles entering the intersection, respectively. Of the total accidents, nine involved a vehicle that went out of control--six of which struck fixed objects; two struck parked automobiles; and one ran off the road--two involved vehicles making a left turn, and one involved a rear-end collision. Eight of the accidents occurred after dark. Personal injury occurred in three of the 12 accidents, all of which involved vehicles that went out of control. The accidents were randomly distributed throughout the days of the week. These accidents were also randomly distributed throughout the year, with five accidents in spring,

four accidents in winter, and three accidents in fall. In nine of the accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--Monroe Avenue and Cedar Street

This nonsignalized intersection experienced a three-year total of 12 traffic accidents--six accidents in 1979, four accidents in 1980, and two accidents in 1981--for an annual accident rate of 4.92, 3.28, and 1.64 accidents per million vehicles entering the intersection, respectively. Of the total accidents, seven involved right-angle collisions, three involved rear-end collisions, one involved a vehicle striking a pedestrian crossing the roadway, and one involved a vehicle sideswiping another vehicle which had been parked and was attempting to enter the traffic stream. Three of the accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in six of the 12 accidents, all of which involved right-angle collisions. The accidents were randomly distributed throughout the year, with five accidents in spring, three accidents in winter, and two accidents in summer and fall. In eight of the 12 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Intersection--STH 60 and Wacker Drive

This nonsignalized intersection experienced a three-year total of five traffic accidents--no accidents in 1979, one accident in 1980, and four accidents in 1981--for an annual accident rate of 0.00, 0.40, and 1.61 accidents per million vehicles entering the intersection, respectively. All of the accidents involved vehicles making a left turn. Three of the left-turn collisions involved vehicles colliding at right angles with other vehicles traveling east- or westbound on STH 60, and two involved left-turning vehicles which were struck in the rear by vehicles traveling in the same direction. None of the accidents occurred after dark or involved a fatality. Personal injuries occurred in the two accidents involving rear-end collisions. The accidents were distributed over the Tuesday through Thursday, midweek period. The accidents were randomly distributed throughout the year, with two accidents in the fall and one accident in the winter, spring, and summer. In two of the five accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Mid-Block--STH 83 Between CTH E and Lee Road

A three-year total of 15 traffic accidents, three in 1979, five in 1980, and seven in 1981, occurred on this section of roadway. Of the total accidents, 13 involved vehicles which went out of control; seven of which struck fixed objects, five which ran off the road, one which struck a parked automobile; one involved a vehicle which struck a deer crossing the roadway, and one involved a vehicle making a left turn. Nine of the accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in six of the 15 accidents, all of which involved vehicles which went out of control. The accidents were randomly distributed throughout the days of the

week. Nine, or 60 percent of these 15 accidents, occurred during the winter time period of the year, with the remaining accidents distributed randomly throughout the year, with three accidents in summer, two accidents in spring, and one accident in fall. In seven of the 15 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Midblock--STH 60 Between the Dodge County Line and Pond Road

A three-year total of 13 traffic accidents, five in 1979 and 1980, and three in 1981, occurred on this section of roadway. Of the total accidents, seven involved vehicles which went out of control, four of which struck fixed objects and three of which went off the roadway; three involved vehicles sideswiping another vehicle; one involved a vehicle making a left turn; one involved a vehicle making a right turn; and one involved a rear-end collision. Seven of the accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in eight of the 13 accidents--six involving vehicles that went out of control, one involving a vehicle making a left turn, and one involving a vehicle that was sideswiped. The accidents were randomly distributed throughout the days of the week. The accidents were also randomly distributed throughout the year, with five accidents occurring during the summer, four in winter, and two in spring and fall. In five of the 13 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Midblock--CTH K Between Waterford Road and CTH E

A three-year total of eight traffic accidents, one in 1979, three in 1980, and four in 1981, occurred on this section of roadway. Of the total accidents, five involved vehicles which collided with deer crossing the roadway, two involved vehicles which went out of control, and one involved a vehicle making a right turn. Five of the accidents occurred after dark. None of the accidents involved a human fatality. Personal injury occurred in two of the eight accidents, the two involving vehicles that went out of control. The accidents were randomly distributed throughout the days of the week. Five of these eight accidents occurred during the spring, with the remaining accidents evenly distributed throughout the winter, summer, and fall. In only one of the eight accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Midblock--STH 83 Between Lee Road and Monroe Avenue

A three-year total of 12 traffic accidents, five in 1979, four in 1980, and three in 1981, occurred on this section of roadway. Of the total accidents, eight involved vehicles which went out of control, six of which struck fixed objects, and two of which ran off the road; two involved right-angle collisions; one involved a rear-end collision; and one involved a vehicle which sideswiped a motorcycle traveling in the same direction. Six of the accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in six of the 12 accidents--four involving vehicles which went out of control, one involving a rear-end collision, and one involving a motorcycle

that was sideswiped. The accidents were randomly distributed throughout the days of the week. These accidents were also randomly distributed throughout the year, with four accidents in spring and fall, three accidents in winter, and one accident in summer. In six of the 12 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Midblock--STH 60 Between Teri Drive and Franklin Lane

A three-year total of 11 traffic accidents, three in 1979, seven in 1980, and one in 1981, occurred on this section of roadway. Of the total accidents, five involved vehicles which went out of control, four of which struck fixed objects, and one of which ran off the roadway; three involved vehicles colliding with deer crossing the roadway; two involved rear-end collisions; and one involved a vehicle which was struck by a motorcycle attempting to avoid hitting a dog in the roadway. Eight of the accidents occurred after dark. None of the accidents involved a fatality. Personal injury occurred in five of the 11 accidents--two involving vehicles which went out of control, two involving rear-end collisions, and one involving the motorcycle which was attempting to avoid hitting a dog in the roadway. The accidents were randomly distributed throughout the days of the week. Eight of the 11 accidents occurred during the fall, with the remaining accidents randomly distributed throughout the year--two accidents in summer and one in spring. In three of the 11 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

Midblock--Kettle Moraine Drive Between STH 60 and Pike Lake State Park

A three-year total of 10 traffic accidents, none in 1979, three in 1980, and seven in 1981, occurred on this section of roadway. Of the total accidents, nine involved vehicles which went out of control, of which seven struck a fixed object and two ran off the roadway; and one involved a vehicle making a left turn. Seven of the accidents occurred after dark. None of the accidents involved a fatality. Personal injuries occurred in three of the 10 accidents, all of which involved vehicles that went out of control. Four of the accidents occurred on Wednesdays and Fridays, with the remaining accidents occurring on Thursday and Saturday. These accidents were randomly distributed throughout the year, with four accidents in winter, three accidents in summer, two accidents in fall, and one accident in the spring. In five of the 10 accidents, weather and/or roadway conditions, i.e., wet or icy pavement and/or rain, sleet, or snow, may have been contributing factors.

The analysis of the 232, 229, and 202 on-street motor vehicle accidents which occurred in the Hartford traffic management study area in 1979, 1980, and 1981, respectively, identified seven high-accident problem intersection locations and six high-accident problem nonintersection locations. At least four motor vehicle accidents in 1981 and/or a three-year average of four accidents per year occurred at these high-accident problem locations. These locations account for a total of 77 accidents, or 33 percent, of the motor vehicle accidents in 1979; 68 accidents, or 30 percent, of the motor vehicle accidents in 1980; and 50 accidents, or 25 percent, of the motor vehicle accidents in 1981.

CITIZEN COMPLAINTS

As indicated in Chapter III of this report, a list of 32 citizen-reported traffic problems was compiled as a part of the study. A summary of this list is contained in Table 20 of Chapter III and the locations concerned are shown on Map 24. The residents of the Hartford study area identified a total of 18 locations with traffic problems. An analysis of the traffic problems listed in Table 20 indicates that the residents of the study area identified eight areas of inadequate sight distance, seven areas of traffic congestion or delay, five areas of inadequate turning capacity, four areas of difficulty in entering the traffic stream, five areas of motor vehicle accident problems, and three areas of inadequate roadway lighting, or a total of 32 traffic-related problems. In many instances, two or three problems were reported at the same location. In addition to the citizen traffic problem complaints summarized in Table 20, a list of eight generalized transportation system problems was reported by the residents of the study area as described in Chapter III of this report.

Some of these reported traffic and transportation system problems, depending upon their severity and relation to the traffic management objectives and standards, were also identified in the preceding sections of this chapter. The following sections describe and evaluate each of the reported traffic problems listed in Table 20, and identify those reported problems as being in agreement with, or related to, a previously identified traffic problem; as being a problem that has not been previously identified; or as being only a perceived problem and not an actual problem, based upon application of the adopted transportation system objectives and standards.

STH 60 at Teri Lane

Citizen complaints indicate that a traffic problem of inadequate sight distance--that is, poor visibility--exists at the intersection of STH 60 and Teri Lane. This public perception is consistent with the study finding that a problem exists on that segment of STH 60 between Teri Lane and Franklin Drive. This problem was accordingly considered in the design and analysis of alternative traffic management actions.

STH 60 at CTH K

Citizen complaints indicate that a motor vehicle accident problem exists at the intersection of STH 60 and CTH K. This public perception is consistent with the study finding that this intersection is one of the high-accident locations in the Hartford traffic management study area. This problem was accordingly considered in the design and analysis of alternative traffic management actions.

STH 60 at Wilson Street

Citizen complaints indicate that traffic problems of inadequate sight distance, motor vehicle accidents, and inadequate roadway lighting exist at the intersection of STH 60 and Wilson Street. A traffic problem could not be identified at

this intersection by application of the standards relating to 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 broad intent of Objective No. 6 to reduce accident exposure and increase traffic safety, alternative traffic management measures to alleviate the perceived traffic problems at this intersection were considered.

STH 60 at Grand Avenue

Citizen complaints indicate that problems of vehicular congestion and delay, and of inadequate northbound left-turning capacity exist at the intersection of STH 60 and Grand Avenue. A traffic problem could not be identified at this intersection by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. A supplemental analysis of existing traffic volumes at this location was conducted by Commission staff. This supplemental analysis compared hourly traffic volumes on the approaches to this intersection to the warrant for the installation of traffic signals which are set forth in the Manual on Uniform Traffic Control Devices. This analysis indicated that traffic volumes at this intersection are sufficient to warrant consideration of the installation of traffic control signals at this intersection. Based upon this finding, and upon the changes in traffic patterns which may be expected to occur with the construction of N. Grand Avenue northward across the Mill Pond to Fourth Street, alternative traffic management actions were considered to abate the problems at this intersection.

STH 60 at STH 83

Citizen complaints indicate that traffic problems of vehicular congestion and delay, and inadequate left-turn capacity exist at the intersection of STH 60 and STH 83. This public perception is consistent with study findings that congestion and traffic accident problems existed at this location. Accordingly, these traffic-related problems were considered in the design and analysis of alternative traffic management actions.

STH 60 and Grant Street

Citizen complaints indicate that problems of inadequate sight distance, traffic congestion and delay, and inadequate turn capacity exist at the intersection of STH 60 and Grant Street. A traffic problem could not be identified at this location by application of 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 broad intent of traffic management Objective No. 5 to provide for the efficient movement of people and goods within the community, alternative traffic management measures to alleviate the reported traffic problems at this intersection were considered.

STH 60 at Rural Road

Citizen complaints indicate that problems of vehicular congestion and delay, difficulty in entering the traffic stream, and motor vehicle accidents exist at the intersection of STH 60 and Rural Road. This public perception is consistent

with the study findings that a traffic accident problem exists at this location. Accordingly, this problem was considered in the design and analysis of alternative traffic management actions.

STH 60 at Cedar Street

Citizen complaints indicate that problems of vehicular congestion and delay, and inadequate turn capacity exist at the intersection of STH 60 and Cedar Street. A traffic problem could not be identified at this location by application of the standards for vehicular congestion or delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in the study.

STH 60 at Wacker Drive

Citizen complaints indicate that problems of vehicular congestion and delay, and inadequate turning capacity for left turns to STH 60 exist at the intersection of STH 60 and Wacker Drive. This public perception is consistent with the study finding that a traffic accident problem exists at this location. Accordingly, these problems were considered in the design and analysis of alternative traffic management actions.

STH 60 at Pond Road

Citizen complaints indicate that problems of motor vehicle accidents and inadequate roadway lighting exist at the intersection of STH 60 and Pond Road. This public perception is consistent with the study finding that an accident problem exists on the segment of STH 60 between the Dodge county line and Pond Road. Accordingly, this problem was considered in the design and analysis of alternative traffic management actions.

STH 83 (S. Grand Avenue) at S. Branch Street and Lincoln Street

Citizen complaints indicate that problems of inadequate sight distance and difficulty in entering the traffic stream for southbound left turns to STH 83 exist at the intersection of STH 83 with S. Branch Street and Lincoln Street. A traffic problem could not be identified at this location by application of the standards for vehicular congestion or delay, accessibility, parking, or traffic accidents. However, to ease the concerns of the residents of the study area, and to satisfy the broad intent of traffic management Objective No. 5 to provide for the efficient movement of people and goods within the community, alternative traffic management measures to alleviate the reported traffic problems at this intersection were considered.

STH 83 at Loos Street

Citizen complaints indicate that a problem of inadequate sight distance exists at the intersection of STH 83 and Loos Street. A traffic problem could not be

identified at this location by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in this study.

STH 83 (S. Branch Street) at S. Main Street and W. Kossuth Street

Citizen complaints indicate that problems of inadequate sight distance and difficulty in entering the traffic stream for northbound traffic on S. Main Street exist at the intersection of STH 83 with S. Main Street and W. Kossuth Street. A traffic problem could not be identified at this intersection by application of 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 broad intent of traffic management Objective No. 5 to provide for the efficient movement of people and goods within the community, alternative traffic management measures to alleviate the reported traffic problems at this intersection were considered.

STH 83 and Wisconsin Street

A citizen complaint indicates that a problem of inadequate sight distance exists at the intersection of STH 83 and Wisconsin Street. A traffic problem could not be identified at this intersection by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in this study.

STH 83 at State Street

Citizen complaints indicate that problems of inadequate sight distance and difficulty in entering the traffic stream exist at the intersection of STH 83 and State Street. A traffic problem could not be identified at this intersection by application of the standards for vehicular congestion and delay, accessibility, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem and was not addressed further in this study.

E. Monroe Avenue at CTH K

Citizen complaints indicate that problems of motor vehicle accidents and inadequate roadway lighting exist at intersection of E. Monroe Avenue and CTH K. A traffic problem could not be identified at this intersection by application the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problems and was not addressed further in the study.

W. Monroe Avenue at S. Cedar Street

Citizen complaints indicate that a problem of vehicular congestion and delay associated with school dismissal times exists at the intersection of W. Monroe Avenue and S. Cedar Street. A traffic problem could not be identified at this intersection by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Field observations by Commission staff of peak-hour traffic operation in the vicinity of this intersection indicate that the reported vehicular congestion is a normal characteristic of school activity and does not appear severe enough to warrant the implementation of traffic management actions beyond those already implemented by the City of Hartford. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in this study.

Generalized Transportation System Problems

In addition to the citizen traffic problem complaints summarized in Table 20, eight more generalized transportation system problems were reported by the residents of the study area, as described in Chapter III. The first such reported problem concerns the high volume of truck traffic on S. Grand Avenue. This reported traffic problem was confirmed by the analysis of arterial service problems in the study area. Accordingly, this traffic problem was considered in the design and analysis of alternative traffic management actions.

The second such reported problem involves excessive vehicle delays when school buses stop to pick up and discharge students. As previously noted under the discussion of the citizen complaint relating to vehicular congestion and delay at the intersection of W. Monroe Avenue and S. Cedar Street, the delays associated with school operations are normal characteristics of any arterial system and, based upon Commission staff field observations, are not severe enough to warrant the implementation of traffic management actions beyond those already implemented by the City of Hartford. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in this study.

The third such reported problem consists of inadequate sight distance for right-turn-on-red vehicles at the signalized intersections of STH 83 with STH 60 and E. Jackson Street. A traffic accident problem was identified at the intersection of STH 83 and STH 60. However, a detailed analysis of the collision patterns at that intersection indicates that none of the 39 reported motor vehicle accidents during the three-year period from January 1, 1979 to December 31, 1981, involved vehicles making a right-turn-on-red maneuver. A traffic problem could not be identified at the intersection of Main Street and E. Jackson Street by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem, and was not addressed further in this study.

The fourth such reported problem involves an insufficient number of north-south arterial streets between STH 60 and STH 83 east of Main Street. This reported problem is related to the previously identified arterial service problem of excessive truck traffic on S. Grand Avenue and arterial system

route continuity. The recently completed construction of N. Grand Avenue between E. Sumner Street and E. Wisconsin Street should serve to ameliorate this reported arterial service problem. However, this problem was further considered in the design and analysis of alternative traffic management actions.

The fifth such reported problem involves an excessive number of north-south arterial streets on the south side of the City of Hartford. As shown on Map 7 in Chapter II, there are three arterial routes--S. Cedar Street between W. Monroe Avenue and STH 60, STH 83 between the south city limits and STH 60, and S. Grand Avenue between STH 83 and STH 60--on the south side of the City of Hartford. The arterial street spacing between S. Cedar Street and STH 83 is approximately one-half mile, satisfying traffic management Objective 3, Standard 2, which requires arterial streets and highways in urban, medium-density, residential areas to be spaced no more than one mile apart. The agreed upon traffic management objectives do not impose a minimum spacing standard for arterial streets except that Objective 3, Standard 1, requires that the total mileage of arterial streets and highways within the study area should comprise between 15 and 25 percent of total community street and highway system mileage. As previously noted in the arterial service section of this chapter, the existing arterial street and highway system comprises about 18 and 24 percent, respectively, of the total arterial street and highway system within the study area and within the City of Hartford. The designation of S. Grand Avenue which intersects with STH 83 as an arterial street was previously identified as an arterial service problem pertaining specifically to excessive truck traffic and arterial system route continuity. These problems were further considered in the design and analysis of alternative traffic management actions.

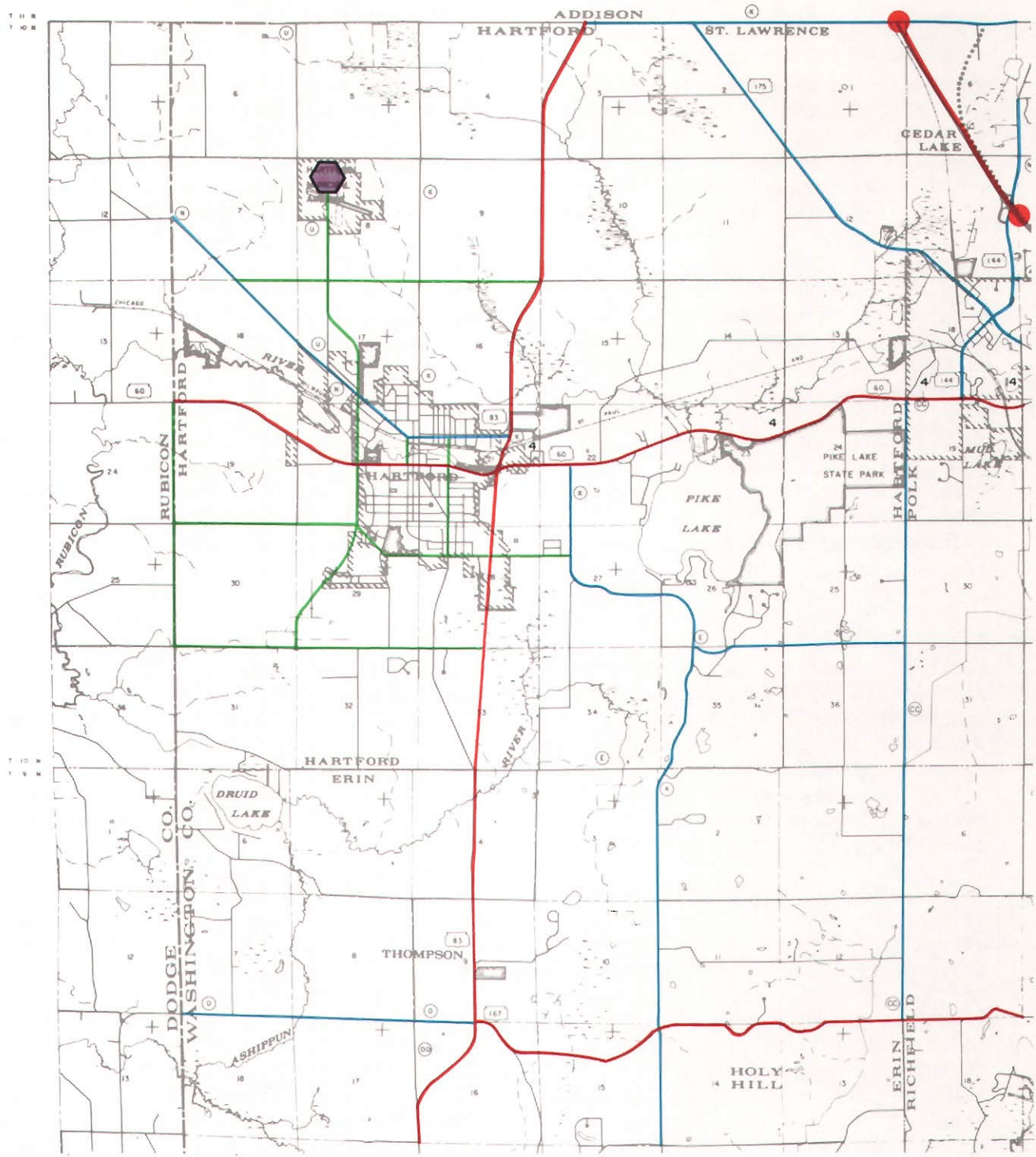
The sixth such reported problem involves traffic congestion and motor vehicle accident potential attributed to the location of mailboxes in front of the Post Office on STH 60. Although the location of mailboxes on STH 60 increases vehicular conflicts between through traffic and traffic desiring to use the postal facilities, a traffic problem could not be identified at this location by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this citizen complaint was classified as a perceived rather than an actual traffic problem and was not addressed further in this study.

The seventh such problem involves the need for and the timing of implementation of the proposed Wilson Avenue bypass on the east side of the City of Hartford between STH 83 and STH 60, the Clover Road extension on the north side of the study area between STH 83 and W. State Street, and the Wacker Drive extension on the west side of the City of Hartford between STH 60 and Lee Road. These three proposed arterial street and highway system improvement projects are identified in the year 2000 long-range transportation system plan for southeastern Wisconsin, as shown on Map 25, and are directly related to arterial service problems previously identified in this chapter. These related problems were further considered in the design and analysis of alternative traffic management actions to solve or ameliorate the arterial service problems in the study area.

The final such reported problem involves a need to restrict on-street parking to improve traffic flow on STH 83 (S. Branch Street) and S. Grand Avenue. Both of these arterial streets have existing, all-day, parking restrictions on the east side of the street. As indicated in Table 12 of Chapter III of this

Map 25

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



LEGEND

ARTERIAL STREET AND HIGHWAY SYSTEM

JURISDICTIONAL CLASSIFICATION

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

4 NUMBER OF TRAFFIC LANES (TWO LANES WHERE UNNUMBERED)

AIRPORT SYSTEM

GENERAL UTILITY AIRPORT

GRAPHIC SCALE

0 1/2 1 MILE

0 2000 4000 6000 8000 FEET

Source: SEWRPC.

report, the average off-peak-hour travel speeds on the segment of STH 83 between S. Grand Avenue and STH 60 are 24 and 27 mph in the northbound and southbound directions, respectively, while the comparable average peak-hour travel speeds are only slightly lower, at 21 and 26 mph, respectively. STH 83, which has a traveled way of 30 feet in width, currently operates with an eight-foot-wide southbound parking lane and 12-foot-wide northbound and southbound travel lanes. A 12-foot-wide travel lane is generally considered desirable on arterial streets. Restriction of southbound on-street parking would permit operation of STH 83 with two 15-foot-wide travel lanes, which may be expected to provide unsafe, higher travel speeds on STH 83. A traffic problem could not be identified on STH 83 by application of the standards for vehicular congestion and delay, accessibility, parking, or traffic accidents. Accordingly, this reported traffic flow problem on STH 83 was classified as a perceived rather than an actual problem, and was not addressed further in this study.

S. Grand Avenue, which is 27 feet in width, currently operates with a seven-foot-wide southbound parking lane and 10-foot-wide northbound and southbound travel lanes. A 10-foot-wide travel lane is generally considered to be the absolute minimum for urban arterial streets. Such a lane does impose some restriction on the safe and efficient movement of vehicular traffic. This reported traffic problem is related to the previously identified arterial service problem of excessive truck traffic on S. Grand Avenue and arterial route continuity. Accordingly, this traffic problem will be considered in the design and analysis of alternative traffic management actions.

In summary, the Citizens and Technical Advisory Committee for the Hartford Area Traffic Management Study reported a total of 32 traffic complaints. These complaints were grouped into six categories: 1) inadequate sight distance; 2) vehicular congestion and delay; 3) inadequate turning capacity; 4) difficulty in entering the traffic stream; 5) motor vehicle accidents; and 6) inadequate roadway lighting. These 32 traffic complaints identified 17 street and highway locations with reported traffic problems. An additional eight generalized traffic complaints were also identified by the Committee. These complaints were primarily concerned with vehicular traffic congestion and existing arterial service. The reported traffic problems at 11 of the 17 street and highway locations, and five of the eight generalized traffic complaints were identified as either a valid traffic problem or directly related to a valid traffic problem based on application of the traffic management standards. The reported problems which were not identified as traffic problems by application of the traffic management standards were classified as perceived rather than actual traffic problems and were not addressed further in this study. It is expected that the magnitude of these perceived traffic problems should be reduced through the improved operation and safety of vehicular traffic on the arterial street and highway system in the study area which may be attributed to the implementation of traffic management actions designed to solve or mitigate the previously identified traffic problems.

SUMMARY

This chapter has identified and described the traffic problems which exist on the transportation system of the Hartford area. The following summary of these problems is organized by arterial facility in order to identify transportation system deficiencies which may be interrelated. The two principal arterials in

the study area are STH 60 and STH 83. These two facilities carry the highest traffic volumes in the study area and, as shown on Map 26, have been identified as experiencing a majority of the traffic problems in the study area. Therefore, resolution 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 segment of STH 60 from the Dodge County line to Pond Road was identified as a high traffic accident area with a three-year total of 13 accidents since 1979, of which eight accidents involved personal injuries. The intersection of STH 60 and Wacker Drive was also identified as a high traffic accident intersection with a three-year total of five accidents since 1979, four of which occurred in 1981, with two accidents involving personal injuries. The intersection of STH 60 and Grant Street was identified as presenting an arterial service traffic problem, with vehicular congestion, inadequate sight distance, and left-turn capacity restrictions.

The segment of STH 60 from Rural Street to South Street contains several high traffic accident and parking problems. The intersection of STH 60 and Rural Street was identified as a high traffic accident intersection with a three-year total of 15 accidents since 1979, of which three accidents involved personal injuries. The intersection of STH 60 and Johnson Street was identified as a high traffic accident intersection with a three-year total of 15 accidents, of which six accidents involved personal injuries. The intersection of STH 60 and STH 83 was also identified as a high traffic accident problem intersection, with a three-year total of 39 accidents since 1979, of which 10 accidents involved personal injuries. Between Johnson Street and South Street, the analyses indicated a lack of sufficient on-street parking spaces. This parking problem extends to the N. and S. Johnson Street public parking facilities, which also do not have an adequate supply of parking spaces.

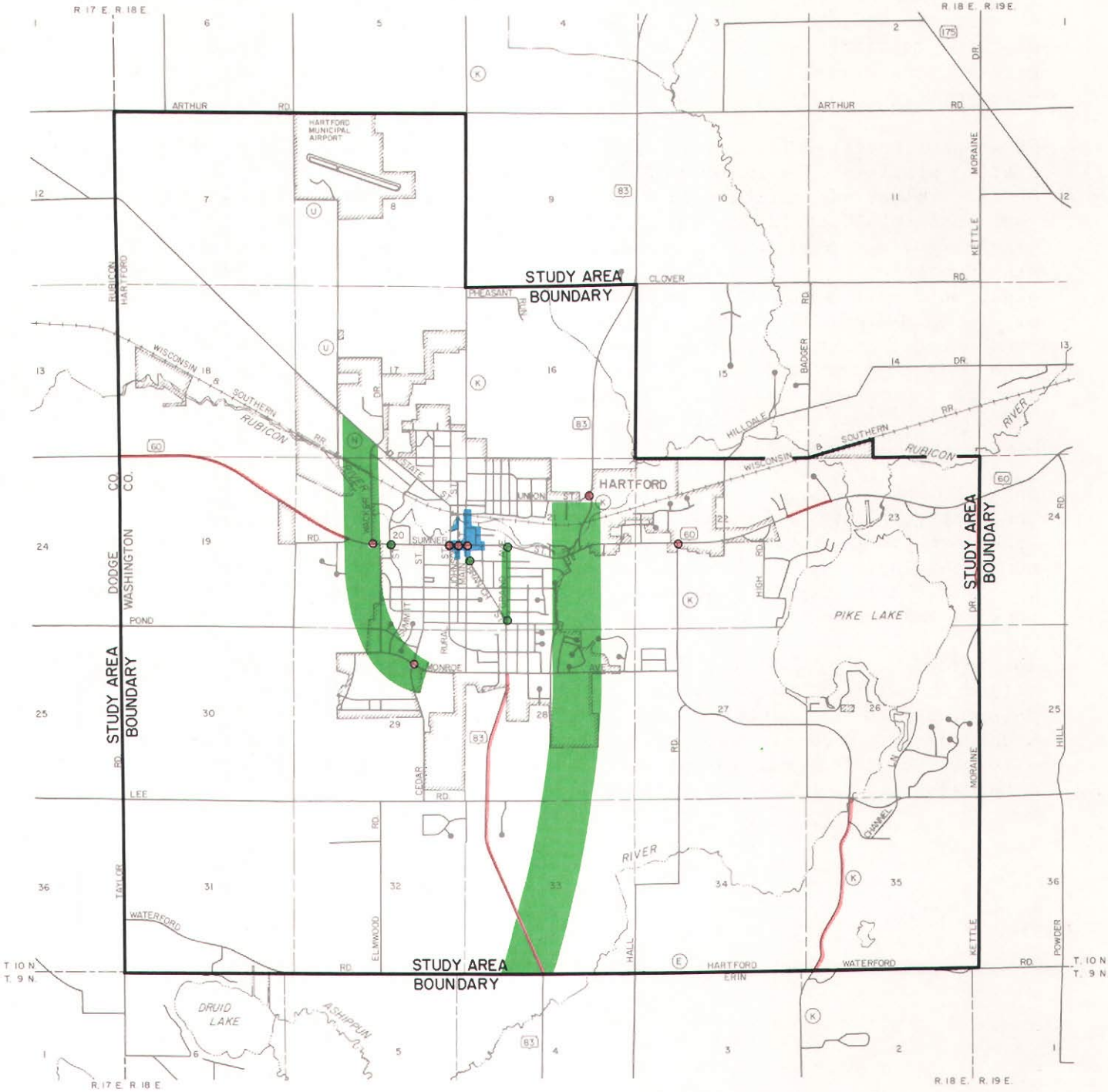
The intersection of STH 60 and Grand Avenue was identified as presenting an arterial service problem, with potential traffic congestion and left-turn capacity restrictions. The intersection of STH 60 and CTH K was identified as a high traffic accident problem intersection with a three-year total of 25 accidents since 1979, of which two accidents involved fatalities and another nine accidents involved personal injuries. The segment of STH 60 from Teri Lane to Franklin Drive was identified as a high traffic accident area with a three-year total of 11 accidents, of which five involved personal injuries.

STH 83, from the southern boundary of the study area to Monroe Street, was identified as a high traffic accident area with a three-year total of 27 accidents, of which 12 accidents involved personal injuries. STH 83, at its intersections with S. Branch Street/Lincoln Street and S. Main Street/W. Kossuth Street, was identified as presenting an arterial service problem, based upon the difficulties entailed in entering the traffic stream on STH 83 from these intersecting roadways.

For the segment of STH 83 between S. Branch Street and STH 60, the analyses indicate a lack of sufficient on-street parking spaces. As previously noted under the discussion of STH 60, the intersection of STH 83 and STH 60 is a high traffic accident location. The segment of STH 83 from Main Street to State Street was identified as an on-street parking supply problem area lacking

Map 26

TRAFFIC PROBLEMS ON THE TRANSPORTATION SYSTEM OF THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



Source: SEWRPC.

a sufficient number of on-street parking spaces. This parking problem extends to the Lower and Upper Mill Street public parking facilities which in total do not have an adequate supply of short-term parking spaces. The final traffic problem identified on STH 83 is a safety problem, located at its intersection with Wilson Avenue, with a three-year total of 12 accidents since 1979, of which three accidents involved personal injuries.

Four other arterial facilities in the study area were identified as exhibiting traffic problems. The segment of Kettle Moraine Drive from STH 60 to Pike Lake State Park was identified as a high traffic accident problem area with a three-year total of 10 accidents since 1979, of which three accidents involved personal injuries. Similarly, the segment of CTH K from Waterford Road to CTH E was identified as a traffic accident problem area with a three-year total of eight accidents since 1979, of which four accidents occurred in 1981 with two of the accidents involving personal injuries. The intersection of W. Monroe Avenue and S. Cedar Street was identified as a traffic accident intersection with a three-year total of 12 accidents since 1979, of which six accidents involved personal injuries. The segment of S. Grand Avenue from STH 83 to STH 60 was identified as presenting arterial service problems, with excessive truck traffic and a lack of arterial route continuity.

An additional problem of inadequate arterial service was identified which indirectly affects the efficiency and operating characteristics of the existing transportation system in the study area. This problem involves an inadequate number of continuous north-south arterial routes through the City of Hartford. The resolution of this problem could serve to ameliorate some of the arterial service and accident problems identified in the study area.

The foregoing represent the principal transportation system deficiencies identified in the Hartford study area through an evaluation of the existing traffic data presented in Chapter III against 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 VII of this report.

Chapter VI

TRAFFIC IMPACT OF PLANNED NEW DEVELOPMENT

INTRODUCTION

A principal concern expressed by members of the Advisory Committee guiding the Hartford area traffic management study was the potential impact on traffic conditions of the vehicular traffic which may be expected to be generated by new development proposed to occur in the study area within the next three years. In order to properly address the potential traffic impacts of such development, it was necessary to identify the location, type, and size of all known proposed major land development projects. With this basic land development data identified, it was possible to estimate the volume of vehicular traffic which may be expected to be generated by each proposed development project, and to estimate the probable impacts of each project on the existing traffic volumes on, and attendant operating conditions of, the arterial street and highway system. Traffic management measures to abate any undesirable impacts so identified could then be investigated to ensure the continued safe and efficient flow of vehicular traffic within and through a community at a minimum of disruption and cost to the community.

PLANNED DEVELOPMENT

The Advisory Committee was asked to identify land development projects proposed to be carried out within the study area during the three-year period from 1983 through 1985. As indicated in Table 22, and as shown on Map 27, the Committee compiled a list of 10 proposed development projects. This list included two residential and three commercial land development projects. In addition, two public park development projects and three roadway construction projects, two of which were to include planned peripheral residential development, were identified.

Residential Development Projects

The proposed residential development projects identified consisted of the Kraft site and the Riverbend East projects. The Kraft site residential development project is proposed to be located between E. Wisconsin Street and the Mill Pond in the vicinity of N. Second Street. The project plans provide for the construction, by 1984, of a total of 30 to 36 dwelling units to be occupied by elderly persons. The Riverbend East residential development project is proposed to be located along Riverbend East Drive which will serve as an easterly extension of Union Street from its intersection with N. Wilson Avenue. The project plans provide for the eventual construction of a total of 254 apartment/condominium dwelling units of which 32 units are to be occupied by elderly persons. It is expected that the first phase of the project will consist of 44 units to be constructed by 1984.

Table 22

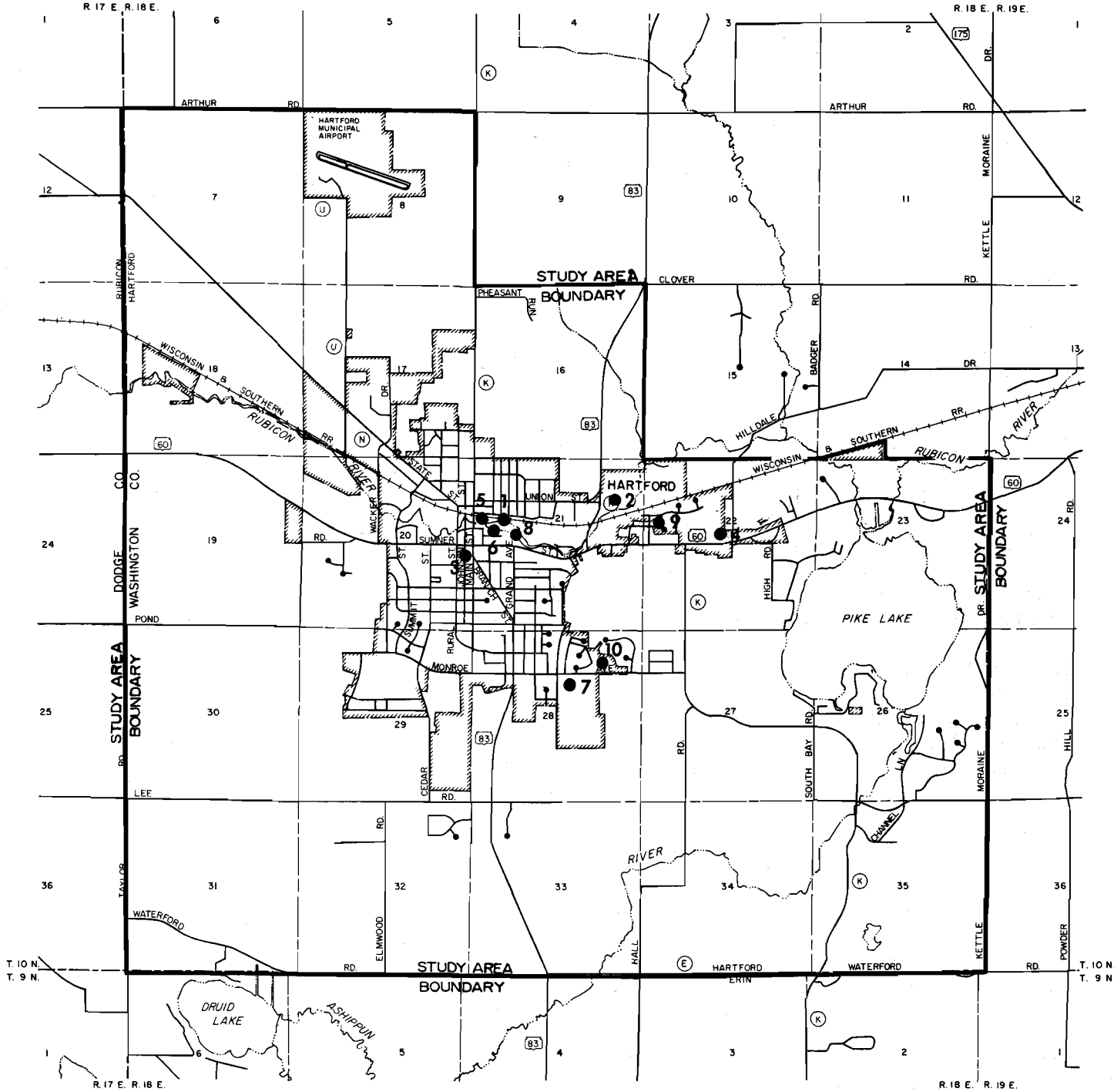
PROPOSED NEW LAND DEVELOPMENTS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1983-1985

Land Use Category	Identification Number on Map 27	Name	Location	Description	Proposed Completion Date
Residential	1	Kraft Site.....	N. Second Street and E. Wisconsin Avenue	Senior citizen housing: 30 to 36 units	1984
	2	Riverbend East..... (first phase)	N. Wilson Street and Union Sreet extended	Apartment/Condominium: 6 two-family units; 4 eight-family units	1984
Commercial	3	Esther's of Hartford..	S. Main Street--south of Sumner Street	Retail Clothing: 24,000 square feet	1983
	4	Hartford Square..... (first phase)	E. Sumner Street and Hilldale Drive	Neighborhood shopping center: 40,000 square feet	1984
	5	Kraft Site.....	N. Main Street and Wisconsin Street	Small shops and offices: 30,000 square feet	1985
Governmental	6	Mill Pond Park.....	Grand Avenue bridge area	City park: four acres	1984
	7	Independence Park..... (first phase)	S. Wilson Street and E. Monroe Avenue	City park: 15 acres	1985
Roadway Construction	8	N. Grand Avenue Extension.....	E. Sumner Street to E. Wisconsin Street	44-foot-wide pavement	1983
	9	Tamarack Avenue.....	Honeysuckle Road to Sell Drive	36-foot-wide pavement	1983
	10	Wildwood Court.....	E. Monroe Avenue east of Ridgeview Drive	30-foot-wide pavement	1983

Source: City of Hartford.

Map 27

LOCATION OF PROPOSED NEW LAND DEVELOPMENTS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1983-1985



LEGEND

- ● PROPOSED NEW LAND DEVELOPMENT
- 3 SEE TABLE 22 FOR LAND DEVELOPMENT NUMBER AND NAME

Source: City of Hartford.

Commercial Development Projects

The proposed commercial development projects identified consisted of the Esther's of Hartford, the Hartford Square, and the Kraft site projects. The Esther's of Hartford commercial development project is proposed to be located adjacent to the west side of STH 83, approximately 75 feet south of its intersection with STH 60. The project plans propose the relocation in 1983 of the existing Esther's of Hartford retail women's apparel store that currently occupies about 4,000 square feet of floor space at a location adjacent to the west side of STH 83, approximately 250 feet north of its intersection with STH 60, to a new building containing approximately 24,000 square feet of floor space. Esther's of Hartford will occupy 9,800 square feet of the new building, with the remaining 14,200 square feet of floor space to be occupied by other retail stores and possibly a restaurant. Development plans provide for an additional 31 off-street parking spaces to serve the proposed 24,000-square-foot building. It is also proposed that the existing building occupied by Esther's of Hartford be leased for expansion purposes to the adjacent Engeldahl Drug Store.

The Hartford Square commercial development project is proposed to be located adjacent to the northwest corner of the intersection of STH 60 and Hilldale Drive. The project plans propose the eventual construction of an 80,000-square-foot neighborhood shopping center. It is expected that the first phase of the project will consist of a 40,000-square-foot development that would include a super-market type grocery store, a drug store, and a McDonald's fast food service restaurant to be constructed by 1984. Current plans call for construction of the McDonald's restaurant to be completed in 1983.

The Kraft site commercial development project is proposed to be located adjacent to the southeast corner of the intersection of STH 83 and E. Wisconsin Street. The Kraft plans propose the construction, by 1985, of a 30,000-square-foot development of commercial space for use by a number of small retail shops and offices.

Public Parks

Two public park development projects consisting of Mill Pond Park and Independence Park are proposed to be constructed by the City of Hartford prior to the fall of 1985. The Mill Pond Park project is proposed to be constructed adjacent to the south side of Mill Pond between N. Grand Avenue and N. Main Street (STH 83), and is planned as a four-acre city park with picnic areas, a year-round use pavilion, walkways and scenic-view open spaces. The Independence Park project is proposed to be constructed adjacent to the southeast corner of the intersection of S. Wilson Avenue and E. Monroe Avenue. Plans call for an 80-acre city park with active outdoor recreational facilities and picnic areas. It is expected that the first phase of the park project will consist of a 15-acre development to be constructed by 1985.

Roadway Improvement

One arterial street extension--N. Grand Avenue--and two land access street construction projects--Tamarack Avenue and Wildwood Court--are proposed to

be constructed by the City of Hartford in 1983. It is proposed that N. Grand Avenue be extended for a distance of about 800 feet between E. Sumner Street (STH 60) and N. Fourth Street. This new arterial facility, which includes construction of a new bridge over the Mill Pond, is designed as a two-lane, 44-foot-wide roadway with on-street parking.

The proposed construction of Tamarack Avenue will extend for a distance of about 400 feet between Honeysuckle Road and Sell Drive. This new land access street is designed as a two-lane, 36-foot-wide roadway to provide access to proposed abutting residential development consisting of 82 single- and multi-family dwelling units.

The proposed construction of Wildwood Court will extend for a distance of about 500 feet north of E. Monroe Avenue approximately 400 feet east of Ridgeview Drive. This new land access street is designed as a two-lane, 30-foot-wide roadway to provide access to proposed abutting residential development consisting of 16 single-family dwelling units.

TRAFFIC GENERATION AND IMPACT

The vehicular traffic generated by new land developments may be expected to directly impact the operating conditions on the arterial street and highway system in the immediate vicinity of such development. To analyze those impacts, it is necessary to estimate the volume of vehicular traffic that may be expected to be generated by the new land development and then determine if that volume will significantly and adversely impact the operating conditions of the existing arterial streets and highways in the immediate vicinity of the new development.

Residential Development Projects

Kraft Site: The Kraft site residential development project is proposed to consist of 30 to 36 dwelling units to be used by elderly persons. Based upon trip generation rates measured at similar developments, it may be expected that the proposed Kraft site development will generate approximately 100 to 120 vehicle trips per average weekday (vpd). It may be assumed that about two-thirds of the traffic generated by the development will use E. Wisconsin Street to STH 83; and about one-third will use E. Wisconsin Street to N. Grand Avenue and STH 60, resulting in a traffic volume increase from 6,900 to 6,980 vpd, or 1 percent, on STH 83; from 1,000 to 1,040 vpd, or 4 percent, on N. Grand Avenue; and from 9,900 to 9,940 vpd, or 1 percent, on STH 60. None of these traffic volume increases may be expected to adversely impact the safety or vehicular operating conditions on STH 83, Grand Avenue, or STH 60.

Riverbend East: The Riverbend East residential development project is proposed to eventually consist of 254 apartment/condominium dwelling units, of which 32 units are designated for use by elderly persons. It is expected that phase one, consisting of 44 units, will be constructed by 1984. Based upon trip generation rates measured at similar apartment/condominium developments, it may be expected that when completed the proposed Riverbend East development

will generate approximately 1,600 vehicle trips on an average weekday, of which 370 trips would be generated by the phase one development. It may be assumed that when completed about one-half of the traffic generated by the development will use Union Street, and about one-half will use N. Wilson Avenue, resulting in a traffic volume increase from 2,800 to 3,600 vpd, or 28 percent, on Union Street; and from 2,600 to 3,400 vpd, or 31 percent, on N. Wilson Avenue. Neither of these traffic volume increases may be expected to cause congestion or adversely impact vehicular operating conditions on Union Street or N. Wilson Avenue. However, as indicated in Chapter V of this report, the intersection of Union Street and N. Wilson Avenue was identified as a high-accident location in the study and the intersection of N. Wilson Avenue and STH 60 was identified on the basis of citizen complaints as a location of inadequate sight distance and roadway lighting. Therefore, it is recommended that the traffic management actions proposed in Chapter VII of this report to solve or mitigate these existing highway safety problems be implemented at an early date to ensure the safe and efficient flow of existing and anticipated vehicular traffic in the vicinity of N. Wilson Avenue at its intersections with Union Street and STH 60.

Commercial Development Projects

Esther's of Hartford: The Esther's of Hartford commercial development is proposed to be relocated from its present 4,000-square-foot store on N. Main Street (STH 83) to a new 24,000-square-foot store located on S. Main Street 75 feet south of STH 60, which it will share with other commercial enterprises. The proposed development is virtually unique with respect to its trip generation potential because the Esther's of Hartford retail establishment draws its clientele from the greater Milwaukee area as well as from the local trade area. Based upon trip generation data provided to the Commission staff by Esther's of Hartford, it may be expected that the relocated Esther's of Hartford and associated commercial development, which is proposed to be located in the same building, will generate approximately 650 vehicle trips per average weekday. This is an increase of about 500 vehicle trips over the number currently generated by Esther's of Hartford at its existing location on N. Main Street. It is expected that the Engledahl Drug Store will increase its total trip generation potential when it expands into the former Esther's of Hartford store location on N. Main Street. The increased Engledahl Drug Store average weekday trip generation is expected to approximately equal the number of trips generated by Esther's of Hartford at that location. Therefore, the combined Esther's of Hartford and Engledahl Drug Store development plans are expected to increase traffic volumes on STH 60 from 10,300 to 10,470 vpd, or 2 percent, west of STH 83, and from 9,900 to 10,250 vpd, or 4 percent, east of STH 83. It is expected that the volume of vehicular trips on STH 83 will increase from 6,800 to 7,320 vpd, or 8 percent, south of STH 60, and from 6,900 to 7,030 vpd, or 2 percent, north of STH 60. It is not expected that these increases in traffic volume will significantly impact the safety or operating conditions on the arterial street and highway system in the study area.

The relocation of Esther's of Hartford and the accompanying commercial development may adversely impact the previously identified parking problems on STH 83 south of STH 60, on STH 60 east and west of STH 83, and in the S. Johnson Street public parking lot. The relocated Esther's of Hartford development

is proposed to add 31 off-street parking stalls to the existing parking supply in the Hartford central business district. According to preliminary parking requirement standards set forth in the July 1982 parking plan prepared by the Hartford Parking Authority, a total of approximately 60 parking spaces should be provided for the relocated Esther's of Hartford development. This indicates a need for approximately 30 additional parking spaces in the vicinity of the Esther's of Hartford development.

Hartford Square: The Hartford Square commercial development is proposed to consist of an 80,000-square-foot neighborhood shopping center. It is expected that phase one, consisting of 40,000 square feet, will be constructed by 1984. Based upon trip generation rates measured at similar developments, it may be expected that when completed the proposed Hartford Square development will generate approximately 6,000 vehicle trips per average weekday, with about 1,500 of those trips generated by the McDonald's restaurant which is proposed to be included in the development project. It may be assumed that approximately 40 percent of the traffic generated by the development will travel on the segment of E. Sumner Street (STH 60) west of Hilldale Drive, 30 percent will travel on the segment of STH 60 east of Hilldale Drive, and 30 percent will be attracted from existing traffic on STH 60. Under this distribution of vehicular traffic generated and attracted to the proposed development, the traffic volume on STH 60 may be expected to increase from 6,200 to 8,600 vehicles per average weekday, an increase of about 40 percent. This increase in vehicular traffic has the potential to adversely impact the safety and operating conditions on STH 60. The application of sound traffic engineering design practices such as construction of deceleration, bypass, and refuge lanes for turning vehicles at the driveways to the proposed development should serve to reduce the conflict between site-generated and through traffic on STH 60. Implementation of such measures prior to the opening of the proposed development should serve to maintain the safe and efficient flow of vehicular traffic on STH 60.

Kraft Site: The Kraft site commercial development is proposed to consist of 30,000 square feet of small retail shops and offices. Based upon trip generation rates measured at similar developments, it may be expected that the proposed Kraft site development will generate approximately 1,000 vehicle trips per average weekday. It may be assumed that approximately two-thirds of the traffic generated by the development will travel on E. Wisconsin Street to STH 83, and approximately one-third will travel on E. Wisconsin Street to N. Grand Avenue and STH 60, resulting in a traffic volume increase from 6,900 to 7,570 vehicles per average weekday (vpd), or 10 percent, on STH 83; from 1,000 to 1,330 vpd, or 33 percent, on N. Grand Avenue; and from 9,900 to 10,230 vpd, or 3 percent, on STH 60. None of these traffic volume increases may be expected to adversely impact the safety or vehicular operating conditions on STH 83, N. Grand Avenue, or STH 60.

Public Park Development Projects

Mill Pond Park: The Mill Pond Park development is proposed to consist of four acres of picnic area, winter recreational facilities, scenic view and open space areas. The park is intended to serve as a small special community park,

as well as an amenity in the redeveloped Hartford central business district. It is not expected that this public park will generate significant volumes of vehicular traffic or adversely impact traffic conditions in the area.

Independence Park: The Independence Park development is proposed to consist of 80 acres of active outdoor recreational facilities and picnic park space, with 15 acres developed by 1985. Based upon trip generation rates measured at similar developments, it may be expected that when completed, the proposed Independence Park development will generate approximately 600 trips per average weekday, resulting in a traffic volume increase from 1,150 to 1,750 on E. Monroe Avenue, an increase of about 52 percent. This traffic volume increase is not expected to adversely impact the safety or vehicular operating conditions on E. Monroe Avenue.

Roadway Improvements

N. Grand Avenue Extension: The construction of N. Grand Avenue between E. Sumner Street (STH 60) and E. Wisconsin Street at N. Fourth Street across the east end of the Mill Pond is not expected to generate significant volumes of vehicular traffic, but is expected to result in the redistribution of existing traffic flows in and through the Hartford central business district and adjacent areas. This redistribution of traffic is expected to result in a 1983 traffic volume of about 2,000 vehicles per average weekday on the newly constructed segment of N. Grand Avenue. This traffic may be expected to be composed of approximately 200 vehicles which formerly traveled on the segment of STH 60 west of N. Main Street (STH 83), and on the segment of STH 83 north of STH 60; approximately 600 vehicles which formerly traveled on the segments of STH 83 south and north of STH 60; approximately 400 vehicles which formerly traveled on the segment of S. Grand Avenue south of STH 60; and approximately 600 vehicles which formerly traveled on the segment of STH 60 east of STH 83 and on the segment of STH 83 north of STH 60, plus an additional 200 vehicles per day which consist of local circulation traffic, involving vehicles which have trip origins or destinations in the immediate vicinity of N. Grand Avenue. Therefore, average weekday traffic volumes on the segment of STH 83 north of STH 60 may be expected to decrease from 6,900 vehicles to 5,600 vehicles, or by about 19 percent; and on the segment of STH 83 south of STH 60 from 6,800 vehicles to 6,300 vehicles, or by about 7 percent. Average weekday traffic volumes on the segment of S. Grand Avenue south of STH 60 may be expected to increase from 2,700 vehicles to 3,200 vehicles, or by about 18 percent. None of these traffic volume changes is expected to adversely impact the safety or vehicular operating conditions on STH 83; however, as noted in Chapter V of this report, vehicular operating conditions at the intersection of STH 60 and Grand Avenue may require the application of traffic management actions to abate problems which may occur as a result of the increased vehicular conflicts at that intersection.

Tamarack Avenue: The construction of Tamarack Avenue will provide land access to the abutting development of 82 single- and multi-family dwelling units. These residential units may be expected to generate approximately 750 vehicle trips per average weekday. These additional 750 vehicle trips will access the

arterial street and highway system at the intersection of E. Sumner Street (STH 60) and Sell Drive. Existing traffic volumes on STH 60 in the vicinity of its intersection with Sell Drive may be expected to increase from 6,200 to 6,950 vehicles per average weekday, or by about 12 percent. Although vehicular conflicts may increase at the intersection of STH 60 and Sell Drive, this increase should not significantly impact the safety or vehicular operating conditions on STH 60 or Sell Drive.

Wildwood Court: The construction of Wildwood Court is proposed to provide access to the abutting development of 16 single-family residential dwelling units which may be expected to generate approximately 160 vehicle trips per average weekday. These additional 160 vehicle trips will access the arterial street and highway system at the intersection of Wildwood Court and E. Monroe Avenue. Existing traffic volumes on E. Monroe Avenue in the vicinity of its intersection with the proposed Wildwood Court may be expected to increase from 1,150 to 1,310 vehicles per average weekday, or by about 14 percent. Although vehicular conflicts will occur at the intersection of Wildwood Court and E. Monroe Avenue, this increase should not significantly impact the safety or operating conditions on E. Monroe Avenue.

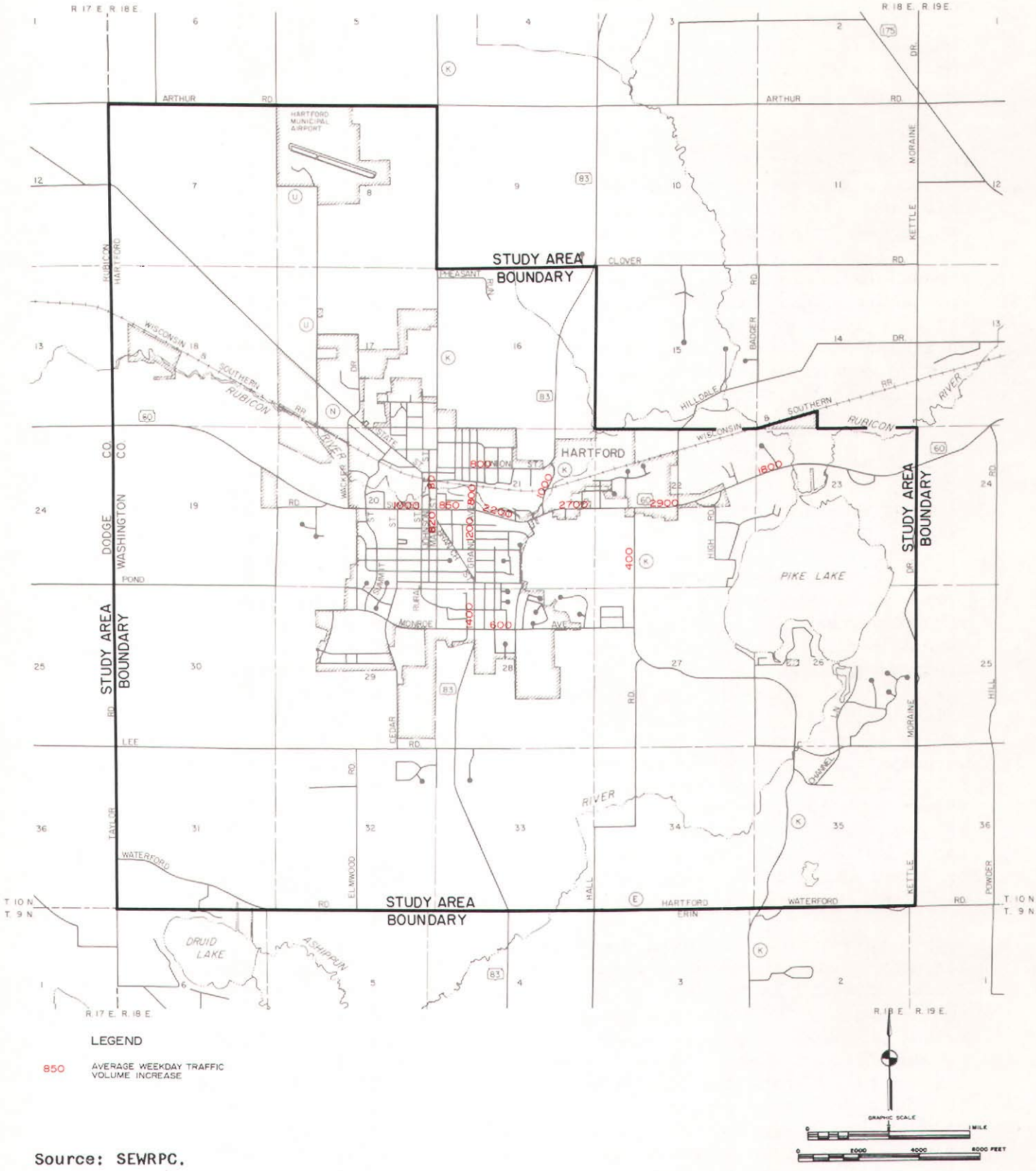
SYSTEM IMPACT OF PLANNED DEVELOPMENTS

Each of the proposed development projects was evaluated individually with respect to the potential impact on the safe and efficient flow of vehicular traffic in the study area. However, it is also necessary and prudent to identify and evaluate the collective traffic impact that may be expected from the proposed development projects, should all be implemented as planned. The vehicular traffic which may be expected to be generated by each development was accordingly assigned to the arterial street and highway system in the study area based upon the traffic flow patterns previously identified in Chapter III of this report. As shown on Map 28, the distributed vehicular traffic volumes were cumulatively summed to indicate the total traffic impacts which may be attributed to the implementation of these planned developments. Average weekday traffic volume increases on Sumner Street (STH 60) may be expected to range from approximately 850 to 2,900 vpd, or about 10 to 40 percent; on Main Street (STH 83) from approximately 100 to 1,400 vpd, or about 1 to 22 percent. It may also be expected that traffic on S. Grand Avenue may increase by approximately 1,200 vpd, or about 45 percent; on N. Wilson Avenue by 1,000 vpd, or about 40 percent; on E. Monroe Avenue by 600 vpd, or about 52 percent; and on CTH K by 400 vpd, or about 27 percent.

These traffic volume increases may be expected to exacerbate the motor vehicle accident problems previously identified in Chapter V at the intersection of STH 60 with CTH K; at the intersection of STH 83 and N. Wilson Avenue; and on the segment of STH 60 between Terri Lane and Franklin Lane. These traffic volume increases may also be expected to exacerbate the north-south arterial service problem identified on the east side of the City of Hartford and on the segment of S. Grand Avenue between STH 60 and STH 83. Finally, implementation of the development projects listed in this report may be expected to cause an evening peak-hour vehicular congestion problem on the northbound approach of STH 83 at its intersection with STH 60. The other approaches to this

Map 28

AVERAGE WEEKDAY TRAFFIC VOLUME INCREASES EXPECTED FROM IMPLEMENTATION OF PLANNED DEVELOPMENT PROJECTS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1983-1985



Source: SEWRPC.

intersection and the northbound approach of STH 83 at its intersection with E. Jackson Street are all expected to operate at design capacity levels with any significant increases in traffic volume on these approaches potentially causing vehicular congestion problems. It is noted that minor traffic volume increases may occur on other segments of the arterial street and highway system in the study area. These minor traffic volume increases, however, are not expected to have a significant impact on vehicular travel in the study area. These potential problems will be considered in the design of alternative traffic management actions to solve the existing traffic problems identified in Chapter V of this report.

CONCLUSIONS

Based upon the analyses of the potential impacts on traffic flows of new land developments which are proposed to occur in the study area over the next three years, it may be concluded that the construction of the Kraft site residential and commercial developments, the Independence and Mill Pond Park developments, and the Tamarack Avenue and Wildwood Court land access street construction and abutting residential developments will not significantly impact the safety and operating conditions of the arterial street and highway system in the Hartford study area. It is expected, however, that the development of the Riverbend East residential project located adjacent to the intersection of Union Street and N. Wilson Avenue which was identified as a high-accident location could exacerbate that safety problem unless traffic management actions designed to solve or ameliorate the accident problem are implemented at an early date. It is also expected that the Esther's of Hartford commercial development could exacerbate the on- and off-street parking space shortage problem identified in the vicinity of the intersection of STH 60 and STH 83. It is expected that the Hartford Square commercial development project will adversely impact the safety and operating conditions of STH 60 in the vicinity of its intersection with Hilldale Drive. Therefore, it is recommended that the application of sound traffic engineering design practices to reduce the vehicular traffic conflicts at the driveway entrances and exits to the Hartford Square development be implemented as a part of the site development plan. Finally, it is expected that the N. Grand Avenue extension between STH 60 and E. Wisconsin Street at N. Fourth Street will increase vehicular conflict problems at the intersection of STH 60 and N. Grand Avenue. The potential adverse traffic and parking impacts which may be expected to be attributed to the proposed Riverbend East, Esther's of Hartford, and N. Grand Avenue extension projects will be considered in the design and evaluation of the alternative traffic management actions described in Chapter VII of this report.

In addition to the individual project impacts, the implementation of these proposed development plans will collectively impact the safety and operating conditions on the arterial street and highway system in the study area. More specifically, implementation of the proposed development projects identified in this chapter may be expected to exacerbate existing motor vehicle accident problems at the intersections of STH 60 with CTH K, N. Wilson Avenue, and STH 83; at the intersection of STH 83 and N. Wilson Avenue; and on the segment of STH 60 between Terri Lane and Franklin Lane. It is also expected that implementation of these proposed development projects may exacerbate the existing north-south arterial service problem on the east side of the study

area and on S. Grand Avenue. Finally, implementation of the proposed development projects has the potential to cause an evening peak-hour congestion problem on the northbound approach of STH 83 at its intersection with STH 60. In Chapter VII these potential traffic problems will be considered in the design and evaluation of the alternative traffic management actions needed to solve the existing traffic problems in the study area.

Chapter VII

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 Hartford 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 is 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 cost and the attendant advantages and disadvantages of each action. Based upon this evaluation, a recommendation with respect to adoption and implementation of each alternative was made. The traffic management actions recommended in the sections of this chapter dealing with traffic congestion, arterial service, parking, and accident problems are summarized in tables 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 VIII of this report. In this manner, an effective and coordinated traffic management plan was designed which would achieve good total system operations.

VEHICULAR CONGESTION PROBLEM ANALYSIS

As noted in Chapter V, none of the signalized intersections in the study area were found to be operating over design-capacity levels. However, the northbound approaches of STH 83 at its intersections with STH 60 and E. Jackson Street and the southbound approach of STH 83 at its intersection with STH 60 were identified as operating at design-capacity levels during the evening peak period. It was also noted in Chapter VI that should the major development projects proposed to be completed in the study area within the next three

years occur as planned, the northbound approach of STH 83 at its intersection with STH 60 may be expected to operate over design-capacity levels, and the other three approaches to the intersection plus the northbound approach of STH 83 at the intersection with E. Jackson Street may be expected to operate at design-capacity levels during the evening peak period.

Five alternative traffic management actions have the potential to improve existing and future vehicular operating conditions at these two signalized intersections: 1) traffic signal timing revisions; 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 these two intersections 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 improving traffic flow and resolving potential traffic congestion problems, capital cost data, and an evaluation of the effect of these actions on vehicular air pollutant emissions and fuel consumption are summarized in a table at the end of this section.

Main Street and Sumner Street

A potential traffic congestion problem has been identified at the intersection of Main Street and Sumner Street. The intersection approach pavement widths at this intersection are 20 feet on the north- and southbound approaches and 22 feet on the east- and westbound approaches. The north- and southbound 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, while the east- and westbound approaches to this intersection provide one lane for use by through and left-turning vehicles and one lane for use by through and right-turning vehicles. The traffic signals at this intersection have a 70-second cycle with a 23.1-second green phase for the north-and southbound approaches, a 26.6-second green phase for the east- and westbound approaches, and an additional exclusive 7.0-second leading green left-turn arrow for the north- and southbound approaches. All approaches are provided with a 4.2-second yellow phase and a 0.7-second common red phase. The signals at this intersection are interconnected with the signals at the intersection of STH 83 and E. Jackson Street and operate with a 7.7-second offset such that the start of the southbound green phase at E. Jackson Street leads the start of the southbound green phase at STH 60 by 7.7 seconds.

Traffic Signal Timing Revisions: The first alternative traffic signal timing revision considered to improve vehicular operating conditions at this intersection would increase the green phase time for the north- and southbound approaches from 23.1 to 24.5 seconds. There is no capital cost associated with this alternative. The advantages of this alternative are that it would increase the operating capacity of the Main Street approaches at Sumner Street, thereby decreasing the average vehicle delay of vehicles using Main Street. The disadvantages of this alternative are that it would decrease the operating capacity of the Sumner Street approaches to Main Street resulting in the eastbound approach of Sumner Street operating at design-capacity levels and would increase the average vehicle delay of vehicles using Sumner Street. Implementation of this alternative is not recommended.

Another alternative traffic signal timing revision considered would eliminate the exclusive left-turn arrows on the north- and southbound intersection approaches. The capital cost of this alternative would be approximately $1,000. The advantages of this alternative are that it would increase the green time available for vehicular traffic passing through the intersection thereby increasing the operating capacity of the intersection for those traffic movements. The disadvantages of this alternative are that it would increase the vehicle delay of north- and southbound left-turning vehicles during the evening peak period, and it would increase the accident potential for north- and southbound left-turning vehicles at the intersection. Implementation of this alternative is not recommended.

Another alternative traffic signal timing revision considered would change the north- and southbound exclusive left-turn arrows from a fixed-time to a traffic-actuated operation whereby the exclusive left-turn arrows would only operate when there were at least two vehicles desiring to turn left from Main Street to Sumner Street during a specific 70-second signal cycle. The capital cost of this alternative is approximately $5,000. The advantages of this alternative are that it would increase the green time available for vehicular traffic passing through the intersection, thereby increasing the capacity of the intersection for those through and right-turning traffic movements without significantly affecting the north- and southbound left-turn capacity. There are no significant disadvantages to this alternative. It is recommended that this alternative be implemented.

Modification of Traffic Movement Patterns: The first alternative modification of traffic movement patterns considered would remove the exclusive left-turn lane regulations on the north- and southbound intersection approaches. The capital cost of this alternative, which would consist of pavement marking, traffic signal changes, and regulatory signing changes, would be approximately $700 per intersection approach. The volume of left-turn traffic movements on these approaches during the evening peak hour is 115 and 130 vehicles per hour (vph), respectively, or 32 and 34 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 by left-turning and through traffic movements of the exclusive left-turn lane which is currently operating well below design levels and it would balance traffic demand 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 removing on-street curb parking on the far-side roadways of the intersection. This is not advisable due to previously identified shortage of on-street parking spaces in the Hartford central business district. Implementation of this alternative is not recommended.

Another alternative traffic movement pattern modification considered would prohibit or restrict 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 would have

the advantages of increasing the operational capacity of the intersection approach and eliminating the conflict between left-turn and through vehicle movements. This alternative would have the disadvantage of increasing turning 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 the two state trunk highways traversing the study area intersect at this location, implementation of this alternative is not recommended.

Another alternative traffic movement pattern modification considered would delineate a downtown bypass route for vehicular traffic using either Main Street or W. Sumner Street. A Main Street to W. Sumner Street bypass could be routed on S. Cedar Street and W. Monroe Avenue on the southwest side of the study area. The capital cost of this alternative, which would consist of installing informational bypass route signs on the segment of S. Cedar Street from W. Sumner Street to W. Monroe Avenue, and on the segment of W. Monroe Avenue from S. Cedar Street to STH 83 (Branch Street); and installing traffic signals at the intersection of W. Sumner Street and S. Cedar Street; would be about $400 and $35,000, respectively. The advantage of this alternative is that it would divert about 500 vehicles per day from the west- and northbound approaches of the intersection of Main Street and Sumner Street, thereby improving vehicular operating conditions at the intersection. The disadvantage of this alternative is that it would encourage the use of S. Cedar Street and W. Monroe Avenue by trucks and through traffic, a use not compatible with the primarily residential character of the abutting land uses. This alternative should not significantly impact vehicle travel time or trip lengths. Implementation of this alternative is not recommended.

A final alternative traffic movement pattern modification considered would identify a downtown bypass route for vehicular traffic using either Main Street or E. Sumner Street over Grand Avenue on the east side of the study area. The capital cost of this alternative, which would consist of installing informational bypass route signs on the segment of Grand Avenue from Branch Street to Union Street and installing traffic signals at the intersection of Grand Avenue and STH 60 would be approximately $200 and $35,000, respectively. The advantage of this alternative is that is would decrease traffic volumes on Main Street by about 2,000 vehicles per day, or about 30 percent, thereby improving vehicular operating conditions on Main Street. This alternative should also reduce vehicle travel times and trip lengths. The disadvantage of this alternative is that it would exacerbate the previously identified arterial service problem on Grand Avenue by encouraging the use of Grand Avenue by trucks and through traffic, a use not compatible with the primarily residential character of the abutting land uses. Implementation of this alternative is not recommended.

Reconstruction of Existing Roadway for Increased Capacity: The only traffic management action considered involving reconstruction would call for increasing the intersection approach pavement width to allow 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 approaches to the intersection of Sumner Street and Main Street range between 60 and 77 vehicles per hour, or about 16 to 19 percent of the total approach traffic volumes. The advantage of this alternative is that it would increase roadway capacity, thereby reducing vehicle queue lengths and intersection delay. The disadvantage of this alternative is that there is insufficient right-of-way available for reconstruction without requiring the razing of commercial establishments adjacent to the intersection. Implementation of this alternative is not recommended.

Construction of New Arterial Streets and Highways: The first alternative action considered involving construction of a new arterial street or highway would call for constructing a north-south arterial bypass across the eastern portion of the Hartford study area. As shown on Map 25 in Chapter V, which depicts the Commission-adopted long-range transportation system plan for the study area, this proposed facility would be located within a corridor extending from the E. Sumner Street intersection with N. Wilson Avenue to STH 83 in the vicinity of its intersection with Waterford Road. The capital cost of this alternative, including right-of-way acquisition would be approximately $2.0 million for a 36-foot-wide, divided, urban arterial street from E. Sumner Street to E. Monroe Avenue, and a 24-foot-wide rural, two-lane highway segment from E. Monroe Avenue to STH 83. According to city officials construction of the 36-foot-wide divided roadway segment of the bypass could be staged such that one-half of the divided cross section could be constructed initially with the other 36-foot-wide roadway constructed when needed to serve future traffic volume growth. The cost of construction of the first phase of the bypass is estimated at $1.7 million. The advantages of this alternative are that it would reduce traffic volumes and improve vehicular operating conditions on STH 83, particularly at its intersection with Sumner Street, 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 on both STH 83 and on S. Grand Avenue; and it would reduce trip lengths and travel times of selected trips by providing a more direct route across the study area. There are no significant disadvantages to this alternative. Therefore, it is recommended that this alternative be implemented.

Another construction alternative considered calls for the construction of a north-south arterial bypass across the western portion of the study area. As shown on Map 25, this facility would be located within a corridor extending from the intersection of W. Sumner Street and N. Wacker Drive to Lee Road, adjacent to the west side of the Hartford Country Club. The capital cost of this alternative, including right-of-way acquisition, would be approximately $1.5 million for a 48-foot-wide, two-lane, urban arterial street from W. Sumner Street to W. Monroe Avenue, and a 24-foot-wide, rural, two-lane highway segment from W. Monroe Avenue to Lee Road. The advantages of this alternative are that it would reduce traffic volumes and improve vehicular operating conditions on STH 83 and on W. Sumner Street west of its intersection with STH 83 by providing an additional arterial route for vehicular traffic, and it would encourage the separation of local and through traffic on STH 83 by providing a bypass route for through traffic on both STH 83 and W. Sumner Street. There are no significant disadvantages to this alternative. Therefore, it is recommended that this alternative be implemented.

Work Time Rescheduling: The final alternative traffic management action considered to solve or mitigate the traffic congestion problem on the Main Street approaches to Sumner Street involves the rescheduling of work starting and quitting times by major employers in the Hartford 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, as 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 shown in Table 23, of the 2,277 employees of the major public and private employment centers in the study area who commute to and from work between 6:00 a.m. and 8:00 a.m., 1,346, or 59 percent, report to or finish work at 7:00 a.m. and 816, or 36 percent, report to or finish work at 8:00 a.m.; and of the 2,619 employees of the major public and private employment centers in the study area who commute to or from work between 3:00 p.m. and 5:00 p.m., 1,304, or 49 percent, report to or finish work during the 3:25 p.m. to 3:35 p.m. time period. The foregoing data do not include students 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 8:00 a.m. to 8:30 a.m. which slightly overlaps the peak 8:00 a.m. work starting time schedule. The evening peak departure period for schools is between 2:58 p.m.

Table 23

SUMMARY OF MAJOR PUBLIC AND PRIVATE EMPLOYMENT CENTER WORK SCHEDULES IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Work Starting or Quitting Time	Employees			
	Existing		Recommendation	
	Number	Percent of Total	Number	Percent of Total
Morning Peak Period				
6:30 a.m.	--	--	--	--
6:50 a.m.	78	3.0	78	3.0
7:00 a.m.	1,346	59.0	1,046	46.0
7:15 a.m.	7	1.0	7	1.0
7:30 a.m.	30	1.0	330	14.0
8:00 a.m.	816	36.0	816	36.0
Total	2,277	100.0	2,277	100.0
Evening Peak Period				
3:00 p.m.	100	4.0	100	4.0
3:20 p.m.	96	4.0	96	4.0
3:25 p.m.	300	11.0	300	11.0
3:30 p.m.	954	36.0	654	25.0
3:35 p.m.	50	2.0	50	2.0
3:48 p.m.	159	6.0	159	6.0
4:00 p.m.	257	10.0	557	21.0
4:18 p.m.	159	6.0	159	6.0
4:30 p.m.	500	19.0	500	19.0
4:45 p.m.	44	2.0	44	2.0
5:00 p.m.	--	--	--	--
Total	2,619	100.0	2,619	100.0

Source: SEWRPC

and 3:20 p.m. which does not overlap the peak employee work dismissal time schedule. It is recommended that the major public and private employers of the study area be asked to consider rescheduling approximately 300 of the 7:00 a.m. and 3:30 p.m. work starting and quitting times to 7:30 a.m. and 4:00 p.m., respectively to more effectively balance the major public and private employee demand for transportation services in the study area.

Concluding Remarks: In conclusion, to alleviate potential traffic congestion problems and to increase the efficiency of vehicular operating conditions at the intersection of Main Street and Sumner Street, it is recommended that the north- and southbound exclusive left-turn arrows in the existing traffic signal sequence at this intersection be changed from fixed-time to traffic-actuated operation. It is also recommended that construction of the north-south arterial bypasses on the east and west sides of the City of Hartford, as identified in the City of Hartford proposed neighborhood development plans and the Commission-adopted long-range transportation system plan, be pursued by the City in cooperation with the Town of Hartford and the Wisconsin Department of Transportation. This would require the conduct of the necessary engineering studies to precisely locate each bypass facility and thereby facilitate the preservation of right-of-way in advance of need. It is also recommended that the major public and private employers in the Hartford study area reschedule some of their employee work shifts to start at 7:30 a.m. and quit at 4:00 p.m. instead of the present 7:00 a.m. and 3:30 p.m. starting and quitting times. This recommendation would affect approximately 300 employees in the study area.

N. Main Street and E. Jackson Street

The other potential problem area for vehicular congestion in the Hartford study area involves the intersection of Main Street and E. Jackson Street. The intersection approach pavement widths at the intersection are 20 feet on the north- and southbound approaches, and 15 feet on the westbound approach. The northbound roadway approach to the intersection provides one lane for exclusive use by right-turning vehicles and one lane for through vehicles. The southbound roadway approach to the intersection provides one lane for exclusive use by left-turning vehicles and one lane for use by through vehicles. The westbound roadway approach to the intersection provides one lane for left- and right-turning vehicles. The traffic signals at this intersection have a 70-second cycle with a 21-second green phase for the westbound approach and a 29.4-second green phase for the north- and southbound approaches, and an additional exclusive 7.0-second leading green left-turn arrow for the southbound approach. All approaches are provided with a 4.2-second yellow phase and a 0.7-second common red phase.

Traffic Signal Timing Revisions: The first traffic signal timing revision considered to improve vehicular operating conditions at this intersection would involve increasing the green phase time for the north- and southbound approaches of N. Main Street from 29.4 to 30.8 seconds. The minimum time required to safely permit pedestrians to cross N. Main Street, based on an average pedestrian walking time of 4.0 feet per second, plus a 7.0-second starting or reaction time, indicates the need for a minimum red phase time on N. Main Street of 18.4 seconds. The existing pedestrian crossing time on

N. Main Street is 21.0 seconds which, under this alternative signal timing revision, would be reduced to 19.6 seconds. There is no capital cost associated with this alternative. The advantages of this alternative are that it would increase the operating capacity of the N. Main Street approaches to E. Jackson Street without increasing the volume-to-capacity ratio to over design levels for the E. Jackson Street approach to the intersection. The disadvantages of this alternative are that it would slightly increase the average delay of those vehicles using E. Jackson Street and it would also adversely impact the pedestrian safety of those pedestrians crossing N. Main Street due to the fact that all traffic entering the intersection from E. Jackson Street must turn left or right onto N. Main Street. Implementation of this alternative is not recommended.

The second alternative traffic signal timing revision considered would involve changing the signal operation from a fixed-time to a semi-actuated operation, whereby the north- and southbound approaches of N. Main Street would remain on a green phase unless westbound vehicular traffic was present on E. Jackson Street, or pedestrians desiring to cross N. Main Street actuated a pedestrian crossing pushbutton which would initiate a red phase on N. Main Sreet, thus permitting westbound traffic on E. Jackson Street to enter the intersection and/or pedestrians to safely cross N. Main Street. The capital cost of this alternative is about $15,000. This alternative would have the advantage of increasing the operational capacity on the north- and southbound intersection approaches of N. Main Street without adversely impacting the pedestrian safety or operational capacity of the E. Jackson Street approach to the intersection. This alternative would have the disadvantage that with an evening peak-hour demand of 160 vehicles on E. Jackson Street, or about three vehicles per minute, the semi-actuated traffic signal would tend to operate as a fixed-time signal, and progressive movement on N. Main Street through the two traffic signals at the intersections of N. Main Street with E. Jackson Street and Sumner Street would not be attainable during off-peak traffic times. Implementation of this alternative is not recommended.

A final alternative traffic signal timing revision considered would involve changing the southbound exclusive left-turn arrow from a fixed-time to a traffic-actuated operation whereby the exclusive left-turn arrow would only operate when there were at least two vehicles desiring to turn left from N. Main Street to E. Jackson Street during a specific 70-second signal cycle. The capital cost of this alternative is approximately $5,000. This alternative would have the advantage of increasing the green time available for northbound traffic passing through the intersection, thereby increasing the capacity of the intersection without significantly affecting the southbound left-turn-lane capacity or pedestrian safety at the intersection. There would be no significant disadvantages to this alternative. It is recommended that this alternative be implemented.

Modification of Traffic Movement Patterns: The only modification of traffic movement patterns considered would prohibit the southbound left-turn movements. The capital cost of this alternative, which would consist of pavement marking, traffic signal, and regulatory signing changes would be approximately $700. This alternative would have the advantage of increasing the operational capacity of the north- and southbound intersection approaches and eliminating the conflict between left-turn and through vehicle movements. This alternative

would have the disadvantage of increasing turning 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. Implementation of this alternative is not recommended.

Construction of New Arterial Streets and Highways: Alternative actions considered involving the construction of a new north-south arterial street or highway across the eastern and western portions of the study area were described in the preceding section of this report. The recommendations for the construction of a new arterial street from the intersection of E. Sumner Street and N. Wilson Avenue to STH 83 in the vicinity of its intersection with Waterford Road, and a new arterial street from the intersection of W. Sumner Street and S. Wacker Drive to W. Lee Road adjacent to the west side of the Hartford Country Club, are further supported by the results of this analysis, which indicate that the new facility would reduce traffic volumes and improve vehicular operating conditions on N. Main Street at its intersection with E. Jackson Street by providing additional arterial routes through the study area for vehicular traffic.

Work Time Rescheduling: The previous section also described how the rescheduling of the starting and quitting times of approximately 300 employees of the major public and private employers in the Hartford study area could assist in balancing the demand for transportation services in the study area. It was recommended that the starting and quitting times of those employees who start or quit work at 7:00 a.m. and 3:30 p.m. be rescheduled by 30 minutes to 7:30 a.m. and 4:00 p.m. This recommendation is further supported by the desirable effect such rescheduling may have on the potential traffic congestion problems at the N. Main Street approaches to E. Jackson Street.

Concluding Remarks: In conclusion, to alleviate potential traffic congestion problems and to increase the efficiency of vehicular operating conditions at the intersection of N. Main Street and E. Jackson Street, it is recommended that the southbound exclusive left-turn arrow in the existing traffic signal sequence at this intersection be changed from a fixed-time to a traffic-actuated operation. It is also recommended that the construction of the north-south arterial facilities on the east and west sides of the City of Hartford--as identified in the City of Hartford proposed neighborhood development plans, and the Commission-adopted long-range transportation plan--be pursued by the City in cooperation with the Town of Hartford and the Wisconsin Department of Transportation. It is also recommended that the major public and private employers in the study area reschedule some of their work shifts to start at 7:30 a.m. and quit at 4:00 p.m. instead of the present 7:00 a.m. and 3:30 p.m. starting and quitting times. This recommendation would affect approximately 300 employees in the study area.

Summary

The analyses presented in this section have investigated the causes of existing and potential traffic congestion problems, evaluated alternative traffic

management actions to improve existing vehicular operating conditions and avoid potential problems, and recommended for implementation those alternatives judged best. Potential traffic congestion problems in the Hartford study area may be expected to occur on the northbound approach of Main Street at its intersection with Sumner Street. The other approaches to this intersection, plus the northbound approach of Main Street at its intersection with E. Jackson Street, are all expected to operate at design-capacity levels through the year 1985 with any significant increases in traffic volume on these approaches causing vehicular congestion problems. Table 24 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 consumption. A total of six recommended traffic management actions are presented in Table 24.

Arterial Service Problem Analysis

Arterial service problems in the Hartford study area were identified in Chapter V of this report. These problems, which affect travel conditions on the existing street and highway system, are a deficiency in direct, continuous, north-south arterial routes; and the penetration of a residential area by an arterial street. Both of these arterial service problems result in a conflict between the movement of through and local traffic within the study area. The alternative traffic management actions which have the potential to solve or mitigate these arterial service problems are limited to the diversion of traffic to an alternative route and the construction of a new arterial facility.

The following analyses for each of the individual arterial service problems set 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, capital cost data, and an evaluation of the impact of these actions on vehicular air pollutant emissions and fuel consumption are summarized in a table at the end of this section.

North-South Arterial Street Spacing Deficiency

As discussed in Chapter V, there is a lack of continuous north-south arterial routes in both the eastern and western portions of the study area.

Traffic Diversion to an Alternative Route: An alternative traffic management action considered to have the potential to mitigate the arterial service problem on the east side of the study area was the diversion of through traffic from the STH 83 and Grand Avenue routes to an alternative route composed of existing facilities on the east side of the City of Hartford. The first alternative route available as a north-south bypass route on the east side of the study area is the E. Monroe Avenue-CTH K-Wilson Avenue route. It is estimated that, due to the circuity of this route, it would not attract a significant volume of traffic from the STH 83 or Grand Avenue routes. This alternative would involve the installation of informational traffic routing signs at a capital cost of approximately $800. There are no significant advantages associated with this alternative. The disadvantages of this alternative are:

Table 24

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

Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Effects	
			Vehicular Emissions	Vehicular Fuel Consumption
Main Street (STH 83) at Sumner Street (STH 60).....	• Change left-turn arrow operation from fixed-time to traffic-actuated	$5,000	Reduction	Reduction
Main Street (STH 83) at E. Jackson Street.....	• Change left-turn arrow operation from fixed-time to traffic-actuated	$5,000	Reduction	Reduction
All Arterial Streets and Highways in the Hartford Study Area.....	• Construct a north-south arterial bypass on the east side of the study area	$2.0 million	Reduction	Reduction
	• Construct a north-south arterial bypass on west side of the study area	$1.5 million	Reduction	Reduction
	• Reschedule the work starting and quitting times of approximately 300 employees of the major public and private employers in the study area	--	Reduction	Reduction
Arterial Streets and Highways in the Hartford Central Business District.....	• Change traffic signal offsets for improved vehicular progression	--	Reduction	Reduction

Source: SEWRPC.

1) it would increase vehicular travel and trip lengths between STH 83 at its intersection with E. Monroe Avenue to its intersection with N. Wilson Avenue; 2) it has the potential to increase the vehicular accident problems identified at the intersection of STH 60 and CTH K; 3) the use of the route by heavy trucks and buses would have to be restricted during the spring thaw period due to trucking regulations imposed on E. Monroe Avenue; 4) it would route traffic over streets currently classified as collector facilities, namely E. Monroe Avenue and CTH K; and 5) it would not provide a continuous, north-south arterial route on the east side of the study area. Implementation of this alternative is not recommended.

The only other alternative route available as a north-south bypass route on the east side of the study area is South Street. It is estimated that, due to the lack of continuity of this route north of E. Sumner Street, and its location between STH 83 and Grand Avenue, it would not attract a significant volume of traffic from the STH 83 or Grand Avenue routes. As with the previous bypass alternative this alternative would involve the installation of informational traffic routing signs at a capital cost of approximately $400. There are no significant advantages associated with this alternative. The disadvantages of this alternative are: 1) it has the potential to cause vehicular conflict and accident problems at the intersection of E. Sumner Street and South Street, 2) it would route traffic over South Street which is currently classified as a land access street; 3) it would route trucks and through traffic through a residential neighborhood; and 4) it would not provide a continuous, north-south arterial route on the east side of the study area. Implementation of this alternative is not recommended.

An alternative traffic management action considered to have the potential to mitigate the arterial service problem on the west side of the study area was the diversion of through traffic from the STH 83 and S. Cedar Street-N. Wacker Drive routes to an alternative route composed of existing facilities on the west side of the City of Hartford. An alternative route available as a north-south bypass route on the west side of the study area is the S. Summit Street-N. Grant Street route. It is estimated that, because of the proximity of this route to the existing S. Cedar Street arterial route, it would not attract a significant volume of traffic from the STH 83 or Grand Avenue routes. This alternative would involve the installation of informational traffic routing signs at a capital cost of approximately $1,000. This alternative would have the advantage of providing a continuous, north-south arterial route on the west side of the study area. The disadvantages of this alternative are: 1) it would route traffic over streets currently classified as land access facilities; 2) it would route trucks and through traffic through a residential neighborhood; and 3) it would not provide a direct route between STH 83 at its intersection with Monroe Avenue to State Street at its intersection with N. Grant Street due to the curvilinear alignment of both S. Summit Street and N. Grant Street. Implementation of this alternative is not recommended.

The only other alternative route available as a north-south bypass route on the west side of the study area is S. Rural Street-Jefferson Street. It is estimated that, because of the close proximity of this route to the existing S. Cedar Street route, it also would not attract a significant volume of traffic from the STH 83 or Grand Avenue routes. This alternative would involve the installation of informational traffic routing signs at a capital cost of approximately $800. This alternative has the advantage of providing a continuous north-south route on the near west side of the study area. The disadvantages of this alternative are: 1) it would route traffic over routes currently classified as land access streets; 2) it has the potential to cause a vehicular conflict problem and exacerbate the previously identified accident problems at the intersection of W. Sumner Street and Rural Street; and 3) it would route trucks and through traffic through a residential neighborhood. Implementation of this alternative is not recommended.

Construction of a New Arterial Facility: Another alternative considered to provide the needed north-south arterial route on the east side of the study

area would involve the construction of a new north-south arterial facility. As noted in the traffic congestion section of this chapter, the proposed facility would be located on the east side of the City of Hartford within a corridor extending in a southerly direction from the E. Sumner Street intersection with N. Wilson Avenue to STH 83 in the vicinity of its intersection with Waterford Road (see Map 25). It is estimated that, if constructed and opened to traffic by 1985, this facility would divert approximately 4,000 vehicles per day from the STH 83 and Grand Avenue north-south arterial routes. The capital cost of this alternative would be about $2.0 million. The advantages of this alternative are that: 1) it would reduce traffic volumes and improve vehicular operation on STH 83, particularly at its intersection with Sumner Street, by providing an additional arterial route for vehicular traffic; 2) it would encourage the separation of through and local traffic on both STH 83 and Grand Avenue; and 3) it would reduce trip lengths and travel times of selected trips by providing a direct, continuous north-south route across the eastern portion of the study area. There are no significant disadvantages associated with this alternative. Therefore, 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 by the City in cooperation with the Town of Hartford and the Wisconsin Department of Transportation so that the right-of-way for the facility can be protected from encroachment by urban development.

The last alternative considered to provide the needed north-south arterial route on the west side of the study area would involve the construction of a new north-south arterial facility. This proposed arterial facility would be located on the west side of the City of Hartford within a corridor extending in a southerly direction from the intersection of W. Sumner Street and N. Wacker Drive to Lee Road, adjacent to the western boundary of the Hartford Country Club (see Map 25). It is estimated that, if constructed and opened to traffic by 1985, this facility would divert approximately 2,000 vehicles per day from the STH 83 and W. Monroe Avenue-S. Cedar Street north-south arterial routes. The capital cost of this alternative would be about $1.5 million. The advantages of this alternative are that: 1) it would reduce traffic volumes and improve vehicular operating conditions on STH 83, particularly at its intersection with Sumner Street, by providing an additional north-south arterial route for vehicular traffic; 2) it would encourage the separation of through and local traffic on STH 83, W. Monroe Avenue, and S. Cedar Street; and 3) it would provide a direct, continuous, north-south route across the western portion of the study area. There are no significant disadvantages associated with this alternative. Therefore, it is recommended that this alternative be adopted. It is further recommended that the precise location of this facility be determined by the City in cooperation with the Town of Hartford so that right-of-way for the facility can be protected from encroachment by urban development.

Concluding Remarks: In conclusion, there do not appear to be any low-capital traffic management actions which will solve the direct and continuous arterial street deficiency problem in the eastern and western portions of the study area. The traffic management actions recommended in other sections of this chapter should serve to increase the safety and promote the efficient operation of the existing arterial street and highway systems. As urbanization and

attendant traffic volumes continue to increase in the Hartford area, however, the ultimate solution to the problems of arterial street continuity will be implementation of the recommendations to construct new north-south arterial facilities on both the east and west sides of the City of Hartford.

Penetration of Residential Area by Arterial Street

As discussed in Chapter V, an arterial service/land use conflict exists between the functional classification of S. Grand Avenue as a minor arterial street and the character of the abutting land development which is medium-density residential. According to the traffic management standards in Chapter IV, the penetration of residential and environmentally significant areas by arterial streets and highways should be avoided.

Traffic Diversion to an Alternative Route: An alternative traffic management action considered to have the potential to mitigate the arterial service problem on S. Grand Avenue would involve the reconstruction of the intersection of S. Grand Avenue and STH 83 (Branch Street), realigning S. Grand Avenue to intersect at a 90-degree angle with STH 83. The capital cost of this alternative would be about $20,000. The advantages of this alternative are that it would divert approximately 500 vehicles per day from S. Grand Avenue to STH 83 (Branch Street). It would also improve vehicular operating conditions at the intersection of S. Grand Avenue and STH 83. The disadvantage of this alternative is that it would increase vehicular traffic volumes on STH 83 (Main Street), causing the northbound approach of Main Street at its intersection with Sumner Street to operate over design levels with congested conditions during several hours of the afternoon time period, between 12:00 p.m. and 5:00 p.m. Implementation of this alternative is not recommended.

A second alternative traffic management action considered to mitigate the arterial service problem on S. Grand Avenue is prohibition of trucking on that segment of S. Grand Avenue extending between E. Sumner Street and STH 83 (Branch Street). This alternative would involve the installation of regulatory traffic signs at a capital cost of approximately $400. The advantage of this alternative is that it would remove through truck traffic from the traffic stream on S. Grand Avenue. The disadvantage of this alternative is that it would increase vehicular traffic volumes on STH 83 (Main Street), causing the northbound approach of Main Street at its intersection with Sumner Street to operate over design levels under congested conditions during the evening peak period. Implementation of this alternative is not recommended.

A final alternative traffic management action considered would prohibit westbound-to-southbound left turns at the intersection of S. Grand Avenue and E. Sumner Street. This alternative would involve the installation of regulatory traffic signs at the intersection of S. Grand Avenue and E. Sumner Street at a capital cost of approximately $200. The advantages of this alternative are that it would divert approximately 900 vehicles per day from southbound S. Grand Avenue to Sumner Street and Main Street, and it would improve vehicular operating conditions at the intersection of S. Grand Avenue with E. Sumner Street and Branch Street. The disadvantage of this alternative is that it would increase traffic volumes on E. Sumner Street, causing the westbound approach

of E. Sumner Street at its intersection with Main Street to operate over design-capacity level with congested conditions during several hours of the afternoon time period, between 12:00 p.m. and 5:00 p.m. Implementation of this alternative is not recommended.

Construction of a New Arterial Facility: The traffic management actions recommended in this chapter to solve or mitigate the continuous north-south arterial street deficiency problem in the Hartford study area consist of the construction of a north-south arterial facility in the eastern and western portions of the study area. The construction of such a north-south arterial on the east side of the City of Hartford is also considered to comprise the only construction alternative with potential to also solve or mitigate the problem created by the penetration of a residential area by an arterial street. As previously noted in this section on arterial service, a proposed north-south arterial facility is recommended to be located on the east side of the City of Hartford extending from the intersection of E. Sumner Street and N. Wilson Avenue to STH 83 in the vicinity of its intersection with Waterford Road. It is estimated that, if constructed and open to traffic by 1985, this facility would divert approximately 1,000 vehicles per day from the S. Grand Avenue route. Furthermore, it is estimated that this facility would divert an additional 3,000 vehicles per day from the segment of STH 83 (Main Street) which traverses the Hartford central business district. The capital cost of this alternative would be about $2.0 million. The advantages of this alternative are the same as previously noted under the continuous north-south arterial street deficiency problem analysis.

It is recommended that this alternative be implemented. It is further recommended that, upon implementation of this alternative, the City of Hartford act to reclassify S. Grand Avenue from its present functional classification as a minor arterial street to a land access street, which is more in keeping with the nature of the residential development abutting S. Grand Avenue. It is also recommended that, upon implementation of this alternative, the intersection of S. Grand Avenue and STH 83 (Branch Street) be reconstructed, realigning S. Grand Avenue to intersect at a 90-degree angle with STH 83 to improve the vehicle operating conditions at that intersection and further discourage the use of S. Grand Avenue by trucks and through traffic.

Concluding Remarks: In conclusion, there does not appear to be any low-capital traffic management actions which will adequately mitigate the problem created by the penetration of a residential neighborhood by an arterial street--S. Grand Avenue. The recommended construction of a new north-south arterial facility on the east side of the City of Hartford to solve the continuous north-south arterial deficiency problem on the east side of the study area would also serve to solve this problem. Upon implementation of this recommendation, the City of Hartford should functionally reclassify S. Grand Avenue from a minor arterial to a land access street. The intersection of S. Grand Avenue and STH 83 (Branch Street) could then be reconstructed to realign S. Grand Avenue to intersect with STH 83 at a 90-degree angle, thereby improving vehicular operating conditions at that intersection and discouraging the use of S. Grand Avenue by trucks and through traffic.

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 Hartford study area are a result of a lack of direct, continuous north-south arterials across the eastern and western portions of the study area, and penetration of a residential neighborhood by an arterial street. Table 25 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 and fuel consumption.

A total of four recommended traffic management actions are contained in Table 25. The basic recommendations to alleviate the arterial service problems in the study area are the construction of north-south arterial facility routes in the eastern and western portions of the study area. There are no low-capital traffic management actions that will substitute for the construction of these two new arterial facility routes across the study area. It is also recommended that, following the construction of the north-south arterial route on the east side of the City of Hartford, the City of Hartford act to functionally reclassify S. Grand Avenue from a minor arterial to a land access street.

Table 25

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

Problem Location	Recommended Traffic Management Actions	Capital Cost	Effects	
			Vehicular Emissions	Vehicular Fuel Consumption
Continuous North-South Arterial Street Deficiency.....	• Construct north-south arterial facility on the east side of the City of Hartford	$2.0 million	Reduction	Reduction
	• Construct north-south arterial facility on the west side of the City of Hartford	$1.5 million	Reduction	Reduction
Penetration of Residential Neighborhood by Arterial Street.....	• Construct north-south arterial facility on the east side of the City of Hartford	$2.0 million	Reduction	Reduction
	• Reclassify S. Grand Avenue as a land access street	--	--	--
	• Reconstruct intersection of S. Grand Avenue and STH 83	$20,000	--	--

Source: SEWRPC.

The intersection of S. Grand Avenue and STH 83 (Branch Street) is recommended to be reconstructed to intersect at a 90-degree angle to improve operating conditions at that intersection and discourage the use of S. Grand Avenue by trucks and through traffic.

VEHICULAR PARKING SUPPLY PROBLEM ANALYSIS

As noted in Chapter V, a parking supply problem exists in the Hartford central business district (CBD). The inventories and analyses made under this study indicate that there is an inadequate supply of on-street parking space, of short-term off-street parking space in the Lower Mill Street public parking facility, and of long-term off-street parking space in the N. and S. Johnson Street public parking facilities. This parking supply problem is reflected by the number of parking stalls in the central business district with occupancy rates exceeding the maximum desirable occupancy rate standard of 80 percent set forth in Chapter IV. The alternative traffic management actions which have the potential to solve or mitigate these parking supply problems are: 1) modifications 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 Hartford central business district parking problem sets forth the approximate costs of, the advantages and disadvantages attendant to, and a recommendation with respect to the adoption and implementation of each alternative parking improvement action. The recommended actions for the on-street and off-street parking supply problems along with capital cost data are summarized in a table 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 150 on-street parking stalls in the Hartford central business district. The recommended occupancy rate standard of 80 percent was exceeded by 47, or 31 percent, of these parking stalls. The parking stalls which experience such violations are located along the west side of N. Main Street from Wisconsin Street to E. Jackson Street and from Sumner Street to Kossuth Street; along the south side of E. Jefferson Street from N. Main Street to Mill Street; along the south side of E. Sumner Street from Main Street to South Street; and along W. Sumner Street from Johnson Street to Main Street. Another 34 spaces, or 23 percent, meet the standard. The parking stalls which meet the standard are located along the west side of N. Main Street from State Street to Wisconsin Street and from E. Jackson Street to Sumner Street; along the south side of W. Sumner Street from Johnson Street to Main Street; along the north side of W. Sumner Street from Rural Street to Johnson Street; and along the north side of E. Sumner Street from Main Street to Mill Street.

Modification of Existing Parking Restrictions: The first alternative parking restriction modification considered to mitigate the on-street parking supply

problem in the central business district was a change of the one-hour parking restriction along selected segments of Main Street, Sumner Street, or E. Jackson Street to a 30-minute restriction. The parking stall locations with the greatest potential to maximize parking stall turnover and efficiency are those located along the east and west sides of N. Main Street between Wisconsin Street and E. Jackson Street; and along the south side of E. Jackson Street between N. Main Street and Mill Street, all of which exceeded the occupancy standard with average occupancy rates of 83, 89, and 100 percent, respectively; and all of which experienced high average vehicle turnover rates of 5.6, 5.9, and 6.5 vehicles per stall, respectively, during the 9:00 a.m. to 5:00 p.m. survey time period. These parking stalls exhibit the highest on-street parking demand in the central business district, as evidenced by these high occupancy and turnover rates. This alternative would reduce the restrictions on two of the six parking stalls located on the west side, and on three of the 10 parking stalls located on the east side of the segment of N. Main Street between Wisconsin Street and E. Jackson Street, and on the two parking stalls on the south side of E. Jackson Street between N. Main Street and Mill Street. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $200 per block segment, or $600 in total. The advantage of this alternative is that it could increase utilization of selected one-hour parking stalls by encouraging a higher rate of parking stall turnover. The disadvantage of this alternative is that it would increase interference with traffic on N. Main Street and E. Jackson Street. Since neither of these roadway segments is identified as a high accident or existing vehicular congestion area, it is recommended that this alternative be implemented.

A second parking modification alternative considered calls for changing the one-hour parking restriction on the south side of W. Wisconsin Street immediately west of N. Main Street to a two-hour restriction. The capital cost of the alternative, which would consist of regulatory signing changes, would be about $200. The advantage of this alternative is that it would add 10 two-hour-restricted stalls in the vicinity of the heavily utilized one-hour parking stalls located along the segment of N. Main Street between W. Wisconsin Street and E. Jackson Street. The disadvantage of this alternative is that it would reduce the number of short-term, one-hour stalls in the CBD. The 10 one-hour stalls, which are located along W. Wisconsin Street immediately west of N. Main Street, are not being fully utilized as short-term stalls, as evidenced by a 16 percent average vehicle occupancy rate. Therefore, it is recommended that this alternative be implemented.

Another parking modification alternative considered would involve changing the two-hour parking area on the south side of Kossuth Street between S. Rural Street and S. Johnson Street to an unrestricted, all-day parking area. The capital cost of this alternative, which would consist of the removal of existing regulatory signing controls, would be negligible. The advantage of this alternative is that it would add five all-day parking stalls in the vicinity of the 29 all-day, unrestricted parking stalls of the S. Johnson Street public parking facility which experience a 9:00 a.m. to 10:00 a.m. occupancy rate of 97 percent and an average occupancy rate of 55 percent. The disadvantage of this alternative is that it removes short-term, on-street parking stalls from the vicinity of the proposed new Esther's of Hartford development which may be expected to increase the demand for such parking facilities. Implementation of this alternative is not recommended.

The final parking modification considered would involve increasing the 15-minute parking restrictions on the south side of E. Sumner Street immediately west of South Street to one hour. The capital cost of this alternative, which consists of regulatory signing changes, would be about $100. The advantages of this alternative are that it would increase the number of one-hour parking stalls along the south side of E. Sumner Street, which experiences a high on-street parking demand with an average parking stall occupancy rate of 81 percent, thus exceeding the occupancy standard; and it decreases interference with traffic on E. Sumner Street. The disadvantage of this alternative is that it restricts parking availability for those persons utilizing the services of the U. S. Post Office located adjacent to this segment of E. Sumner Street. Implementation of this alternative is not recommended.

Addition of On-Street Parking Space at Selected Locations: The only alternative considered with the potential to solve or mitigate the parking supply problem in the Hartford CBD through the addition of on-street parking space would involve changing the all-day parking restriction along the south side of Kossuth Street between S. Main Street and S. Johnson Street to a one-hour time restriction. The capital cost of this alternative, which consists of regulatory signing changes, would be about $200. The advantage of this alternative is that five parking stalls would be added to the supply of on-street parking in the vicinity of the proposed Esther's of Hartford development, which may be expected to increase demand for such parking. The disadvantage of this alternative is that the vehicular capacity of Kossuth Street, which has a 30-foot-wide pavement, would be reduced. As indicated in Chapter V, a 30-foot-wide pavement can accommodate two travel lanes plus parking on one side, as is the situation on the segment of STH 83 (Branch Street) between Main Street and S. Grand Avenue. Therefore, it is recommended that the alternative be implemented as a short-term parking solution until the off-street parking facilities proposed for the Esther's of Hartford development and the preliminary plans set forth in the July 1982 parking plan prepared by the Hartford Parking Authority are completed.

Concluding Remarks: In conclusion, it is recommended that the one-hour parking restrictions be changed to a 30-minute limit on two of the parking stalls located on the west side, and three of the parking stalls located on the east side of the segment of N. Main Street between Wisconsin Street and E. Jackson Street, and on the two parking stalls located on the south side of E. Jackson Street. It is also recommended that the parking restrictions on the 10 parking stalls located on the south side of W. Wisconsin Street immediately west of N. Main Street be changed from a one-hour to a two-hour limit. It is further recommended that the number of on-street parking stalls be increased by removing the all-day parking restriction on the segment of the south side of Kossuth Street between S. Main Street and S. Johnson Street to allow for five one-hour parking stalls until such time as the Esther's of Hartford off-street parking facility, as set forth in the July 1982 parking plan prepared by the Hartford Parking Authority, is completed.

Off-Street Parking Supply Problems

There are currently 248 off-street public parking stalls in the Hartford CBD. Violation of the 80 percent parking stall occupancy rate standard occurs at 114, or 46 percent of these stalls. The parking stalls exceeding the standard include the 60 two-hour stalls in the Lower Mill Street parking facility; the 25 all-day, unrestricted stalls in the N. Johnson Street parking facility; and the 29 all-day, unrestricted stalls in the S. Johnson Street parking facility. The average 9:00 a.m. to 5:00 p.m. occupancy rates for all parking stalls in these three facilities are: 81 percent, which is over the standard, for the Lower Mill Street Parking facility; 77 percent, which is approximately at the standard; for the N. Johnson Street parking facility; and 55 percent, which is below the standard, for the S. Johnson Street parking facility.

Modification of Existing Parking Restrictions: The first alternative parking restriction modification considered to solve or mitigate the off-street parking supply problem in the Hartford CBD was the changing of the short-term parking restrictions in the Lower Mill Street parking facility and the adjacent Upper Mill Street parking facility. As noted in Chapter V of this report, there are 18 two-hour stalls in the Upper Mill Street parking facility which experienced an average occupancy rate of 40 percent, well below the occupancy rate standard. However, the total 68 parking spaces in the Lower and Upper Mill Street parking facilities meet or exceed the 80 percent occupancy rate standard during four of the seven hours for which the parking survey was conducted. Therefore, this alternative calls for decreasing the parking restriction on 12 of the two-hour, restricted stalls in the eastern portion of the Lower Mill Street parking facility to one-hour restrictions. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $200. This alternative has the advantages of maximizing parking stall turnover, thereby increasing the parking efficiency of the Lower Mill Street facility, and encouraging increased utilization of the Upper Mill Street parking facility which should result in balancing the parking stall occupancy rate between these two directly adjacent facilities. There are no significant disadvantages to the alternative. Therefore, it is recommended that this alternative be implemented.

The only other parking restriction modification alternative considered was changing the short-term, two-hour time restriction in the City Hall parking facility. As noted in Chapter V, the 50 parking spaces in the City Hall parking facility experienced an average occupancy rate of 31 percent, well below the occupancy rate standard. The 75 parking spaces in the N. Johnson Street and City Hall parking facilities, in total, do not exceed the parking occupancy rate standard with a peak-hour demand during the 11:00 a.m. to 12:00 p.m. time period of 60 percent, and an average seven-hour occupancy rate of 47 percent. Therefore, this alternative calls for changing the parking restriction on 10 of the two-hour, restricted stalls in the northern portion of the City Hall parking facility to all-day, unrestricted parking. The capital cost of this alternative, which would consist of regulatory signing changes, would be about $200. This alternative has the advantages of maximizing parking stall utilization in the adjacent N. Johnson Street and City Hall parking facilities without adversely impacting parking stall availability in the City Hall facility, and of encouraging increased use of the City Hall parking facility

by short-term patrons through its reinforced identity as a convenient and well-used parking facility. There are no significant disadvantages to this alternative. Therefore, it is recommended that this alternative be implemented.

Addition of On-Street Parking Stalls at Selected Locations: As previously noted, change of the all-day, restricted parking regulation on the south side of the segment of Kossuth Street between S. Main Street and S. Johnson Street would add five short-term, one-hour, time-restricted stalls in the vicinity of the S. Johnson Street parking facility. This recommendation is further supported by the fact that there is an inadequate supply of parking stalls in the S. Johnson Street parking facility.

Construction of Additional Off-Street Parking Facilities: The first alternative action considered involving the construction of additional facilities to solve or mitigate the off-street parking supply problem in the Hartford CBD calls for vacating the segment of S. Johnson Street between W. Sumner Street and Kossuth Street and reconstructing the S. Johnson Street parking facility to increase its capacity from the existing 29 stalls to 51 stalls, as proposed in the July 1982 parking plan prepared by the Hartford Parking Authority. The capital cost of this alternative would be about $40,000 for reconstruction of the parking facility and $60,000 to acquire the Push residence located adjacent to the S. Johnson Street parking facility. The advantages of this alternative are that the number of short- and long-term parking stalls in the central business district would be increased by 22 stalls, reducing the previously identified parking supply deficiency in the central business district from 155 to 133 stalls, or by about 14 percent; vehicular conflict on W. Sumner Street in the vicinity of its intersection with Main Street would be eliminated; and implementation of this alternative would permit further development of the preliminary proposals set forth in the July 1982 parking plan proposed by the Hartford Parking Authority for the redesign of the N. Johnson Street and City Hall public parking facilities north of W. Sumner Street, and the installation of traffic signals which should be warranted at the intersection of W. Sumner Street and Rural Street. Existing public and private off-street parking facilities, located along N. Johnson Street are unattractive, lack continuity, and are not clearly defined. The proposed redesign of the N. Johnson Street and City Hall public parking facilities should serve to improve off-street parking conditions and increase parking space utilization and efficiency through the provision of an organized and attractive parking area. The installation of traffic signals should serve to provide vehicular progression on W. Sumner Street, improve vehicular operating conditions in the central business district area, and also serve to permit preempted entrance onto W. Sumner Street by fire and emergency rescue vehicles garaged on Rural Street north of W. Sumner Street. The disadvantage of this alternative is that it may be expected to divert about 700 vehicles per day to Rural Street and/or Main Street as drivers change their travel patterns to reach their trip destinations. These changes in traffic volumes, however, should not adversely impact vehicular operating conditions in the central business district. Therefore, it is recommended that this alternative be implemented.

Another alternative considered would construct a new off-street parking facility on the site of the former Pick 'n Pack food store on the east side

of S. Main Street adjacent to its intersection with Kossuth Street. The capital cost of this alternative would be about $16,000, plus the cost of acquiring the land and razing the vacant building located on the property. The advantage of this alternative is that it would add about 20 new parking stalls in the central business district, reducing the previously identified parking supply deficiency from 155 to 135 stalls, or by about 13 percent. The disadvantage of this alternative is that it would remove a potential commercial land development site from the central business district. Implementation of this alternative is not recommended.

Another alternative considered would construct an off-street parking structure with approximately 45 parking stalls on the existing location of the Lower and Upper Mill Street parking facility. The capital cost of this alternative, which would involve constructing a partial parking deck over the Lower Mill Street facility which would be at-grade with the Upper Mill Street facility, would be about $180,000. The advantage of this alternative is that the number of short- and long-term parking stalls would be increased, reducing the previously identified parking supply deficiency from 155 to 110 stalls, or by about 29 percent. In addition, parking stalls would be located in the area of heaviest parking demand. There are no significant disadvantages to this alternative. Therefore, it is recommended that this alternative be implemented.

A final alternative considered would construct an off-street parking structure with approximately 40 parking stalls on the existing location of the S. Johnson Street parking facility. The capital cost of this alternative, which would involve constructing a parking deck over the S. Johnson Street facility, would be about $160,000. The advantage of this alternative is that the number of short- and long-term parking stalls would be increased, reducing the previously identified parking supply deficiency from 155 to 115 stalls, or by about 26 percent. The disadvantage of this alternative is that it would not provide the needed parking spaces in the area of heaviest parking demand. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the two-hour parking restriction on 12 of the restricted stalls in the Lower Mill Street parking facility be reduced to a one-hour restriction; and that the two-hour parking restriction on 10 of the restricted stalls in the City Hall parking facility be removed to permit all-day, unrestricted parking. It is also recommended that a short segment of S. Johnson Street south of W. Sumner Street be vacated and that the Push residence located adjacent to the S. Johnson Street public parking facility be purchased by the City to permit reconstruction of the S. Johnson Street parking facility, increasing the capacity of that deck with about 45 parking spaces be constructed over the existing Lower Mill Street parking facility. It is also noted that the Hartford Parking Authority proposed redesign of the public and private parking facilities along N. Johnson Street should serve to improve parking conditions and increase parking space utilization and efficiency in the central business district through the provision of an organized and attractive off-street parking area.

Summary

The preceding parking supply problem analysis has investigated the shortage of short- and long-term parking stalls, evaluated alternative actions to solve or mitigate the problem, and recommended for implementation those alternative actions best suited to solve the identified parking problems. Both on-street and off-street parking problems were studied as a part of the analysis. Table 26 summarizes the traffic management recommendations based upon this analysis, and indicates the number of parking stalls affected and the capital cost of implementing each alternative. A total of nine recommended traffic management actions are set forth in the table. Although implementation of these recommendations would not fully satisfy the entire estimated demand for 155 additional parking spaces in the central businss district, it would serve to significantly reduce the parking space shortage to 72 spaces, or by about 54 percent. It would also serve to increase the efficiency of both the

Table 26

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

Problem Location	Recommended Traffic Management Actions	Number of Parking Stalls	Capital Cost
West Side of N. Main Street Between W. Wisconsin Street and E. Jackson Street.....	• Change parking restriction from one-hour to 30-minute	2	$ 200
East Side of N. Main Street Between E. Wisconsin Street and E. Jackson Street.....	• Change parking restriction from one-hour to 30-minute	3	200
South Side of E. Jackson Street Immediately East of N. Main Street.....	• Change parking restriction from one-hour to 30-minute	2	200
South Side of W. Wisconsin Street Immediately West of N. Main Street.....	• Change parking restriction from one-hour to two-hour	10	200
South Side of Kossuth Street Between S. Main Street and S. Johnson Street.....	• Remove all-day parking restrictions to allow one-hour parking	5	100
Lower Mill Street Public Parking Facility.....	• Change parking restrictions from two-hour to one-hour	12	200
	• Construct a parking structure with a partial deck over existing surface lot	45	180,000
City Hall Public Parking Facility.....	• Remove two-hour restriction to permit all-day, unrestricted parking	10	200
S. Johnson Street Public Parking Facility.....	• Vacate a segment of S. Johnson Street between W. Sumner Street and Kossuth Street and purchase Push residence to reconstruct existing surface lot	22	100,000

Source: SEWRPC.

existing on-street and off-street parking spaces and would also solve the peak-period parking space problems at the Lower Mill Street, the N. Johnson Street, and the S. Johnson Street off-street parking facilities. Implementation of the Hartford Parking Authority proposed redesign of the off-street parking facilities located along N. Johnson Street should also serve to increase parking space utilization and efficiency in that area of the central business district.

TRAFFIC ACCIDENT PROBLEM ANALYSIS

As noted in Chapter V, there are 13 locations that exhibit a high number of motor vehicle accident problems on the arterial street and highway system in the Hartford study area. These accident problem locations, along with the total number of accidents which occurred during the three-year time period from 1979 through 1981 at each location, are listed in Table 27. Included in Table 27 is an indication of the predominant type of collision involved in these accidents and a range of 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 signal; 2) street lighting; 3) signing; 4) pavement marking; 5) construction; 6) regulation; and 7) other. Application of one or more of the traffic management actions should reduce the number and/or severity of accidents at each location. The following analysis of each problem location sets forth the approximate cost and the advantages and disadvantages of each alternative traffic management action. The recommended actions for each accident problem location along with capital cost data, and an evaluation of the effect of these actions on vehicular air pollution and fuel consumption, are summarized in a table provided at the end of this section.

Main Street and Sumner Street

The predominant collision patterns experienced at the intersection of Main Street and Sumner Street, a signalized intersection, involved vehicles colliding into the rear end of stopped vehicles--12 accidents--and vehicles turning right and colliding into another vehicle or fixed objects--nine accidents. These two collision types accounted 56 percent or 21 of the 39 accidents which occurred at this location in calendar years 1979 through 1981. However, vehicular travel and accident patterns at this location were directly affected in 1980 by the reconstruction of the segment of Main Street north of Sumner Street and the intersection of Main Street and Sumner Street. The effect of this reconstruction is reflected in the reduced number of motor vehicle accidents at this location which, as previously noted in Chapter V, experienced a reduction from 21 accidents in 1979 to 10 accidents in 1980, or a reduction of 52 percent; and a further reduction to eight accidents in 1981, or a reduction from 1979 of 62 percent. A more detailed examination of the motor vehicle accidents that occurred in 1981, which should be more representative of existing conditions, indicates that of the eight accidents reported, four involved vehicles colliding into the rear end of stopped vehicles, one involved a vehicle turning right and striking another vehicle traveling in the same direction, one involved a vehicle turning left and colliding with a vehicle traveling in the opposite direction, one involved a vehicle colliding at a right angle with another vehicle, and one involved a vehicle striking a vehicle exiting a parking stall. The accident patterns at this location do

Table 27

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

Problem Location	Number of Accidents 1979-1981	Collision		Traffic Signals			Street Lighting	Signing		Pavement Markings						Construction			Regulations			
		Type	Number	Install Traffic Signals	Modify Existing Signals	Revise Signal Sequence	Improve Street Lighting	Install Advance Warning Signs	Install Lane-Use Signs	Install Stop Lines	Install Lane Lines	Install Turn Lanes	Install Advance Warnings	Install Raised Markers	Install Edgelining	Widen Roadway	Widen Shoulders	New Arterial	Prohibit Traffic Movements	Prohibit Parking	Reduce Speed Limit	Other
Main Street and Sumner Street.....	39	Rear end Right turn	11 9		X	X			X		X		X						X			
E. Sumner Street and CTH K.....	25	Out of control	10	X											X	X				X		
W. Sumner Street and Johnson Street....	15	Out of control	10	X															X	X		
W. Sumner Street and Rural Street.....	15	Left turn Right angle	5 4	X X						X		X							X X	X		
STH 83 and N. Wilson Avenue.....	12	Out of control	10				X							X					X		X	Skidproof Roadway
W. Monroe Avenue and S. Cedar Street.....	12	Right angle	7	X				X														
W. Sumner Street and N. Wacker Drive.....	5	Left turn	3	X				X													X	
STH 83-CTH E to Lee Road.....	15	Out of control	13											X	X	X		X			X	Skidproof Rodway
W. Sumner Street-Dodge County Line to Pond Road.....	13	Out of control	7											X	X						X	Skidproof Roadway
CTH K-Waterford Road to CTH E.....	8	Deer	5					X													X	
STH 83-Lee Road to Monroe Avenue.....	12	Out of control	8											X	X	X		X			X	Skidproof Roadway
E. Sumner Street-Teri Lane to Franklin Lane.....	11	Out of control	6											X	X	X					X	Skidproof Roadway
Kettle Moraine Drive-E. Sumner Street to Pike Lake State Park..	10	Out of control	9												X	X						

Source: SEWRPC.

not appear to have changed significantly during the three-year time period between 1979 and 1981 except that the frequency of motor vehicle accidents in 1980 and 1981 have been nearly halved when compared to the number of accidents that occurred in 1979.

Rear-End Accident Problems: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the rear-end accident problem at this intersection include: modification of traffic signals and revision of the signal sequence. Of the 12 rear-end accidents at this intersection, four accidents involved vehicles traveling in an east-to-west direction on the westbound approach of E. Sumner Street with the remaining rear-end accidents exhibiting a random pattern of collisions resulting from extenuating circumstances on the other approaches to the intersection. Only 17 percent or two of the 12 rear-end accidents occurred at night.

The first alternative--modification of traffic signals--would consist of reducing the mounting height of the near-side signals from 17 to eight feet. The capital cost of reducing the near-side signal mounting height would be about $1,000 per signal. The advantage of this alternative is that a reduced mounting height would lower the traffic signal head indication so as to be more within the drivers' normal field of vision, thereby increasing the signal visibility. The disadvantages of this alternative are that a reduced mounting height would make the signal more susceptible to damage from right-turning trucks and the sidewalks on each corner of the intersection would become restricted for pedestrian use. Implementation of this alternative is not recommended.

The second alternative--revising the traffic signal sequence--involves changing the green time on each approach to more closely match the traffic volume demand on each approach. The capital cost of revising the signal sequence, which consists of changing the north- and southbound exclusive left-turn phase from fixed-time to traffic-actuated, would be about $5,000. The advantage of changing the signal sequence is that as traffic patterns change, the traffic signal phases are automatically changed to more efficiently accommodate the changes in traffic volumes. This has the advantage of reducing the number of stopped vehicles and minimizing delays experienced by drivers at signalized intersections, thereby decreasing overall vehicular travel times. There are no significant disadvantages to revising the signal sequence. Therefore, the recommendation made in the traffic congestion section of this chapter to change the exclusive north- and southbound left-turn arrows at this intersection from fixed-time to traffic-actuated is further supported as a traffic management action to solve or mitigate the rear-end accident problem at this intersection.

Right-Turn Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the right-turn accident problem at this intersection include: installation of additional lane-use control signs, installation of advance pavement markings or lane lines, and prohibition of turning movements. Of the nine right-turn accidents at this intersection: four involved vehicles traveling westbound on E. Sumner Street; three involved vehicles traveling eastbound on W. Sumner Street; and two involved vehicles traveling northbound on S. Main Street. None of the right-turn accidents occurred at night.

The first alternative consists of installing additional lane-use control signs on the far-right side overhead traffic signals controlling the north- and southbound intersection approaches. Both of these intersection approaches have existing exclusive left-turn lanes with lane-use control signs located on the right-hand curbing at a distance of about 100 feet from the intersection. The capital cost of installing additional lane-use control signs at this intersection is about $200 per approach. The advantage of this alternative is that it should reduce driver confusion and subsequent last second lane changing thereby improving the flow of vehicular traffic through the intersection. The disadvantage of this alternative is that, if used excessively, traffic signs tend to lose effectiveness. Such signs can also serve to distract from the appearance of the downtown streetscape. It is recommended that a lane-use control sign with directional arrows be placed on the far-right side traffic signal support controlling northbound traffic at this intersection.

The second alternative traffic management action suggested to solve the right-turn accident problem at this intersection is the installation of advance pavement markings. The capital cost of advance pavement markings, which involves placing directional lane-use arrows on the roadway pavement, is about $200 per intersection approach. The advantage of pavement markings is that they are used to supplement information provided on traffic signs by conveying information to the driver without diverting his attention from the roadway. Pavement markings have the disadvantage of requiring additional driver response time to comprehend their message. 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. The confined roadway pavement area on the approaches to this intersection severely limits the effectiveness of advance pavement markings to reinforce the existing lane-use pavement markings on the north- and southbound approaches to the intersection. Implementation of this alternative is not recommended.

Another pavement marking alternative with potential to ameliorate the right-turn accident problem at this intersection involves installing lane lines on the east- and westbound approaches to the intersection. The capital cost of this alternative would be about $100 per intersection approach. The advantage of lane lines is that they delineate the separation of traffic flows in the same direction of travel. The only disadvantage to this alternative is that lane lines would identify two separate traffic lanes on each intersection approach, which serves to encourage motorists to use both lanes for through traffic in addition to use by left- and right-turning traffic. This tends to create a potential accident problem as the far-side roadways opposite each intersection approach provide only one lane for through traffic and one lane for on-street public parking. Implementation of this alternative would require prohibition of on-street parking on the east- and westbound far-side roadways at this intersection. This is not advisable due to the previously identified shortage of on-street parking in the Hartford central business district. Implementation of this alternative is not recommended.

The final alternative traffic management action with potential to solve the right-turn accident problem at this intersection is the prohibition of left turns. The capital cost of 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 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 motor fuel consumption. Since Main Street and Sumner Street are the two principal arterial streets in the study area, implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the north- and southbound exclusive left-turn arrows at the intersection be changed from fixed-time to traffic-actuated operation and that a lane-use control sign with directional arrows be placed on the far right side overhead traffic signal support controlling northbound traffic.

E. Sumner Street and CTH K

The predominant accident collision pattern experienced at the intersection of E. Sumner Street and CTH K, a nonsignalized intersection, involved vehicles that went out of control. This collision type accounted for 10 of the total 25 accidents, or 40 percent of the accidents at this intersection in calendar years 1979 through 1981. Of the 10 out-of-control vehicle accidents at this intersection, four occurred on the northbound and westbound approaches and two occurred on the eastbound approach. Two of the accidents at this intersection involved fatalities. Fifteen, or 60 percent of the accidents, occurred at night.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the out-of-control vehicle accident problem at this intersection include: installation of a flashing red stop sign control beacon, installation of edgeline pavement marking, widening of the roadway pavement, and reducing the speed limit.

The first alternative with potential to ameliorate the out-of-control vehicle accident problem at this intersection involves installing a flashing red stop sign control beacon on the stop sign controlling traffic on the northbound approach to the intersection. The capital cost of this alternative would be about $600. This alternative action has the advantages of reinforcing the stop sign regulation and providing advance warning of a stop sign-controlled intersection to northbound traffic. There are no significant disadvantages to this alternative. Therefore, it is recommended that this alternative be implemented.

The second alternative traffic management action with potential to ameliorate the out-of-control vehicle accident problem at this intersection involves the installation of white edgeline pavement markings along E. Sumner Street east and west of its intersection with CTH K. The capital cost of this alternative would be about $100 per approach. This alternative has the advantage of delineating the edge of the roadway pavement as a guide for drivers during periods of darkness. There are no significant disadvantages to this alternative. It is recommended that this alternative be implemented.

Another alternative traffic management action to ameliorate the out-of-control vehicle accident problem at this intersection involves widening the roadway pavement. The existing through roadway on E. Sumner Street is 22 feet wide, providing a single 11-foot-wide traffic lane in each direction. A 22-foot-wide roadway width meets the minimum design standard for a rural arterial highway. The westbound roadway approach at this intersection is widened an additional 10 feet to allow through traffic to bypass westbound left-turning vehicles. The capital cost of this alternative, which consists of increasing the roadway width to 24 feet, would be about $46,000. This alternative has the advantage of increasing the roadway width to meet the desirable--as opposed to minimum--design standard for a rural arterial highway, thereby providing additional roadway surface to facilitate safe control of vehicles. There are no significant disadvantages associated with this alternative. It is recommended that the segment of E. Sumner Street extending between Sell Drive and the Village of Slinger, a distance of about 4.6 miles, be widened to 24 feet when regular maintenance schedules require the roadway to be resurfaced.

The final alternative to ameliorate the out-of-control vehicle accident problem at this intersection involves reducing the posted speed limit from 45 miles per hour (mph) to 35 mph on the E. Sumner Street approaches to the intersection. The capital cost of the speed limit reduction, which consists 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 type of motor vehicle accident observed on the problem segment of E. Sumner Street from Teri Lane to Franklin Lane, as will be identified in a subsequent analysis in this section, involved out-of-control vehicles during periods of darkness. A contributing factor to an out-of-control vehicle accident problem is usually high travel speeds in excess of the posted speed limit. Furthermore, the higher the travel speed and volume of traffic on a roadway, the more important it is that vehicles maintain the same relative travel speed. The 45 mph speed limit on E. Sumner Street is satisfactory for the geometric and land development conditions at this 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 because of the rural and suburban character of the land development adjacent to E. Sumner Street in the vicinity of this intersection. A reduced speed limit could actually lead to a more severe accident problem on the roadway approaches to this intersection. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that a flashing red stop sign control beacon be installed on the stop sign controlling northbound traffic at the intersection of E. Sumner Street and CTH K and that white edgeline pavement markings be placed along E. Sumner Street east and west of its intersection with CTH K. It is also recommended that when the segment of E. Sumner Street between Sell Drive and the Village of Slinger is resurfaced, it be widened from the existing 22-foot-wide roadway pavement to a 24-foot-wide roadway pavement.

W. Sumner Street and Johnson Street

The predominant accident collision pattern experienced at the intersection of W. Sumner Street and Johnson Street, a nonsignalized intersection, involved vehicles colliding at right angles. This collision type accounted for 73 percent, or 11 of the total 15 accidents at this intersection in calendar years 1979 through 1981. Only two, or 13 percent of the accidents at this intersection, occurred at night.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 27 with potential to solve or mitigate the right-angle accident problem at this intersection include: prohibition of curb parking, installation of traffic signals, and prohibition of north- and/or southbound through traffic.

The first alternative with potential to solve or ameliorate the right-angle accident problem at this intersection involves prohibiting curb parking on the east- and westbound W. Sumner Street approaches to the intersection. The capital cost of this alternative, which consists of regulatory signing, would be about $200. This alternative would increase visibility of vehicles on W. Sumner Street for drivers on Johnson Street. The disadvantage of this alternative is that it would reduce the supply of on-street parking spaces in the Hartford central business district. The current supply of on-street parking spaces in the central business district was identified as inadequate in Chapter V. The parking stall occupancy rate standard of 80 percent is met during several hours of the average weekday along block faces 14 and 18 which consist of five stalls located on the north side of W. Sumner Street between Johnson Street and Main Street, and five stalls located on the south side of W. Sumner Street between Rural Street and Johnson Street. Implementation of the alternative is not recommended.

The installation of traffic signals at this intersection is another alternative solution to the right-angle accident problem at this intersection. The capital cost of this alternative would be about $35,000. The advantage of this alternative is that it would stop oncoming traffic and provide for the more orderly movement of vehicular and pedestrian traffic 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--the vehicles using W. Sumner Street. However, this overall delay would be minimized by the fact that the signals could be coordinated with the signals at the intersection of W. Sumner Street and Main Street to maximize vehicular progression on W. Sumner Street. According to the criteria set forth in the Manual on Uniform Traffic Control Devices, a traffic signal is not warranted at this intersection at this time. Therefore, the installation of traffic signals at this intersection is not recommended.

A final alternative action to solve the right-angle accident problem at this intersection is the prohibition of north- and/or southbound through traffic. The prohibition of through traffic can best be facilitated at this intersection by the designation of Johnson Street as a one-way street, permitting traffic to travel northbound north of W. Sumner Street and southbound south

of W. Sumner Street. The capital cost of this alternative, which would involve regulatory signing changes, is about $800. This alternative has the advantage of eliminating the conflict between through traffic on W. Sumner Street and Johnson Street. The disadvantage of this alternative is that it reduces vehicular accessibility, resulting in increased travel times and trip lengths of selected trips within the Hartford central business district. This alternative is consistent with the previously mentioned parking problem recommendation to vacate a segment of S. Johnson Street to permit construction of an off-street parking facility. Therefore, it is recommended that the segment of N. Johnson Street between W. Sumner Street and W. Jackson Street be designated as a one-way northbound facility, and that the segment of S. Johnson Street between W. Sumner Street and Kossuth Street be vacated for the reconstruction of the S. Johnson Street public parking facility.

Concluding Remarks: In conclusion, it is recommended that the segment of N. Johnson Street between W. Sumner Street and W. Jackson Street be designated as a one-way northbound facility and that the segment of S. Johnson Street between W. Sumner Street and Kossuth Street be vacated to permit reconstruction of the S. Johnson Street public parking facility in the Hartford central business district.

W. Sumner Street and Rural Street

The predominant accident collision pattern experienced at the intersection of W. Sumner Street and Rural Street, a nonsignalized intersection, involved vehicles turning left into the opposing traffic stream and colliding with oncoming vehicles--five accidents; and vehicles colliding at right angles--four accidents. These two collision types accounted for 60 percent, or nine of the total 15 accidents at this intersection in calendar years 1979 through 1981. None of the accidents reported at this intersection occurred at night.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the left-turn accident problem at this intersection include: prohibition of curb parking; installation of painted turn lanes; prohibition of left turns; and installation of traffic signals.

The first alternative with potential to solve or ameliorate the left-turn accident problem at this intersection involves prohibiting curb parking on the east- and westbound W. Sumner Street approaches to the intersection. The capital cost of this alternative, which consists of regulatory signing changes, would be about $200. This alternative would increase visibility of vehicles on W. Sumner Street for drivers on Rural Street. The disadvantage of this alternative is that it would reduce the supply of on-street parking spaces in the Hartford central business district. The current supply of on-street parking spaces in the central business district was identified as inadequate in Chapter V. The parking stall occupancy rate along block face 13, which consists of five stalls located on the south side of W. Sumner Street between Rural Street and Johnson Street, however, did not exceed 60 percent

during the 9:00 a.m. to 5:00 p.m. parking survey time period. Therefore, it is recommended that parking in the westernmost parking stall along the westbound W. Sumner Street approach to the intersection be prohibited.

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 ready identification of traffic lanes and the facilitation of orderly traffic flow through an intersection. The disadvantage of turning guidelines at an intersection is that they can confuse drivers desiring to make other movements across the intersection; i. e., north- or southbound drivers making right turns. Straight-ahead traffic movements would be influenced by the turning guidelines as both the north- and southbound intersection approaches are one lane wide, with left turns making up 18 and 20 percent of the northbound morning and evening peak-hour traffic volume, respectively, and 25 and 45 percent of the southbound approach morning and evening peak-hour traffic volume, respectively. Implementation of this alternative is not recommended.

Another alternative action suggested to solve the left-turn accident problem at this intersection is the prohibition of left turns. The capital cost of this alternative, which consists of regulatory signing, would be about $400 per approach. This alternative would eliminate the possibility of left-turn collisions and increase intersection capacity for right-turn and through 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 motor fuel consumption. Implementation of this alternative is not recommended.

A final alternative action considered to solve or ameliorate the left-turn accident problem at this intersection is the installation of semi-actuated traffic signals. The capital cost of this alternative would be about $35,000. The principal advantage of this alternative is that a traffic signal would stop oncoming traffic and provide for the orderly movement of vehicular and pedestrian traffic through the intersection, thereby reducing the frequency of left-turn and right-turn accidents. This alternative could be designed so as to permit signal preemption by the fire and emergency vehicles garaged on Rural Street, thereby providing safer and more efficient access by such vehicles to W. Sumner Street, one of the principal arterial streets in the study area. The disadvantage of this alternative is that it would increase vehicle delay by stopping vehicles which were previously uncontrolled--the vehicles using W. Sumner Street. However, this delay would be minimized by the fact that the proposed traffic signals would be actuated by traffic on Rural Street and would be interconnected with and operate on a background cycle with the existing traffic signals at the intersection of Sumner Street and Main Street to provide for progressive traffic flow along W. Sumner Street. According to the Manual on Uniform Traffic Control Devices, a traffic signal would be warranted at this intersection if vehicular traffic on S. Johnson Street were diverted to Rural Street due to its previously recommended vacation for parking lot construction and correction of the right-angle accident problem identified at the intersection of Johnson Street and W. Sumner Street. Therefore, it is recommended that traffic signals be installed at this intersection upon the vacation of S. Johnson Street for parking lot construction purposes.

Right-Angle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the right-angle accident problem at this intersection include: painting of stop line pavement markings; the prohibition of north- and/or southbound through traffic; and the installation of traffic signals.

The first alternative traffic management action with potential to solve or ameliorate the right-angle accident problem at this intersection is the application of pavement markings. This alternative would consist of painting "stop" lines on the Rural Street approaches to the intersection. The annual cost of this alternative 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 disadvantages, 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. It is recommended that stop lines be painted on the Rural Street approaches to the intersection to ameliorate the right-angle accident problem which currently exists.

Another alternative traffic management action suggested to solve the right-angle accident problem at this intersection is the prohibition of north- and/or southbound through traffic. The prohibition of through traffic can be facilitated at this intersection by the designation of Rural Street as a one-way street, permitting traffic to travel northbound north of W. Sumner Street and southbound south of W. Sumner Street. The capital cost of this alternative, which would involve regulatory signing changes, is about $800. This alternative has the advantage of eliminating the conflict between through traffic on W. Sumner Street and Rural Street. The disadvantages of this alternative are that it reduces vehicular accessibility resulting in increased travel times and trip lengths of selected trips within the Hartford central business district, and it would also severely restrict the access of fire and emergency vehicles from Rural Street to W. Sumner Street. Implementation of this alternative is not recommended.

A final alternative suggested to solve the right-angle accident problem at this intersection involves the installation of traffic signals. As noted in the left-turn accident problem analysis for this intersection, it is recommended that semi-actuated traffic signals be installed at this location. This recommendation is further supported by the analysis of the right-angle accident problem at this intersection.

Concluding Remarks: In conclusion, it is recommended that semi-actuated traffic signals be installed at this intersection; that such signals be interconnected to operate on a background cycle with the existing signals at the intersection of Sumner Street and Main Street to provide for the progressive movement of traffic on W. Sumner Street; and that the signals be provided with a preemption system to permit fire and emergency vehicles garaged on Rural Street safe and efficient access to W. Sumner Street. It is also recommended that parking be prohibited in the westernmost parking stall on the westbound approach of W. Sumner Street at Rural Street, and that stop line pavement marking be installed on the north- and southbound approaches of Rural Street to W. Sumner Street.

STH 83 and N. Wilson Avenue

The predominant accident collision pattern experienced at the intersection of STH 83 and N. Wilson Avenue, a nonsignalized intersection, involved vehicles that went out of control. This collision type accounted for 83 percent, or 10 of the total 12 accidents at this intersection in calendar years 1979 through 1981. Interestingly, only one of the 12 accidents at this intersection occurred in calendar year 1981. Nine of the 12 accidents, or 75 percent, reported at this intersection occurred at night and/or under inclement weather or slippery roadway conditions.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the out-of-control vehicle accident problem at this intersection include: reducing the speed limit, installing overhead street lights, installing raised pavement markers, and skidproofing the roadway surface.

The first alternative with potential to solve the out-of-control vehicle accident problem at this intersection involves reducing the posted speed limit on STH 83. The posted speed limit on STH 83 at the intersection is 30 mph, while at the city limits, immediately north of the intersection, the posted speed limit is 55 mph, and east of the intersection at N. 7th Street the posted speed limit is lowered 25 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 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 limits are accident experience and traffic volume. The frequency of out-of-control vehicle accidents should be reduced with a lower intersection approach speed. The disadvantage of this alternative is that a reduced speed limit 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 character of the land development adjacent to STH 83 north of this intersection. Based on the vehicle operating speed data previously presented in Table 12 of Chapter III, travel speeds on the segment of STH 83 east of its intersection with N. Wilson Avenue average 28 to 30 mph, which is approximately five miles per hour over the posted speed limit. Without strict enforcement, it does not appear reasonable to expect vehicles to travel through the intersection of STH 83 and N. Wilson Avenue at a speed below 30 mph which is the posted speed limit through the intersection. Implementation of this alternative is not recommended.

Another alternative with potential to solve or mitigate the out-of-control vehicle accident problem at this intersection is the installation of overhead street lights on the STH 83 approaches to the intersection. Street lighting at this intersection consists of an overhead light which was installed in 1981 located on the southwest corner of the intersection. The capital cost of this alternative would be about $5,000. As previously noted, 75 percent of accidents at this intersection occurred at night. This is an above average number of

nighttime accidents. However, only one accident has occurred since the installation of the existing overhead light in 1981. The advantage of street lighting on the approaches to this intersection is that it would provide for the safer and more efficient flow of traffic through the intersection. Currently, the roadway changes from a rural, 24-foot-wide pavement north of the intersection to an urban, 42-foot-wide pavement west of the intersection. Improved street lighting would aid the motorist in making the transition from rural to urban driving conditions. The disadvantage of this alternative is that improved street lighting may encourage vehicular traffic to increase travel speeds through the intersection due to improved nighttime visibility. Accordingly, based upon the significant accident reduction associated with the installation of the existing street light the installation of improved street lighting at this intersection is not recommended.

The installation of raised pavement markers is another action suggested to solve or ameliorate the out-of-control vehicle accident problem at this intersection. The capital cost of this alternative, which consists of placing reflectorized pavement markings along the roadway centerline approach to this intersection, would be approximately $400. Raised pavement markers have the advantage of delineating the roadway centerline during periods of darkness and inclement weather conditions. There are no significant disadvantages to this alternative. Based upon the significant accident reduction attributed to the installation of street lighting at this intersection it is not considered necessary to install raised pavement markers at this time. Therefore, implementation of this alternative is not recommended.

The final alternative action with potential to solve or mitigate the out-of-control vehicle accident problem at this intersection involves skidproofing the roadway surface. Skidproofing can be accomplished by either sawing longitudinal grooves in or placing a bituminous overlay containing igneous or trap rock material over the existing roadway surface. The capital cost of this alternative with grooving or a bituminous overlay would be about $10,000 or $7,500, respectively. The advantage of this alternative is that it would improve vehicle traction, thereby reducing the opportunity for vehicles to lose control as they travel through the intersection. The disadvantages of this alternative is that it would increase the noise level of vehicular traffic and that it requires periodic maintenance to remain effective. Implementation of this alternative is not recommended at this time.

Concluding Remarks: In conclusion, based upon the significant accident reduction attributed to the installation, in 1981, of an overhead street light at this intersection and the proposed intersection reconstruction in 1984 to accommodate the Riverbend East residential development, no traffic management actions to solve the out-of-control vehicle accident problem are recommended to be implemented at this intersection.

W. Monroe Avenue and S. Cedar Street

The predominant accident collision pattern experienced at the intersection of W. Monroe Avenue and S. Cedar Street, an unsignalized intersection, involved vehicles colliding at right angles. This collision type accounted for 58 percent, or seven of the total 12 accidents at this intersection in calendar years

1979 through 1981. Eight of the 12 accidents, or 67 percent, reported at this intersection occurred under inclement weather or slippery roadway conditions. Three, or 25 percent, of the accidents occurred at night.

Right-Angle Accident Problem: The alternative traffic management plans indicated in Table 27 to have potential to solve or ameliorate the right-angle accident problem at this intersection include installation of four-way stop signs and the installation of warning "Traffic on Cedar Street Does Not Stop" signs.

The first alternative action suggested to solve the right-angle accident problem at this location involves installing stop signs at the S. Cedar Street approaches to the intersection. Currently, there are stop signs controlling traffic on W. Monroe Avenue at its intersection with S. Cedar Street. The capital cost of this alternative would be about $200. 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 previously were uncontrolled--the vehicles using S. Cedar Street. According to criteria set forth in the Manual on Uniform Traffic Control Devices, a four-way stop sign controlled intersection is not warranted at this location. Therefore, the installation of stop signs on S. Cedar Street is not recommended.

The other alternative action suggested to solve the right-angle accident problem at this location involves installing warning signs. The capital cost of this alternative would be about $100. This alternative would consist of installing "Traffic on Cedar Street Does Not Stop" warning signs on the W. Monroe Avenue approachs to the intersection. The advantage of warning signs is that they alert the motorist to a potentially hazardous situation. The disadvantage of such signs is that if used excessively, they lose their effectiveness. It is recommended that "Traffic on Cedar Street Does Not Stop" signs be installed as a supplementary message below the existing east- and westbound stop signs at this intersection.

Concluding Remarks: In conclusion, it is recommended that a warning sign stating "Traffic on Cedar Street Does Not Stop" be installed on the east- and westbound approaches of W. Monroe Avenue at its intersection with S. Cedar Street.

W. Sumner Street and N. Wacker Drive

The predominant accident collision pattern experienced at the intersection of W. Sumner Street and N. Wacker Drive, an unsignalized intersection, involved southbound, left-turning vehicles on N. Wacker Drive colliding with vehicles traveling east- or westbound on W. Sumner Street. This collision type accounted for 60 percent, or three of the total five accidents at this intersection in calendar years 1979 through 1981. Four of the five accidents at this intersection occurred in 1981, with none of the accidents occurring at night.

Left-Turn Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or mitigate the left-turn accident problem at this intersection include installation of traffic signals, installation of advance warning signs, and reduction of the speed limit.

The first alternative action suggested to solve the left-turn accident problem at this intersection involves the installation of traffic signals at a capital cost of about $30,000. The principal advantage of this alternative is that it would stop oncoming traffic and provide for the more orderly movement of traffic through the intersection. The disadvantage of this alternative is that it would increase vehicle delay by stopping vehicles which were previously uncontrolled--the vehicles using W. Sumner Street. According to criteria set forth in 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 a beacon 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 1980 and 1981--there were no reported accidents at this intersection in 1979--was 0.40 and 1.61 accidents per million vehicles entering this intersection. Although an accident rate of 1.61 is relatively low, it is the sixth highest intersection accident rate in the study area in 1981. 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 criteria set forth in the Manual on Uniform Traffic Control Devices, a flashing intersection control beacon is not warranted at this intersection. Therefore, the installation of such a beacon at this intersection is not recommended.

The installation of advance warning signs is another alternative action with potential to solve the left-turn accident problem at this intersection. The capital cost of this alternative, which would consist of placing "Side Road" warning signs on the W. Sumner Street approaches to Wacker Drive, would be about $200. Advance warning signs have the advantage of informing the motorist who is unfamiliar with a road that he is approaching an intersection or an area of potentially hazardous conditions. It is noted, however, that the five accidents reported at this location occurred during the morning or evening peak hour, more specifically at either 8:00 a.m. or 3:15 p.m. to 3:45 p.m., which coincides with the work starting and dismissal times of the commercial and industrial development located immediately north of this intersection. Therefore, it is concluded that the motorists involved in these accidents were probably familiar with the intersection location and were reporting to or departing from their place of employment. Advance warning signs have the disadvantage, if used excessively, of tending to lose their effectiveness. Implementation of this alternative is not recommended.

A final alternative action with potential to solve the left-turn accident problem at this intersection involves reducing the posted speed limit on W. Sumner Street. The posted speed limit on W. Sumner Street is 30 mph east of its intersection with N. Wacker Drive and 45 mph west of its intersection with N. Wacker Drive. The capital cost of reducing the speed limit, which would consist of regulatory signing, would be about $400.

As in all regulatory procedures, the limit 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 frequency of left-turn accidents experienced at this intersection could be reduced with a lower intersection approach speed. The disadvantage of this alternative is that a reduced speed limit would have to be strictly enforced, as drivers may have a tendency to drive at a higher speed than the posted speed because of the rural and suburban character of the land development adjacent to W. Sumner Street at this intersection. It would appear from the average travel speed data contained in Table 12 of Chapter III that motorists are already exceeding the posted speed limit as travel speeds on the segment of W. Sumner Street from N. Wacker Drive to Rural Street averaged 30 to 35 mph. It is noted that the segment of W. Sumner Street from Cedar Street to Rural Sreet which makes up about one-half of the aforenoted roadway segment extending from N. Wacker Drive to Rural Street is posted for a 25 mph speed limit. Based upon this data, it may be concluded that vehicular traffic is exceeding the posted speed limit on the W. Sumner Street approaches to N. Wacker Drive. Therefore, reduction of the speed limit on W. Sumner Street is not recommended. Strict enforcement of the posted speed limit should serve to reduce average travel speeds at the N. Wacker Drive intersection.

Concluding Remarks: In conclusion, it is recommended that the posted speed limits on the W. Sumner Street approaches to N. Wacker Drive be strictly enforced, particularly during the morning and evening peak-hour periods, to reduce average vehicular travel speeds and the frequency of left-turn accidents at this location.

STH 83-CTH E to Lee Road

The predominant accident collision pattern experienced on the segment of STH 83 between CTH E and Lee Road involved vehicles that went out-of-control--13 accidents--eight of which struck fixed objects. This collision type accounted for 87 percent of the total 15 accidents on this roadway segment in calendar years 1979 through 1981. Nine of the 15 accidents, or 60 percent, occurred at night, and seven, or 47 percent, occurred when roadway conditions were wet or icy, and it was raining, sleeting, or snowing.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment include: installing raised pavement markers; installing edgeline pavement markings; reducing the speed limit; widening the roadway; skidproofing the roadway surface; and constructing a north-south bypass facility.

The first alternative--installing raised pavement markers--would involve placing reflectorized pavement markings along the roadway centerline. The capital cost of this alternative would be approximately $3,000. Raised pavement

markers have the advantage of delineating the roadway centerline during periods of darkness or inclement weather conditions, providing guidance to motorists without diverting their attention from the roadway. There are no significant disadvantages to this alternative. Raised pavement markers are normally used on short segments of roadway to provide motorist guidance through horizontal curves or at pavement width transitions. Therefore, implementation of this alternative is not recommended. However, it is recommended that, based upon Commission staff field inspections, the existing white edgeline pavement markings placed along this roadway segment be renewed to improve their visibility.

The second alternative traffic management action with potential to solve or ameliorate the out-of-control vehicle accident problem on this roadway segment involves reducing the posted speed limit. The posted speed limit on the northern one-half mile of this segment of STH 83 is 45 mph, while the southern one-half mile is posted at 55 mph. The capital cost of this alternative, which involves regulatory signing changes, 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 frequency of out-of-control vehicle accidents experienced along this roadway segment could be reduced with a lower posted speed limit. The disadvantage of this alternative is that a reduced speed limit would have to be strictly enforced, as some drivers will have a tendency to drive at a higher speed than the posted speed because of the rural character of the land development adjacent to this segment of STH 83. A reduced speed limit could result in a more severe accident problem on this roadway segment. It would appear from the average travel speed data shown in Table 12 of Chapter III that motorists are not exceeding the existing posted speed limit on the roadway segment with travel speeds on the segment of STH 83 immediately north of Lee Road averaging between 38 to 40 mph. Based upon this data, it may be concluded that vehicles are probably not going out-of-control on the segment of STH 83 between CTH E and Lee Road because of motorists traveling at excessive speeds. Therefore, implementation of this alternative is not recommended.

An alternative action with potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment involves skidproofing the roadway surface. Skidproofing can be accomplished by either sawing longitudinal grooves in or placing a bituminous overlay containing igneous or trap rock material over the existing roadway surface. The capital cost of this alternative with grooving or a bituminous overlay would be about $120,000 or $45,000, respectively, for the one-mile-long roadway segment between CTH E and Lee Road. The advantage of this alternative is that it would increase pavement friction, thereby reducing the potential for vehicles to go out of control, especially during periods of slippery roadway conditions. The disadvantages of this alternative are that it would increase the noise level of vehicular traffic and that it requires periodic maintenance to remain effective. Roadway skidproofing is, therefore, normally reserved for isolated areas of concentrated accident problems and is not applied over extended sections of roadway. Implementation of this alternative is not recommended.

A final alternative action with potential to ameliorate the out-of-control vehicle accident problem on this roadway segment involves construction of the S. Wilson Avenue bypass. As previously noted, the capital cost of this alternative is estimated at $2.0 million. This alternative has the advantage of indirectly reducing the frequency of accidents occurring on STH 83 by attracting vehicular traffic to a safer facility which would be constructed to meet current roadway design standards. There are no significant disadvantages associated with this alternative. The recommendation to construct the S. Wilson Avenue bypass to solve arterial service and vehicular congestion problems in the study area is further supported by this analyis of motor vehicle accidents on the roadway segment of STH 83 between CTH E and Lee Road.

Concluding Remarks: In conclusion, it is recommended that the existing white edgeline pavement markings along this roadway segment be renewed on a semi-annual schedule at an estimated cost of $2,000 to improve their visibility and attendant provision of pavement delineation during periods of darkness, and that the S. Wilson Avenue bypass be constructed from CTH E to E. Sumner Street.

W. Sumner Street-Dodge County Line to Pond Road

The predominant accident collision pattern experienced on the segment of W. Sumner Street from the Dodge County Line to Pond Road involved vehicles that went out of control and either ran off the roadway or struck fixed objects. This collision type accounted for 54 percent, or seven of the total 13 accidents on this roadway segment in calendar years 1979 through 1981. Six of the 13 accidents, or 46 percent, occurred at night, and five, or 38 percent, occurred when roadway conditions were wet or icy, and it was raining, sleeting, or snowing.

Out-of-Control Vehicle Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment include installing raised pavement markers, reducing the speed limit, and skidproofing the roadway surface.

The first alternative traffic management action with potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment involves installing raised pavement markers along the roadway centerline. The capital cost of this alternative would be approximately $6,000. Raised pavement markers have the advantage of delineating the roadway centerline during periods of darkness or inclement weather conditions, providing guidance to motorists without diverting their attention from the roadway. There are no significant disadvantages associated with this alternative. Raised pavement markers, however, are normally used on short segments of roadway to provide motorists guidance through horizontal curves or at pavement width transitions. Therefore, implementation of this alternative is not recommended. However, based upon Commission staff field inspections, it is recommended that the existing white edgeline pavement markings placed along this roadway segment be renewed, at an estimated cost of $2,500, to improve their visibility and provide motorists with pavement delineation guidance.

The second alternative with potential to solve or ameliorate the out-of-control vehicle accident problem on this roadway segment involves reducing the posted speed limit. The posted speed limit on this segment of W. Sumner Street is basically 55 mph, with the roadway approaches to Pond Road posted at 45 mph. The capital cost of this alternative, which involves 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 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 frequency of out-of-control vehicle accidents experienced along this roadway segment could be reduced with a lower posted speed limit. The disadvantage of this alternative is that a reduced speed limit would have to be strictly enforced, as some drivers will have a tendency to drive at a higher speed than the posted speed limit because of the rural character of the land development adjacent to the segment of W. Sumner Street. A reduced speed limit could result in a more severe accident problem along this roadway segment. Implementation of this alternative is not recommended.

The final alternative with potential to solve or ameliorate the out-of-control vehicle accident problem along the roadway segment involves skidproofing the roadway surface. Skidproofing can be accomplished by either sawing longitudinal grooves in or placing a bituminous overlay containing igneous or trap rock material over the existing roadway surface. The capital cost of this alternative with grooving or a bituminous overlay would be about $170,000 or $63,000, respectively, for the 1.4-mile-long roadway segment between the Dodge County line and Pond Road. The advantage of this alternative is that it would increase pavement friction, thereby reducing the potential for vehicles to go out of control, especially during periods of slippery roadway conditions. The disadvantages of this alternative are that it would increase the noise level of vehicular traffic and that it requires periodic maintenance to remain effective. Roadway skidproofing is, therefore, normally reserved for isolated areas of concentrated accident problems such as sharp horizontal curves or intersection approaches with excessive downhill roadway grades. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the existing white edgeline pavement markings along the roadway segment be renewed on a semi-annual schedule to improve their visibility and the attendant provision of pavement delineation during periods of darkness.

CTH K-Waterford Road to CTH E

The predominant accident collision pattern experienced along the segment at CTH K between Waterford Road and CTH E involved vehicles that collided with deer crossing the roadway. This collision type accounted for 62 percent, or five of the total eight accidents on this roadway segment in calendar years

1979 through 1981. Five of the eight accidents, or 62 percent, occurred at night, with four, or 50 percent, of the deer-vehicle collisions occurring in calendar year 1981.

Deer Crossing Accident Problem: Aside from fencing the entire roadway segment from Waterford Road to CTH E, a distance of about one mile, the only alternative traffic management actions indicated in Table 27 to have potential to ameliorate the deer crossing accident problem involve installing advance warning signs, or reducing the posted speed limit.

The first alternative--installing advance warning signs--consists of placing "Deer Crossing" signs along this segment of CTH K. The capital cost of this alternative would be about $400. The advantage of this alternative is that it would alert motorists to unexpected entries onto the roadway pavement. The only disadvantage to this alternative is that, if used in excess, the signs tend to lose their effectiveness. It is recommended that deer crossing warning signs be placed on this segment of CTH K.

The only other alternative with potential to ameliorate the deer crossing accident problem on this roadway segment involves reducing the posted speed limit. The posted speed limit on this segment of CTH K is 55 mph. The capital cost of this alternative, which involves 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 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 frequency of deer crossing accidents could probably be reduced with a lower posted speed limit. However, the disadvantage of this alternative is that it would have to be strictly enforced, particularly during periods of darkness, as some drivers will have a tendency to drive at a higher speed than the posted speed limit because of the rural character of the land development adjacent to this segment of CTH K. A reduced speed limit could result in a more severe accident problem along this roadway segment. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that advance warning "Deer Crossing" signs be installed on this roadway segment of CTH K.

STH 83-Lee Road to Monroe Avenue

The predominant accident collision pattern experienced along the segment of STH 83 from Lee Road to Monroe Avenue involved vehicles that went out of control and either ran off the roadway or struck fixed objects. This collision type accounted for 67 percent, or eight of the total 12 accidents on the roadway segment in calendar years 1979 through 1981. Six of the 12 accidents, or 50 percent, occurred at night with six of the accidents occurring when roadway conditions were wet or icy, and it was raining, sleeting, or snowing.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment include: installing raised pavement markers; reducing the speed limit; widening the roadway; skidproofing the roadway surface; and constructing a north-south bypass facility. It is noted that this accident problem is similar to the accident problem previously analyzed for the segment of STH 83 from CTH E to Lee Road, which is immediately south of and adjacent to this accident problem segment of STH 83. Accordingly, based upon the similarities of the accident problems and roadway characteristics of these two adjacent segments of STH 83, it is recommended that the existing white edgeline pavement markings along this roadway segment be renewed on a semi-annual schedule to improve their visiblity and the attendant provision of pavement delineation during periods of darkness and that the S. Wilson Avenue bypass be constructed to divert vehicular traffic to a safer facility.

Another alternative action suggested to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment involves widening the roadway. The existing through roadway on STH 83 is 24 feet wide, providing a single 12-foot-wide traffic lane in each direction. A 24-foot-wide roadway meets the desirable design standard for a rural arterial highway. However, the northern one-half of the roadway segment is constructed with approximately four-foot-wide gravel shoulders, which do not meet the six-foot-wide minimum design standard for gravel shoulders on a rural arterial highway. The capital cost of widening the roadway shoulders is approximately $55,000. This alternative has the advantage of providing a recovery area for drivers who loose control of their vehicles, thereby avoiding an accident problem. There are no disadvantages associated with this alternative. It is recommended that the gravel shoulders along the northern one-half of the segment of STH 83 extending between Monroe Avenue and Lee Road, a distance of approximately 0.5 mile, be widened to 10 feet.

Concluding Remarks: In conclusion, it is recommended that the white edgeline pavement markings along this segment of STH 83 be renewed on a semi-annual schedule, that the gravel roadway shoulders along this roadway segment be widened to 10 feet, and that the S. Wilson Street bypass be constructed from CTH E to E. Sumner Street.

E. Sumner Street-Teri Lane to Franklin Lane

The predominant accident collision pattern experienced along the segment of E. Sumner Street from Teri Lane to Franklin Lane involved vehicles that went out of control and either ran off the roadway or struck fixed objects. This collision type accounted for 54 percent, or six of the total 11 accidents on this roadway segment in calendar years 1979 through 1981. Eight of the 11 accidents, or 73 percent, occurred at night. A detailed review of the individual accident reports for these 11 accidents indicates that four of the accidents could probably be attributed to inattentive drivers and/or driving too fast for the roadway conditions during periods when the roadway was wet or icy.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment include installing raised pavement markers, reducing the speed limit, widening the roadway, and skidproofing the roadway surface.

The first alternative--installing raised pavement markers--consists of placing reflectorized pavement markers along the roadway centerline. The capital cost of this alternative would be approximately $2,000. Raised pavement markers have the advantage of delineating the roadway centerline during periods of darkness or inclement weather conditions thereby providing guidance to motorists without diverting their attention from the roadway. There are no significant disadvantages associated with this alternative. Raised pavement markers, however, are normally used on short segments of roadway to provide motorists with guidance through horizontal curves or at pavement width transitions. Therefore, implementation of this alternative is not recommended. It is recommended, however, based upon Commission field inspections, that the existing white edgeline pavement markings placed along this roadway segment be renewed at an estimated cost of $900 to improve their visibility and provide motorists with pavement delineation guidance.

The second alternative--reducing the speed limit--consists of regulatory signing changes. The posted speed limit on this segment of E. Sumner Street is 55 mph. The capital cost of this alternative 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 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 frequency of out-of-control vehicle accidents could probably be reduced with a lower posted speed limit. The disadvantage of this alternative is that it would have to be strictly enforced, as some drivers will have a tendency to drive at a higher speed than the posted speed limit because of the rural character of the land development adjacent to this segment of E. Sumner Street. A reduced speed limit could result in a more severe accident problem on this roadway segment. Implementation of this alternative is not recommended.

The final alternative action with potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment involves skidproofing the roadway surface. Skidproofing can be accomplished by either sawing longitudinal grooves in or placing a bituminous overlay containing igneous or trap rock material over the existing roadway surface. The capital cost of this alternative with grooving or a bituminous overlay would be about $60,000 or $23,000, respectively, for the 0.5-mile-long roadway segment between Teri Lane and Franklin Lane. The advantage of this alternative is that it would increase pavement friction, thereby reducing the potential for vehicles to go out of control, especially during periods of slippery roadway conditions. The disadvantages of this alternative are that it would increase the noise level of vehicular traffic and that it requires periodic maintenance to remain effective. Therefore, roadway skidproofing is normally reserved for isolated areas

of concentrated accident problems such as a sharp horizontal curve or intersection approaches with negative roadway grades. Implementation of this alternative is not recommended.

Concluding Remarks: In conclusion, it is recommended that the existing white edgline pavement markings along this roadway segment be renewed to provide pavement delineation guidance to motorists during periods of darkness or inclement weather conditions.

Kettle Moraine Drive-E. Sumner Street to Pike Lake State Park

The predominant accident collision pattern experienced along the segment of Kettle Moraine Drive from E. Sumner Street to Pike Lake State Park involved vehicles that went out of control and either ran off the roadway and/or struck fixed objects. This collision type accounted for 90 percent, or nine of the total 10 accidents reported along this roadway segment. Eight of the out-of-control vehicle accidents involved southbound vehicles on Kettle Moraine Drive. Five of the 10 accidents, or 50 percent, occurred at night, and five, or 50 percent, of the accidents occurred when roadway conditions were wet or icy, and it was raining, sleeting, or snowing.

Out-of-Control Vehicle Accident Problem: The alternative traffic management actions indicated in Table 27 to have potential to solve or ameliorate the out-of-control vehicle accident problem on this roadway segment include widening the roadway, and installing pavement markings.

The first alternative--widening the roadway--consists of increasing the existing 20-foot-wide pavement to a 24-foot-wide roadway. The capital cost of this alternative would be about $110,000. A 20-foot roadway width meets the minimum standard for a rural land access street. However, the existing roadway does not have any gravel shoulders or clear area between the existing edge of pavement and the adjacent land which is heavily wooded. The capital cost of constructing gravel shoulders along this roadway segment is about $90,000. This alternative has the advantages of providing a recovery area for drivers who loose control of their vehicles thereby avoiding an accident problem, removing fixed objects from the path of out-of-control vehicles, and also improving vehicle sight distances to inform motorists of oncoming vehicular traffic and/or changes in roadway alignment. There are no significant disadvantages associated with this alternative. Therefore, it is recommended that five-foot wide gravel shoulders be constructed adjacent to the segment of Kettle Moraine Drive extending from E. Sumner Street to Pike Lake State Park.

The final alternative action suggested to have potential to solve or ameliorate the out-of-control vehicle accident problem along this roadway segment involves the installation of edgeline pavement markings. The capital cost of this alternative would be about $900. There are currently no edgeline pavement markings along this segment of Kettle Moraine Drive. This alternative has the advantage of delineating the roadway pavement edge during periods of darkness or inclement weather, providing guidance to motorists without diverting their attention from the roadway. There are no significant disadvantages associated with this alternative. It is recommended that this alternative be implemented.

Concluding Remarks: In conclusion, it is recommended that five-foot wide gravel shoulders be constructed along this segment of Kettle Moraine Drive from E. Sumner Street to Pike Lake State Park and that white edgeline pavement markings be installed to provide guidance to motorists during periods of darkness or inclement weather.

Summary

The preceding accident problem analyses have investigated the causes of the traffic problems in the Hartford study area, evaluated alternative traffic management actions to solve or mitigate these problems, and recommended for implementation those alternatives judged best. Thirteen high-accident problem locations were studied as a part of the analysis. Table 28 summarizes the traffic management recommendations resulting from this analysis and indicates the capital and/or annual cost of implementing each recommendation and the effect that the recommended actions would have on vehicular air pollutant emissions and motor fuel consumption. A total of 21 recommended traffic management actions are set forth in Table 28. 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 vehicle collision patterns experienced at each problem location. At one of the high-accident problem locations studied as a part of this analysis, no traffic management actions are recommended for implementation based upon the significant reduction in accidents experienced at that intersection in 1981 and the proposed reconstruction of that intersection in 1984.

AIR QUALITY AND MOTOR FUEL CONSUMPTION IMPACTS

The primary purpose of the Hartford area traffic management plan is to improve the operating efficiency and safety of the arterial streets and highways in the Hartford 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 36 recommended traffic management actions summarized in Tables 24, 25, 26, and 28 indicated that seven actions, or about 19 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,

Table 28

SUMMARY OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS TO SOLVE OR MITIGATE THE TRAFFIC ACCIDENT PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Total Number of Accidents	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Effects	
				Vehicular Emissions	Vehicular Fuel Consumption
Main Street and Sumner Street	39	• Modify traffic signal sequence • Install lane-use control sign	$ 5,000 200	Reduction	Reduction
E. Sumner Street and CTH K	25	• Install flashing red signal beacon • Install edgeline pavement markings • Widen roadway	$ 600 200 46,000	-- -- --	-- -- --
W. Sumner Street and Johnson Street	15	• Designate N. Johnson Street between W. Sumner Street and W. Jackson Steet as one-way northbound • Vacate S. Johnson Street between W. Sumner Street and Kossuth Street for parking lot construction	$ 400 --	-- --	-- --
W. Sumner Street and Rural Street	15	• Prohibit parking on westbound approach of W. Sumner Street • Install traffic signals • Install pavement markings	$ 100 35,000 100	-- Increase --	-- Increase --
STH 83 and N. Wilson Avenue	12	• No recommendation	$ --	--	--
W. Monroe Avenue and S. Cedar Street	12	• Install advance warning signs	$ 100	--	--
W. Sumner Street and N. Wacker Drive	5	• Strictly enforce speed limit	$ --	--	--
STH 83-CTH E to Lee Road	15	• Contruct W. Wilson Avenue bypass • Install edgeline pavement markings	$2.0 million $ 2,000	Reduction	Reduction
W. Sumner Street-Dodge County Line to Pond Road	13	• Install edgeline pavement markings	$ 2,500	--	--
CTH K-Waterford Road-CTH E	8	• Install "Deer Crossing" signs	$ 400	--	--
STH 83-Lee Road to Monroe Avenue	12	• Install edgeline pavement markings • Widen gravel shoulders • Construct S. Wilson Avenue bypass	$ 1,400 55,000 $2.0 million	-- -- Reduction	-- -- Reduction
E. Sumner Street-Teri Lane to Franklin Lane	11	• Install edgeline pavement markings	$ 900	--	--
Kettle Moraine Drive-E. Sumner Street to Pike Lake State Park	10	• Construct gravel shoulders • Install edgeline pavement markings	$90,000 900	-- --	-- --

Source: SEWRPC.

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 vehicluar 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 estimated 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 in Table 29, the analyses indicated that six of the seven recommended traffic management actions, or about 86 percent of the actions, would effectively reduce carbon monoxide and hydrocarbon pollutant emissions in the study area. Together, these six actions may be expected to reduce such emissions by approximately 111.6 tons and 9.5 tons per year, respectively. The only action which would increase vehicular emissions is the installation of semi-actuated traffic signals at the intersection of W. Sumner Street and Rural Street, which would result in an increase of approximately 1.9 tons and 0.2 ton per year, respectively, of carbon monoxide and hydrocarbon pollutants. 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 arterial bypass on the east side of the study area (S. Wilson Avenue), which would result in reductions of 98.6 tons and 8.4 tons per year, respectively, and the construction of the proposed north-south arterial bypass on the west side of the study area (S. Wacker Drive), which would result in reductions of 5.7 tons and 0.5 ton 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 1983 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 seven recommended traffic management actions on air quality in the study area, if implemented in 1983, would be an approximate reduction of 110 tons per year in carbon monoxide emissions and nine 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 arterial bypasses on the east and west sides of the study area--the short-range, low-cost traffic management actions recommended in the plan would reduce carbon monoxide emissions by about five tons per year and hydrocarbon emissions by 0.5 ton 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 Hartford area traffic management plan.

As shown in Table 29, six of the seven recommended traffic management actions, or about 86 percent of the actions, would effectively reduce motor fuel consumption in the study area. Together the six actions may be expected to reduce motor fuel consumption by approximately 17,130 gallons per year. The only action which would increase motor fuel consumption is the installation of traffic signals at the intersection of W. Sumner Street and Rural Street, which would result in an increase in consumption of approximately 650 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 W. Sumner Street. 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 north-south arterial bypass on the east side of the study area (S. Wilson Avenue), which would result in a reduction in consumption of approximately 12,300 gallons of motor fuel per year, and the

Table 29

IMPACT OF RECOMMENDED TRAFFIC MANAGEMENT ACTIONS ON AIR QUALITY AND MOTOR FUEL CONSUMPTION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1983

Problem or Problem Location	Recommended Traffic Management Actions	Effects		
		Vehicular Emissions (tons per year)		Vehicular Motor Fuel Consumption (gallons per year)
		Carbon Monoxide	Hydrocarbons	
Main Street and Sumner Street...	● Modify traffic signal sequence	- 1.3	- 0.1	- 460
Main Street and E. Jackson Street.....	● Modify traffic signal sequence	- 0.9	- 0.1	- 300
W. Sumner Street and Rural Street.....	● Install semi-actuated traffic signals	1.9	0.2	650
Continuous north-south arterial street deficiency.....	● Construct north-south arterial bypass on east side of study area	- 98.6	- 8.4	- 12,300
	● Construct north-south arterial bypass on west side of study area	- 5.7	- 0.5	- 2,600
Arterial streets and highways in the Hartford study area.....	● Reschedule work starting and quitting times of approximately 300 employees of the major public and private employers in the study area	- 3.8	- 0.3	- 1,100
Arterial streets and highways in the Hartford central business district.....	● Change traffic signal offsets for improved vehicular progression	- 1.3	- 0.1	- 370
Total		- 109.7	- 9.3	- 16,480

Source: SEWRPC.

construction of the north-south arterial bypass on the west side of the study area (S. Wacker Drive), which would result in a reduction in consumption of approximately 2,600 gallons of motor fuel per year.

In conclusion, the total impact of the seven recommended traffic management actions on motor fuel consumption in the study area, if implemented in 1983, would be a reduction of approximately 16,480 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 arterial bypasses on the east and west sides of the study area--the short-range, low-cost traffic management actions recommended in the plan would reduce motor fuel consumption by approximately 1,580 gallons per year.

Summary

Implementation of the traffic management actions recommended in the Hartford area traffic management plan may be expected to result in improved air quality and reduced motor fuel consumption in the Hartford area. Of the 36 traffic management actions recommended in the plan, seven 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 W. Sumner Street and Rural Street. This action is recommended as an effort to decrease the number and severity of traffic accidents at the intersections of W. Sumner Street with Rural Street and Johnson Street.

The low-cost, short-range traffic management actions contained in the plan would reduce vehicular carbon monoxide emissions by approximately five tons per year and hydrocarbon emissions by approximately 0.5 tons per year, while reducing motor fuel consumption by 1,580 gallons per year. The two high-capital, long-range traffic management actions recommended in the plan--the construction of the proposed north-south arterial bypasses on the east and west sides of the study area--if implemented in 1983, would reduce vehicular carbon monoxide emissions by approximately 104 tons per year and hydrocarbon emissions by approximately nine tons per year, while reducing motor fuel consumption by approximately 14,900 gallons per year.

The total impact of the traffic management actions recommended in the Hartford area traffic management plan on air quality and motor fuel consumption is a reduction of approximately 110 tons per year in carbon monoxide emissions, nine tons per year in hydrocarbon emissions, and 16,500 gallons per year in motor fuel consumption in the Hartford study area.

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 transportation system problems of the Hartford study 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 60 (Sumner Street) and STH 83 (Branch Street, Main Street, and Union Street). The majority of transportation system 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 problem encountered on STH 60 approaching Hartford from the west involves the segment of STH 60 between the Dodge County Line and Pond Road at the western boundary of the study area. It is recommended that edgeline pavement markings be installed along this roadway segment to mitigate an out-of-control vehicle accident problem.

The next traffic problem on STH 60 occurs at the intersection of STH 60 and N. Wacker Drive, which exhibits an excessive number of left-turn accidents. It is recommended that the existing speed limit on the STH 60 approaches to this intersection be strictly enforced, particularly during the morning and evening peak travel periods.

Continuing eastward on STH 60 as it enters the Hartford central business district, a right-angle and left-turn accident problem and emergency vehicle delay problem was identified at the intersection of STH 60 and Rural Street. It is recommended that parking be prohibited on the westernmost parking stall on the westbound approach to the intersection, that semi-actuated traffic signals be installed and coordinated on a background cycle with the traffic signals at the intersection of Main Street and Sumner Street, that the new traffic signals be provided with an emergency vehicle preemption capability, and that "stop line" pavement markings be installed on the Rural Street approaches to the intersection.

A right-angle accident problem occurs at the intersection of STH 60 and Johnson Street. It is recommended that the segment of N. Johnson Street between STH 60 and W. Jackson Street be designated as a one-way northbound street and that the segment of S. Johnson Street between STH 60 and Kossuth Street be vacated to permit reconstruction of the S. Johnson Street public parking facility for increased parking capacity.

The principal intersection in the Hartford central business district, STH 60 with STH 83, was identified as an accident and potential vehicular congestion problem intersection. It is recommended that the existing traffic signal operation be modified to change the pre-timed north- and southbound exclusive left-turn arrows to traffic-actuated operation which would also require changing the offset time between the signals at the intersection STH 60 and Main Street and the signals at the intersection of Main Street and E. Jefferson Street. It is also recommended that a lane-use control sign be mounted on the far-right side traffic signal support controlling northbound traffic.

The intersection of STH 60 and CTH K located east of the Hartford central business district has been identified as an out-of-control vehicle accident problem intersection. The following actions are recommended: installation of a flashing

red traffic control beacon on the stop sign controlling traffic on the northbound approach to the intersection; installation of edgeline pavement markings on the east- and westbound approaches to the intersection; and widening the existing STH 60 roadway between Sell Drive and the Village of Slinger from 20 feet to 24 feet when that roadway segment is scheduled for normal maintenance and resurfacing.

Finally, the segment of STH 60 between Teri Lane and Franklin Lane was identified as an out-of-control vehicle accident problem area. It is recommended that edgeline pavement markings be installed along this roadway segment of STH 60.

The initial traffic problem encountered approaching Hartford from the south on STH 83--an out-of-control vehicle accident problem--involves the segment of STH 83 between CTH E and Monroe Avenue. It is recommended that edgeline pavement markings be installed, that the gravel shoulders on the one-half mile long portion of STH 83 immediately south of Monroe Avenue be widened, and that the S. Wilson Avenue bypass from CTH E to STH 60 be constructed.

Following the construction of the S. Wilson Avenue bypass the reconstruction of the intersection of STH 83 (Branch Street) and S. Grand Avenue to divert through traffic from traveling on S. Grand Avenue is recommended.

Modification of the existing traffic signals at the intersection of STH 83 (Main Street) and E. Jackson Street by changing the pre-timed southbound exclusive left-turn arrow from fixed time to traffic actuated to minimize delay and improve vehicular traffic flow through the Hartford central business district is recommended.

The final problem on STH 83 involved an out-of-control vehicle accident problem at the intersection of STH 83 (Union Street) and N. Wilson Avenue. Based upon the significant accident reduction attributed to the installation, in 1981, of an overhead street light at this intersection and the proposed reconstruction of the intersection in 1984 there are no traffic management actions recommended for implementation at this intersection.

A traffic management action involving rescheduling the starting and quitting times of employees of the major public and private employers in the Hartford study area is recommended in order to balance demand for transportation services during the peak travel periods on STH 60 and STH 83. 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 potential congestion and existing traffic accident problems identified on STH 60 and STH 83, traffic management actions were also recommended to mitigate traffic accident problems identified on W. Monroe Avenue, CTH K, and Kettle Moraine Drive.

A right-angle accident problem was identified at the intersection of W. Monroe Avenue and S. Cedar Street. It is recommended that "Traffic Does Not Stop on S. Cedar Street" warning signs be placed on the stop signs controlling traffic on the W. Monroe Avenue approaches to the intersection.

The segment of CTH K between Waterford Road and CTH E was identified as a deer crossing collision area. It is recommended that "Deer Crossing" warning signs be installed on this problem segment of CTH K.

Finally, an out-of-control vehicle accident problem occurs on the segment of Kettle Moraine Drive between STH 60 and Pike Lake State Park. It is recommended that gravel shoulders be constructed and that edgeline pavement markings be installed on this segment of Kettle Moraine Drive.

The cost of these low-capital, short-term traffic management action recommendations, in 1983 dollars, exclusive of the construction of the S. Wilson Avenue and S. Wacker Drive arterial bypasses, was estimated at $265,800. 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 probable, traffic problems which may be expected to occur as urban development continues in the Hartford area. These long-range, high-capital investment recommendations consist of constructing the previously noted north-south arterial bypass (S. Wilson Avenue) on the east side of the study area, at an estimated approximate cost of $2.0 million and constructing a north-south arterial bypass (S. Wacker Drive) on the west side of the study area at an approximate cost of $1.5 million.

Another category of traffic problems identified in the Hartford study area is arterial service problems. A continuous north-south arterial street spacing problem exists in both the eastern and western portions of the study area and a conflict problem of an arterial street penetrating a residential neighborhood has been identified on S. Grand Avenue. There are no short-term, low-cost traffic management actions available to mitigate these arterial service problems. The ultimate solution to these arterial service problems will require the construction of the previously recommended long-range, high-capital investment at S. Wilson Street and the S. Wacker Drive arterial bypass facilities. Upon completion of the construction of the S. Wilson Avenue bypass, it is further recommended that S. Grand Avenue be reclassified as a land access street and that the intersection of S. Grand Avenue and Branch Street be reconstructed.

The final traffic problem identified in the Hartford study area is an inadequate supply of public parking spaces in the Hartford central business district. The following low-cost traffic management actions will not solve, but are recommended to ameliorate this parking supply problem. It is recommended that the one-hour parking restriction be reduced to a 30-minute restriction on: two parking stalls on the west side of N. Main Street between Wisconsin Street and E. Jackson Street; three parking stalls on the east side of N. Main Street between Wisconsin Street and E. Jackson Street; and two parking stalls on the south side of E. Jackson Street immediately east of N. Main Street. It is also recommended that the 10 one-hour parking stall restrictions on the south side of W. Wisconsin Street immediately west of N. Main Street be increased to two-hour time restrictions. It is further recommended that the all-day parking restriction on the south side of Kossuth Street be temporarily changed to permit five one-hour time-restricted parking stalls until the S. Johnson Street parking lot is reconstructed and construction of the Esther's of Hartford off-street parking lot is completed. It is recommended that 12 two-hour parking

stall time restrictions be reduced to one-hour restrictions in the Lower Mill Street public parking facility and that 10 two-hour parking stall time restrictions in the City Hall public parking facility be removed to permit all-day unrestricted parking. The capital cost of implementing these traffic management action recommendations would be about $1,300.

In addition to the low-capital traffic management actions recommended to ameliorate the existing public parking supply problem in the Hartford central business district, it is recommended that a parking structure with a partial deck be constructed over the existing Lower Mill Street public parking facility and that the segment of S. Johnson Street between W. Sumner Street and Kossuth Street be vacated to permit reconstruction of the S. Johnson Street public parking facility. The estimated capital cost for those two recommendations is $180,000 and $100,000, respectively. Implementation of the Hartford Parking Authority proposed redesign of the off-street parking facilities located along N. Johnson Street should also serve to increase parking space utilization and efficiency through provision of an organized and attractive parking area in the central business district.

In conclusion, the cost of implementing the short-range, low-capital traffic management actions and the long-range, high-capital investment recommendations to solve or mitigate the existing traffic problems identified in the study area would be $267,100 and $3.78 million, respectively. In keeping with the regional objectives of improving ambient air quality and minimizing motor fuel consumption, each recommended traffic management action was analyzed for its impact on air quality and motor fuel consumption in addition to being evaluated on the basis of its ability to improve vehicular operating conditions and safety on the existing arterial streets and highways in the study area. Of the 36 recommended traffic management actions set forth in the chapter, seven actions, or 19 percent, would have a measurable impact on air quality and motor fuel consumption. The total estimated 1983 impact of these seven traffic management actions is a 110-ton-per-year reduction in carbon monoxide emissions, a nine-ton-per-year reduction in hydrocarbon emissions, and a 16,500-gallon-per-year reduction in motor fuel consumption. The following chapter will identify the governmental agency which should assume responsibility for implementing the recommended traffic management actions, and recommend funding sources for each action.

Chapter VIII

PLAN IMPLEMENTATION

INTRODUCTION

Implementation of the recommended traffic management actions described in the preceding chapter of this report should provide the Hartford area with a safer and more efficient and effective arterial street and highway system. This chapter is presented as a guide for use in such implementation. Basically, it outlines which levels of government should assume responsibility for the actions which must be taken if the recommended traffic management plan is to be 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 responsible for implementation of the transportation management plan recommendations are identified.

Any plan implementation program should emphasize the 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 improve traffic flow and mitigate traffic accident problems in the Hartford study area, and thereby increase the efficiency and safety of the area arterial street and highway system. This is not to say that the 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 arterial street and highway system efficiency and safety.

A priority schedule for project implementation is an important element of a traffic management plan. Successful completion of a high-priority traffic management recommendation is not required, and should not be necessarily insisted upon, prior to implementation of another, lower-priority recommendation. The implementation of a lower-priority recommendation which can be readily accomplished may and whenever possible, should 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 five units or agencies of government: the U. S. Department of Transportation, Federal Highway Administration; the Wisconsin Department of Transportation; the Washington County Board; the City of Hartford; and the Town of Hartford. Although for convenience the actions required

by these five agencies are addressed separately, the interdependence of the actions of the various levels of government concerned and the need for close interagency communication and cooperation cannot be overemphasized. A brief discussion of the duties and functions of these five agencies as they relate to implementation of the Hartford area traffic management plan follows.

U. S. Department of Transportation, Federal Highway Administration

The U. S. Department of Transportation, Federal Highway Administration, administers all federal aid highway 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, layout, revision, construction, 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 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 relative 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 existing 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.

Washington County Board

At the county level of government in Wisconsin, county highway 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 and Town of Hartford

At the local level of government within Wisconsin, the city common councils and the village and town boards, through boards of public works and upon advice of city, village, and town plan commissions, are responsible for the administration of all city, village, and town funds for the design, construction, operation, and maintenance of streets and highways within the geographic limits of the municipality; for the maintenance and management of connecting streets--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, village, or town street and highway purposes. As local units of government, the City of Hartford, acting through the Common Council, and the Town of Hartford acting through the Town Board, carries out these important transportation-related responsibilities.

Plan Adoption

Adoption or endorsement of the recommended Hartford area traffic management plan by the five major highway project implementation agencies is important to assure a common understanding among the several governmental agencies on actions needed to improve the arterial street and highway system, 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 the City of Hartford 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 Hartford 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 management within the City.

2. Upon adoption of the recommended plan by the Common Council of the City of Hartford, the Washington County Board of Supervisors, after due consideration and recommendation by the Washington County Highway Committee and the Washington 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 Hartford and the Hartford area.

3. Upon adoption of the recommended plan by the Common Council of the City of Hartford, the Hartford Town Board, after due consideration should formally act to endorse the recommended traffic management plan as a guide to the management of the town road system.

4. Upon approval of the recommended traffic management plan by the Common Council of the City of Hartford, 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 Hartford and the Hartford area.

5. 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 Hartford area.

6. Upon approval of the recommended traffic management plan by the Common Council of the City of Hartford, the Southeastern Wisconsin Regional Planning Commission should incorporate the plan recommendations into the regional transportation systems management plan in its annual review of that plan element.

A model resolution that can be used in adopting the Hartford 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 Hartford assume responsibility for periodically reviewing and 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 Hartford Area Traffic Management Study periodically review the operating conditions of the existing arterial streets and highways 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 development 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 four 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 Washington County Highway Committee; 3) implementation of actions on the local arterial street and highway system under the jurisdiction of the City of Hartford; and 4) implementation of actions on the local town road system under the jurisdiction of the Town of Hartford. The recommended plan implementation actions are summarized in the following paragraphs by level or unit 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

TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO BE IMPLEMENTED BY THE WISCONSIN DEPARTMENT OF TRANSPORTATION IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)
Intersection E. Sumner Street and CTH K	• Install edgeline pavement markings	$ 200
	• Widen roadway	$ 46,000
STH 83 from CTH E to Lee Road	• Install edgeline pavement markings	$ 2,000
W. Sumner Street from Dodge County Line to Pond Road	• Install edgeline pavement markings	$ 2,500
STH 83 from Lee Road to Monroe Avenue	• Install edgeline pavement markings	$ 1,400
	• Widen gravel shoulders	$ 55,000
STH 60 from Teri Lane to Franklin Lane	• Install edgeline pavement markings	$ 900
	Total	$108,000

Source: SEWRPC.

Table 30, seven traffic management actions are recommended for five different locations on the state trunk highway system, with an estimated total capital cost of $108,000. An action not listed in Table 30 but also a responsibility of the Wisconsin Department of Transportation in cooperation with the City of Hartford is the design of, acquisition of right-of-way for, and construction of the recommended north-south arterial bypass route (S. Wilson Avenue) on the east side of the study area at an estimated cost of $2.0 million.

Washington County

It is recommended that Washington County, acting through the County Highway Committee, install a flashing red signal beacon on the northbound approach of CTH K to E. Sumner Street, and that "Deer Crossing" warning signs be installed on the segment of CTH K between Waterford Road and CTH E at a total estimated capital cost of $1,000.

City of Hartford

It is recommended that the traffic management actions listed in Table 31 be implemented by the City of Hartford. As indicated in Table 31, 21 traffic management actions are recommended for 14 different locations, at an estimated total capital cost of $167,200. Of these 21 recommended actions, 17 actions, or 81 percent, are on the state trunk highway connecting street system and require the approval of the Wisconsin Department of Transportation before they can be implemented.

Three recommended traffic management actions not listed in Table 31 because they require high capital investment, but which are also the responsibility of the City of Hartford are: 1) the design of, acquisition of right-of-way for, and construction of the recommended S. Wacker Drive arterial bypass extension through the western portion of the study area at an estimated capital cost of $1.5 million; 2) the design and construction of the Lower Mill Street public parking facility at an estimated capital cost of $180,000; and 3) the design of, acquisition of additional right-of-way for, and reconstruction of the S. Johnson Street public parking facility at an estimated capital cost of $100,000. These traffic management actions are in addition to the previously noted design of, acquisition of right-of-way for, and construction of the S. Wilson Avenue arterial bypass through the eastern portion of the study area which the City should undertake in cooperation with Wisconsin Department of Transportation at an estimated capital cost of $2.0 million.

Town of Hartford

It is recommended that the construction of gravel shoulders and installation of edgeline pavement markings on the segment of Kettle Moraine Drive between STH 60 and Pike Lake State Park be implemented by the Town of Hartford at an estimated capital cost of $90,900.

Table 31

TRAFFIC MANGEMENT ACTIONS RECOMMENDED TO BE IMPLEMENTED BY THE CITY OF HARTFORD IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)
Intersection Main Street and Sumner Street.....	● Change left-turn arrow operation from fixed-time to traffic-actuated ● Install lane-use control sign ● Implement work time rescheduling	$ 5,000 $ 200 --
	Subtotal	$ 5,200
Intersection Main Street and E. Jackson Street.....	● Change left-turn arrow operation from fixed-time to traffic-actuated ● Change traffic signal offsets for improved vehicular progression	$ 5,000 --
	Subtotal	$ 5,000
Intersection W. Sumner Street and Johnson Street.....	● Designate N. Johnson Street from W. Sumner Street to W. Jackson Street as one-way northbound ● Vacate S. Johnson Street from W. Sumner Street to Kossuth Street for parking lot reconstruction	$ 400 --
	Subtotal	$ 400
Intersection W. Sumner Street and Rural Street.....	● Prohibit parking on westbound approach of W. Sumner Street ● Install and interconnect traffic signals with fire department preempt with signals at intersection of Main Street and Sumner Street ● Install pavement markings	$ 100 $35,000 $ 100
	Subtotal	$35,200
Intersection W. Monroe Avenue and S. Cedar Street.....	● Install advance warning signs	$ 100
Intersection W. Sumner Street and N. Wacker Street.....	● Strictly enforce speed limit	--
Intersection S. Grand Avenue and STH 83 (Branch Street).....	● Reconstruct intersection ● Reclassify S. Grand Avenue as a land access street	$20,000 --
	Subtotal	$20,000
West Side of N. Main Street-- Wisconsin Street to E. Jackson Street	● Change two of the one-hour parking restrictions to 30-minute restrictions	$ 200
East Side of N. Main Street-- Wisconsin Street to E. Jackson Street.....	● Change three of the one-hour parking restrictions to 30-minute restrictions	$ 200
South Side of E. Jackson Street-- East of N. Main Street.....	● Change parking restriction from one-hour to 30-minute	$ 200
South Side of Wisconsin Street-- West of N. Main Street.....	● Change parking restriction from one-hour to two-hour	$ 200
South Side of Kossuth Street--S. Main Street to S. Jonnson Street.....	● Change all-day parking restriction to allow one-hour parking restriction	$ 100
Lower Mill Street Public Parking Facility.....	● Change 12 of the two-hour parking restrictions to one-hour restrictions	$ 200
City Hall Public Parking Facility.....	● Change 10 of the two-hour parking restrictions to allow all-day unrestricted parking	$ 200
	Total	$67,200

Source: SEWRPC.

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, as already noted, this does not mean that several traffic management actions cannot be implemented simultaneously, or that implementation of a higher priority action must be completed before initiating implementation of a subsequent lower priority action.

The priority listings in Tables 32, 33, and 34 have purposely not been combined in order to permit the City of Hartford to determine its own priority of needs among the categories of traffic accident and congestion, arterial service, and

Table 32

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE TRAFFIC ACCIDENT AND CONGESTION PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Problem Location	EPDO Index[a]	Implementation Priority
Intersection Sumner Street and Main Street.....	90	1
Intersection Main Street and E. Jackson Street.....	--	2
Intersection E. Sumner Street and CTH K.....	233	3
STH 60-Dodge County Line to Pond Road.....	101	4
STH 83-CTH E to Lee Road.....	81	5
STH 83-Lee Road to Monroe Avenue.....	66	6
STH 60-Teri Lane to Franklin Lane.....	66	7
Intersection W. Sumner Street and Rural Street.....	48	8
Intersection W. Sumner Street and Johnson Street.....	59	9
Intersection W. Monroe Avenue and S. Cedar Street.....	57	10
Kettle Moraine Drive-STH 60 to Pike Lake State Park.....	43	11
CTH K-Waterford Road to CTH E.....	33	12
Intersection-STH 60 and N. Wacker Street.....	16	13
All Arterial Streets and Highways		
Reschedule the work starting and quitting times of approximately 300 employees of the major public and private employers in the study area.....	--	14
Construct north-south bypass (S. Wilson Avenue) on east side of the study area.....	--	15
Construct north-south bypass (S. Wacker Drive) on west side of the study area.....	--	16
Arterial Streets and Highways in the Hartford Central Business District		
Change traffic signal offsets for improved vehicular progression.....	--	17

[a] "Equivalent Property Damage Only" Index.

Source: SEWRPC.

Table 33

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE ARTERIAL SERVICE PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Recommended Traffic Management Action	Implementation Priority
Construct north-south arterial bypass (S. Wilson Avenue) on east side of the study area.....	1
Reclassify S. Grand Avenue as a land access street.....	2
Reconstruct intersection of S. Grand Avenue and STH 83.....	3
Construct north-south arterial bypass (S. Wacker Drive) on west side of the study area.....	4

Source: SEWRPC.

public parking. 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 Hartford community and of their elected and appointed officials. It is recommended, however, that those traffic management actions which increase the safety and operating efficiency of the existing transportation system be undertaken as soon as practicable, followed 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.

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 ranking accident problem locations with fatalities and injuries higher than accident problem locations with property damage only. Since traffic accident and potential vehicular congestion problems were identified only at the intersection of Sumner Street and Main Street the traffic management actions recommended for solving the problems at that intersection were provided the highest priority on the listing set forth in Table 32.

The traffic management actions listed in Table 33--those recommended to solve or mitigate the arterial service problems in the Hartford 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 construct a north-south arterial bypass (S. Wilson Avenue) on the east side of the study area is listed as the highest priority because of the possible intrusion of new urban development into the right-of-way required for that facility and the net impact that the recommendation may be expected to have on improved vehicular operating conditions on the arterial streets and highways in the Hartford study area. This recommendation is followed by the reclassification of S. Grand Avenue from minor arterial to land access street as the S. Wilson Avenue bypass should remove the need for S. Grand Avenue to serve the function of an arterial facility in that portion of the study area. Upon the reclassification of S. Grand Avenue as a land

Table 34

IMPLEMENTATION PRIORITY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE PUBLIC PARKING SUPPLY PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Problem Location	Recommended Traffic Management Action	Implementation Priority
South Side of Kossuth Street Main Street to S. Johnson Street.....	Change all-day parking restriction to allow five one-hour restricted parking stalls	1
Lower Mill Street Public Parking Facility.....	Change 12 parking stall restrictions from two-hour to one-hour restrictions	2
South Side of Wisconsin Street Immediately West of Main Street..	Change 10 parking stall restrictions from one-hour to two-hour restrictions	3
East Side of Main Street Wisconsin Street to E. Jackson Street.....	Change 3 parking stall restrictions from one-hour to 20-minute restrictions	4
South Side of E. Jackson Street Immediately East of Main Street..	Change 2 parking stall restrictions from one-hour to 30-minute restrictions	5
West Side of Main Street Wisconsin Street to E. Jackson Street.....	Change 2 parking stall restrictions from one-hour to 30-minute restrictions	6
City Hall Public Parking Facility.....	Change two-hour restriction on 10 parking stalls to allow all-day unrestricted parking	7
S. Johnson Street Public Parking Facility.....	Vacate S. Johnson Street between W. Sumner Street and Kossuth Street to reconstruct existing surface lot	8
Lower Mill Street Public Parking Facility.....	Construct a parking structure with a partial deck over existing surface lot	9

Source: SEWRPC.

access street the intersection of S. Grand Avenue and Branch Street should be reconstructed to discourage through traffic from using S. Grand Avenue and to improve vehicular operating conditions at that intersection. Finally, it is recommended that a north-south arterial bypass (S. Wacker Drive) be constructed on the west side of the study area to improve vehicular operating conditions on the arterial streets and highways in that portion of the Hartford study area. Both the proposed S. Wilson Avenue and S. Wacker Drive arterial bypass facilities are located on the Official Map of the City of Hartford which, if properly administered, should reserve the required right-of-way for future implementation of this recommendation.

The traffic management actions prioritized in Table 34--those recommended to solve and mitigate the parking supply problems in the Hartford central business district--are listed according to their ability 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 managment 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 each recommended traffic management action.

Federal Highway Aid

Federal aids for highway construction are derived from federal highway user excise taxes and the federal motor fuel tax, the latter presently established at $0.09 per gallon, and are adminstered by the U. S. Department of Transportation, Federal Highway Administration, as a segregated fund which can be used only for highway, highway-related, and, as of 1973, mass transit improvement purposes. Federal aids are provided as reimbursements for previously expended funds on authorized projects on the interstate and the federal aid primary, secondary, and urban systems, and for bridge replacement and safety improvements. 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 may be used on designated facilities on the federal aid urban system. The 1982 Surface Transportation Assistance Act provides funds under the hazard elimination program for safety improvement projects to existing streets and highways both on and off 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 the Department 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 and secondary system mileage and the number of registered motor vehicles. Funds allocated to Wisconsin under the federal aid urban programs 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. However, the 1973 Act 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 Hartford traffic management study area in 1983. As can be seen in Table 35, the City of Hartford has a negative 1983 entitlement balance resulting from the financing of the reconstruction of W. State Street in 1979 with urban system funds.

Therefore, federal aid urban system funds are currently not available to the City of Hartford for any roadway improvement projects.

The 1982 Surface Transportation Assistance Act continued the Title I authorizations for interstate, federal aid primary, federal aid secondary, and federal aid urban system funds for federal fiscal years 1983 through 1986. The 1982 Act also continued Title II safety program authorization for bridge replacement and rehabilitation, hazard elimination, and rail-highway crossings. In general, 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 (P. L. 92-512), as amended in 1976 (General Revenue Sharing); and 2) the Housing and Urban Development (HUD) Community Development Block Grant 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.

Table 35

FEDERAL AID URBAN SYSTEM HIGHWAY FUND ENTITLEMENTS TO THE LOCAL UNITS OF GOVERNMENT IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1983

Unit of Government	Annual Entitlement	1983 Entitlement Balance
Washington County.....	$ 3,380	$ 35,608
City of Hartford ...	10,301	-326,062
Town of Hartford ...	5,311	63,215

Source: Wisconsin Department of Transportation.

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 the United States Code Sections 103 and 104. The basic

Table 36

MATCHING REQUIRMENTS 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
Hazard Elimination	90	10
Bridge Replacement and Rehabilitation	80	20
Interstate Resurfacing, Restoring, and Rehabilitation	75	25

[a] The federal aid programs and funding percentages are based upon the 1982 Surface Transportation Assistance Act. Local matching funds specified in the respective programs are comprised of state, county, and/or local monies.

Source: SEWRPC.

requirement for federal aid grant eligibility for the majority of highway improvement projects is that the project be on the federal aid highway system. There are some exceptions to the 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 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, 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.

Hazard Elimination: 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 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, and widen narrow bridges.

Bridge Replacement and Rehabilitation: 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.

State and Local Highway Improvement Programs

Upon satisfying these federal aid highway program eligiblity 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 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 government representatives and the Wisconsin Department of Transportation, Division of Transportation Districts, 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 36 recommended traffic management actions have a total estimated cost of $4,047,100. Of these actions, 18, or 50 percent, qualify for federal aid highway funds totaling approximately $2,838,630. 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. The north-south arterial bypasses--S. Wilson Avenue and S. Wacker Drive--are not scheduled for construction within the time span covered by the Wisconsin Department of Transportation six-year state highway improvement program for 1983-1988, and unless additional state highway revenues are made available, it is unlikely that these projects can be constructed within the next several years.

Table 37

FEDERAL AID HIGHWAY FUNDING SOURCES FOR THE TRAFFIC MANAGEMENT ACTIONS RECOMMENDED IN THE HARTFORD TRAFFIC MANAGEMENT STUDY

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion	Intersection Main Street and Sumner Street.....	• Modify traffic signal sequence	$ 5,000	HE	$ 4,500	$ --	$ --	$ 500
		• Install lane-use control sign	200	HE	180	--	--	20
		• Implement work time rescheduling	--	--	--	--	--	--
		• Construct north-south bypass on east side of study area	-- [b]	FAP	--	--	--	--
		• Construct north-south bypass on west side of study area	-- [b]	FAU	--	--	--	--
		Subtotal	$ 5,200	--	$ 4,680	$ --	$ --	$ 520
	Intersection Main Street and E. Jackson Street.....	• Modify traffic signal sequence	$ 5,000	HE	$ 4,500	$ --	$ --	$ 500
		• Change traffic signal offsets with traffic signals at intersection of Main Street and Sumner Street	--	--	--	--	--	--
		Subtotal	$ 5,000	--	$ 4,500	$ --	$ --	$ 500
	Intersection E. Sumner Street and CTH K.....	• Install flashing red beacon	$ 600	FAS	$ 450	$ --	$150	--
		• Install edgeline pavement markings	200	HE	180	20	--	--
		• Widen roadway	46,000	FAP	34,500	11,500	--	--
		Subtotal	$ 46,800	--	$ 35,130	$ 11,520	$150	$ --
	Intersection W. Sumner Street and Johnson Street...	• Designate N. Johnson Street from W. Sumner Street to W. Jackson Street as one-way northbound	$ 400	--	$ --	$ --	$ --	$ 400
		• Vacate S. Johnson Street from W. Sumner Street to Kossuth Street for parking lot reconstruction	--	--	--	--	--	--
		Subtotal	$ 400	--	--	$ --	$ --	$ 400
	Intersection W. Sumner Street and Rural Street.....	• Prohibit parking on westbound approach of W. Sumner Street	$ 100	--	$ --	$ --	$ --	$ 100
		• Install traffic signals	35,000	HE	31,500	--	--	3,500
		• Install stop-line pavement markings	100	HE	90	--	--	10
		Subtotal	$ 35,200	--	$ 31,590	$ --	$ --	$ 3,610

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion Problems (continued)	Intersection W. Monroe Avenue and S. Cedar Street.....	● Install warning signs	$ 100	--	$ --	$ --	$ --	$ 100
		Subtotal	$ 100	--	$ --	$ --	$ --	$ 100
	Intersection W. Sumner Street and N. Wacker Drive.....	● Strictly enforce speed limit	$ --	--	$ --	$ --	$ --	$ --
		Subtotal	$ --	--	$ --	$ --	$ --	$ --
	STH 83-CTH E to Lee Road.....	● Construct north-south arterial bypass on east side of study area	$ --[b]	FAP	$ --	$ --	$ --	$ --
		● Install edgeline pavement markings	2,000	HE	1,800	200	--	--
		Subtotal	$ 2,000	--	$ 1,800	$ 200	$ --	$ --
	W. Sumner Street-Dodge County Line to Pond Road....	● Install edgeline pavement markings	$ 2,500	HE	$ 2,250	$ 250	$ --	$ --
		Subtotal	$ 2,500	--	$ 2,250	$ 250	$ --	$ --
	CTH K-Waterford Road to CTH E.....	● Install "Deer Crossing" signs	$ 400	FAS	$ 300	$ --	$100	$ --
		Subtotal	$ 400	--	$ 300	$ --	$100	$ --
	STH 83-Lee Road to Monroe Avenue.....	● Construct north-south arterial bypass on east side of study area	$ --[b]	FAP	$ --	$ --	$ --	$ --
		● Widen gravel shoulders	$ 55,000	HE	49,500	5,500	--	--
		● Install edgeline pavement markings	1,400	HE	1,260	140	--	--
		Subtotal	$ 56,400	--	$ 50,760	$ 5,640	$ --	$ --
	STH 60-Teri Lane to Franklin Lane.....	● Install edgeline pavement markings	$ 900	HE	$ 810	$ 90	$ --	$ --
		Subtotal	$ 900	--	$ 810	$ 90	$ --	$ --

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Accident/ Congestion Problems (continued)	Kettle Moraine Drive- STH 60 to Pike Lake State Park.....	● Construct gravel shoulders	$ 90,000	HE	$ 81,000	$ --	$ --	$ 9,000
		● Install edgeline pavement markings	900	HE	810	--	--	90
		Subtotal	$ 90,900	--	$ 81,810	$ --	$ --	$ 9,090
		Total	$ 245,800	--	$ 213,630	$ 17,700	$ 250	$ 14,220
Arterial Service	Continuous North-South Arterial Street Deficiency.....	● Construct north-south arterial bypass on east side of study area	$2,000,000	FAP	$1,500,000	$500,000	$ --	$ --
		● Construct north-south arterial bypass on west side of study area	$1,500,000	FAU	$1,125,000	--	--	375,000
		Subtotal	$3,500,000	--	$2,625,000	$500,000	$ --	$375,000
	Penetration of Residential Neighborhood by Arterial Street.....	● Construct north-south arterial bypass on east side of study area	$ --[b]	FAP	$ --	$ --	$ --	$ --
		● Reclassify S. Grand Avenue as a land access street	--	--	--	--	--	--
		● Reconstruct intersection of S. Grand Avenue and Branch Street	20,000	--	--	--	--	20,000
		Subtotal	$ 20,000	--	$ --	$ --	$ --	$ 20,000
		Total	$3,520,000	--	$2,625,000	$500,000	$ --	$395,000
Parking	West Side of N. Main Street Between Wisconsin Street and E. Jackson Street.....	● Change two one-hour parking restrictions to 30-minute restrictions	$ 200	--	$ --	$ --	$ --	$ 200
	East Side of N. Main Street Between Wisconsin Street and E. Jackson Street.....	● Change three one-hour parking restrictions to 30-minute restrictions	$ 200	--	$ --	$ --	$ --	$ 200
	South Side of E. Jackson Street Immediately East of N. Main Street	● Change two one-hour parking restrictions to 30-minute restrictions	$ 200	--	$ --	$ --	$ --	$ 200

Table 37 (continued)

Traffic Problem Category	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Source of Federal Funds[a]	Funding by Unit of Government			
					Federal	State	County	Local
Parking Problems (continued)	South Side of E. Wisconsin Street Immediately West of N. Main Street.....	• Change 10 one-hour parking restrictions to two-hour restrictions	$ 200	--	$ --	$ --	$ --	$ 200
	South side of Kossuth Street Between S. Main Street and S. Johnson Street.....	• Change all-day parking restrictions to allow one-hour parking	$ 100	--	$ --	$ --	$ --	$ 100
	Lower Mill Street Public Parking Facility.....	• Change 12 two-hour parking restrictions to one-hour restrictions	$ 200	--	$ --	$ --	$ --	$ 200
		• Construct a parking structure with a partial deck over existing surface lot	180,000	--	$ --	$ --	$ --	$180,000
	City Hall Public Parking Facility.....	• Change 10 two-hour parking restrictions to allow all-day unrestricted parking	$ 200	--	$ --	$ --	$ --	$ 200
	S. Johnson Street Public Parking Facility.....	• Vacate S. Johnson Street between W. Sumner Street and Kossuth Street and reconstruct existing surface lot	$ 100,000	--	$ --	$ --	$ --	$100,000
		Subtotal	$ 281,300	--	$ --	$ --	$ --	$281,300
		Total	$4,047,100	--	$2,838,630	$517,700	$ 250	$690,520

[a] Federal aid highway programs identified as funding sources include: federal aid primary (FAP); federal aid secondary (FAS); federal aid urban (FAU; and hazard elimination (HE).

[b] Capital cost included in recommended action at another location.

Source: SEWRPC.

The local funds required of the City of Hartford, the Town of Hartford, and Washington County to implement the recommended traffic management actions in the plan total approximately $690,770. Removal of the long-range, high-capital investment recommendations from this total results in the following local short-range traffic management implementation costs: City of Hartford, $26,430; Town of Hartford, $9,090; and Washington County, $250. The City of Hartford, as indicated in Table 35, cannot, under present conditions, finance the implementation of any of these recommended actions with federal aid urban funds and will have to rely either on other federal funding programs such as the hazard elimination program or on city funds. It is recommended that the principal traffic management actions which qualify for funds under the federal aid hazard elimination program be packaged or combined into a single system funding request in order to efficiently obtain Wisconsin Department of Transportation approvals and to coordinate implementation action. The Town of Hartford traffic management action recommendation to construct gravel shoulders and install edgeline pavement markings on the segment of Kettle Moraine Drive between STH 60 and Pike Lake State Park cannot be financed from federal aid urban system funds as Kettle Moraine Drive is classified as a land access street and is not on the federal aid urban highway system. However, the recommended actions for Kettle Moraine Drive may qualify for funds under the federal aid hazard elimination program. Since Washington County has a 1983 federal aid urban system entitlement of $35,608, it is reasonable to assume that traffic management actions recommended for implementation on the county trunk highway system will qualify for and receive federal funds, based upon the highway improvement funding priority schedule of the Wisconsin Department of Transportation.

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 Hartford 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, eight actions are proposed to be implemented by the Wisconsin Department of Transportation; two actions are proposed to be implemented by the Town of Hartford; two actions are proposed to be implemented by Washington County; and the remaining 24 actions are proposed to be implemented by the City of Hartford.

The priorities for implementing the recommended traffic management actions are based on a desire to provide for the safe and more efficient 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 among these categories in order to allow the City of Hartford 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 $4,047,100 capital cost that will be required to implement the traffic management actions in the plan, approximately $2,838,630 is eligible for coverage under existing federal aid highway programs. This conclusion is based upon 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 Hartford, the Town of Hartford, Washington County, and the Wisconsin Department of Transportation.

Chapter IX

SUMMARY AND CONCLUSIONS

INTRODUCTION

Concern expressed by local elected officials, businessmen, and residents of the City of Hartford over growing traffic congestion, arterial street and highway system operating efficiency, motor vehicle accident problems, and the potential impact on traffic volumes and patterns of the newly constructed N. Grand Avenue crossing of the Rubicon River resulted in a request by the Common Council of the City of Hartford for the assistance of the Regional Planning Commission in the conduct of a traffic management study of the Hartford area. On February 1, 1982, the Wisconsin Department of Transportation, Office of Highway Safety, formally approved the City request for a grant in partial support of the conduct of the desired traffic management study. A committee, the Citizens and Technical Advisory Committee for the Hartford Area Traffic Management Study, was created by the City to assist the Regional Planning Commission staff in the conduct of the study, which was initiated on March 23, 1982.

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 arterial street and highway system. The short-range traffic management actions were to be consistent with the long-range transportation system plan for the Hartford area so that such short-range actions would not foreclose implementation of the long-range plans when the practical limits of the effectiveness of traffic management measures were reached and long-range plan implementation became necessary. Recognizing that traffic problems do not begin or end at corporate limits, the study area was defined to include the immediate environs of the City, as well as the City proper. The study area, therefore, encompassed an approximately 20-square-mile area, of which 2.97 square miles were within the city limits.

EXISTING STREET AND HIGHWAY SYSTEM

It is only through careful, detailed analysis of the existing arterial street and highway system, and particularly of those factors directly affecting the operation of that system, 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 analysis, inventories of the existing land use development and of the existing arterial street and highway system of the study area were undertaken. The inventories found that there were, in 1982, 77.02 miles of streets and highways in the Hartford study area, of which 34.97 miles, or 45 percent, were within the city limits. Of the 77.02 miles within the study area, 13.78 miles, or 18 percent, were functionally classified as arterials; 10.03 miles, or 13 percent, as collectors; and the remaining 53.21 miles, or 69 percent, as land access streets. Of the 34.97 miles within the city limits, 8.52 miles, or 24 percent, were functionally classified as arterials; 2.56 miles, or 7 percent, as collectors; and 23.89 miles, or 69 percent, as land access streets.

Of the 13.78 miles of arterial streets and highways in the study area, 9.98 miles, or 73 percent, were state trunk highways or connecting streets; 1.14 miles, or 8 percent, were county trunk highways; and the remaining 2.66 miles, or 19 percent, were local trunks. In addition, 10.27 miles of county trunk highway were routed over nonarterial facilities in the study area. Of the 8.52 miles of arterial streets and highways within the city limits, 4.03 miles, or 47 percent, were state trunk highways or connecting streets; 1.14 miles, or 13 percent, were county trunk highways; and the remaining 3.35 miles, or 40 percent, were local trunks. Of the 13.78 miles of arterial streets and highways in the study area, 13.14 miles, or 95 percent, were on the federal aid highway system. Of the 8.52 miles within the city limits, 7.88 miles, or 92 percent, were on the federal aid highway system. The right-of-way and pavement widths of all 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 public parking facilities in the central business district of the City of Hartford.

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 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 history, and citizen complaints. This information, together with the information on the physical characteristics of the arterial 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 60 (Sumner Street) and were found to range from 4,100 to 10,300 vehicles per average weekday in 1982. STH 83 was found to carry the next highest traffic volumes, ranging from 2,300 to 6,900 vehicles per average weekday. The remaining arterial and collector streets in the study area were found to have traffic volumes ranging from 950 to 3,000 vehicles per average weekday. These traffic volumes were found to vary seasonally, with the highest volumes occurring in July when volumes were found to average about 110 percent of the annual average weekday volumes; and the lowest volumes occurring in January when volumes were found to average about 86 percent of the annual average weekday volumes. Traffic volumes in the months of March, April, October, and November were found to approximate annual average weekday volumes.

Daily traffic volume fluctuations were also found to occur, with Saturday and Sunday traffic volumes found to average about 90 percent of average weekday volumes and Friday volumes found to average about 110 percent of average weekday volumes. The morning and evening weekday peak-hour traffic volumes were found to comprise approximately 7.5 percent and 9.5 percent, respectively, of the average weekday traffic volumes. The morning peak hour was found to occur between 7:00 a.m. and 8:00 a.m., and the evening peak hour between 3:00 p.m.

and 4:00 p.m., and remained approximately at that level during the 4:00 p.m. to 5:00 p.m. time period.

Measures of existing arterial street and highway system utilization include volume-to-capacity ratios, signalized intersection load factors and delay, average operating speeds, and traffic accidents. Existing traffic volumes were found to exceed design capacity on the southbound approach of Main Street at its intersection with Sumner Street, and to be at design-capacity levels at the northbound approaches of Main Street at its intersections with Sumner Street and E. Jackson Street. The roadway segments experiencing high volume-to-capacity ratios occur within the central business district of the City.

Signalized intersection approach load factors were found to exceed a value of 0.30 on the northbound approach of Main Street at Sumner Street, and to approach a value of 0.30 on the southbound approach of Main Street at Sumner Street during the 3:30 p.m. to 4:30 p.m. time period. The remaining signalized intersection approach load factors were found to range from zero to 0.12. Average vehicle delays at the two signalized intersections in the study area were found to exceed 15 seconds at the north-, west-, and eastbound approaches at the intersection of Main Street and Sumner Street during the 3:30 p.m. to 4:30 p.m. time period. Nonpeak-hour vehicle operating speeds on the principal arterials in the study area--STH 60 and STH 83--were found to average 25 to 29 miles per hour (mph). These average speeds were found to be reduced during the evening peak hour to 24 to 27 mph. Vehicle operating speeds in the central business district were found to average 13 to 27 mph during the off-peak travel periods, and 7 to 26 mph during the evening peak hour.

It was estimated that on an average weekday in 1982, 40,400 person trips were made in the study area. A comparison of the breakdown of person trips by trip purpose for the Hartford study area with that for Washington County and the Region indicated that the study area experiences a lower percentage of shopping trips, and of trips which do not originate at home, but which are made after the initial trip from home has been completed. This comparison also indicates that the study area experiences a higher percentage of school trips.

It was estimated that 31,600 vehicle trips were made in or through the study area in 1982, with 15,400, or 49 percent, being internal trips; 13,200, or 42 percent, being internal/external trips; and 3,000, or 9 percent, being through trips. It was found that 14,500, or 44 percent, of all the average weekday vehicle trips in the study area traveled through the Hartford central business district.

Information collected on public parking facilities in the Hartford central business district indicated an average parking space occupancy rate of 54 percent during the hours of peak parking demand--9:00 a.m. to noon, and 1:00 p.m. to 5:00 p.m. Off-street parking facilities in the central business district experienced an average occupancy rate of 52 percent, compared to 58 percent for on-street parking facilities. However, the on-street parking occupancy rate was considerably higher along certain block faces in the heart of the central business district, ranging from 73 to 100 percent. Off-street parking in the Lower Mill Street and N. Johnson Street parking facilities also was considerably higher, averaging 77 to 81 percent, respectively. The average turnover rate for on-street parking spaces was found to be 3.6 vehicles per

stall. The average turnover rate for the eight off-street public parking facilities in the central business district was found to be 2.6 vehicles per stall during the 9:00 a.m. to noon and the 1:00 p.m. to 5:00 p.m. time periods.

Within the study area there were 232 on-street traffic accidents in 1979; 229 accidents, three of them involving fatalities, in 1980; and 202 accidents, three of them also involving fatalities, in 1981. Seventy percent of the traffic accidents in 1979 involved property damage only, compared to 67 percent in 1980, and 54 percent in 1981. The intersections of Main Street and Sumner Street and Sumner Street and CTH K were the highest motor vehicle accident locations in the study area.

EXISTING TRAFFIC PROBLEMS

A number of transportation system operating 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 alternative traffic management actions designed to solve or mitigate the identified problems. Based on the application of the objectives and standards to the existing transportation system operating characteristics, the two principal arterials in the study area--STH 60 and STH 83--were identified as having the majority of the deficiencies in the study area. High traffic accident locations, segments of existing and potential vehicular congestion, and areas of insufficient on-street parking were found to exist on and along both facilities.

High traffic accident locations were found on the segments of STH 60 from the Dodge County Line to Pond Road and from Teri Lane to Franklin Lane, in addition to the STH 60 (Sumner Street) intersections with N. Wacker Drive, Rural Street, Johnson Street, Main Street, and CTH K, where a total of 123 accidents occurred during the three-year period between 1979 and 1981. High traffic accident locations also were found on the segment of STH 83 from CTH E to Monroe Avenue, where a total of 39 accidents occurred during the three-year period between 1979 and 1981. Traffic congestion was not found to occur at the intersections of Main Street with Sumner Street and E. Jackson Street. Insufficient on-street parking was found to exist on Main Street between Kossuth Street and Wisconsin Street, and on Sumner Street between Johnson Street and Mill Street.

While the two principal arterials--STH 60 and STH 83--experienced a majority of the traffic problems identified in the Hartford study area, additional problems were also identified. Motor vehicle accident problems occurred on the following segments: CTH K between CTH E and Waterford Road--eight accidents; Kettle Moraine Drive between STH 60 and Pike Lake State Park--10 accidents; and the intersection of W. Monroe Avenue and S. Cedar Street--12 accidents during the 1979 to 1981 period. Off-street public parking problems were found to exist in the Lower Mill Street and N. and S. Johnson Street facilities. Arterial service problems caused by a lack of continuous north-south streets on the east and west sides of the study area were also found to exist and a problem with an arterial street penetrating a residential neighborhood was identified.

TRAFFIC IMPACT OF PLANNED NEW DEVELOPMENT

A list of 10 proposed development projects planned to be carried out during the three-year period from 1983 through 1985 was compiled to determine the impact such development might have on the operation of the existing street and highway system in the study area. This list included two residential developments--the Kraft and Riverbend East developments; three commercial developments--Esther's of Hartford, Hartford Square, and the Kraft development projects; two governmental developments--Mill Pond and Independence Parks; and three roadway construction developments--the N. Grand Avenue, Tamarack Avenue, and Wildwood Court projects. Both the Tamarack Avenue and Wildwood Court proposed projects include planned peripheral residential development.

It was found that the construction of the Kraft site residential and commercial developments, the Mill Pond and Independence Park developments, and the Tamarack Avenue and Wildwood Court land access street construction and abutting residential developments should not significantly impact the safety and/or operating conditions on the arterial street and highway system in the study area. It was also found that the development of the Riverbend East residential development project may adversely impact the existing accident problem at the intersection of STH 83 and N. Wilson Avenue unless traffic management actions designed to solve or ameliorate that problem are implemented at an early date. It was also found that the Esther's of Hartford commercial development project could exacerbate the existing on- and off-street parking space problem identified in the vicinity of the intersection of Main Street and Sumner Street. It was found that the Hartford Square commercial development project may be expected to adversely impact the safety and operating conditions on STH 60 in the vicinity of its intersection with Hilldale Drive. Accordingly, it was recommended that sound traffic engineering design practices to reduce vehicular traffic conflicts at the driveway entrances and exits to the Hartford Square development be implemented as a part of the site development plan. Finally, it was found that the N. Grand Avenue extension between E. Sumner Street and E. Wisconsin Avenue may be expected to increase vehicular conflict problems at the intersection of N. Grand Avenue and E. Sumner Street.

In addition to the individual project impact, implementation of all the proposed development projects may be expected to exacerbate existing motor vehicle accident problems at the intersections of E. Sumner Street with CTH K and Main Street; at the intersection of STH 83 and N. Wilson Avenue; and on the segment of STH 60 between Teri Lane and Franklin Lane. It is expected that implementation of these projects will exacerbate the existing north-south arterial service problems on the east side of the study area and also cause evening peak-hour congestion problems at the intersection of Main Street and Sumner Street.

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 traffic management actions recommended for implementation were those judged to provide the most improvement in the level of overall transportation service at the least cost. 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 Hartford study area are listed in Table 38. Each problem location identified in Table 38 is shown on, and keyed to Map 29. The majority of the recommended alternative traffic management actions are of a low-capital, short-range, operational nature. The total investment, in 1983 dollars, required to implement those low-cost, short-range actions is estimated at $267,100, with the cost of individual actions ranging from $100 for the installation of a "No Parking" sign to $90,000 for the construction of gravel shoulders along a roadway segment. It should be noted that many of the recommended traffic management actions require no capital investment whatsoever, and that approximately 60 percent of the low-capital, short-range actions require an investment of less than $10,000.

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 will also have to be made, in order to achieve the ultimate solutions to certain of the existing, as well as probable, traffic problems expected to occur as the Hartford area continues to develop. Accordingly, four long-range, high-capital investment recommendations, estimated to have a total capital cost of $3.78 million in 1983 dollars, are made in this report. These recommendations include two projects to abate parking and traffic accident problems--the construction of a parking structure with a partial deck over the Lower Mill Street public parking facility, estimated to cost $180,000; and the vacation of a segment of N. Johnson Street to permit the reconstruction of the S. Johnson Street public parking facility, estimated to cost $100,000; and two projects to abate arterial service and congestion problems--the construction of a north-south arterial bypass route through the eastern portion of the study area, estimated to cost $2.0 million; and the construction of a north-south arterial bypass route (S. Wacker Drive) through the western portion of the study area, estimated to cost $1.5 million. Finally, implementation of the Hartford Parking Authority proposed redesign of the public and private parking facilities located along N. Johnson Street should serve to improve parking conditions and increase parking space utilization and efficiency in the central business district through the provision of an organized and attractive off-street parking area.

Each recommended traffic management action, in addition to being evaluated for its impact on the operating efficiency of the transportation system of the Hartford 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 that can be expected to be attendant to the recommended actions, which is becoming increasingly important in these times of increasing fuel prices and potential energy shortages or emergencies.

Table 38

SUMMARY OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE THE TRANSPORTATION SYSTEM PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982

Traffic Problem Category	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Implementation	
					Agency	Priority
Accident/ Congestion	1	Intersection Main Street and Sumner Street	● Modify traffic signal sequence	$ 5,000	City of Hartford	1
			● Install lane-use control sign	200	City of Hartford	
			● Implement work time rescheduling	--	City of Hartford	14
			● Construct north-south arterial bypass on east side of study area	--[a]	Wisconsin Department of Transportation/ City of Hartford	15
			● Construct north-south arterial bypass on west side of study area	--[a]	City of Hartford	16
			Subtotal	$ 5,200		
	2	Intersection Main Street and E. Jackson Street	● Modify traffic signal sequence	$ 5,000	City of Hartford	2
			● Change traffic signal offsets with traffic signals at intersection of Main Street and Sumner Street	--	City of Hartford	
			Subtotal	$ 5,000		
	3	Intersection E. Sumner Street and CTH K	● Install flashing red beacon	$ 600	Washington County	3
			● Install edgeline pavement markings	200	Wisconsin Department of Transportation	
			● Widen roadway	46,000	Wisconsin Department of Transportation	
			Subtotal	$ 46,800		
	4	Intersection W. Sumner Street and Johnson Street	● Designate N. Johnson Street between W. Sumner Street and W. Jackson Street as one-way northbound	$ 400	City of Hartford	9
			● Vacate S. Johnson Street between W. Sumner Street and Kossuth Street for parking lot reconstruction	--	City of Hartford	
			Subtotal	$ 400		
	5	Intersection W. Sumner Street and Rural Street	● Prohibit parking on westbound approach of W. Sumner Street	$ 100	City of Hartford	8
			● Install traffic signals	35,000	City of Hartford	
			● Install stop-line pavement markings	100	City of Hartford	
			Subtotal	$ 35,200		

Table 38 (continued)

Traffic Problem Category	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Implementation	
					Agency	Priority
Accident/ Congestion (continued)	6	Intersection W. Monroe Avenue and S. Cedar Street	● Install warning signs	$ 100	City of Hartford	10
			Subtotal	$ 100		
	7	Intersection W. Sumner Street and N. Wacker Drive	● Strictly enforce speed limit	$ --	City of Hartford	13
			Subtotal	$ --		
	8	STH 83 - CTH E to Lee Road	● Construct north-south arterial bypass on east side of study area	$ --[a]	Wisconsin Department of Transportation/ City of Hartford	5
			● Install edgeline pavement markings	2,000	Wisconsin Department of Transportation	
			Subtotal	$ 2,000		
	9	W. Sumner Street- Dodge County Line to Pond Road	● Install edgeline pavement markings	$ 2,500	Wisconsin Department of Transportation	4
			Subtotal	$ 2,500		
	10	CTH K-Waterford Road to CTH E	● Install "Deer Crossing" signs	$ 400	Washington County	12
			Subtotal	$ 400		
	11	STH 83-Lee Road to Monroe Avenue	● Construct north-south arterial bypass on east side of study area	$ --[a]	Wisconsin Department of Transportation/ City of Hartford	6
			● Widen gravel shoulders	55,000	Wisconsin Department of Transportation	
			● Install edgeline pavement markings	1,400	Wisconsin Department of Transportation	
			Subtotal	$ 56,400		
	12	STH 60-Teri Lane to Franklin Lane	● Install edgeline pavement markings	$ 900	Wisconsin Department of Transportation	7
			Subtotal	$ 900		
	13	Kettle Moraine Drive- STH 60 to Pike Lake State Park	● Construct gravel shoulders	$ 90,800	Town of Hartford	11
			● Install edgeline pavement markings	900	Town of Hartford	
			Subtotal	$ 90,900		

Table 38 (continued)

Traffic Problem Category	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Implementation	
					Agency	Priority
Arterial Service	14	Continuous North-South Arterial Street Deficiency	● Construct north-south arterial bypass on east side of study area	$2.0 million	Wisconsin Department of Transportation/ City of Hartford	1
			● Construct north-south arterial bypass on west side of study area	1.5 million	City of Hartford	4
			Subtotal	$3.5 million		
	15	Penetration of Residential Neighborhood by Arterial Street	● Construct north-south arterial bypass on east side of study area	$ --[a]	Wisconsin Department of Transportation/ City of Hartford	1
			● Reclassify S. Grand Avenue as a land access street	--	City of Hartford	2
			● Reconstruct intersection of S. Grand Avenue and Branch Street	20,000	City of Hartford	3
			Subtotal	$ 20,000		
Parking	16	West Side of N. Main Street between Wisconsin Street and E. Jackson Street	● Change two one-hour parking restrictions to 30-minute restrictions	$ 200	City of Hartford	6
	17	East Side of N. Main Street Between Wisconsin Street and E. Jackson Street	● Change three one-hour parking restrictions to 30-minute restrictions	$ 200	City of Hartford	4
	18	South Side of E. Jackson Street Immediately East of N. Main Street	● Change two one-hour parking restrictions to 30-minute restrictions	$ 200	City of Hartford	5
	19	South Side of E. Wisconsin Street Immediately West of N. Main Street	● Change 10 one-hour parking restrictions to two-hour restrictions	$ 200	City of Hartford	3
	20	South Side of Kossuth Street Between S. Main Street and S. Johnson Street	● Change all-day parking restrictions to allow one-hour parking	$ 100	City of Hartford	1
	21	Lower Mill Street Public Parking Facility	● Change 12 two-hour parking restrictions to one-hour restrictions	$ 200	City of Hartford	2
			● Construct a parking structure with a partial deck over existing surface lot	180,000	City of Hartford	9

Table 38 (continued)

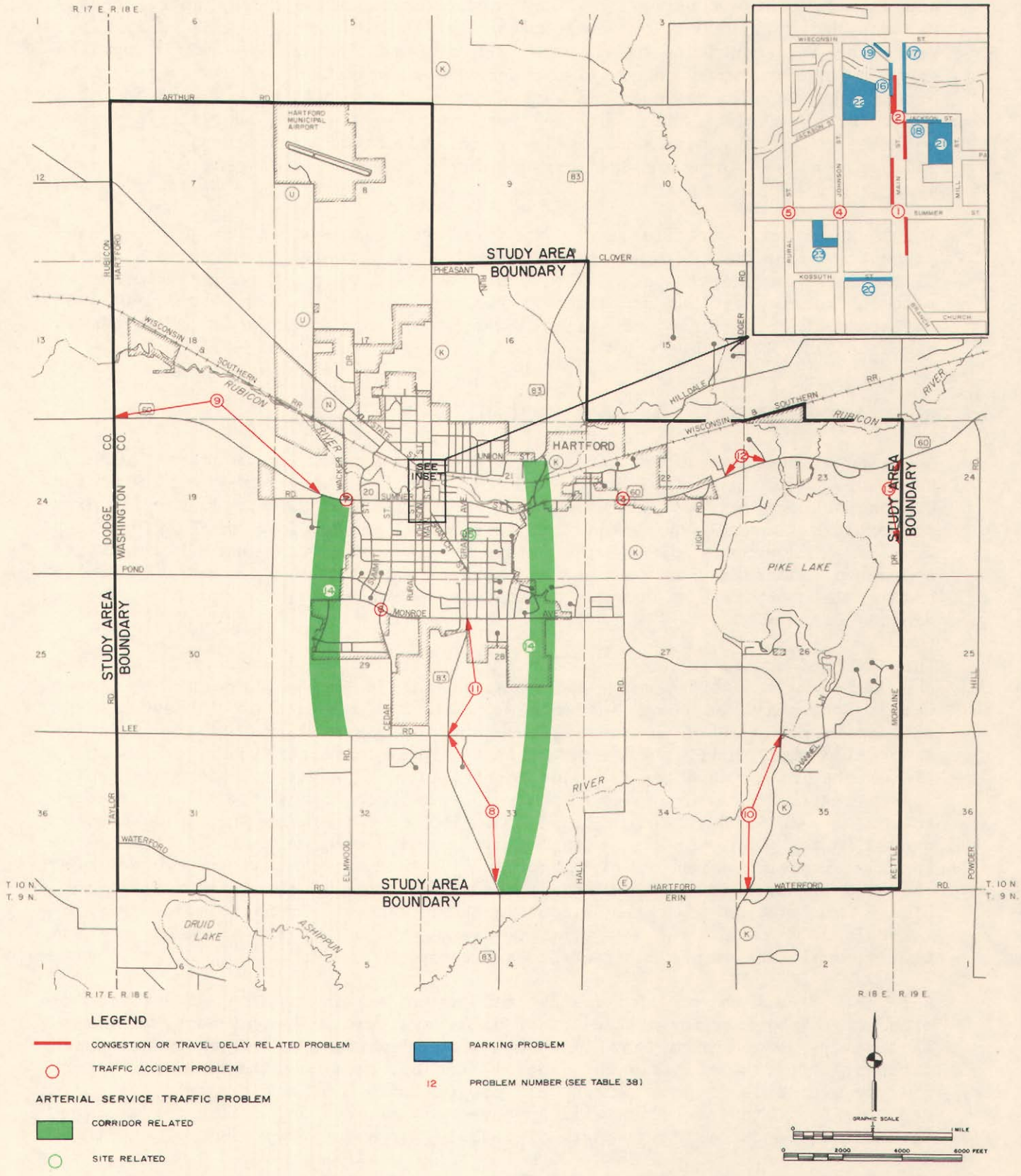
Traffic Problem Category	Number on Map 26	Problem Location	Recommended Traffic Management Actions	Capital Cost (1983 dollars)	Implementation	
					Agency	Priority
Parking (continued)	22	City Hall Public Parking Facility	• Change 10 two-hour parking restrictions to allow all-day unrestricted parking	$ 200	City of Hartford	7
	23	S. Johnson Street Public Parking Facility	• Vacate S. Johnson Street Between W. Sumner Street and Kossuth Street and reconstruct existing surface lot	$ 100,000	City of Hartford	8
		Total		$4,047,100		

[a] The capital cost of constructing the proposed north-south arterial bypass routes on the east and west sides of the study area, which would be approximately $2.0 million and $1.5 million, respectively, has been included in the continuous north-south arterial street deficiency problem costs.

Source: SEWRPC.

Map 29

LOCATION OF TRAFFIC MANAGEMENT ACTIONS RECOMMENDED TO SOLVE OR MITIGATE TRANSPORTATION SYSTEM PROBLEMS IN THE HARTFORD TRAFFIC MANAGEMENT STUDY AREA: 1982



LEGEND

- CONGESTION OR TRAVEL DELAY RELATED PROBLEM
- TRAFFIC ACCIDENT PROBLEM
- PARKING PROBLEM
- 12 PROBLEM NUMBER (SEE TABLE 38)

ARTERIAL SERVICE TRAFFIC PROBLEM

- CORRIDOR RELATED
- SITE RELATED

Source: SEWRPC.

Accordingly, implementation of the low-cost, short-range traffic management actions recommended in the plan should reduce carbon monoxide emissions by approximately five tons per year and hydrocarbon emissions by approximately 0.5 ton per year, while reducing motor fuel consumption by 1,580 gallons per year. The implementation of the two high-capital, long-range traffic management actions recommended in the plan--the construction of the north-south arterial bypasses on the east and west sides of the study area--should increase the total air quality and motor fuel reductions to 110 tons per year in carbon monoxide emissions, nine tons per year in hydrocarbon emissions, and 16,500 gallons per year in motor fuel consumption in the Hartford traffic management study area.

The Hartford area traffic management plan recommends that 36 traffic management actions be implemented to solve or mitigate the traffic problems at 23 locations in the study area. The total capital investment required to implement the recommendations contained in the plan is estimated at $4,047,100 (1983 dollars)--$267,100 in short-range, low-capital solutions; and $3,780,000 in high-capital, long-range solutions.

PLAN ADOPTION AND IMPLEMENTATION

Adoption or endorsement of the Hartford area transportation management plan by the U. S. Department of Transportation, Federal Highway Administration; the Wisconsin Department of Transportation; the Washington County Board; the City of Hartford Common Council; and the Town Board of the Town of Hartford--the five most important 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 Hartford traffic management plan sets forth implementation priorities 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 implementation of each recommended traffic management action is set forth in Table 38. Of the 36 traffic management actions recommended in the plan, the Wisconsin Department of Transportation is responsible for the implementation of eight actions; Washington County for two actions; the City of Hartford for 24 actions; and the Town of Hartford for two 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 18 actions, or 50 percent of all the recommended actions, should be 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 $2,689,230, or about 70 percent of the total

$4,047,100--expressed in 1983 dollars--required to implement all of the recommendations contained in the plan. The Wisconsin Department of Transportation could, similarly, be expected to fund approximately $467,900, or 12 percent of the total plan cost; Washington County about $250, or 0.1 percent; the City of Hartford about $681,430, or 17.7 percent; and the Town of Hartford about $9,090, or 0.2 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 Hartford area can provide a valuable guide for improving the operating efficiency of the existing arterial street and highway system in the Hartford 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 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 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 Hartford 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.

(This page intentionally left blank)

APPENDICES

(This page intentionally left blank)

Appendix A

RESOLUTION #1715: A RESOLUTION AUTHORIZING A TRAFFIC MANAGEMENT STUDY IN AND FOR THE CITY OF HARTFORD

WHEREAS, Southeastern Wisconsin Regional Planning Commission staff members have met with representatives of the City of Hartford to gain an understanding of transportation problems in the City thus enabling 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 of a traffic management study to be $65,000; and

WHEREAS, the Regional Planning Commission has submitted a proposal under date of January 12, 1981 concering a City of Hartford, Wisconsin Traffic Management Study, wherein the Commission outlines the proposed study to be undertaken; and

WHEREAS, the cost to the City will be 10 percent of the cost of the study.

NOW, THEREFORE BE IT RESOLVED that the Common Council of the City of Hartford, Washington County, Wisconsin that the Southeastern Wisconsin Regional Planning Commission is hereby authorized and requested to:

1) Secure federal funding to defray up to 90 percent of the cost of the Traffic Management Study as outlined in the January 12, 1981 proposal;

2) Upon the approval of grant funds for the study, to undertake the conduct of a Traffic Management Study for the City of Hartford.

Signed:

Donald H. Lieven

Donald H. Lieven, Mayor

Introduced: March 3, 1981

Adopted: March 3, 1981

Attest:

John C. Spielmann

John C. Spielmann, Clerk-Comptroller

(This page intentionally left blank)

Appendix B

AGREEMENT BETWEEN THE CITY OF HARTFORD, WISCONSIN, AND THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

THIS AGREEMENT between the City of Hartford, Wisconsin (CITY) and the Southeastern Wisconsin Regional Planning Commission (SEWRPC) is entered into on this second day of October, 1981.

In consideration of the mutual promises expressed in this AGREEMENT, and contingent upon approval of the grant application from the Wisconsin Department of Transportation, Office of Highway Safety to the CITY for the purpose of carrying out the Hartford Area Traffic Management Plan, as described in Appendix A, entitled "Scope of Services", the CITY and the SEWRPC mutually agree as follows:

Article I: Use of Highway Safety Moneys

A. The CITY agrees to provide Highway Safety program money and City money and/or services to the SEWRPC for the purpose of carrying out the Hartford Area Traffic Management Plan for the CITY and its immediately surrounding environs, as described in Appendix A, and in accordance with the general provisions of this Agreement. The Highway Safety program moneys to constitute ninety percent of the cost of this study.

B. The CITY will be responsible to bear their allocable share of costs of the study determined to be ineligible by WISOHS audit.

C. Moneys provided to the SEWRPC under this agreement shall be used exclusively to compensate SEWRPC staff for their work directly related to activities associated with the Hartford Area Traffic Management Plan.

Article II: Personnel

All of the services required by the project being financed under this Agreement shall be performed by the SEWRPC or under its direct supervision and all personnel engaged in this work shall be fully qualified and shall be authorized or permitted under state and local law to perform these services. The SEWRPC shall furnish sufficient technical supervisory and administrative personnel to ensure proper performance of the services being financed under this Agreement.

Article III: Performance

The work financed under this Agreement shall be completed in accordance with the schedule developed jointly by the CITY and the SEWRPC. The final report shall be published within 12 months after the approval of the CITY grant request by the WISOHS.

Article IV: Reimbursement of Costs

A. The SEWRPC shall submit to the CITY project billings in such detail as the CITY and the Wisconsin Office of Highway Safety (WISOHS) may require.

B. The total payment to the SEWRPC under this agreement may not exceed $55,000.

Article V: Method of Payment

The SEWRPC shall submit monthly billings to the CITY which the CITY will verify and forward to the WISOHS. Upon approval of the billings by the WISOHS, the payments will be made on the invoices by the WISOHS not later than 60 days after the invoice date.

Article VI: Methods and Audits

The SEWRPC shall maintain complete and accurate records with respect to allowable costs incurred under this Agreement. All such records shall be

maintained on a generally accepted accounting basis and shall be clearly identified and readily accessible. All work data, documents, proceedings, and activities related to this Agreement shall be maintained for a period of three years from the date of the last payment under this Agreement.

Article VII: Termination of Agreement

The CITY reserves the right to terminate this Agreement at any time upon giving written notice to the SEWRPC. Upon such termination, the CITY shall be liable for reimbursement of eligible costs incurred by the SEWRPC to that date.

Article VIII: Copies of Final Report

The SEWRPC shall furnish the CITY with 30 copies of the final study report and shall forward additional copies of the final report as required under the WISOHS funding grant to the WISOHS and to those governmental agencies impacted or indirectly affected by the recommendations set forth in the Hartford Area Traffic Management Plan.

IN WITNESS WHEREOF, the CITY and the SEWRPC have caused this Agreement to be signed by their proper corporate officers, and have caused their proper official seal to be affixed this Second day of October, 1981.

SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION

By Alfred G Raetz
(Chairman)

Date 10/2/81

Attest:

By Philip C. Evenson

Date 10/2/81

CITY OF HARTFORD, WISCONSIN

By Lorraine H Lemm
(Mayor)

Date 10/2/81

Attest:

By

Date 10/2/81

(This page intentionally left blank)

Appendix C

CITY OF HARTFORD'S GRANT REQUEST APPROVAL

State of Wisconsin \ DEPARTMENT OF TRANSPORTATION
Office for Highway Safety

February 1, 1982

4802 Sheboygan Avenue
P. O. Box 7910
Madison, WI 53707
Telephone: (608) 266-0402

Trans. #3597

Mr. William G. Ripp
City Engineer
109 North Main Street
Hartford, Wi 53027

Dear Mr. Ripp:

Enclosed is a signed copy of the approved project/contract for Wisconsin Highway Safety Project No. 67-81-09-02-043-020, Trans. #3597, "Hartford Area Traffic Management Plan" submitted by the City of Hartford.

Federal funds in the amount of $49,585.00 are obligated for this approved project/contract. This is the upper limit of compensation eligible for reimbursement for the approved period beginning January 28, 1982, and ending January 27, 1983.

Additionally, this agreement is subject to the following conditions:

1. Payroll and Distribution of Time. Amounts charged to grant programs for personal services, regardless of whether treated as direct or indirect costs, will be based on payrolls documented and approved in accordance with generally accepted practices of the State or local agency. Payrolls must be supported by time and attendance or equivalent records for individual employees. Salaries and wages of employees chargeable to more than one grant program or other cost objective will be supported by appropriate time distribution records. The method used should produce an equitable distribution of time and effort.

2. Contract Agreement. This approval incorporates all provisions of Exhibit B, Agreement between the City of Hartford and the Southeastern Wisconsin Regional Planning Commission, into the project/contract agreement.

   Additionally, this approval incorporates applicable provisions detailed in the Cooperative Agreement, as amended, into this approved project/contract agreement (see enclosed).

   Subsequently, all requirements are considered in effect for this project/contract and shall be binding for program and fiscal audit purposes.

It is the policy of the Wisconsin Department of Transportation-Office for Highway Safety that minority business enterprises as defined in 49 CFR Part 23

shall have the maximum opportunity to participate in the performance of agreements financed in whole or in part with federal funds under this agreement. Consequently, the MBE requirements of 49 CFR Part 23 apply to this agreement.

The grantee must ensure that minority business enterprises as defined in 49 CFR Part 23 have the maximum opportunity to participate in the performance of agreements and subagreements financed in whole or in part with federal funds provided under this agreement. In this regard, all grantees shall take all necessary and reasonable steps in accordance with 49 CFR Part 23 to ensure that minority business enterprises have the maximum opportunity to compete for and perform agreements. Grantees shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of WIDOT-OHS grant agreements.

A quantitative and qualitative progress report must be submitted six months after the project beginning date and also at the completion of the project. If this requirement is not adhered to, pending reimbursements may be withheld.

Please route all progress reports and expenditure reports to your County Highway Safety Coordinator.

The Office for Highway Safety is pleased to cooperate with you in this highway safety effort.

Sincerely,

James O. Peterson
Highway Safety Coordinator

JOP/dcd
Enc.
cc: Donald Lieven, Mayor
Sherman Carr, Washington County Highway Safety Coordinator
Nelma Ross, Local Programs Specialist
Bill Bremer
Kenneth H. Voigt

Appendix D

COMMITTEE LIST

Arthur C. Snyder.....Citizen Member, City of Hartford
Chairman
Robert H. Bates.....Member, City of Hartford Parking Authority
Howard Black.....Staff, Hartford Union High School
Dennis A. Carroll.....Vice-President, First National Bank of Hartford
Lucian M. Darin.....Director of Public Works, City of Hartford
John A. Frey.....Supervisor, Town of Hartford;
Supervisor, Washington County
David C. Henry.....Police Chief, City of Hartford
Daniel J. Hiller.....Member, Hartford Area Development Corporation
Dyson A. Hunt.....Traffic Manager, Micro Design
Thomas Kennelly.....Member, Hartford Chamber of Commerce
James J. King.....Citizen Member, City of Hartford
Donald H. Lieven.....Citizen Member, City of Hartford
Donald F. Margelowsky.....Assistant Fire Chief, City of Hartford
James McLoone.....Publisher, Hartford Times Press
Richard Mroczynski.....Alderman, City of Hartford
Dorothy Pierce.....Citizen Member, City of Hartford
Richard H. Roggenbauer.....Member, City of Hartford Plan Commission
Joan A. Russell.....Alderman, City of Hartford
Edward F. Rzepka.....Member, City of Hartford Emergency Squad
Clyde Schuessel.....Member, Hartford Common School Board
Frederick C. Thome.....Citizen Member, City of Hartford
Floyd S. Tinder.....Staff, Hartford Memorial Hospital
Ronald R. Verstrate.....Traffic Manager, Broan Manufacturing Company
Nancy C. Wangles.....Citizen Member, City of Hartford
Richard W. Witt.....Mayor, City of Hartford
David W. Wolbrink.....Member, Hartford Historical
Preservation Committee

Over the course of the study Mr. Michael J. Kern served on the Committee during his tenure as an Alderman for the City of Hartford. Acknowledgement is also due to Mr. Harlan E. Clinkenbeard, City Planner; Mr. William G. Ripp, City Engineer; Mr. Frank D. Scharrer, Commissioner, Washington County Highway Department; and Mr. Henry D. Schiffer, Traffic Engineer, District 2, Wisconsin Department of Transportation for their contributions to this report. Mr. Kenneth H. Voigt, Principal Engineer, SEWRPC, although not a member of the Committee, served as its secretary.

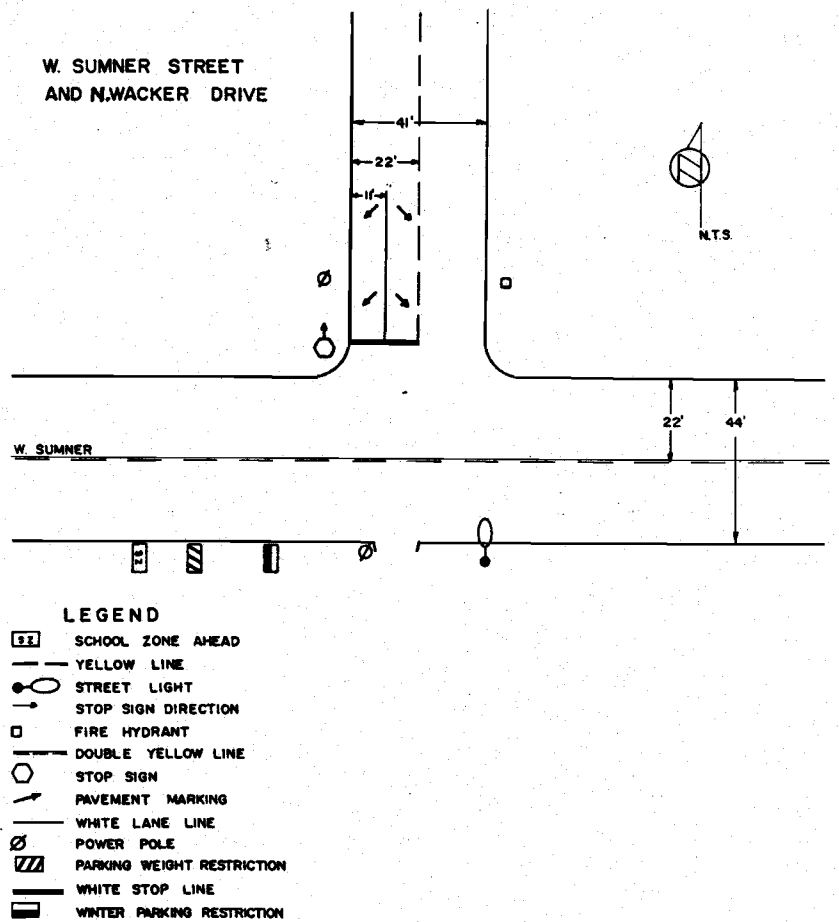
(This page intentionally left blank)

Appendix E

DETAILED GEOMETRIC INTERSECTION FIGURES
HARTFORD TRAFFIC MANAGEMENT STUDY AREA

Figure E-1

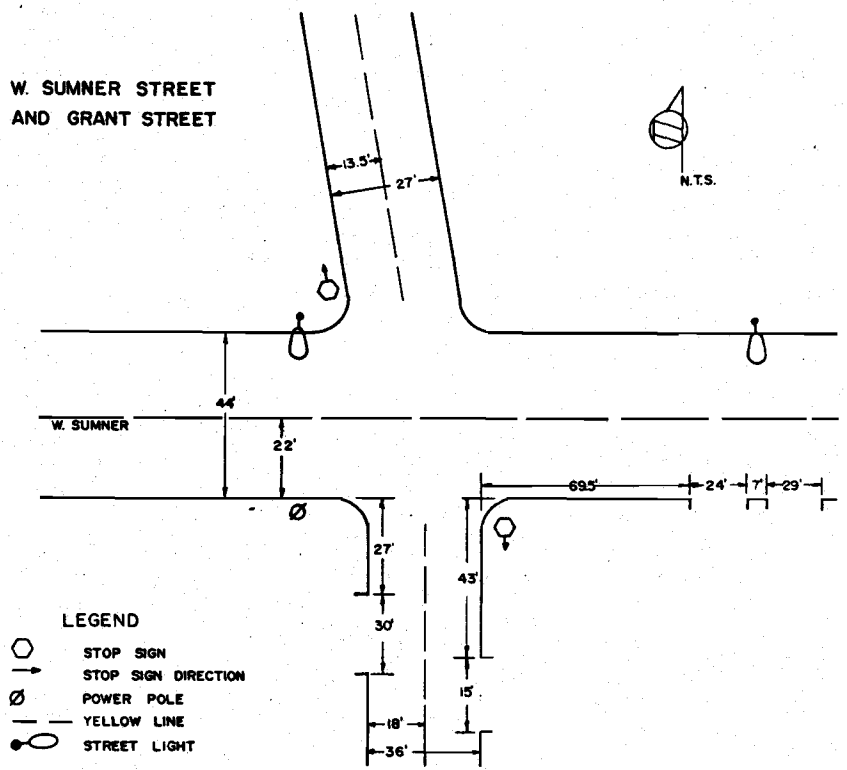
W. SUMNER STREET AND N. WACKER DRIVE



City of Hartford.

Figure E-2

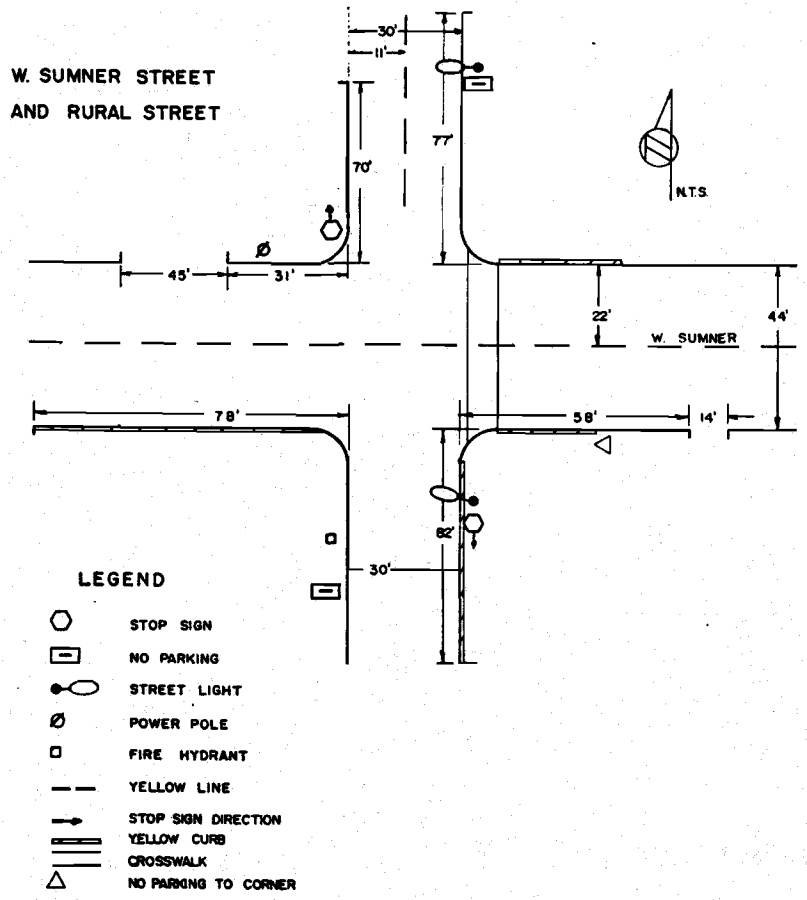
W. SUMNER STREET AND GRANT STREET



City of Hartford.

Figure E-3

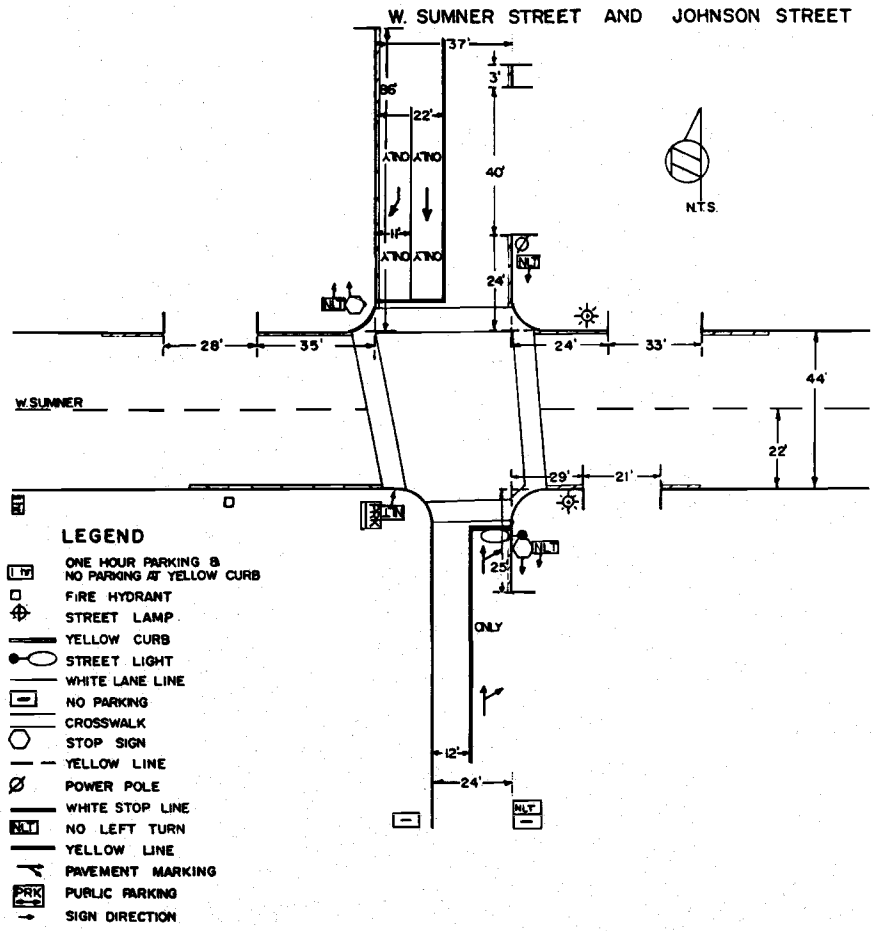
W. SUMNER STREET AND RURAL STREET



City of Hartford.

Figure E-4

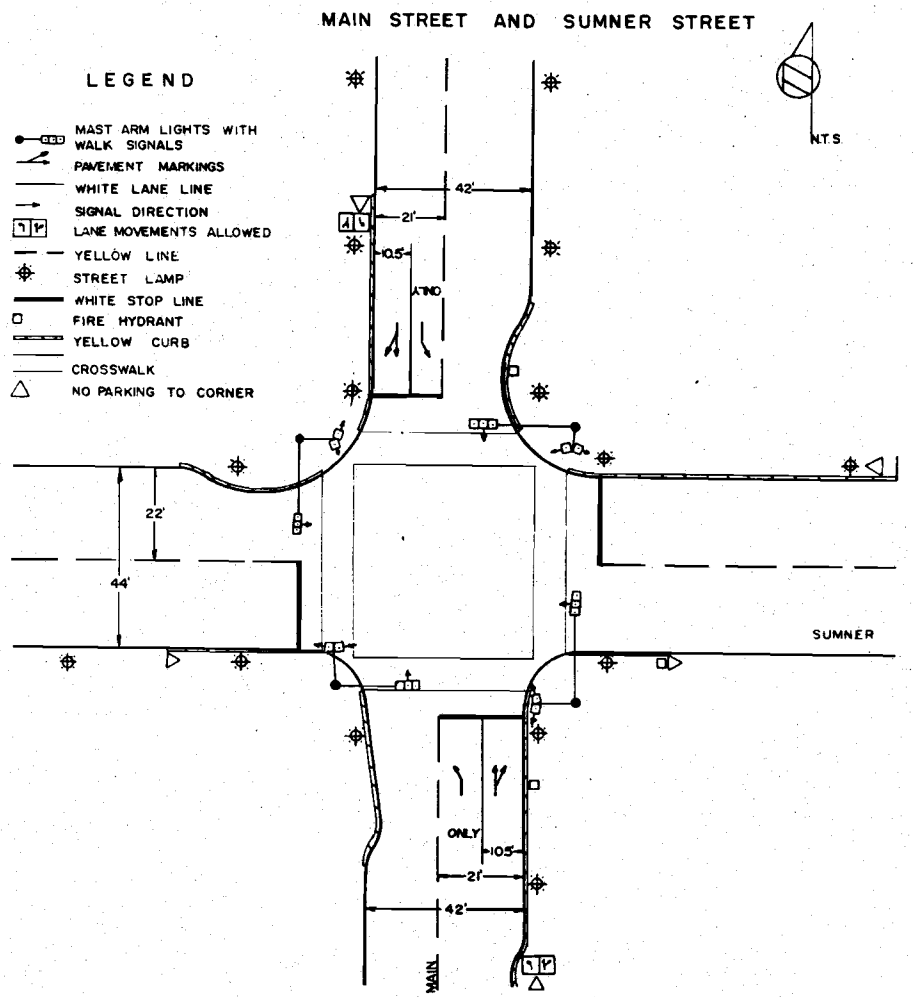
W. SUMNER STREET AND JOHNSON STREET



City of Hartford.

Figure E-5

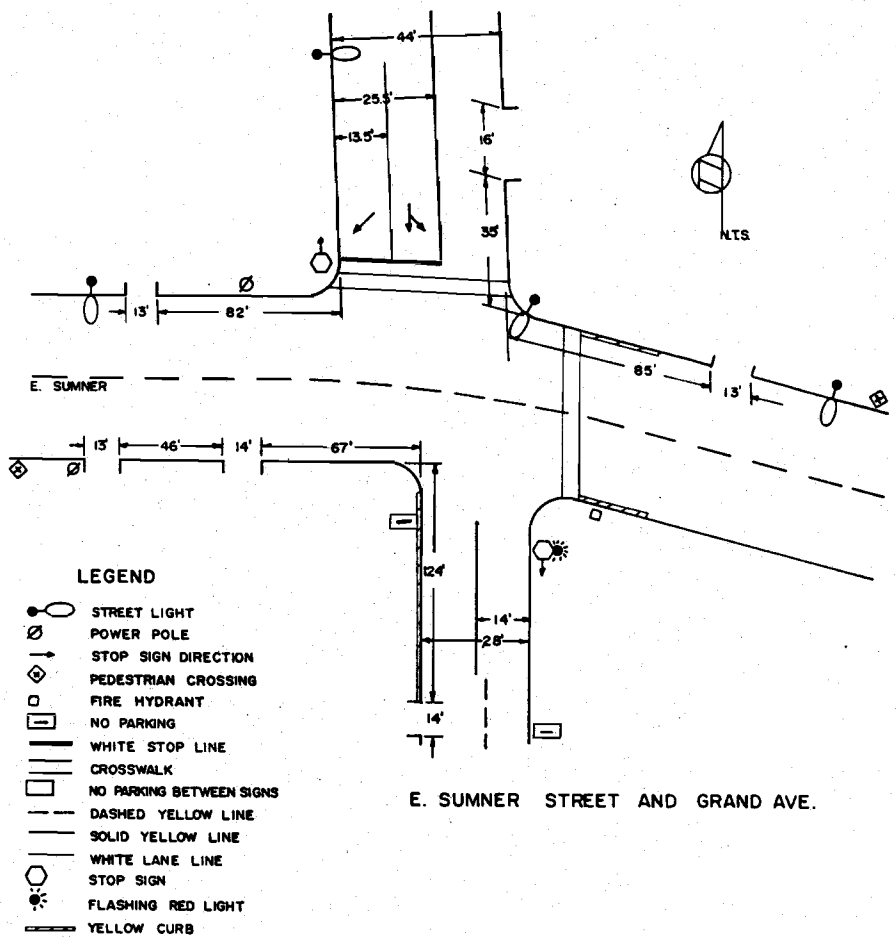
MAIN STREET AND SUMNER STREET



City of Hartford.

Figure E-6

E. SUMNER STREET AND GRAND AVENUE

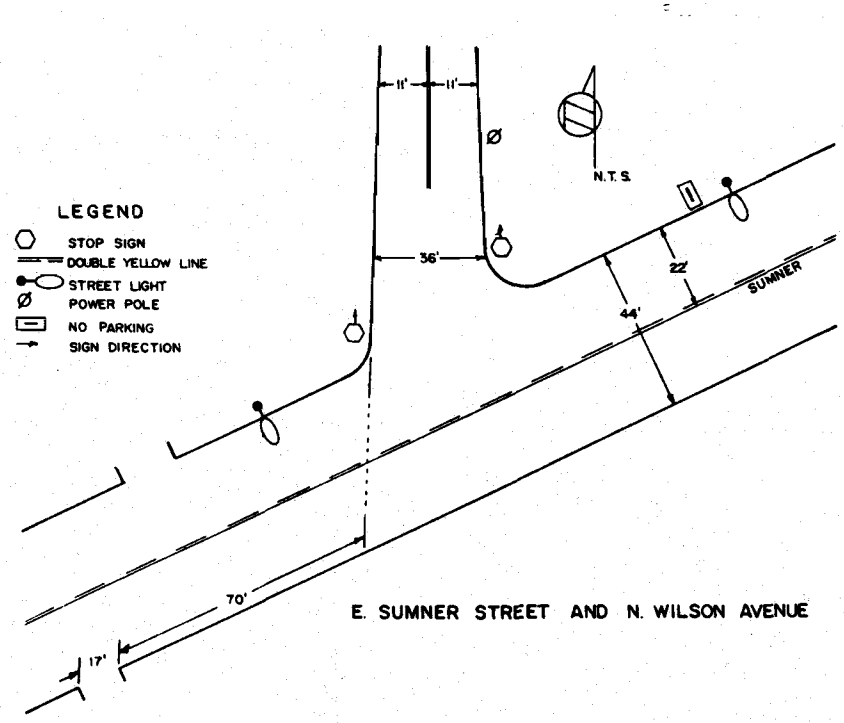


E. SUMNER STREET AND GRAND AVE.

City of Hartford.

Figure E-7

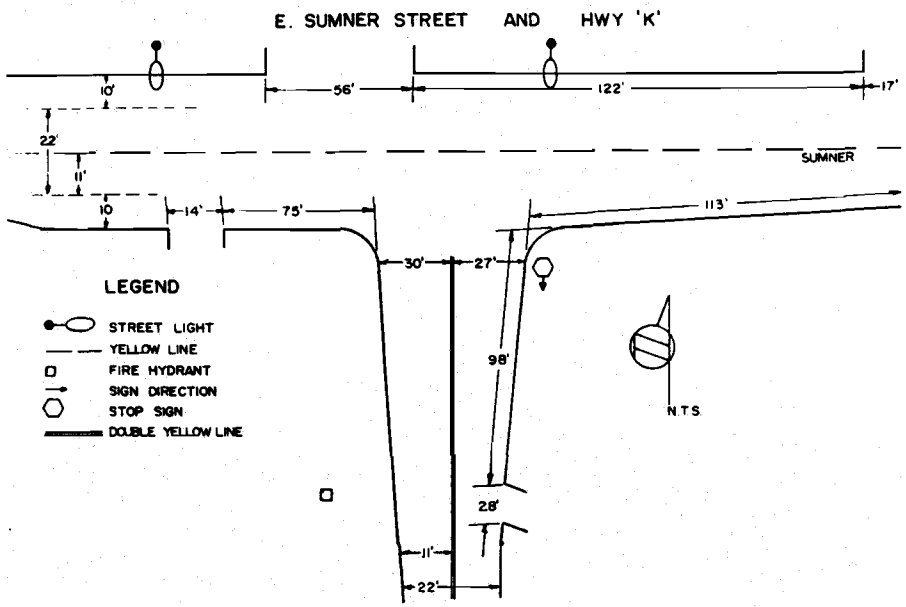
E. SUMNER STREET AND N. WILSON AVENUE



City of Hartford.

Figure E-8

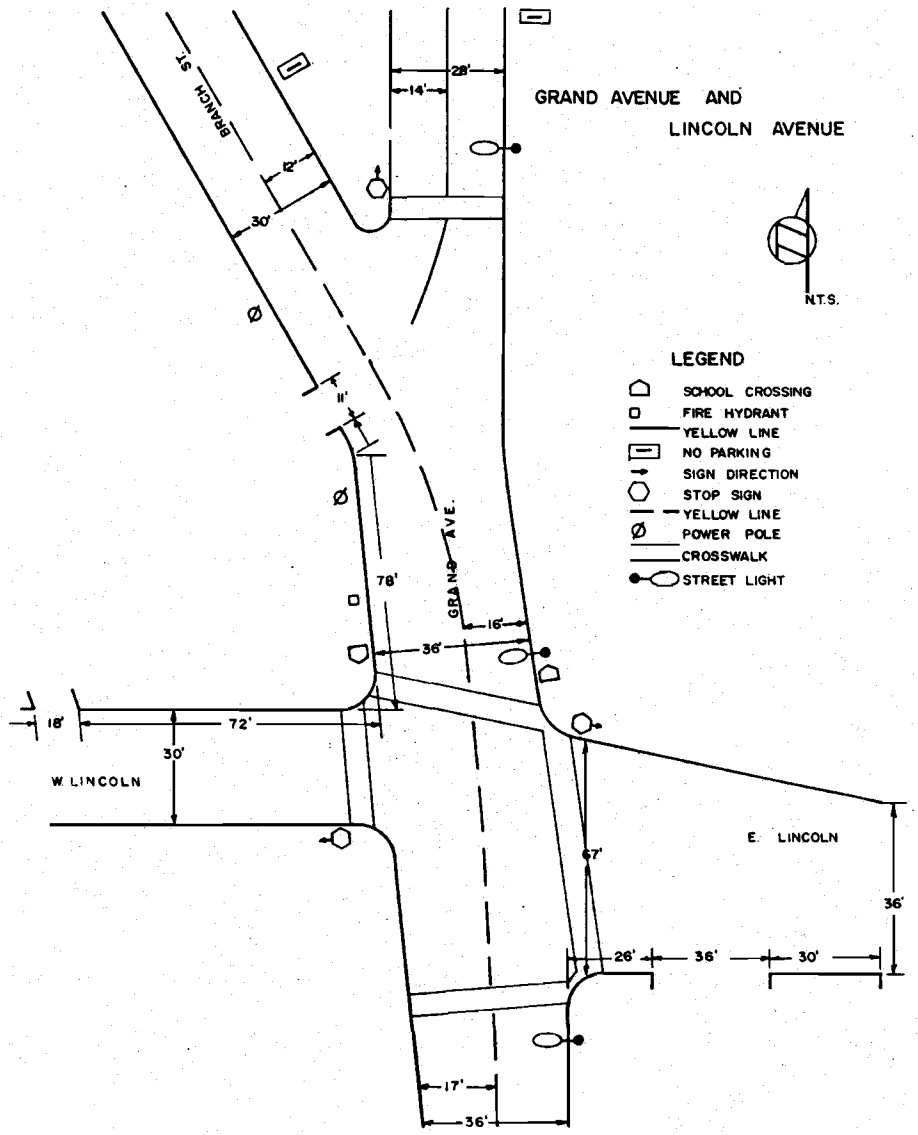
E. SUMNER STREET AND HIGHWAY 'K'



City of Hartford.

Figure E-9

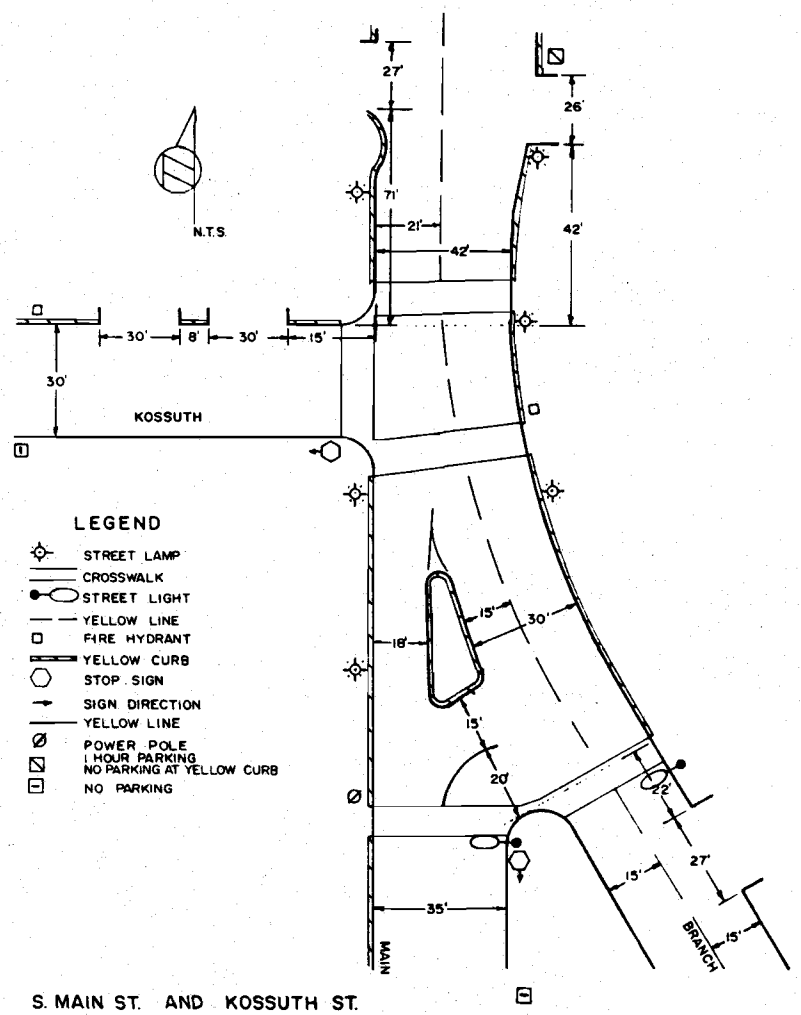
GRAND AVENUE AND LINCOLN AVENUE



City of Hartford.

Figure E-10

S. MAIN STREET AND KOSSUTH STREET

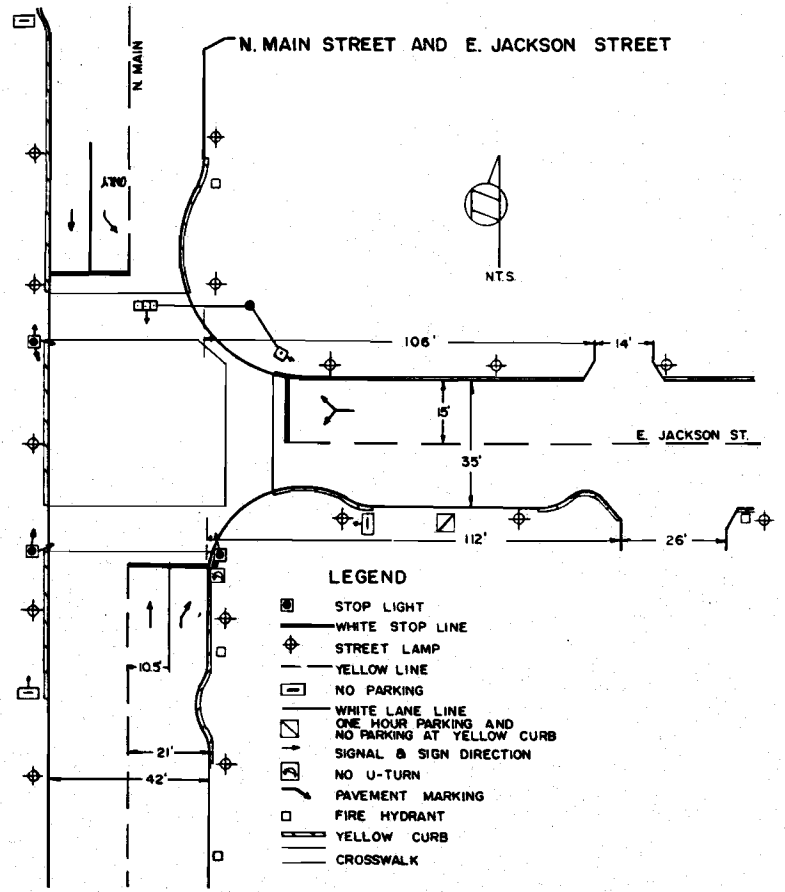


S. MAIN ST. AND KOSSUTH ST.

City of Hartford.

Figure E-11

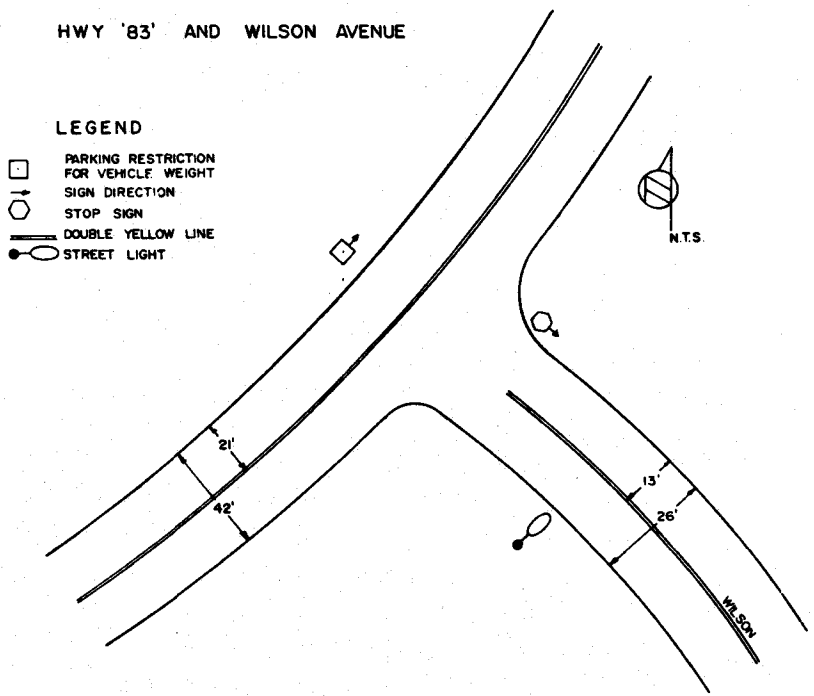
N. MAIN STREET AND E. JACKSON STREET



City of Hartford.

Figure E-12

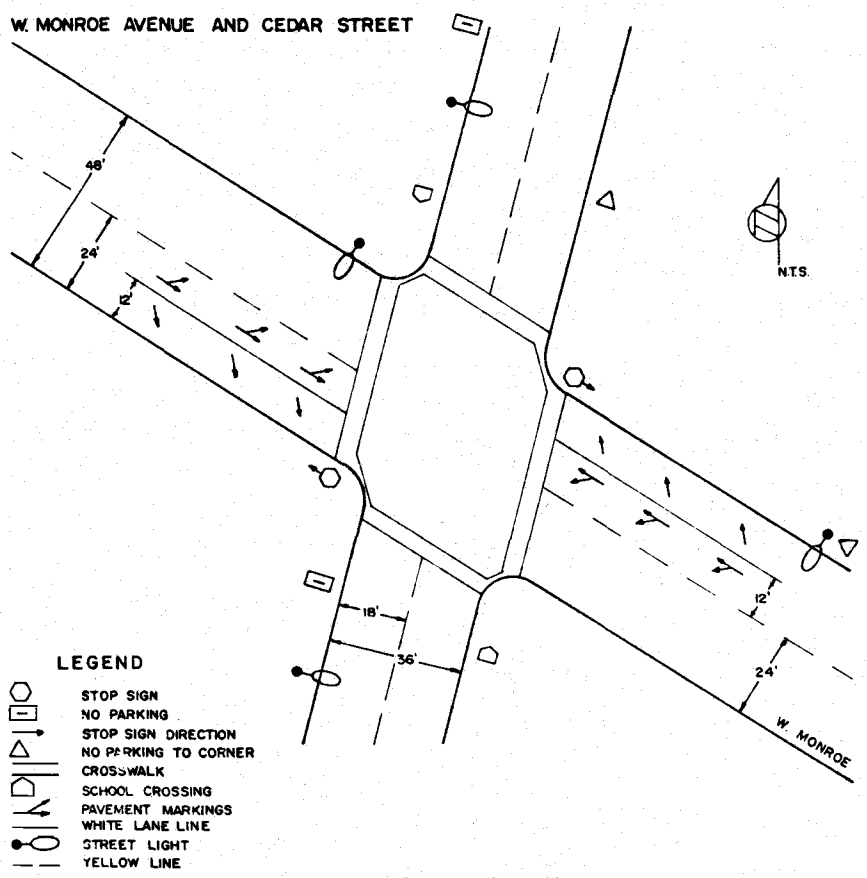
HIGHWAY '83' AND WILSON AVENUE



City of Hartford.

Figure E-13

W. MONROE AVENUE AND CEDAR STREET



City of Hartford.

(This page intentionally left blank)

MOTOR VEHICLE COLLISION DIAGRAMS

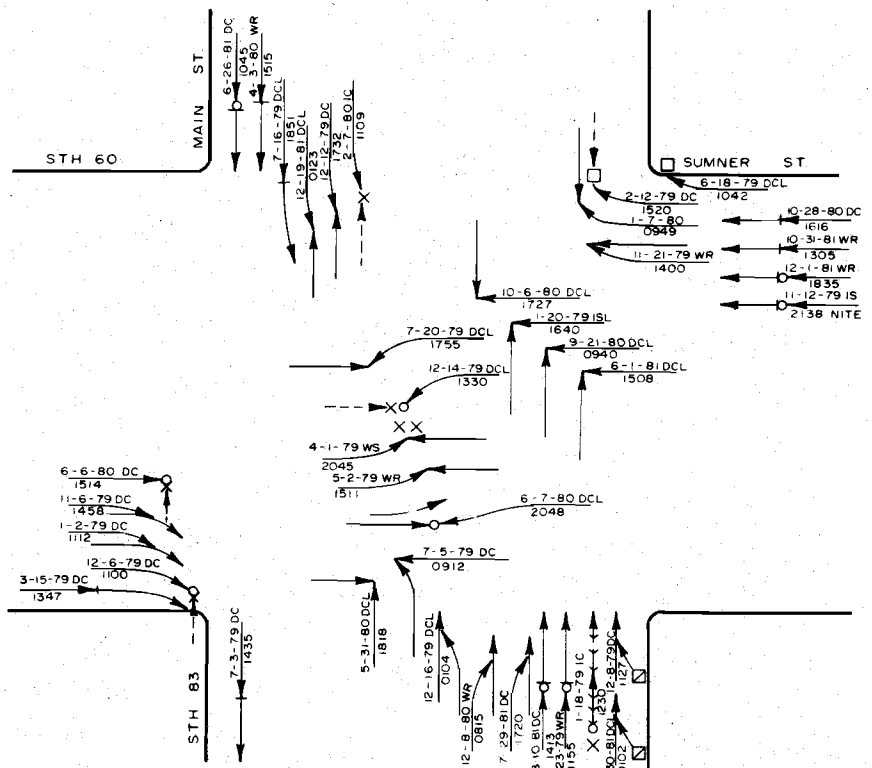
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 83 (Main Street) and STH 60 (Sumner Street)

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY City of Hartford Prepared by CW Sheet 1 of 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	5	0	5
4. NITE - IF BETWEEN DUSK AND DAWN.	NONINVOLVED VEHICLE	SIDESWIPE	OTHER INJURY	3	3	6
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	23	5	28
	DEER	LEFT TURN	TOTAL	31	8	39
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

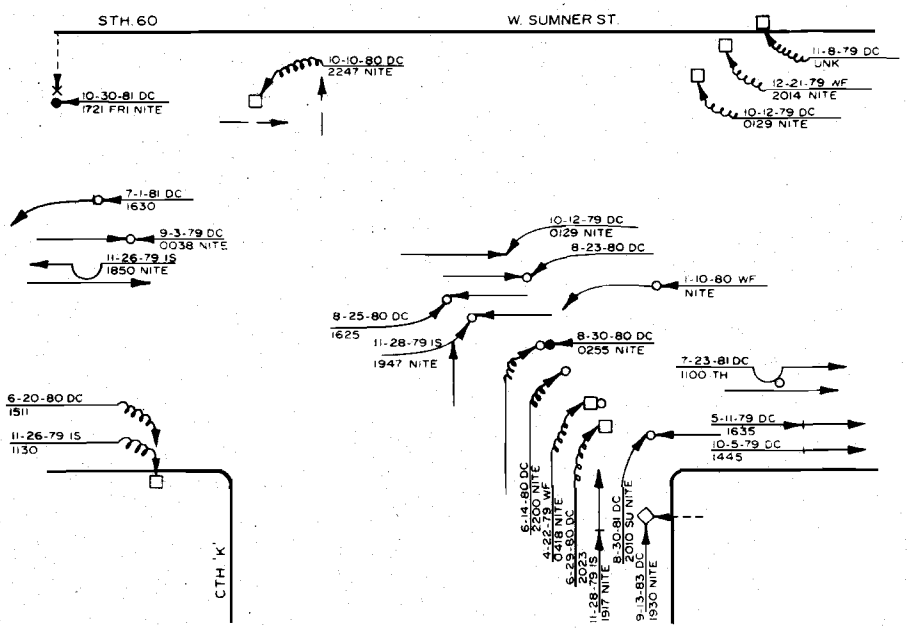
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 60 (Sumner Street) and CTH "K"

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY City of Hartford Prepared by CW Sheet 1 of 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	2	2
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	7	10
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	7	6	13
	DEER	LEFT TURN	TOTAL	10	15	25
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

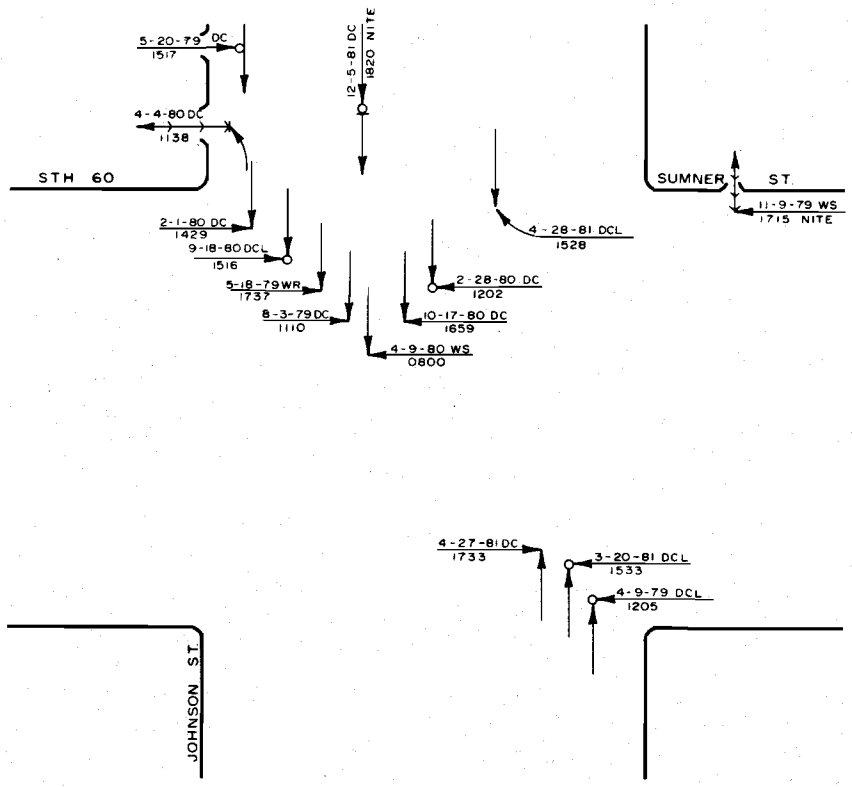
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 60 (Sumner Street) and Johnson Street

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	8	1	9
	DEER	LEFT TURN	TOTAL	13	2	15
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

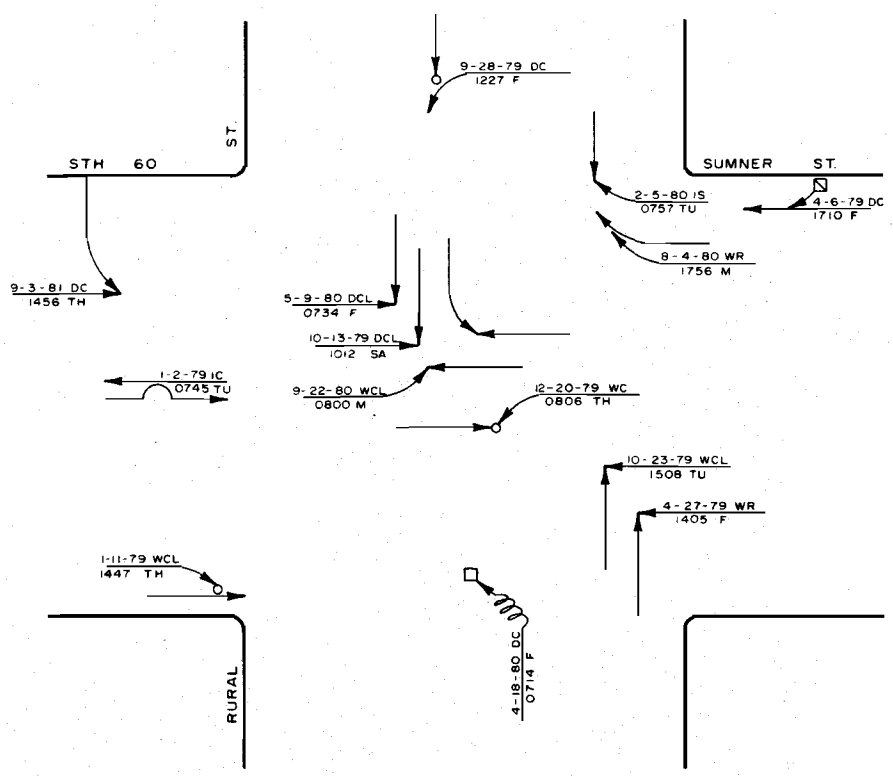
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 60 (Sumner Street) and Rural Street

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	12	0	12
	DEER	LEFT TURN	TOTAL	15	0	15
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

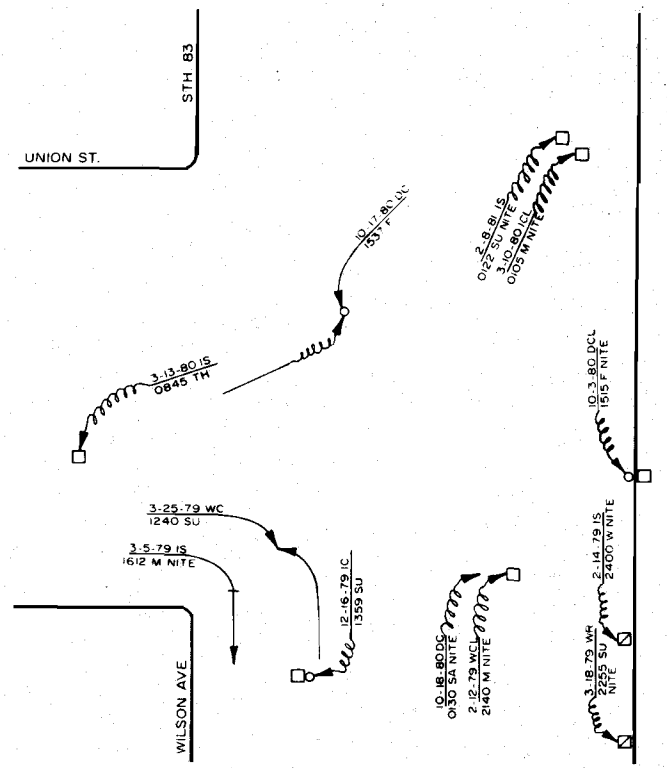
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 83 (Union Street) and N. Wilson Avenue

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	2	3
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	3	6	9
	DEER	LEFT TURN	TOTAL	4	8	12
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

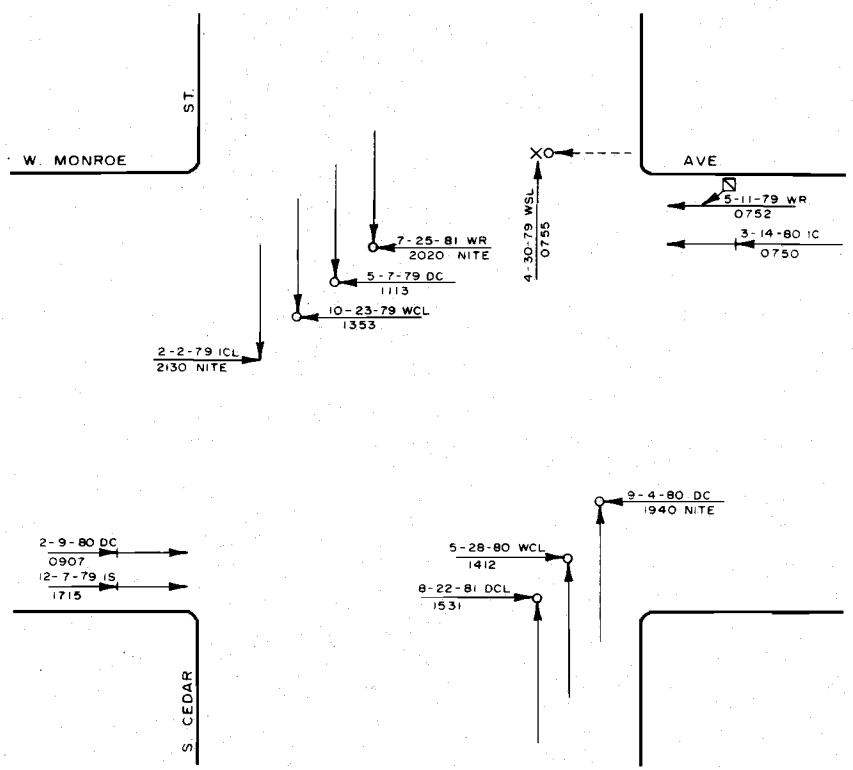
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION W. Monroe Avenue and S. Cedar Street

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	4	1	5
	DEER	LEFT TURN	TOTAL	9	3	12
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

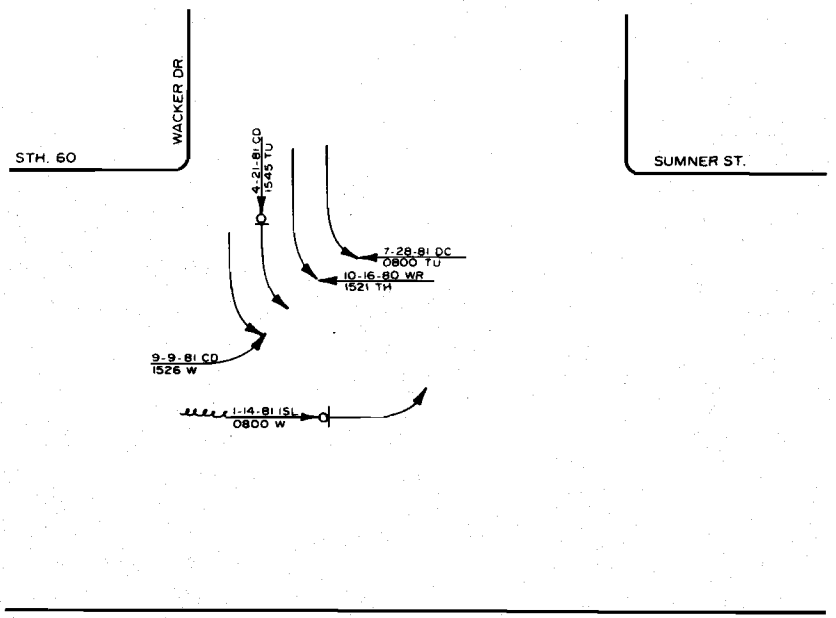
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

INTERSECTION STH 60 (Sumner Street) and Wacker Drive

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	4	0	4
	DEER	LEFT TURN	TOTAL	5	0	5
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

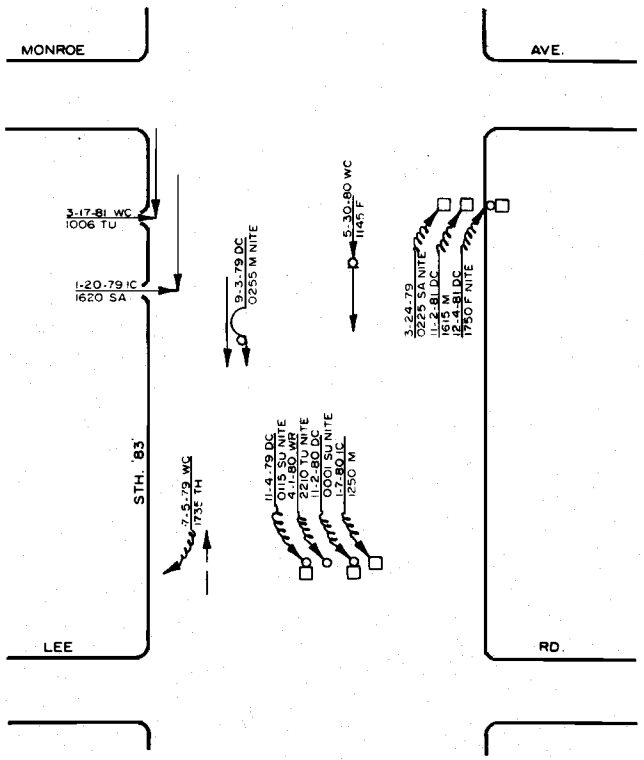
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK STH 83 BETWEEN Lee Road AND Monroe Avenue

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Town of Hartford Prepared by CW Sheet 1 of 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	5	6
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	5	1	6
	DEER	LEFT TURN	TOTAL	6	6	12
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

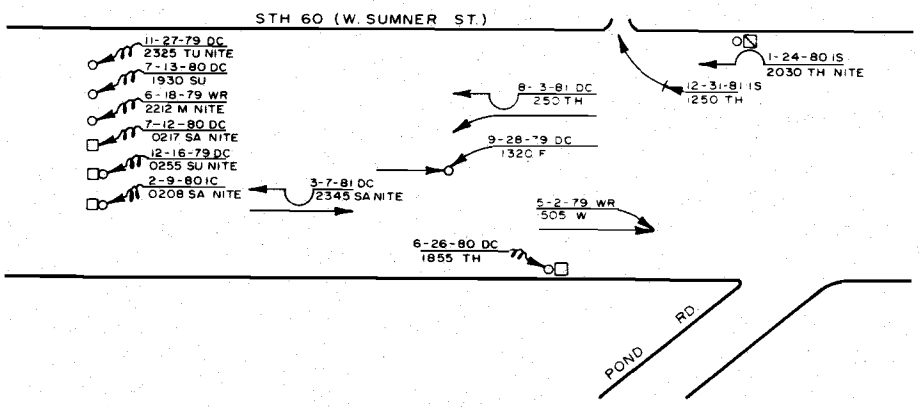
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK STH 60 (W. Sumner Street) BETWEEN Dodge County Line AND Pond Road

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Town of Hartford Prepared by CW Sheet 1 of 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 BACKING VEHICLE NONINVOLVED VEHICLE PEDESTRIAN DEER PARKED VEHICLE FIXED OBJECT FATAL ACCIDENT INJURY ACCIDENT	REAR END HEAD ON SIDESWIPE OUT-OF-CONTROL LEFT TURN RIGHT ANGLE	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.			PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.			OTHER INJURY	3	5	8
			PROPERTY DAMAGE ONLY	3	2	5
			TOTAL	6	7	13

Source: SEWRPC.

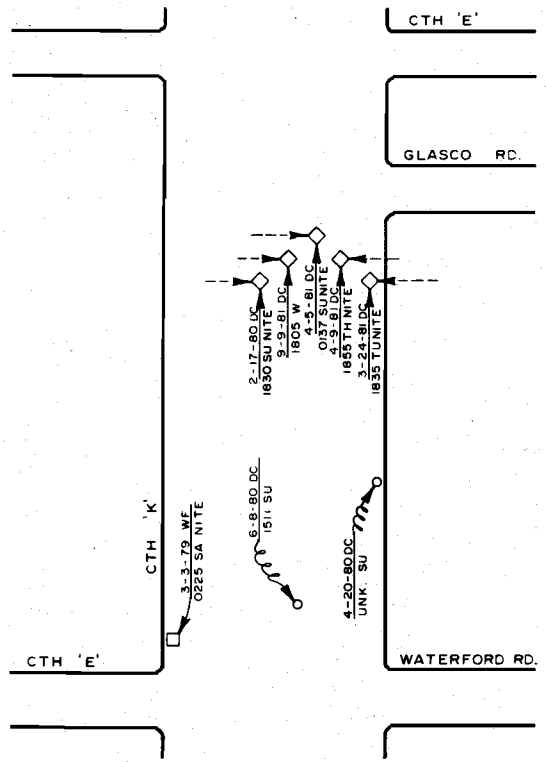
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK CTH "K" BETWEEN Waterford Road AND CTH "E"

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Town of Hartford Prepared by CW Sheet 1 of 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 BACKING VEHICLE NONINVOLVED VEHICLE PEDESTRIAN DEER PARKED VEHICLE FIXED OBJECT FATAL ACCIDENT INJURY ACCIDENT	REAR END HEAD ON SIDESWIPE OUT-OF-CONTROL LEFT TURN RIGHT ANGLE	FATAL	0	0	0
3. PAVEMENT: C = CLEAR; F = FOG; R = RAIN; SL = SLEET; S = SNOW.			PEDESTRIAN INJURY	0	0	0
4. NITE - IF BETWEEN DUSK AND DAWN.			OTHER INJURY	2	0	2
			PROPERTY DAMAGE ONLY	1	5	6
			TOTAL	3	5	8

Source: SEWRPC.

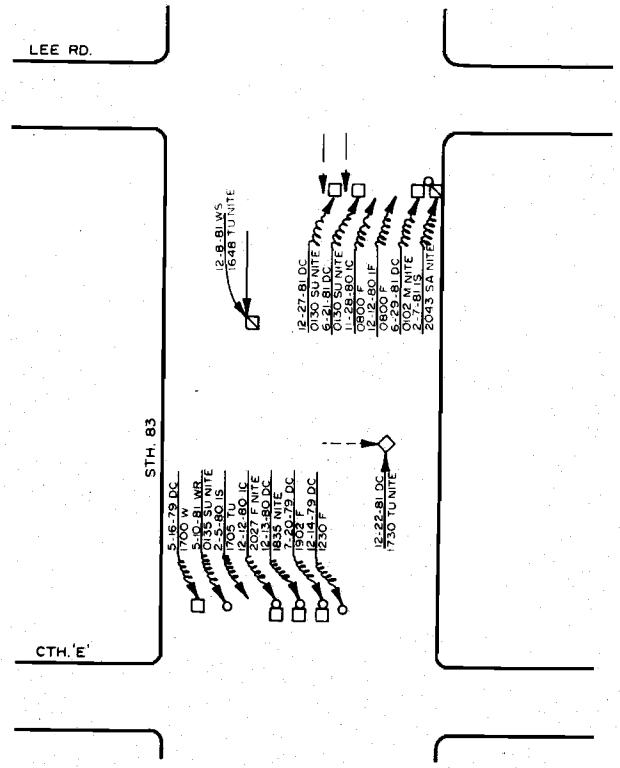
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK STH 83 BETWEEN CTH "E" AND Lee Road

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Town of Hartford Prepared by CW Sheet 1 of 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	4	6
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	4	5	9
	DEER	LEFT TURN	TOTAL	6	9	15
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

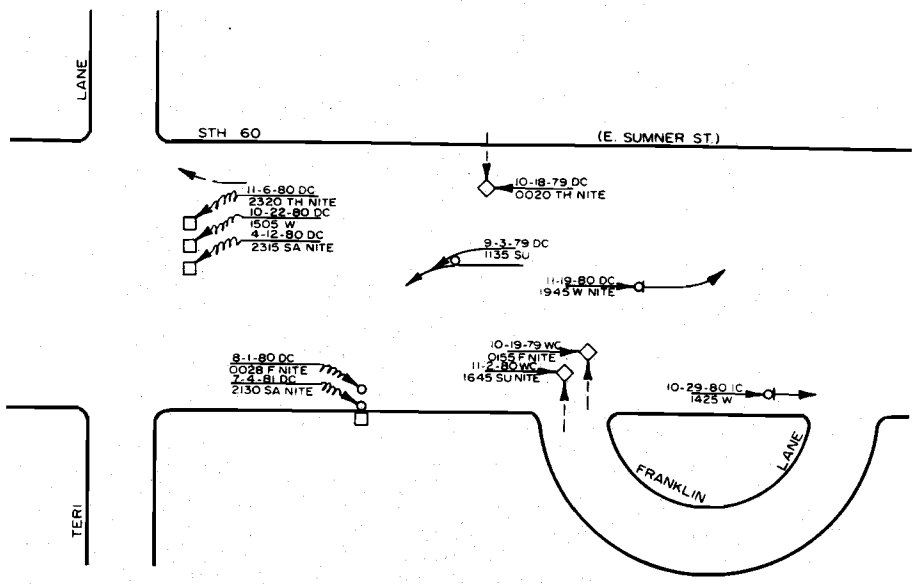
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK STH 60 (E. Sumner Street) BETWEEN Teri Lane AND Franklin Lane

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Hartford Prepared by CW Sheet 1 of 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	3	5
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	1	5	6
	DEER	LEFT TURN	TOTAL	3	8	11
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

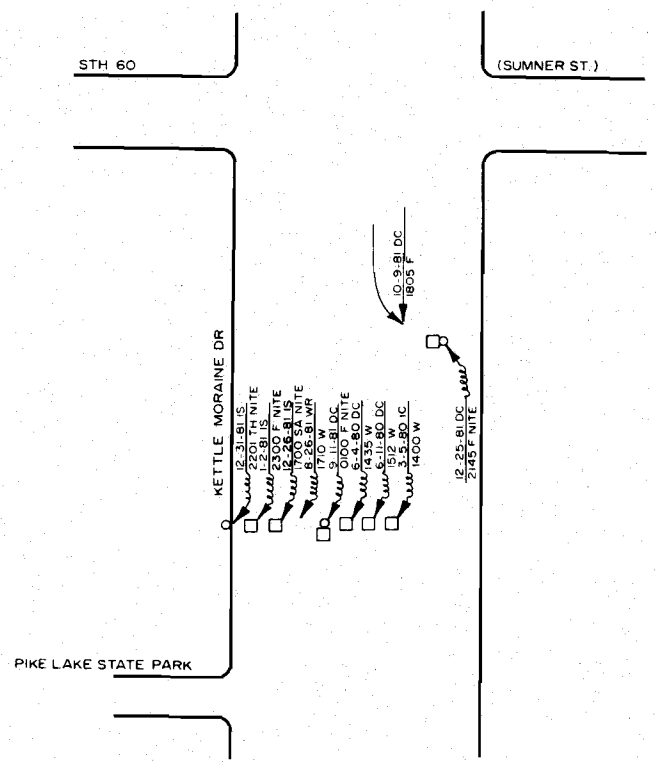
COLLISION DIAGRAM

Southeastern Wisconsin Regional Planning Commission

MIDBLOCK Kettle Moraine Drive BETWEEN STH 60 (Sumner Street) AND Pike Lake State Park

PERIOD Three Years From January 1, 1979 To December 31, 1981

MUNICIPALITY Town of Hartford Prepared by CW Sheet 1 of 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	3	3
	PEDESTRIAN	OUT-OF-CONTROL	PROPERTY DAMAGE ONLY	5	2	7
	DEER	LEFT TURN	TOTAL	5	5	10
	PARKED VEHICLE	RIGHT ANGLE				
	FIXED OBJECT					
	FATAL ACCIDENT					
	INJURY ACCIDENT					

Source: SEWRPC.

(This page intentionally left blank)

A SUGGESTED MODEL RESOLUTION FOR THE ENDORSEMENT OF THE HARTFORD AREA TRAFFIC MANAGEMENT PLAN BY THE COMMON COUNCIL OF THE CITY OF HARTFORD

WHEREAS, the City of Hartford 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 Hartford the endorsement of SEWRPC Community Assistance Planning Report No. 81, A Traffic Management Plan for the Hartford Area, published in June of 1983; and

WHEREAS, the City of Hartford 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 February 1982 to advise and assist the City of Hartford in the development of a plan to increase the operating efficiency and safety of the existing transportation system in the Hartford area through the implementation of low-cost, short-range traffic management actions, as documented in SEWRPC Community Assistance Planning Report No. 81; and

WHEREAS, the aforementioned SEWRPC Community Assistance Planning Report No. 81 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. 81 by the City of Hartford 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 Hartford Common Council, on the _____ day of _____, 1983, hereby endorses the traffic management plan set forth in SEWRPC Community Assistance Planning Report No. 81 as a guide for the arterial street and highway system development and management within the City of Hartford 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 Hartford.

BE IT FURTHER RESOLVED that the Hartford City Clerk transmit a copy of this resolution to the Southeastern Wisconsin Regional Planning Commission.

_____

Mayor, City of Hartford

ATTESTATION:

_____

Hartford City Clerk