PLANNING REPORT NO. 34

A TRANSPORTATION SYSTEM PLAN FOR THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE COUNTY STUDY AREA

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

Special acknowledgement is due Mr. Joseph M. Kampschroer, SEWRPC Senior Planner, for his contribution to the preparation of this report.

Cover photo courtesy of City of Milwaukee, Department of City Development

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Prepared by the
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This planning report documents the findings of the Milwaukee Northwest Side/Ozaukee County transportation improvement study, conducted by the Regional Planning Commission, and financed in part through a joint planning grant from the Wisconsin Department of Transportation, Federal and Urban Mass Transportation Administrations, and the U. S. Department of Housing and Urban Development.

August 1983

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SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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August 25, 1983

STATEMENT OF THE CHAIRMAN

In December 1977, the Commission removed the Park Freeway-West and Stadium Freeway-North "gap closure" from the adopted regional transportation system plan. This action was taken as a result of the deep division of public opinion which existed regarding the construction of these two freeways, a division which affected almost all transportation improvements in the Milwaukee area. Recognizing that this action, in effect, left the Milwaukee northwest side and southern Ozaukee County area originally proposed to be served by these two freeways without an adequate transportation system plan, the Commission concurrently resolved to undertake a study of the best way to meet the existing and probable future transportation needs of the area in the absence of the two freeways. To provide overall guidance to the study, the Commission established a 15-member advisory committee. Membership on this committee was broadly drawn to include elected and appointed public officials at the local, county, state, and federal levels of government, as well as knowledgeable and concerned citizen members.

This report presents the findings and recommendations of that study, including recommended short- and long-range transportation system plans for the Milwaukee northwest side and southern Ozaukee County area. These plans together serve to amend two important elements of the comprehensive plan for the physical development of the seven-county Southeastern Wisconsin Region: the long-range arterial street and highway system plan and the short-range transportation systems management plan.

The recommended plans provide facilities and services intended to substitute, to the degree practicable, for the no-longer-planned Park Freeway-West and Stadium Freeway-North. Major transportation facilities and systems management measures provided for under these newly recommended transportation plans which were not provided for under the adopted regional transportation system plan include: 1) the reconstruction of the Hillside Interchange, to connect the "stub ends" of this Interchange into the surface arterial street system ; 2) the widening of W. Fond du Lac Avenue between the Hillside Interchange and N. 19th Street; 3) the addition of a new segment of N. 68th Street in north-central Milwaukee County between N. Industrial Road and W. Brown Deer Road; 4) extensive traffic management actions to increase the capacity of arterial intersections within the study area; 5) expanded local and express bus service; and, 6) the construction of a light rail line in the Milwaukee County portion of the study area.

The recommended plans also reaffirm certain long-standing proposals for transportation system improvement in the Milwaukee Northwest Side/Ozaukee County area, including: 1) the widening of the North-South Freeway (IH 43) from four to six lanes through the Hillside Interchange; 2) the widening of the North-South Freeway (IH 43) from four to six lanes from Henry Clay Street to Bender Road; 3) the widening of Wauwatosa Road from County Line Road to STH 60; 4) the widening of Mequon Road (STH 167) from County Line Road to the North-South Freeway (IH 43); and the construction of a new interchange on IH 43 at Highland Road in Ozaukee County.

While the recommended plan, through these facility improvements, provides for the abatement of much of the traffic congestion which may be anticipated to occur within the study area in the absence of the Park Freeway-West and Stadium Freeway-North, the recommended plan does not, and cannot, provide for the complete replacement of the traffic-carrying capacity and level of transportation service which would have been provided by these two freeway facilities. This is due to the inherent high capacities and speeds afforded by freeway facilities; to the fact that, during the course of the study, the Advisory Committee determined not to recommend certain major improvements to the arterial street and highway system of the study area; and to the fact that State legislation was enacted to prohibit certain major street and highway improvements. Principal among such improvements would have been the more complete integration of the Stadium Freeway-North "stub end" into the surface arterial street system; the improvement of the W. Lisbon Avenue and W. Appleton Avenue arterials, which provide major access to the Stadium Freeway-North; the widening of W. Fond du Lac Avenue from N. 19th Street to N. 35th Street; and the widening of the North-South Freeway (IH 43) from Bender Road to Mequon Road.

Nevertheless, implementation of the recommended short- and long-range plans for the Milwaukee Northwest Side/Ozaukee County area as set forth in the report should provide the area with a significantly improved level of transportation service; a reduction in traffic congestion; and a reduction in travel times between various parts of the study area. Such implementation will, however, require an increased commitment to public transit and continuing intensive traffic engineering and transportation systems management.

Respectfully submitted,

Alfred G. Raetz

Alfred G. Raetz
Chairman

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Chapter I

INTRODUCTION

The Milwaukee Northwest Side/Ozaukee County transportation improvement study represents an attempt by the Southeastern Wisconsin Regional Planning Commission to identify the existing and probable future problems of northwestern Milwaukee and southern Ozaukee Counties, and to recommend the best means by which these problems can be resolved. As such, the study: 1) identifies through inventories, analyses, and forecasts the existing and potential transportation problems of the study area, 2) prepares alternative plans to meet those problems, and 3) evaluates these alternative plans, and recommends the best short-range and long-range plans for integration into the previously adopted long-range year 2000 regional transportation system plan and into the previously adopted transportation systems management plan for the Milwaukee urbanized area.

THE REGIONAL PLANNING COMMISSION

The work of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) represents an attempt to provide the necessary areawide planning services for the seven-county Southeastern Wisconsin Region. The Commission was created upon the unanimous petition of the seven county boards concerned in August 1960 under the provisions of Section 66.945 of the Wisconsin Statutes. It exists to serve and assist the local, state, and federal levels, units, and agencies of government in planning for the orderly physical and economic development and redevelopment of the seven-county Southeastern Wisconsin Region comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties (see Map 1). The Commission's role is entirely advisory, and participation by local units of government is on a voluntary, cooperative basis. The Commission is composed of 21 citizen members, three from each county in the Region, who serve without pay.

The powers, duties, and functions of the Commission are set forth in state enabling legislation. The Commission is authorized to employ experts and staff as necessary to execute its responsibilities. Basic funds necessary to support Commission operations are provided by the member counties, with the budget apportioned among the seven counties on the basis of relative equalized assessed property valuation. The Commission is authorized to request and accept aid from all levels and agencies of government to accomplish its objectives and is authorized to deal directly with the state and federal governments for this purpose. The Commission, its committee structure, and staff organization, together with its relationship to the constituent counties, are shown in Figure 1.

COMMISSION FUNCTIONS

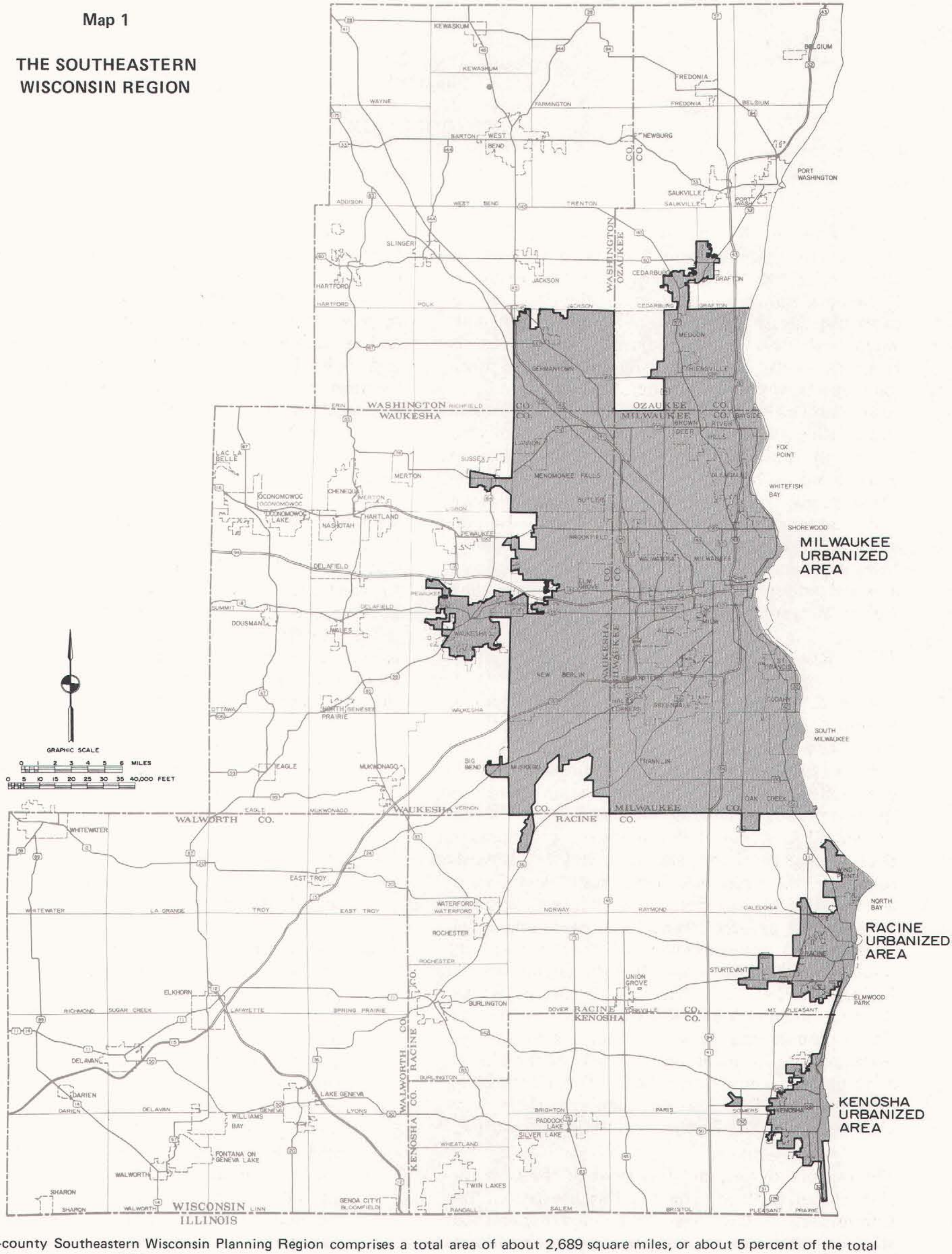
As conceived by the Commission, regional planning is not a substitute for, but a supplement to, local, state, and federal planning efforts. Its objective is to assist the various levels, units, and agencies of government in finding solutions to areawide developmental and environmental problems which cannot be properly resolved within the framework of a single municipality or county. As such, regional planning has three principal functions:

1. Inventory—the collection, analysis, and dissemination of basic planning and engineering data on a uniform, areawide basis so that, in light of such data, the various levels and agencies of government and private investors operating within the Region can better make decisions concerning community development.

2. Plan Design—the preparation of a framework of long-range and short-range plans for the physical development of the Region, these plans being limited to functional elements having areawide significance. To this end, the Commission is charged by law with the function and duty of "making and adopting a master plan for the physical development of the Region." The permissible scope and content of this plan, as outlined in the enabling legislation, extend to all phases of regional development, implicitly emphasizing preparation of alternative spatial designs for land use and for supporting transportation and utility facilities.

Map 1

THE SOUTHEASTERN WISCONSIN REGION

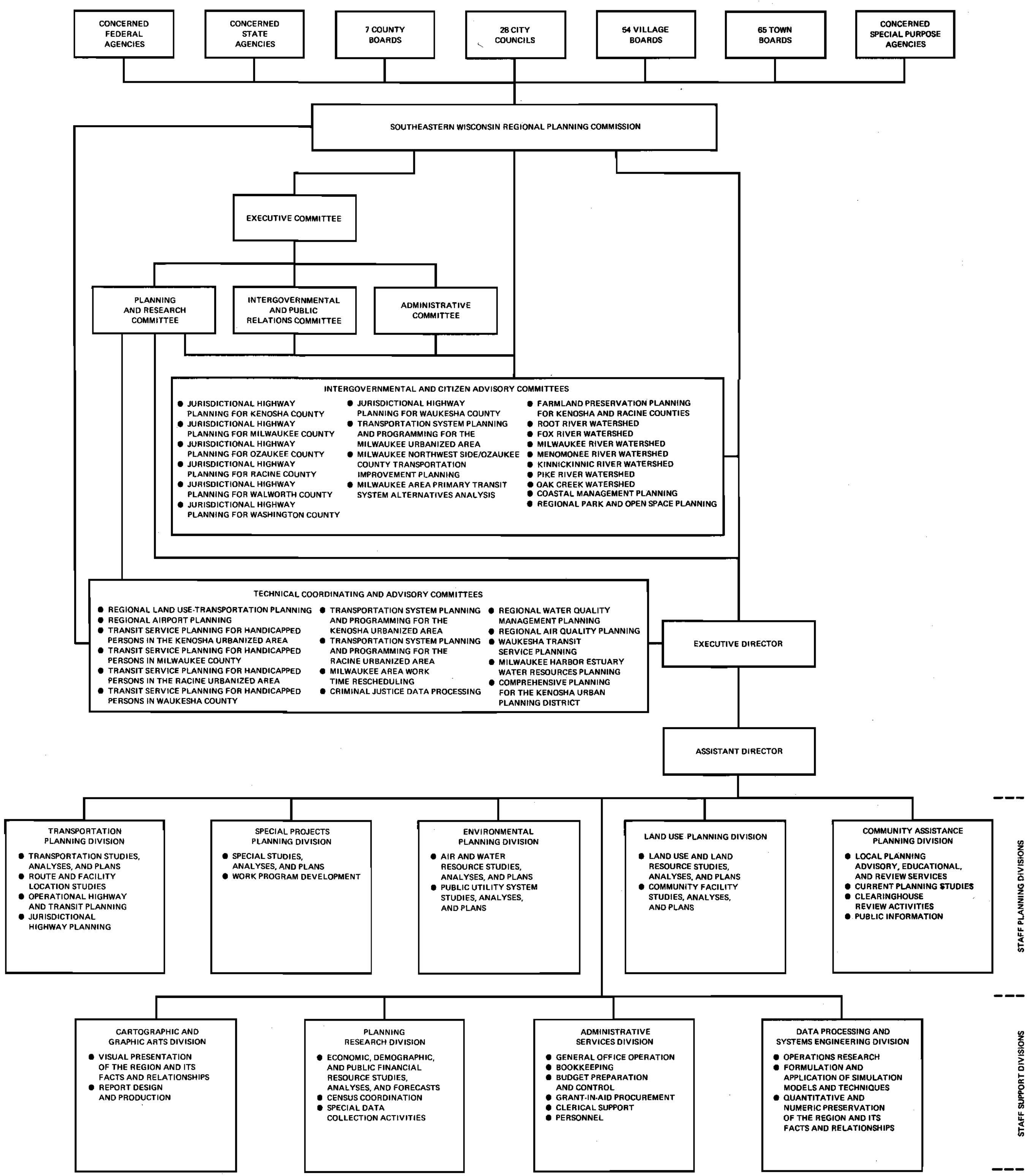


The seven-county Southeastern Wisconsin Planning Region comprises a total area of about 2,689 square miles, or about 5 percent of the total land and inland water area of Wisconsin.

Source: SEWRPC.

Figure 1

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION ORGANIZATIONAL STRUCTURE



3. Plan Implementation—the promotion of plan implementation through the provision of a center to coordinate the planning and plan implementation activities of the various levels and agencies of government in the Region and to enter solutions to areawide problems, and alternatives thereto, into the existing decision-making process.

The work of the Commission is seen as a continuing planning process providing outputs of value to the making of development decisions by public and private agencies, and to the preparation of plans and plan implementation programs at the local, state, and federal levels. It emphasizes close cooperation among the governmental agencies and private enterprise responsible for the development and maintenance of land uses in the Region, and for the design, construction, operation, and maintenance of the supporting public works facilities. All Commission work programs are intended to be carried out within the context of a continuing planning program which provides for periodic reevaluation of the plans produced, and for the extension of planning information and advice necessary to convert the plans into action programs at the local, state, and federal levels.

THE REGION

The seven counties that comprise the Southeastern Wisconsin Planning Region, exclusive of Lake Michigan, have a total area of 2,689 square miles, and a resident population of about 1.8 million persons.

As shown on Map 1, the Region can be divided into those areas which are urbanized and those areas which are not urbanized. There are three urbanized areas, as defined by the U. S. Bureau of the Census, within the Southeastern Wisconsin Region: Kenosha, Milwaukee, and Racine. Each of the urbanized areas is comprised of a large central city with a population of at least 50,000 and the surrounding area contiguous to the city which is devoted to intensive urban use. The intent of defining urbanized areas is to identify those areas which function as a single urban entity and, as such, comprise a true physical city.

COMMISSION TRANSPORTATION PLANNING AND CONSIDERATION OF A MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY

The first major work program of the Commission actually directed toward the preparation of long-range development plans was a regional land use-transportation study, initiated in January 1963 and completed on December 1, 1966. This study produced two key elements of a comprehensive plan for the physical development of the Region: a land use plan and a surface transportation plan, including highway and transit elements. The findings and recommendations of the study, which served for over a decade to guide land use and transportation system development in the Region, have been published in the three-volume Commission Planning Report No. 7, The Regional Land Use-Transportation Study.

Immediately following the long-range land use and transportation system plan adoption, the Commission conducted and participated in the refinement of the regional transportation plan necessary to its eventual implementation. In cooperation with the constituent county boards of supervisors, the Commission prepared jurisdictional highway system plans for all seven counties in the Region.[1] These jurisdictional highway system plans, adopted by the respective seven county boards, as well as by the Regional Planning Commission and by the Wisconsin Department of Transportation, recommended jurisdictional responsibilities for the various segments of the recommended regional arterial street and highway system, including the realignment of the federal aid routes underlying that system. The planning effort provided an

[1] *See SEWRPC Planning Report No. 11, A Jurisdictional Highway System Plan for Milwaukee County, formally adopted by the Commission on June 4, 1970; SEWRPC Planning Report No. 15, A Jurisdictional Highway System Plan for Walworth County, formally adopted by the Commission on March 1, 1974; SEWRPC Planning Report No. 17, A Jurisdictional Highway System Plan for Ozaukee County, formally adopted by the Commission on March 7, 1974; SEWRPC Planning Report No. 18, A Jurisdictional Highway System Plan for Waukesha County, formally adopted by the Commission on June 5, 1975; SEWRPC Planning Report No. 22, A Jurisdictional Highway System Plan for Racine County, formally adopted by the Commission on December 4, 1975; SEWRPC Planning Report No. 23, A Jurisdictional Highway System Plan for Washington County, formally adopted by the Commission on September 11, 1975; and SEWRPC Planning Report No. 24, A Jurisdictional Highway System Plan for Kenosha County, formally adopted by the Commission on September 11, 1975.*

important frame of reference for the extensive corridor refinement and right-of-way reservation, acquisition, and construction activities undertaken by the state, county, and local units of government in implementation of the arterial street and highway system recommendations of the regional plan. The Commission also assisted in the preparation of the Milwaukee Area Transit Plan, which served to refine, detail, and stage the recommendations of the regional plan concerning long-range transit development in the Milwaukee urbanized area.[2] The Commission has also annually monitored and reported on land use and transportation system plan implementation, including the assessment of the continued validity of plan forecasts.

A complete reevaluation of the initial regional land use and transportation plans began in 1972 with extensive reinventories of the factors affecting land use and transportation development in the Region, and an assessment of the extent of land use and transportation system plan implementation since 1966. The inventories indicated that substantial changes in population, economic activity, land use development, public finance, community plans and zoning, and travel characteristics had occurred over the 10 years since the original land use and transportation inventories were conducted. Although anticipated in the original regional planning effort, some of the changes in the factors influencing land use and transportation development, particularly regional population growth and the distribution of employment and land use development within the Region, were not incorporated into the normative centralized land use plan adopted in that effort.

The assessment of regional transportation plan implementation indicated long delays in planned freeway construction in Milwaukee County since the early 1970's, with the rights-of-way for a number of facilities—the Park Freeway-East and -West and portions of the Stadium Freeway-South—remaining almost entirely cleared for seven or more years, with construction blocked by public resistance. The assessment indicated that a sharp division of public opinion had developed as to freeway construction recommendations in Milwaukee County. This division of public opinion was reflected at public hearings, meetings of public officials, and meetings of technical and citizen advisory committees to the Regional Planning Commission.

As a result of some of the changes in the factors influencing land use and transportation development and the sharp division of opinion that existed on the completion of the proposed Milwaukee County freeway system and the impasse that had been created by that division of opinion, the Commission staff recommended that about 96 miles of freeways that had been included in the original 1990 regional system plan not be included in the revised year 2000 regional transportation system plan. The freeway facilities which were deleted, primarily because they did not, under revised forecasts of probable future population and economic activity levels, meet revised recommended travel demand, included the Milwaukee Metropolitan Belt Freeway, extending from the proposed Lake Freeway in the City of Oak Creek westerly through Milwaukee County and northerly through the eastern communities in Waukesha County to a junction with USH 41 in the Village of Germantown; the extension of the Stadium Freeway-North from the Fond du Lac Freeway in the N. 76th Street corridor to a junction with IH 43 near the Village of Saukville; and the Racine Loop Freeway. The Bay Freeway, extending from the Village of Pewaukee easterly to IH 43 near the Hampton Avenue interchange, was deleted because the State Legislature had enacted legislation specifically prohibiting the Wisconsin Department of Transportation from constructing a freeway in the Hampton Avenue corridor.

It should be pointed out that these changes in the new regional transportation system plan resulted from and are consistent with the Commission's conception of a cyclical planning process. Having been proposed at the system level in the original land use-transportation plan, detailed location, design, and engineering work was completed for many of the planned freeway facilities, and was initiated for all of such facilities during the 1960's and early 1970's. As a result it was possible to better define the precise costs and impacts—both positive and negative—of the proposed freeways, and to consider the public official and community reaction to those costs and impacts in the next cycle of the planning process. Thus, the planning process is envisioned as proceeding in a cyclical manner from a system-level plan to detailed project plans, and, based on reactions to the project-level plans, back to a revised system-level plan.

The Commission staff, moreover, recommended that the freeway system proposed for the Southeastern Wisconsin Region under the revised year 2000 regional transportation system plan consist

[2] *See Milwaukee Area Transit Plan, prepared by the Milwaukee County Expressway and Transportation Commission in cooperation with the Southeastern Wisconsin Regional Planning Commission, and formally adopted by the Commission on March 2, 1972.*

of two "tiers," an "upper tier" and a "lower tier,"[3] as shown on Map 2. About 106 miles of uncompleted freeways proposed under the original regional plan were recommended by the staff to remain on the long-range plan. About 46 of these miles, however, were placed in the upper tier of the plan. With but two exceptions, all 25 miles of uncompleted freeways in Milwaukee County recommended to remain on the long-range plan were placed in the upper tier. The two exceptions were the Stadium Freeway-South from its current terminus at W. National Avenue to a new terminus at W. Lincoln Avenue, a distance of 0.8 mile, and the Lake Freeway-South from its current terminus at Carferry Drive south to a new terminus at E. Layton Avenue, a distance of 3.1 miles. These exceptions were recommended for placement in the lower tier (see Map 2). Freeways in Milwaukee County recommended by the Commission staff to be placed in the upper tier included the Park Freeway-East and -West, the Stadium Freeway-South from W. Lincoln Avenue to the Airport Freeway, the Stadium Freeway-North "gap closure" from its current terminus to the Fond du Lac Freeway, the Lake Freeway-North from its current northern terminus to the Park Freeway-East, and the Lake Freeway-South from E. Layton Avenue to the Wisconsin-Illinois State line.

The two-tier plan envisioned that if at some future date it was determined that actions to modify travel demand and achieve maximum facility and service efficiency had been effective and that surface arterials and transit services were adequately accommodating travel demand, steps could be taken at that time to formally remove the upper-tier freeway proposals from the long-range plan. On the other hand, if the consensus at such later time was that travel demand modification and improved transportation efficiency efforts had not worked well and that arterial street and transit improvements had not adequately provided needed transportation service, work could again proceed toward the design and construction of the upper-tier freeways. In the meantime, the proposed plan recommended that all right-of-way currently cleared for the remaining freeway segments be held in a transportation land bank, with appropriate consideration given to the use of the land for park and open space purposes. The proposed plan also recommended that any currently undeveloped lands needed to accommodate construction of freeways in the upper tier of the plan continue to be held in open use through public open space acquisition and/or agriculture.

The recommendation to divide the freeway system plan into two tiers was principally intended to provide a compromise to the freeway and transportation system development controversy and impasse in the Region, and primarily in Milwaukee County. However, citizen and public official reaction at, and following, public hearings on the proposed two-tier plan indicated that the two-tier compromise Milwaukee County freeway plan would be likely to further intensify the division of public opinion concerning two proposed freeways: the Park Freeway-West and the Stadium Freeway-North "gap closure."

As a consequence, after considering the advantages of these two facilities, which were primarily directed toward increasing mobility and economic objectives, and assessing their disadvantages, which principally consisted of their financial and social costs and the probable future polarization of the Milwaukee area with respect to transportation system development, the Regional Planning Commission deleted the Stadium Freeway-North "gap closure" and Park Freeway-West from the proposed regional transportation plan, as indicated on Map 3, while approving the other staff recommendations.[4]

As part of this action, the Regional Planning Commission resolved to undertake a study to be conducted in cooperation with the Wisconsin Department of Transportation, Ozaukee County, Milwaukee County, the City of Milwaukee, and concerned citizens of the best way to meet the

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[3] *Under the two-tier plan, facilities placed in the upper tier, although remaining on the long-range plan, would have no further work undertaken for their design and construction for an indeterminate period of at least a decade. During that period a combination of so-called "transportation systems management" measures, intended to reduce the anticipated peak-hour travel demand in Milwaukee County while obtaining the highest possible efficiency from existing transportation facilities and services, would be implemented in place of the upper-tier facilities.*

[4] *In a formal amendment to the long-range regional transportation system plan for the year 2000, adopted by the Southeastern Wisconsin Regional Planning Commission on June 18, 1981, the Lake Freeway-South from Carferry Drive to the Wisconsin-Illinois State line was removed from the plan. As part of that amendment, a four-lane, limited-access, surface arterial highway facility was added to the plan to replace this freeway segment. The new arterial facility would follow the same general alignment through Milwaukee, Racine, and Kenosha Counties previously defined for the Lake Freeway-South.*

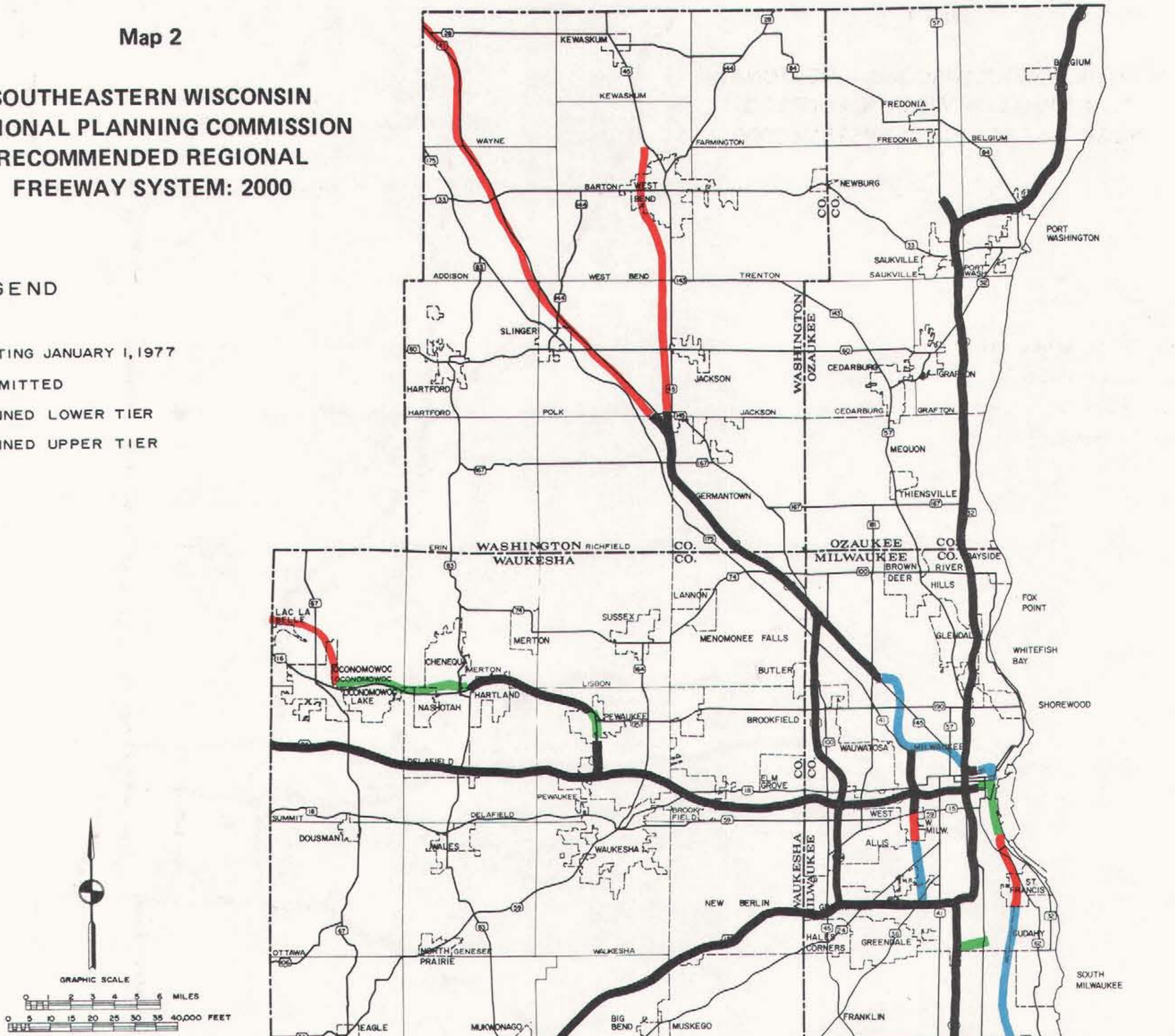
Map 2

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION RECOMMENDED REGIONAL FREEWAY SYSTEM: 2000

LEGEND

FREEWAY

- EXISTING JANUARY 1, 1977
- COMMITTED
- PLANNED LOWER TIER
- PLANNED UPPER TIER



The freeway system proposed under the staff-recommended year 2000 regional transportation system plan consisted of a total of about 344 miles, or about 10 percent of the total arterial street and highway system. About 228 miles, or 66 percent of this proposed freeway system, would have been comprised of existing facilities open to traffic as of January 1977; about 11 miles, or 3 percent, would have been comprised of facilities considered to be committed to construction; and about 106 miles, or 31 percent, would have been comprised of planned new facilities. The planned facilities consisted of a lower tier, the implementation of which would have proceeded immediately, and an upper tier, the implementation of which would have not proceeded beyond the phase of right-of-way preservation for at least a decade, until such time as the effect of proposed substitute low capital-intensive improvements and their impact on the need for these upper-tier freeways had been fully demonstrated. The lower tier consisted of about 60 miles of facility, or 18 percent of the total proposed system. The upper tier consisted of about 46 miles of facility, or 13 percent of the total proposed system.

Source: SEWRPC.

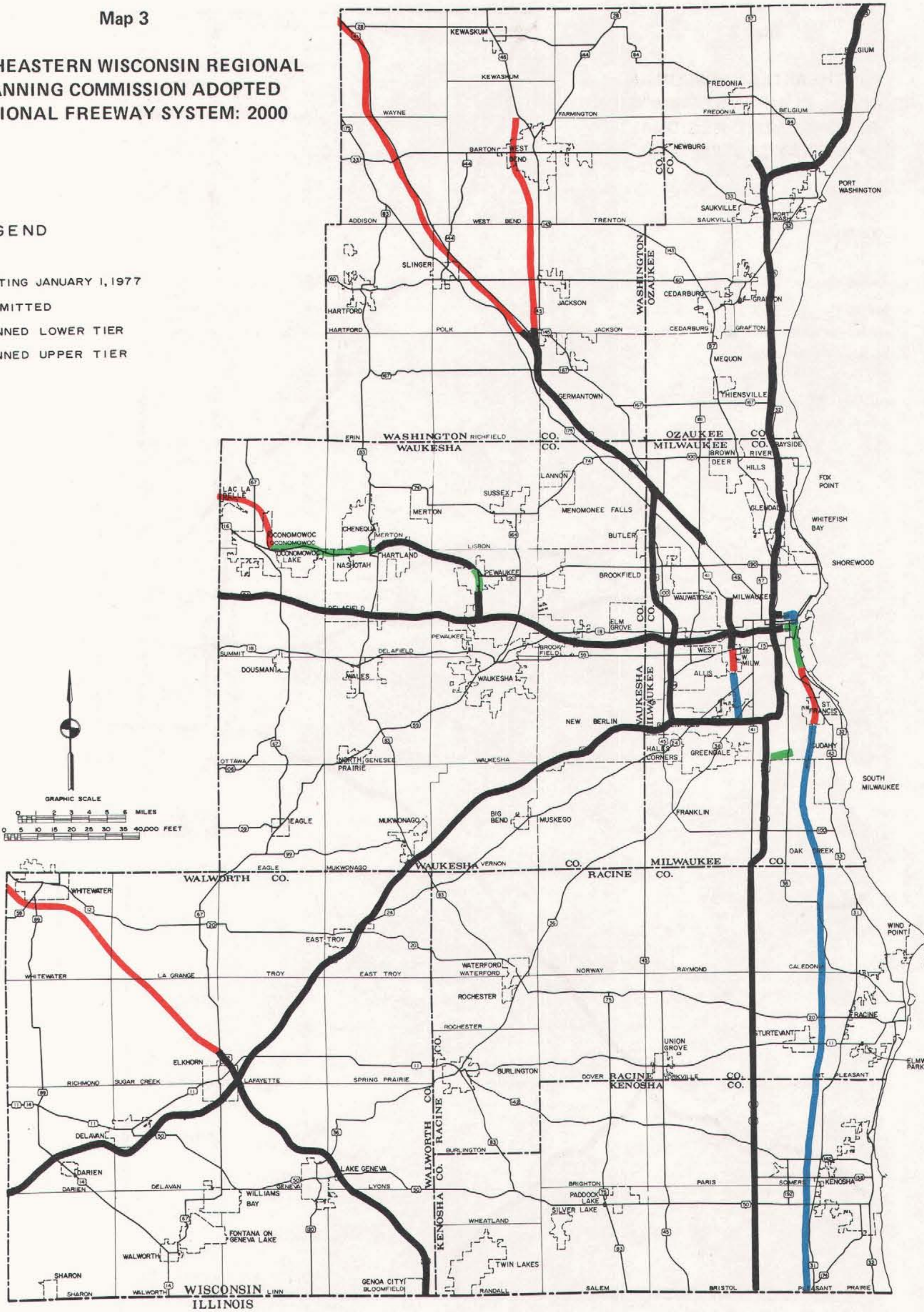
Map 3

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION ADOPTED REGIONAL FREEWAY SYSTEM: 2000

LEGEND

FREEWAY

- EXISTING JANUARY 1, 1977
- COMMITTED
- PLANNED LOWER TIER
- PLANNED UPPER TIER



The freeway system proposed under the final recommended transportation system plan consisted of about 336 miles of facilities, or about 9 percent of the total arterial street and highway system. About 231 miles, or 78 percent of this proposed freeway system, would be comprised of freeways open to traffic as of January 1978; about 8 miles, or nearly 3 percent, would be comprised of facilities considered to be committed to construction; and about 97 miles, or about 29 percent, would be comprised of planned new facilities. Under the new plan, the proposed freeway system would be comprised of two "tiers": a lower tier, for which implementation should proceed immediately, and an upper tier, for which implementation would not proceed beyond the phase of right-of-way preservation for at least a decade and until the effectiveness of low capital-intensive improvements proposed in lieu of these freeways has been demonstrated. The proposed lower-tier facilities would total about 60 miles, or nearly 18 percent of the total freeway system. The upper-tier facilities would total about 37 miles, or 11 percent of the total freeway system.

Source: SEWRPC.

existing and probable future transportation needs of the area originally proposed to be served by these two freeways in the absence of these freeways. At the meeting of the Executive Committee of the Commission on February 6, 1978, the Committee directed the Commission staff to undertake the work necessary to prepare a prospectus for a study of existing and future transportation problems in the northwestern quadrant of the Milwaukee urbanized area. In order to actively involve the units of government and governmental agencies most concerned with transportation system development in the affected area of the Region in the preparation of the prospectus, as well as to bring the knowledge of individuals possessing broad experience in the planning, design, construction, operation, maintenance, and use of transportation facilities to bear on the question, the Commission further acted on February 6, 1978, to create a Milwaukee Northwest Side/ Ozaukee County Transportation Improvement Study Prospectus Steering Committee. Membership on this Committee is set forth in Appendix A.

THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY PROSPECTUS

The prospectus investigated the need for the proposed study and, finding a need to exist for the study, defined the desirable scope and content of the study, and prepared a recommended time schedule, cost estimate, and budget for the study.

Study Area

The area within the Region to which this special transportation planning study is addressed was defined in the prospectus to include those areas of the Region most affected by the removal of the Park Freeway-West and Stadium Freeway-North "gap closure" from the new regional transportation system plan, while limiting the study area only to those parts of the Region within which transportation improvements would be considered in the study for implementation. The study area, located in the Region on Map 4 and shown on Map 5, consists of northwestern Milwaukee County and southern Ozaukee County. The term "northwestern Milwaukee County" was defined as that area bounded on the north by the Ozaukee-Milwaukee County line, on the east by the North-South Freeway (IH 43), on the south by the East-West Freeway (IH 94), and on the west by the Milwaukee-Waukesha County line. The term "southern Ozaukee County" was defined as that area bounded on the north by Center Road, on the east by the North-South Freeway (IH 43), on the south by the Ozaukee-Milwaukee County line, and on the west by the Ozaukee-Washington County line.

Need for the Study

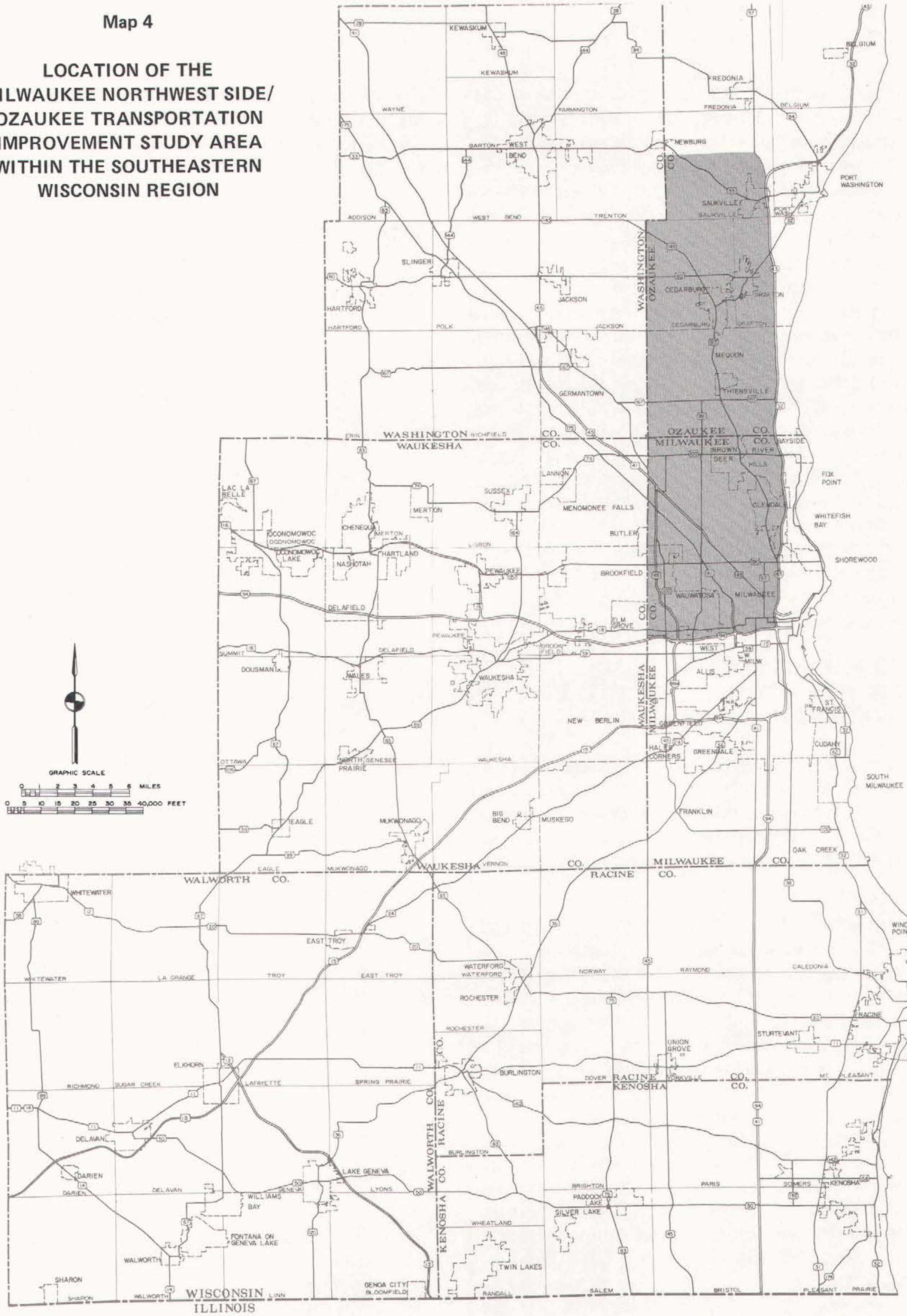
The prospectus determined that there were five major considerations that dictated the need for a transportation planning study of northwestern Milwaukee County and southern Ozaukee County:

1. The need to consider the transportation problems of the northwest quadrant of the Milwaukee urbanized area lying in Milwaukee and Ozaukee Counties as a result of the elimination of the Park Freeway-West and Stadium Freeway-North "gap closure" from the new year 2000 long-range regional transportation plan—The impact of the deletion of these two freeways on the proposed transportation system of the northwest side of the Milwaukee urbanized area was substantial. These two freeways were anticipated to carry, on an average weekday in the year 2000, approximately 63,000 automobile trips, serving 88,000 auto drivers and auto passengers, and 12,000 truck trips. More than 700 bus trips were planned to utilize these two freeways in serving 20,000 passengers on an average weekday in a modified rapid transit operation. Removal of the two freeways from the regional transportation plan left no readily apparent new way to provide rapid or modified rapid mass transit service to the northwest side of the Milwaukee urbanized area. The need for a reexamination of the best way to meet the needs of the northwestern quadrant of the Milwaukee urbanized area is particularly acute because freeway construction in the Park Freeway-West and Stadium Freeway-North "gap closure" corridors has been anticipated since the early 1950's and, as a consequence, major arterial street improvement or expansion in that area has been delayed.

2. The urgent need to deal with the inadequacies of the existing transportation system of the northwest quadrant of the Milwaukee urbanized area—A substantial portion of the arterial street mileage within the northwest side, particularly that within Milwaukee County, was carrying weekday traffic volumes in 1972 that were equal to

Map 4

LOCATION OF THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE TRANSPORTATION IMPROVEMENT STUDY AREA WITHIN THE SOUTHEASTERN WISCONSIN REGION

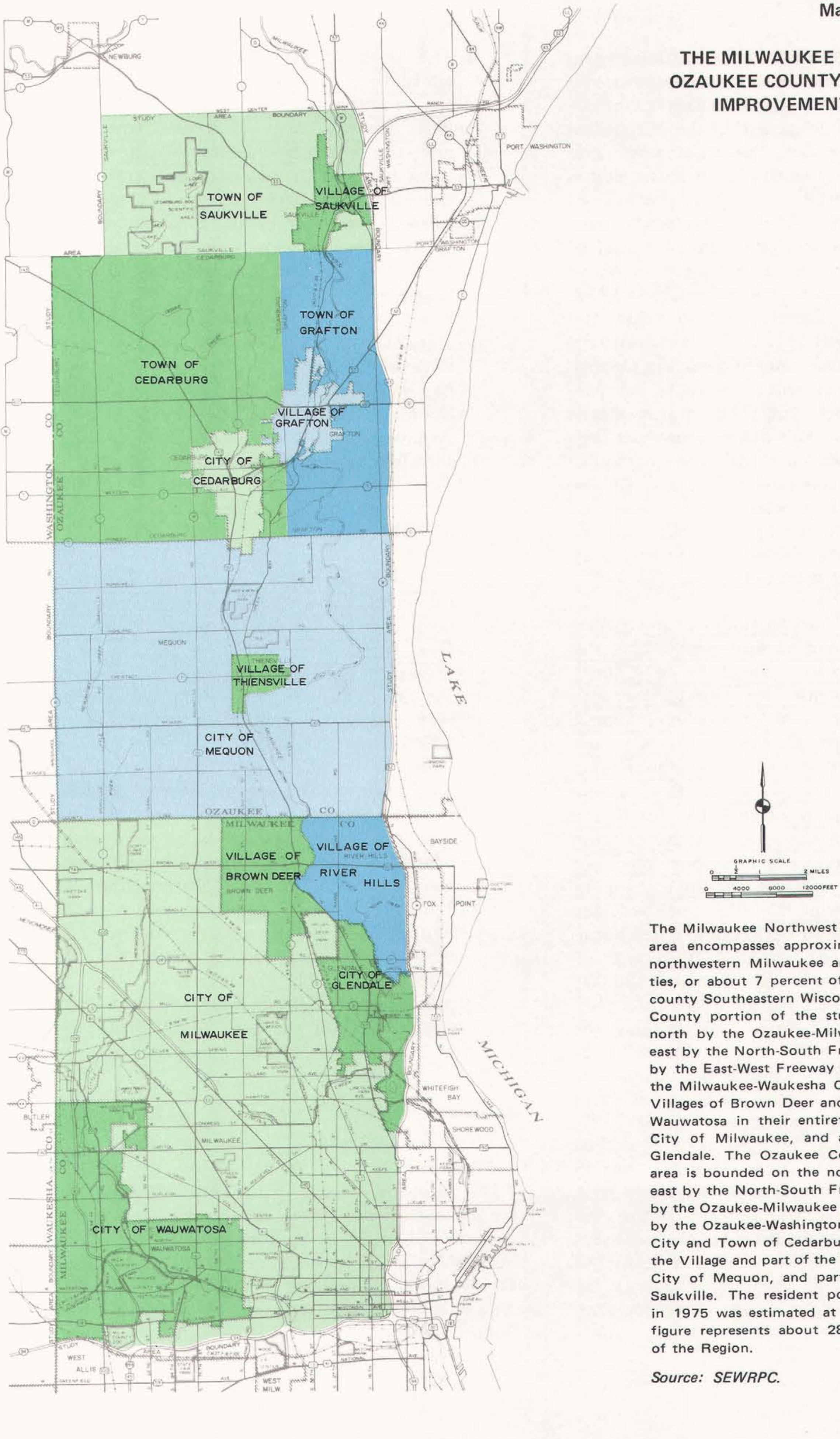


The Milwaukee Northwest Side/Ozaukee County study area comprises about 7 percent of the total area of the seven-county Southeastern Wisconsin Region, contains about 28 percent of the Region's population, and employs about 25 percent of its labor force. The study area consists of that part of the Region most affected by the removal of the Park Freeway-West and Stadium Freeway-North "gap closure" facilities from the new regional transportation system plan, and therefore requiring further study in order to determine the kinds of transportation system management and improvement actions that should be taken to meet the transportation needs of the area in the absence of these two freeways.

Source: SEWRPC.

Map 5

THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY AREA



The Milwaukee Northwest Side/Ozaukee County study area encompasses approximately 183 square miles in northwestern Milwaukee and southern Ozaukee Counties, or about 7 percent of the total area of the seven-county Southeastern Wisconsin Region. The Milwaukee County portion of the study area is bounded on the north by the Ozaukee-Milwaukee County line, on the east by the North-South Freeway (IH 43), on the south by the East-West Freeway (IH 94), and on the west by the Milwaukee-Waukesha County Line. It includes the Villages of Brown Deer and River Hills and the City of Wauwatosa in their entirety, the northern half of the City of Milwaukee, and a large part of the City of Glendale. The Ozaukee County portion of the study area is bounded on the north by Center Road, on the east by the North-South Freeway (IH 43), on the south by the Ozaukee-Milwaukee County line, and on the west by the Ozaukee-Washington County line. It includes the City and Town of Cedarburg, the Village of Thiensville, the Village and part of the Town of Grafton, part of the City of Mequon, and parts of the City and Town of Saukville. The resident population of the study area in 1975 was estimated at about 499,000 people. This figure represents about 28 percent of the population of the Region.

Source: SEWRPC.

or greater than its design traffic-carrying capacity, and consequently was experiencing traffic congestion. About 25 percent of the arterial street mileage within the Milwaukee County portion of the northwest side study area was operating at or above design capacity in 1972, and that portion of Ozaukee County within the study area contained more than 65 percent of all of the arterial facilities operating at or above design capacity in Ozaukee County in 1972. Recent traffic counts indicate that the traffic congestion problem in northwestern Milwaukee County and in Ozaukee County has increased, in some instances substantially, since that year. The northwestern quadrant of the Milwaukee urbanized area has also experienced a high level of traffic accidents over the past few years. Of the 30 worst street intersections in terms of traffic accidents in 1978 in the City of Milwaukee, 23 lie within or on the boundary of the northwest side study area.

3. The need to accommodate anticipated future growth and change within the Milwaukee Northwest Side/Ozaukee County area and the Region; the need to deal with the impacts of such growth and change on northwestern Milwaukee County and Ozaukee County and on the transportation system of this subarea of the Region; and the need to serve and direct this growth and change through adequate transportation facilities and services in a manner consistent with the public interest and the attainment of a high quality of life—The northwest side area is expected to experience a net population increase of about 20,000 and an employment increase of more than 50,000 under the adopted regional land use plan. Because the Park Freeway-West and the Stadium Freeway-North "gap closure" were removed, traffic congestion within the northwest side is forecast to remain at about the same level, proportionately, as in 1972, under the regional transportation plan, but is expected to be concentrated more in the southeastern portion of the study area. If the viability of this portion of the central city is to be maintained, the potential for minimizing these expected levels of traffic congestion through a variety of transportation alternatives deserves careful examination.

4. The need to consider permanent facility alternatives as eventual replacements for the once-temporary "stub ends" of the Park Freeway-West (Hillside Interchange) and the Stadium Freeway-North—Connections between the arterial street system and these two freeways have always been considered temporary, but with the removal of the Stadium Freeway-North "gap closure" and the Park Freeway-West from the long-range plan, the endings of these two freeways must now be regarded as permanent connections to the surface arterial network. Improvements should in particular be considered for the terminus of the Stadium Freeway-North near W. North Avenue and W. Lisbon Avenue. Since 1974, this freeway terminus has been among the three street intersections with the highest number of traffic accidents within the City of Milwaukee.

5. The need to consider the potential transportation facility and service requirements of proposed uses of the cleared Park Freeway-West corridor[5]—Ninety-nine percent of the necessary right-of-acquisition and clearance for this freeway segment as far west as Sherman Boulevard had been completed by 1977. Removal of the Park Freeway-West from the recommended plan has resulted in a corridor of cleared, vacant land 3.2 miles in length and having an area of about 111 acres, exclusive of existing street rights-of-way. The redevelopment of this corridor has been actively considered since early 1977. Because transportation facility improvements, which may be needed in lieu of the Stadium Freeway-North "gap closure" and Park Freeway-West, have the potential to influence redevelopment recommendations for the Park West corridor and, in turn, because redevelopment proposals

[5] *Milwaukee County Board Resolution No. 78-1227, adopted by the Milwaukee County Board on December 12, 1978, set forth a plan for the proposed disposition of the lands of the cleared Park West Freeway corridor allocating parcels to the State of Wisconsin, the City of Milwaukee, Milwaukee County, and the Milwaukee Public School System.*

for the corridor may result in a need to consider additional transportation facilities and services within the Park West area, a comprehensive study of transportation needs and alternatives for the northwest side of the Milwaukee urbanized area deserves consideration at this time.

THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY PLANNING PROCESS

The Milwaukee Northwest Side/Ozaukee County transportation improvement study utilizes a seven-step planning process to develop a recommended short-range transportation system plan and a recommended design year 2000 long-range transportation system plan for the northwest side of Milwaukee County and for the southern portion of Ozaukee County. Through this process the study area and its principal functional land use and transportation relationships are accurately described; the study area's existing and future transportation problems are quantified; and the effects of different courses of action with respect to transportation system management and development in the study area are quantitatively evaluated. The seven steps of the process are: 1) study design, 2) formulation of objectives, principles, and standards, 3) inventory, 4) analyses and forecasts, 5) plan preparation, testing, and evaluation, 6) plan selection and adoption, and 7) plan implementation.

Study Design

Essential to the coordination, efficient resource use, and orderly and expeditious advancement of the elements in any planning study is the determination early in the study of detailed work procedures, staff assignments, and time schedules. The first step in the Milwaukee Northwest Side/ Ozaukee County transportation improvement study was the preparation of a study design taking the form of staff memoranda setting forth the methods and procedures to be used and the time and resources required in each particular study work element. The memoranda were flexible enough to accommodate any unforeseen changes once the work is underway. The major elements of the Milwaukee Northwest Side/Ozaukee County transportation improvement study as set forth in the study design are outlined in Figure 2. In addition, in the study design phase of the study, the Steering Committee that guided the preparation of the study prospectus was expanded as recommended in the prospectus to a Citizens Intergovernmental and Technical Coordinating and Advisory Committee, shown in Appendix A, to guide the conduct of the study itself.

Formulation of Objectives, Principles, and Standards

The formulation of objectives in a planning process constitutes a formal definition of the desired characteristics of the system which is to be planned by listing the broad needs which the system being planned should aim to satisfy. The formulation of objectives for the Milwaukee Northwest Side/ Ozaukee County transportation improvement study is, therefore, an essential task in the study. Objectives have to be established before study area transportation system problems can be identified, alternative transportation system plans designed, the impacts of the alternative plans evaluated, and long- and short-range plans recommended for implementation. The objectives not only have to be clearly stated and logically sound, but have to be related in a demonstrable way to alternative plans so as to permit evaluation of the relative desirability of those plans. To satisfy this need in the study, logically conceived and clearly expressed objectives were translated into quantifiable standards to provide the basis for problem identification, plan development and evaluation, and plan selection.

Inventory

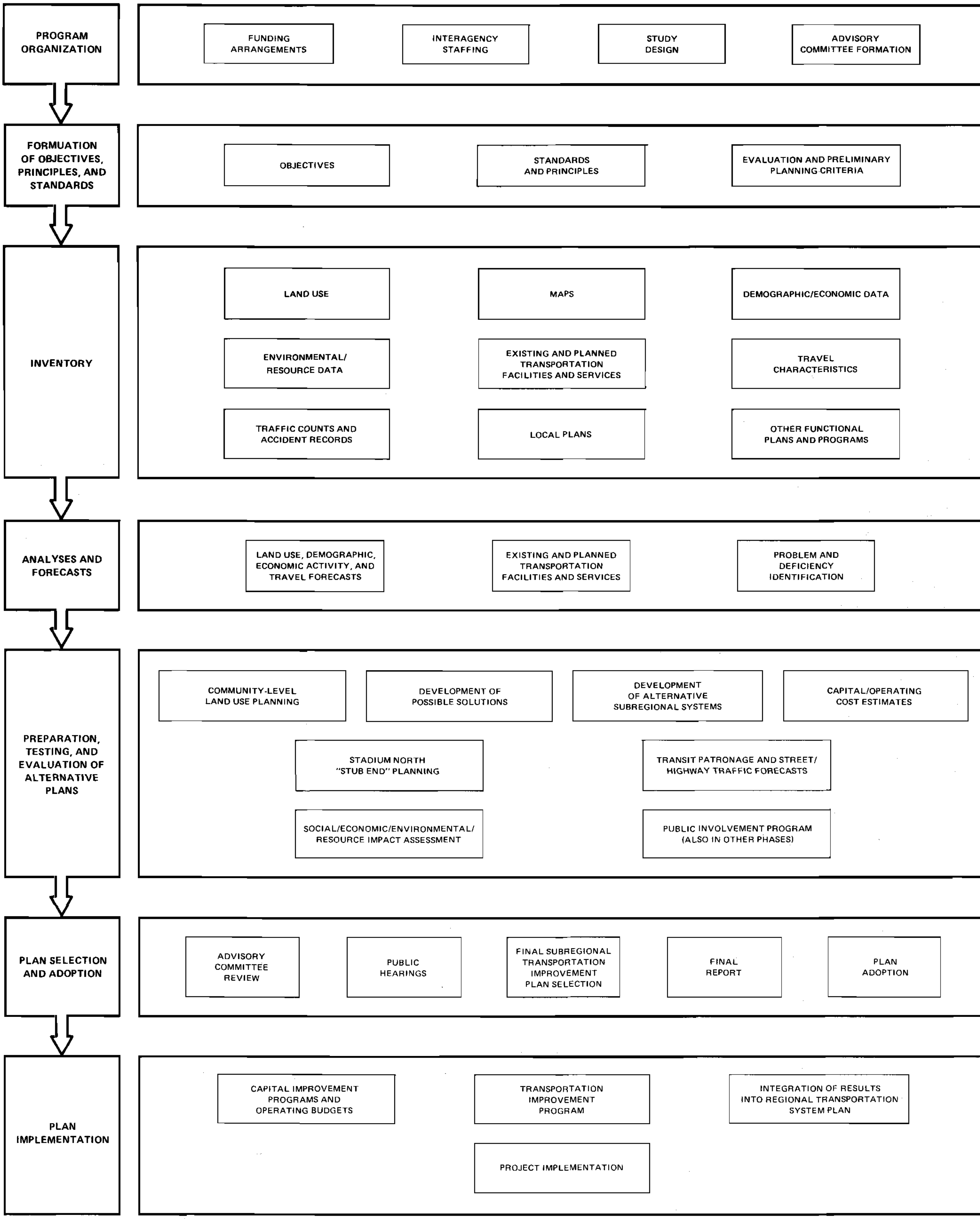
Reliable basic planning and engineering data are required for the sound conduct of planning analyses and for plan preparation and evaluation in any planning program. Inventory, consequently, is the first operational step in the study planning process, growing out of the study design. To a large extent, the necessary data for this study were collated from information already acquired, rather than collected through direct measurement as a part of the study planning program. The basic types of inventory data gathered for the study included base maps, land use data, demographic characteristics, economic activity data, existing transportation facility and service physical and operational characteristics, travel characteristics, traffic counts and accident records, environmental and resource data, and local plans and programs data.

Analyses and Forecasts

Analyses of existing conditions and forecasts of future conditions are necessary to the selection of the best short- and long-range transportation

Figure 2

MAJOR PHASES OF THE MILWAUKEE NORTHWEST SIDE/ OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY



Source: SEWRPC

plans for a planning area, as they permit the identification of problems and the development and evaluation of alternative proposed transportation improvements. Economic activity and population forecasts allow future development patterns to be scaled in the area. These patterns can, in turn, be translated into probable future demand for transportation facilities and services following analyses of the existing relationships between land use activity and travel demand. Forecast transportation problems and deficiencies can then be identified and alternative solutions developed and evaluated. Analyses conducted under the study include, importantly, the identification of existing and probable future transportation problems.

Preparation, Testing, and Evaluation of Alternative Transportation Plans

The preparation and evaluation of alternative transportation system plans is conducted for both short- and long-range horizons under this study. In the short range, transportation systems management (TSM) alternatives are explored as potential solutions to existing arterial street and highway problems.[6] Also, transit service improvements are explored as solutions to the area's current transit system deficiencies.

Following the consideration of these short-range transportation alternatives to existing problems, the study focuses upon probable future problems and alternative long-range solutions thereto. The transit element of the long-range plan for the study area—including primary, secondary, and tertiary components[7]—is based largely upon the transit element of the adopted long-range transportation system plan for two reasons. First, the local and secondary, or express, elements of the adopted regional transit plan were selected and adopted as part of the regional transportation system plan reevaluation with little debate or disagreement.[8] The adopted local and express transit system for the study area is more extensive than the existing system, and there was a consensus that little need existed to reopen this issue through examination of alternatives. Second, the primary, or modified rapid or rapid, component of the transit system of

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[6] *Transportation systems management refers to a variety of transit facility and service, traffic engineering, and travel demand modification actions which are primarily of a low capital investment nature, and which have a general objective of enhancing the efficiency of existing transportation facilities and services. These actions can be divided into four categories: those actions directed toward the more efficient use of existing road space; those actions directed toward the reduction of vehicle use in congested areas; those actions which would improve transit service; and those actions which would increase internal transit management efficiency.*

[7] *Primary public transit service is that component of the urban public transit system which provides rapid transit service on exclusive guideways or modified rapid transit service on freeways for trips in the most heavily traveled corridors of the transit system service area. The operating speeds of primary transit service are the highest of those of the public transit system, and the length of the trips served by primary transit are the longest. Stops on the primary transit system, however, are generally located a distance of one mile or more apart, making it the least accessible element of the public transit system.*

Secondary transit service is that component of the urban public transit system which provides express transit service over arterial streets and highways. Stops are generally located only at intersecting transit routes and major traffic generators. The operating speeds provided, and the length of the trips served, are usually less than those characteristic of primary transit service.

Tertiary public transit service is that component of the urban public transit system which provides either a local service for trips of short length, or a collection-circulation-distribution feeder service to the secondary and primary transit services. Operating speeds provided by tertiary service are low, but accessibility to the service is high as stops are generally located no more than a quarter-mile apart. The coverage of tertiary transit service in an urbanized area is much greater than that of primary and secondary transit service, which is used only to interconnect and serve major land use activities. Tertiary transit service routes are generally located throughout an urbanized area at spacings of one-half to one mile.

[8] *See 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, formally adopted by the Commission on May 30, 1978.*

the adopted plan generated considerable differences of opinion under the long-range transportation system plan reevaluation, and removal of the two freeways from the adopted plan effectively eliminated the possible provision of primary transit service to the northwestern quadrant of the Milwaukee urbanized area by the use of motor buses operating over exclusive transit lanes which were to have been provided in these freeways. A study is presently being conducted by the Commission of alternative means of providing primary transit service in the Milwaukee area.[9] It was not considered appropriate for this northwest side study to consider further extensive primary transit alternatives apart from the specific study of Milwaukee area primary transit. It was considered appropriate and desirable, however, to consider additional express transit alternatives and to coordinate the specific primary transit considerations of the northwest side with the concurrently conducted study of primary transit in the greater Milwaukee area.

Arterial street and highway transportation system management alternatives are considered in the long-range plan based on the selected short-range system management recommendations and the investigation of additional long-range management actions. Following consideration of the full potential effects of transit improvements and transportation system management measures, alternative transportation system plans, consisting primarily of the one remaining transportation alternative for the area—arterial street improvement—are developed and evaluated as potential solutions to the long-range problems which would remain following short- and long-range transportation system management and transit improvement. Detailed estimates of costs, disruption, and other negative impacts attendant to these facility improvements are developed for each individual facility improvement alternative. This project-level evaluation was included in the study to reduce the need for further cycling between system and project planning for arterial street improvement in the study area.

Plan Selection and Adoption

Following preliminary recommendation of the short-range and long-range plans by the Advisory Committee and public hearings on these preliminary findings, one short-range and one long-range system plan for the area were chosen from among the alternatives as the final transportation improvement plan by the Advisory Committee and were adopted by the Commission as amendments to the adopted long-range regional transportation system plan for the Southeastern Wisconsin Region and to the adopted transportation systems management plan for the Milwaukee urbanized area. The final plans clearly identify all transportation systems management, public transit, and arterial street and highway improvements recommended for implementation, together with a recommended staging for each improvement and a recommended implementing agency.

Plan Implementation

The actions which must be taken by the various levels and agencies of government concerned if the recommended short- and long-range transportation system plans are to be carried out are outlined. Those units and agencies of government with applicable plan adoption and implementation powers are identified, necessary plan adoption actions are specified, and specific implementation actions are recommended.

Public Involvement

Public involvement was recognized as an important element of the study and, while a variety of public involvement mechanisms were utilized including public informational meetings and public hearings, the study relied primarily on the involvement of the Advisory Committee, composed of citizens as well as elected officials and technicians (see Appendix A).

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[9] *See Milwaukee Area Primary Transit System Alternatives Analysis Prospectus, SEWRPC, formally adopted by the Commission on September 14, 1978. This prospectus calls for a study of the feasibility of exclusive guideway transit systems for the Milwaukee area. Because removal of the Park Freeway-West and Stadium Freeway-North "gap closure" from the adopted regional transportation system plan effectively eliminated the possibility of the provision of primary transit service to the northwest quadrant of the Milwaukee urbanized area by motor buses operating on freeways, the only remaining means of providing primary transit service for the area is via an exclusive transit guideway. This alternative will be examined as part of the Milwaukee area primary transit system alternatives analysis. Recommendation of major transit capital investment in the Milwaukee Northwest Side/Ozaukee County area under the alternatives analysis is a possibility.*

STUDY ORGANIZATION

The Milwaukee Northwest Side/Ozaukee County transportation improvement study was carried out through the cooperative participation of the Regional Planning Commission, the Wisconsin Department of Transportation, and concerned and affected local governmental agencies. The Commission assumed lead agency responsibility for the entire study, and specifically carried out those work elements which logically were considered of a general regional planning nature. The Wisconsin Department of Transportation (WisDOT), District 2; the City of Milwaukee; Milwaukee County; and the Milwaukee County Transit System worked closely with the Commission staff in the Milwaukee portion of the study, and conducted all detailed short-range Milwaukee County transit planning and all project-level arterial street and highway planning in the study. WisDOT, District 2; Ozaukee County; and concerned local municipalities participated closely in the Ozaukee County portion of the study.

SCHEME OF PRESENTATION

The major findings and conclusions of the Milwaukee Northwest Side/Ozaukee County transportation system improvement study are presented in this planning report. A series of technical reports has also been prepared to more fully document some of the more detailed technical aspects of the work, which require only a summary in the planning report. Chapter II of this report presents the objectives, principles, and standards for transportation development and management for this study. A summary of the existing characteristics of the Milwaukee Northwest Side/Ozaukee County area is presented in Chapter III. Chapter IV outlines the existing problems and deficiencies of the current transportation system in the study area. Chapter V presents a comparison and evaluation of the short-range transportation systems management and transit service improvements considered in the study as potential alternative solutions to those existing problems, and the recommended short-range transportation system plan for the Milwaukee Northwest Side/Ozaukee County area. Chapter VI summarizes planned and forecast future socioeconomic and land use characteristics of the Milwaukee Northwest Side/Ozaukee County area. Chapter VII identifies the long-range transportation system alternatives for transportation systems management, public transit, and arterial street and highway physical improvement considered as potential solutions to the identified future transportation system problems, and sets forth the recommended long-range transportation system plan for the Milwaukee Northwest Side/Ozaukee County area. Chapter VIII outlines the actions that must be taken by the various levels and agencies of government if the recommended long-range and short-range plans for the study area are to be implemented. Finally, a summary of the report and conclusions regarding long-range and short-range transportation system problems in the study area and recommended solutions to those problems are presented in Chapter IX.

SUMMARY

In an attempt to reach a compromise on the division of public opinion and resulting impasse in freeway and related transportation system development in Milwaukee County, the Regional Planning Commission staff recommended that the new long-range transportation system plan have a freeway component consisting of two tiers, an upper tier and a lower tier. However, citizen and public official reaction at and following public hearings for the proposed two-tier plan indicated that such a plan, although intended to provide a compromise, would be more likely to further intensify the division of public opinion concerning two freeways in Milwaukee County: the Park Freeway-West and the Stadium Freeway-North "gap closure." As a consequence, the Regional Planning Commission, after considering the advantages and disadvantages of these two facilities, deleted the Stadium Freeway-North "gap closure" and the Park Freeway-West from the proposed regional transportation plan while approving all other staff recommendations. As part of this action, the Regional Planning Commission resolved to undertake a study to be conducted in cooperation with the Wisconsin Department of Transportation, Ozaukee County, Milwaukee County, the City of Milwaukee, and concerned citizens of the best way to meet the existing and probable future transportation needs of the area proposed to be served by these two freeways in absence of those two freeways.

On February 6, 1978, the Executive Committee of the Commission directed the Commission staff to undertake the work necessary to prepare a prospectus for a study of existing and future transportation problems in the northwestern quadrant of the Milwaukee area, and appointed a 16-member special steering Committee to assist the Commission staff in that effort. The prospectus was to identify the need for such a study and, if a need was found to exist, determine the desirable scope and content of the study and recommend a time schedule, cost estimate, and budget for the study.

The prospectus found that there were five major considerations that dictated the need for a transportation planning study of this area:

1. The need to consider the transportation problems of the northwest quadrant of the Milwaukee urbanized area lying in Milwaukee and Ozaukee Counties as a result of the elimination of the Park Freeway-West and Stadium Freeway-North "gap closure" from the new year 2000 long-range regional transportation plan;
2. The need to deal with the traffic-carrying capacity inadequacies of the existing transportation system of the northwest quadrant of the Milwaukee urbanized area;
3. The need to accommodate anticipated future growth and change within the Milwaukee Northwest Side/Ozaukee County area;
4. The need to consider permanent facility alternatives as eventual replacements for the once-temporary "stub ends" of the two concerned freeways to adequately provide connection to the arterial street system; and
5. The need to consider the potential transportation facility and service requirements of alternative uses of the cleared Park Freeway-West corridor.

The findings and recommendations presented herein were developed through a planning process consisting of the following seven steps: 1) study design, 2) formulation of objectives, principles, and standards, 3) inventory, 4) analyses and forecasts, 5) plan preparation, testing, and evaluation, 6) plan selection and adoption, and 7) plan implementation. Through the seven-step planning process, the study explored physical improvement and transportation system management alternatives as solutions to short- and long-range problems identified for both the arterial highway system and transit system of the Milwaukee Northwest Side/ Ozaukee County area.

Following preliminary recommendation of short-range and long-range plans and public hearings, one short-range and one long-range system plan for the area were chosen from among the alternatives as the final transportation improvement plans. The final plans, as identified herein, clearly identify all transportation systems management, public transit, and arterial street and highway improvements recommended for implementation, together with a recommended staging for each improvement and a recommended implementing agency.

Chapter II

OBJECTIVES, PRINCIPLES, AND STANDARDS

INTRODUCTION

In any transportation planning process, the formulation of objectives constitutes a formal definition of the desired characteristics of the transportation system being planned. The formulation of objectives for transportation system management and development in the Milwaukee Northwest Side/Ozaukee County area is therefore an essential task which must be undertaken before transportation problems can be systematically identified, alternative transportation plans logically designed, the impacts of alternative plans evaluated, and a plan recommended for implementation.

It is important to recognize that the formulation of objectives essentially involves a formal definition of needs, and that, as a consequence, the defined objectives explicitly reflect an underlying value system for the residents of the area for which the planning is conducted. The diverse and often conflicting nature of personal values concerning transportation in any large urban community complicates this problem of objective formulation and makes it one of the most difficult tasks in the transportation planning process.

Because it recognizes the value system implications inherent in any set of planning objectives, the Commission, since its inception, has provided for the involvement of interested and knowledgeable public officials, technicians, and private citizens in the transportation planning process. This participation by elected or appointed public officials and by citizen leaders in the planning process, including the formulation of objectives, is implicit in the structure and organization of the Southeastern Wisconsin Regional Planning Commission. Moreover, through its establishment of advisory committees to assist the Commission and its staff in the conduct of its planning programs, the Commission has provided an even broader opportunity for the active participation of public officials and private interest groups in the regional planning process.

The use of advisory committees has been, and still appears to be, the most practical and effective way available to involve public officials, technicians, and citizen leaders in the transportation planning process and to openly arrive at decisions and action programs which can shape the future development and present management of the Region's transportation system. Only by combining the accumulated knowledge, experience, views, and values of the various advisory committee members concerning the transportation system can a meaningful expression of the desired direction, magnitude, and quality of the future development and current management of that system be obtained.

The advisory committee structure established by the Commission for the preparation of short- and long-range transportation system plans for the Milwaukee Northwest Side/Ozaukee County area has been described in Chapter I of this report. One of the major tasks of the Advisory Committee in this effort was to assist in the formulation of transportation system objectives and supporting planning principles and standards.

The transportation system objectives formulated for this study are similar, but not identical, to the adopted long-range regional transportation system plan objectives and the Milwaukee urbanized area short-range transportation systems management objectives. The strong parallels among these three sets of objectives result from the fact that transportation planning objectives, as already indicated, serve to define formally the basic needs which transportation facilities and services should satisfy, such as land use accessibility, personal mobility, economic efficiency, environmental quality, and public safety. These transportation planning objectives, which are essentially a list of basic transportation needs, should not be expected to change from subarea to subarea of the Region, or with the time frame of the planning effort. However, the importance or priority of the planning objectives, and the constraints on the attainment of those objectives, within subareas of the Region such as the Milwaukee Northwest Side/Ozaukee County area may be expected to differ from those of other subareas of the Region or from those of the Region as a whole.

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 planning work which are equally subject to a wide range of interpretation and application. Therefore, in order to provide a common frame of reference, the following definitions have been adopted in previous Commission planning efforts:

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

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

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

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

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

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

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

OBJECTIVES

In order to be useful in the Milwaukee Northwest Side/Ozaukee County transportation improvement study, objectives must be logically sound, clearly stated, and derived from local values. Moreover, objectives must be related in a demonstrable and measurable way to alternative transportation plans to facilitate objective tests of, and intelligent selection from among, alternative plans. Specific objectives which can be directly related to system plans and can be at least crudely quantified were postulated for transportation system management and development in the Milwaukee Northwest Side/Ozaukee County area. The quantification of objectives for alternative plan design, evaluation, and selection was facilitated by complementing each specific objective with a set of standards. These standards are, in turn, directly relatable to a planning principle which supports the chosen objective.

The objectives adopted for transportation system management and development are concerned with providing to the area a balanced transportation system which will facilitate convenient travel at a high level of safety and aesthetic quality, while minimizing costs and disruption of the communities and natural resource base of the area. The following objectives have been adopted by the Commission after careful review and upon recommendation from the study advisory committee:

1. An integrated transportation system which, through its location, capacity, and design, effectively serves the existing land use pattern of northwestern Milwaukee County and southern Ozaukee County and promotes the implementation of the regional land use plan, meeting the current and anticipated travel demand generated by the existing and proposed land uses.

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

3. A balanced transportation system which provides the appropriate types of transportation needed by all residents of the northwestern portion of Milwaukee County and southern Ozaukee County, regardless of race, color, or national origin, at an adequate level of service.

4. A transportation system which minimizes the disruption of existing and desirable future neighborhood and community development, including adverse impacts upon the property tax base, and of the natural resource base.

5. A transportation system which facilitates quick and convenient travel among component parts of northwestern Milwaukee County and southern Ozaukee County, and between that area and other component parts of the Region.

6. A transportation system which reduces accident exposure and provides for increased travel safety in northwestern Milwaukee County and southern Ozaukee County.

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

PRINCIPLES AND STANDARDS

Complementing each of the foregoing specific transportation systems management and development objectives are a planning principle and a set of standards, as set forth in Table 1. A planning principle supports each specific objective by asserting its validity. Each set of standards is directly related to the planning principle, as well as to the objective, and serves to facilitate quantitative application of the objectives in plan design, testing, and evaluation. The planning standards provide either comparative or absolute measurements. The comparative standards provide a measure or criterion for comparison among alternative plans. The absolute standards provide absolute measures of alternative plan objective attainment, specifying minimum, maximum, or desirable values of objective attainment. The standards identified for each planning objective are intended to include all relevant and important measures which would indicate the attainment of the objective, while limiting the measures included to those that can be quantified with reasonable effort, thus keeping the entire set of measures to a level which can be worked with and comprehended in the plan evaluation process.

OVERRIDING CONSIDERATIONS

In the application of the planning standards and in the selection of a recommended transportation system plan, several overriding considerations must be recognized. First, the recommended plan must be consistent with the adopted short-range Milwaukee urbanized area transportation systems management plan and the adopted long-range regional transportation system plan. Actions recommended in the transportation system plan for the Milwaukee Northwest Side/Ozaukee County transportation improvement study should not conflict with the adopted areawide plans, but should be consistent with those plans.

Second, it must be recognized that each proposed alternative transportation system plan must constitute an integrated system. It is not possible from an application of the standards alone, however, to ensure such a system since the standards cannot be used to determine the effect of individual facility management or improvement actions on each other or on the system as a whole. This requires the application of traffic simulation models to quantitatively test the proposed system, thereby permitting adjustment of the spatial distribution and capacities of the system to the future travel demand as derived from the land use plan.

Third, an evaluation should be conducted of the flexibility of the alternative transportation plans. A transportation plan which is flexible will permit relatively ready adaptation to changes in travel demand or transportation technology. Unforeseen changes in travel demand or transportation technology, although unlikely, may occur during and beyond the time frame of long-range transportation plans. Consequently, each plan's ability to accommodate changes in travel demand and transportation technology other than the anticipated changes should be at least qualitatively explored.

Fourth, all planned transportation facilities and services, but particularly public transit facilities and services, must be designed to meet the special needs of transportation handicapped people, including both the physically and mentally disabled, unless specialized transportation services are proposed to be provided to adequately meet their needs.

Fifth, it must be recognized that an overall evaluation of each transportation plan must be made on the basis of cost. Such an analysis may show that the attainment of one or more of the planning standards is beyond economic capabilities, and, therefore, that the standards cannot be met practically and must be either modified or eliminated.

Sixth, it must be recognized that it is unlikely that any one plan will meet all of the standards completely, and that the extent to which each standard is met, exceeded, or violated must serve as a measure of the ability of each alternative plan to achieve the specific objective which the given standard complements. In this respect, it must be recognized that certain objectives and standards may be in conflict, requiring resolution through compromise, and that meaningful plan evaluation can take place only through a comprehensive assessment of each of the alternative plans against all of the standards.

Table 1

MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY
TRANSPORTATION SYSTEM MANAGEMENT AND DEVELOPMENT OBJECTIVES

OBJECTIVE NO. 1

An integrated transportation system which, through its location, capacity, and design, effectively serves the existing land use pattern of northwestern Milwaukee County and southern Ozaukee County, and promotes the implementation of the regional land use plan, meeting the current and anticipated travel demand generated by the existing and proposed land uses.

PRINCIPLE

A transportation system serves to interconnect the various land use activities within a planning area, thereby providing the attribute of accessibility essential to the support of these activities. Through its effect on accessibility, the transportation system can be used to support and induce development in desired locations and to separate incompatible land uses.

STANDARDS

1. The transportation system should, without regard to color, race, or national origin, provide service within the urbanized portion of the study area such that a maximum number of residents are within:

   a. 30 minutes overall travel time[a] of 40 percent of the Milwaukee urbanized area's employment opportunities;

   b. 35 minutes overall travel time of three major retail and service centers;[b]

   c. 30 minutes overall travel time of a major medical center or a hospital and/or medical clinic;

   d. 40 minutes overall travel time of a major park and outdoor recreation area;[c]

   e. 40 minutes overall travel time of a technical or vocational school, college, or university; and

   f. 60 minutes overall travel time of a scheduled air transport facility.

2. The relative accessibility provided by the transportation system should be adjusted to the adopted regional land use plan, providing to areas in which development is to be induced a higher relative accessibility than that provided to areas which should be protected from development.

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 which can be devoted to the transportation system of the study area are limited, and any undue investment in transportation facilities and services must occur at the expense of transportation investment in other areas of the Region and, more generally, of all other public and private investment. Therefore, total transportation costs should be minimized for the desired level of transportation service.

STANDARDS

1. The sum of transportation system operating and capital investment costs should be minimized.

2. The direct benefits derived from transportation system improvements should exceed the direct costs of such improvements.

Table 1 (continued)

3. Full use of all existing major transportation facilities should be encouraged through low and noncapital-intensive techniques, and such use shall be ensured before capital-intensive techniques are proposed.

4. The amount of energy utilized in the operation of the transportation system, particularly petroleum-based motor fuels, should be minimized.

OBJECTIVE NO. 3

A balanced transportation system which provides the appropriate types of transportation needed by all residents of the northwestern portion of Milwaukee County and southern Ozaukee County, regardless of race, color, or national origin, at an adequate level of service.

PRINCIPLE

A balanced transportation system, consisting of highway and public transit transportation 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. The highway component supplies transportation service primarily for passenger movements utilizing automobiles, taxicabs, and buses and for goods movements utilizing trucks and buses. The public transit component supplies transportation service for those passenger movements utilizing buses, vans, and taxicabs, and particularly for that segment of the population which cannot or does not utilize automobiles regularly, including, but not limited to, the handicapped, the elderly, and the isolated rural populations where specialized transportation service is required. In addition, the public transit component supplies additional passenger transportation system capacity which can efficiently accommodate travel demand in high-density urban corridors, alleviating peak loadings on highway facilities and resulting in decreased congestion and associated energy consumption, air pollution, and demand for land necessary for highway transportation and for parking facilities at major land use activities.

STANDARDS

1. Arterial streets and highways should be provided at intervals of no more than one-half mile in each direction in urban high-density areas, at intervals of no more than one mile in each direction in urban medium- density areas, at intervals of no more than two miles in each direction in urban low-density and suburban-density areas, and at intervals of no more than two miles in each direction in rural areas.[d]

2. Primary[e] and secondary[e] public transit routes should connect and serve[f] areas of concentrated land use activities consisting of:

   a. major retail and service centers;

   b. major industrial centers;[g]

   c. major medical centers or hospitals and/or medical clinics;

   d. major park and outdoor recreational areas;

   e. technical or vocational schools, colleges, and universities;

   f. scheduled air transport terminals; and

   g. high-density residential areas.

3. Tertiary[e], or local, public transit service should have route spacings not exceeding one mile in low-density areas, and one-half mile in medium-density and high-density areas.

Table 1 (continued)

4. Public transit routes should be direct in alignment with a minimum number of turning movements.

5. Public transit routes should be arranged so as to minimize duplication of service.

6. Public transit routes should be arranged so as to minimize the total number of transfers required.

7. Passenger stop locations along primary public transit lines should be located at terminal areas and at distances of one-half mile or more apart along the line haul route.

8. Passenger stop locations along secondary public transit lines should be located at terminal areas and at intersections with other transit routes or at intersections adjacent to major land use activities.

9. Passenger stop locations along tertiary public transit lines should be no less frequent than 660 to 1,250 feet apart, but through commercial and residential areas no more frequent than 12 per mile.

10. The number of residents served by public transit should be maximized. Urban residential land is considered served by public transit when such land is within the following distances of the various types of public transit service:

Type of Mass Transit Service	Maximum Distance		Maximum Overall Travel Time
	Walking	Driving	Feeder Bus
Primary	½ Mile	3 Miles	15 Minutes
Secondary	½ Mile	3 Miles	- -
Tertiary	¼ Mile	- -	- -

11. The number of employment opportunities served by public transit should be maximized. Employment opportunities are considered served by public transit when within the following distances of the various types of public transit:

Type of Mass Transit Service	Maximum Distance
	Walking
Primary	½ Mile
Secondary	½ Mile
Tertiary	¼ Mile

12. Sufficient off-street automobile parking should be provided at park-and-ride primary transit stations to accommodate the total parking demand generated by trips which change from auto to public transit modes.

13. The public transit system should be operated so as to provide adequate transit vehicle capacity to meet travel demand. The average maximum load factor[h] should not exceed 1.00 in primary, secondary, and tertiary mass transit service in off-peak periods. The load factor in peak periods should not exceed 1.00 in primary public transit service, 1.25 in secondary public transit service, and 1.33 in tertiary public transit service.

Table 1 (continued)

OBJECTIVE NO. 4

A transportation system which minimizes the disruption of existing and desirable future neighborhood and community development, including adverse impacts upon the property tax base, and of the 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 transportation facilities and services.

STANDARDS

1. The dislocation of households, businesses, industries, and public and institutional buildings, as measured by the number and value of the facilities to be displaced by the reconstruction of existing, or the construction of new, transportation facilities, should be minimized.

2. The amount of land used for transportation facilities should be minimized.

3. The penetration of neighborhoods and communities by arterial streets and highways and by primary public transit routes should be minimized.

4. The destruction of historic buildings and of historic, scenic, scientific, archaeological, and cultural sites by the reconstruction of existing, or the construction of new, transportation facilities should be minimized.

5. The transportation system should be located and designed so as to minimize the exposure of the population to harmful, as well as annoying, noise levels.i

6. The transportation system should be located, designed, and operated so as to minimize the amount of air pollutants generated.

7. The proper use of land for, and adjacent to, transportation facilities should be maximized and the disruption of future development minimized through advance reservation of rights-of-way for future development.

OBJECTIVE NO. 5

A transportation system which facilitates quick and convenient travel among component parts of northwestern Milwaukee County and southern Ozaukee County, and between that area and other component parts of the Region.

PRINCIPLE

To support the everyday activities of business, shopping, and social intercourse, a transportation system which provides for reasonably fast, convenient travel is essential. Congestion increases the cost of transportation, including the cost of the journey to work, and is reflected in higher production costs, thereby adversely affecting the relative market advantages of businesses and industries in the planning area.

STANDARDS

1. Total passenger hours of travel should be minimized.

2. Total vehicle hours of travel should be minimized.

3. Total vehicle miles of travel should be minimized.

Table 1 (continued)

4. The proportion of the total actual street and highway system subject to congestion, as measured by a peak-hour volume-to-design capacity ratio of 1.10 or greater,[j] should be minimized.

5. The proportion of the total arterial street and highway and transit system operating at travel speeds below those speeds specified below should be minimized:

Transportation System Component	Overall Travel Speed by Area (mph)		
	Central Business District	Urban	Rural
Freeway	35	40	50
Expressway	25	30	50
Standard Arterial			
Divided	15	25	45
Undivided.	15	20	40
Primary Transit.	10	30	40
Secondary Transit	10	20	40
Tertiary Transit.	5	10	40

6. The surface condition of the arterial street and highway system should be of adequate quality, specifically so as not to inhibit an otherwise safe and convenient travel speed.

7. Public transit overall travel times should be comparable to arterial street overall travel times among component parts of the study area, and between parts of the area and the remainder of the Milwaukee transit service area.

8. Frequency of public transit service should be sufficient to accommodate passenger volume so as not to exceed specified load factors, but should not in any case be less than one vehicle every 30 minutes during the peak periods, or one vehicle every 60 minutes during off-peak periods.

9. Transit ridership should be maximized.

10. The transportation system should provide such service so as to maximize the number of industrial centers in the study area within:

a. 30 minutes overall travel time of 50 percent of the study area's resident population;

b. 30 minutes overall travel time by truck of the Milwaukee port facility;

c. 15 minutes overall travel time by truck of a railroad team track; and

d. 10 minutes overall travel time by truck of a freeway entrance and exit.

OBJECTIVE NO. 6

A transportation system which reduces accident exposure and provides for increased travel safety in northwestern Milwaukee County and southern Ozaukee County.

Table 1 (continued)

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 the severity of accidents.

STANDARDS

1. Travel on facilities exhibiting the lowest accident exposure should be maximized.

2. The proportion of the total arterial street and highway system operating during peak hours at a volume-to-design capacity ratio of 0.9 should be maximized.

3. Conflicts between pedestrians and vehicular traffic patterns should be minimized.

OBJECTIVE NO. 7

A transportation system with a high aesthetic quality whose major facilities have 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. Transportation facility construction plans should be developed using sound geometric, structural, and landscape design standards which consider the aesthetic quality of the transportation facilities and the areas through which they pass.

2. Transportation facilities should be located so as to avoid destruction of visually pleasing buildings, structures, and natural features and to avoid interference with vistas to such features.

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[a] *Overall travel time is defined as the total door-to-door time of travel from origin to destination, including the time required to arrive at the vehicle and leave the vehicle as well as route travel time.*

[b] *Major retail and service centers, as defined by the Commission, are those retail and service lands within designated community central business districts, strip shopping districts, and shopping centers which meet at least five of the following six criteria: 1) two or more department stores; 2) 10 or more additional retail and service establishments; 3) a combined average annual sales totaling $30 million or more; 4) a combined net site area of 20 acres or more; 5) the attraction of 3,000 shopping trips or more on an average weekday; and 6) accessibility to a population of at least 100,000 in a radius of 10 miles, or 20 minutes one-way travel time.*

[c] *Major park and outdoor recreation areas, as defined by the Commission, are those public multiple-use outdoor recreation sites having an area of 250 acres or more.*

[d] *Urban residential density categories as defined for Milwaukee County are: urban high density, 8,000 to 20,000 persons per gross square mile; urban medium density, 3,000 to 7,999 persons per gross square mile; urban low density, 900 to 2,999 persons per gross square mile; and suburban density, 275 to 899 persons per gross square mile. Urban residential density*

Table 1 (continued)

categories as defined for Ozaukee County are: urban high density, 10,700 to 25,000 persons per gross square mile; urban medium density, 4,000 to 10,699 persons per gross square mile; urban low density, 1,200 to 3,999 persons per gross square mile; and suburban density, 370 to 1,199 persons per gross square mile.

[e] *Primary public transit service is that component of the urban public transit system which provides rapid transit service on exclusive guideways or modified rapid transit service on freeways for trips in the most heavily traveled corridors of the transit system service area. The operating speeds of primary transit service are the highest of those of the public transit system, and the length of the trips served by primary transit are the longest. Stops on the primary transit system, however, are generally located a distance of one mile or more apart, making it the least accessible element of the public transit system.*

Secondary transit service is that component of the urban public transit system which provides express transit service over arterial streets and highways. Stops are generally located only at intersecting transit routes and major traffic generators. The operating speeds provided, and the length of the trips served, are usually less than those characteristic of primary transit service.

Tertiary public transit service is that component of the urban public transit system which provides either a local service for trips of short length, or a collection-circulation-distribution feeder service to the secondary and primary transit services. Operating speeds provided by tertiary service are low, but accessibility to the service is high as stops are generally located no more than a quarter-mile apart. The coverage of tertiary transit service in an urbanized area is much greater than that of primary and secondary transit service, which is used only to interconnect and serve major land use activities. Tertiary transit service routes are generally located throughout an urbanized area at spacings of one-half to one mile.

[f] *The terms "connect" and "serve" used together are defined as the linking of major trip destinations by one or more scheduled routes.*

[g] *Major industrial centers, as defined in the Commission's adopted regional land use plan, are those contiguous U. S. Public Land Survey quarter sections having 250 acres or more of net industrial land or a minimum of 3,500 industrial employees.*

[h] *The average maximum load factor is defined as the ratio of the number of passengers carried on public transit vehicles past the maximum load point of any route to the seating capacity of those vehicles past that point in the peak flow direction during the operating period.*

[i] *Annoying noise levels are defined as the maximum desirable outside noise level for residences, public buildings, and parks based on studies and standards of the U. S. Department of Transportation. Those noise levels considered to be annoying were established as those generated by transportation facility use which exceed 70 dBA at least 10 percent of the time at the exterior of buildings adjacent to the facility. Noise levels considered to be harmful have been established as those which exceed 85 dBA at least 50 percent of the time.*

[j] *The design capacity of an arterial facility is a level of traffic volume sufficiently below the maximum capacity of an arterial facility, usually 70 percent of maximum capacity, so that traffic flow breakdown conditions characteristic of maximum capacity arterial facility operation do not occur, and unstable flow conditions characteristic of near maximum capacity arterial facility operation do not occur. The unstable flow conditions of near maximum capacity arterial facility operation include restricted operating speeds, necessary speed changes, and momentary stoppages. Under traffic breakdown conditions stoppages are more frequent, with substantially lower operating speeds. Arterial facility traffic volumes that are 10 percent greater than design capacity are approaching the unstable flow conditions of near maximum capacity arterial facility operation.*

Source: SEWRPC.

SUMMARY

This chapter has presented a set of transportation system development and management objectives, principles, and standards for the Milwaukee Northwest Side/Ozaukee County area. These objectives, principles, and standards were prepared and adopted by the study Advisory Committee and the Commission. The purpose of the objectives is to guide the testing and evaluation of alternative short- and long-range transportation system plans for the Milwaukee Northwest Side/Ozaukee County area and to thereby aid in the selection of a recommended plan. The seven specific objectives adopted were developed within the context of the regional transportation system development and the Milwaukee urbanized area transportation systems management objectives, principles and standards, both previously adopted by the Regional Planning Commission. The standards that support the seven objectives provide important guidelines for measuring the attainment of the objectives in the evaluation of both alternative plans and subsequent more detailed facility design and related plan implementation efforts.

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Chapter III

EXISTING CHARACTERISTICS OF THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA

INTRODUCTION

This chapter presents the basic planning and engineering data necessary to logically prepare and evaluate short- and long-range transportation system plans for northwestern Milwaukee County and southern Ozaukee County under the Milwaukee Northwest Side/Ozaukee County transportation improvement study. Data are presented on existing and historical trends in population and economic activity levels and characteristics, land use development, travel habits and patterns, and transportation and facilities and services for the northwestern Milwaukee County and southern Ozaukee County study area. Data are also presented for the larger socioeconomic region of which the northwestern Milwaukee County and southern Ozaukee County study area is an integral part, and which must be considered along with the study area itself in any logical transportation planning for the study area. This larger area must be considered because the factors that influence land use development, travel habits and patterns, and transportation system needs in the study area operate over a much larger area—specifically, the seven-county Southeastern Wisconsin Region.

The data on existing population, economic activity, land use, transportation facilities and services, and travel habits and patterns herein presented have been collated largely from the data bank assembled under the Regional Planning Commission's continuing, comprehensive, areawide planning program. These data have been updated as necessary and possible for presentation herein and for use later in the study for the design, testing, and evaluation of alternative transportation system plans.

The discussion of the demography of the study area includes a description of existing and historic trends in resident population levels in the study area and in the Region. Characteristics of the resident population of the study area and of the Region are also presented, including information on age, race, household size, and income. The presentation on the economic base includes a description of historic and existing employment levels and characteristics in the study area and in the Region. The discussion on land use development describes historic urban growth patterns and attendant population densities, and presents data on the existing and historic trends in the distribution of land use by type within the study area and the Region. The presentation on transportation facilities and services includes descriptions of the study area arterial, jurisdictional, and federal aid street and highway system and its public transit facilities and services. The final section describes the travel habits and patterns of the study area and of the Region.

DEMOGRAPHIC BASE

An important consideration in any transportation planning effort is the resident population of the planning area, including the size, composition, and spatial distribution of that population, and changes in those demographic parameters over time. Such a time series analysis provides an overview of cumulative population change and thereby provides important insights essential to the proper conduct of any land use and transportation system planning program.

The necessary demographic data can be extracted, in part, from the censuses of population conducted at 10-year intervals. More recent population information must be obtained from current population estimates, prepared annually for civil divisions by the Wisconsin Department of Administration, or from special censuses conducted for individual civil divisions by the U. S. Bureau of the Census. Since 1975 special censuses were conducted within a number of municipalities within the study area, including, importantly, the City of Milwaukee and the Towns of Cedarburg, Grafton, and Saukville.

Population Size

The population of the Region has increased every decade since 1850, when the federal census first included southeastern Wisconsin, as shown in Table 2. In the late nineteenth and early twentieth centuries, the resident population of the Region increased rapidly, at rates of up to 222,000 persons per decade. After a relatively small increase of only

Table 2

POPULATION TRENDS IN THE UNITED STATES, WISCONSIN, AND THE REGION: 1850-1970

Year	Region			Wisconsin			United States			Regional Population as a Percent of:	
		Change from Preceding Time Period			Change from Preceding Time Period			Change from Preceding Time Period			
	Population	Absolute	Percent	Population	Absolute	Percent	Population	Absolute	Percent	Wisconsin	United States
1850	113,389	- -	- -	305,391	- -	- -	23,191,876	- -	- -	37.1	0.49
1860	190,409	77,020	67.9	775,881	470,498	154.1	31,443,321	8,251,445	35.6	24.5	0.60
1870	223,546	33,137	17.4	1,054,670	278,789	35.9	38,448,371	7,005,050	22.6	21.2	0.58
1880	277,119	53,573	24.0	1,315,497	260,827	24.4	50,155,783	11,707,412	30.1	21.2	0.55
1890	386,774	109,655	39.6	1,693,330	377,833	28.7	62,947,714	12,791,931	25.5	22.8	0.61
1900	501,808	115,034	29.7	2,069,042	375,712	22.2	75,994,575	13,046,861	20.7	24.2	0.66
1910	631,161	129,353	25.8	2,333,860	264,818	12.8	91,972,266	15,977,691	21.0	27.0	0.69
1920	783,681	152,520	24.2	2,632,067	298,207	12.8	105,710,620	13,738,354	14.9	29.8	0.74
1930	1,006,118	222,437	28.4	2,929,006	306,939	11.7	122,775,046	17,064,426	16.1	34.2	0.82
1940	1,067,699	61,581	6.1	3,137,587	198,581	6.8	131,669,587	8,894,541	7.2	34.0	0.81
1950	1,240,618	172,919	16.2	3,434,575	296,988	9.5	151,325,798	19,656,211	14.9	36.1	0.82
1960	1,573,620	333,002	26.8	3,952,771	518,196	15.1	179,323,175	27,997,377	18.5	39.8	0.88
1970	1,756,086	182,466	11.6	4,417,933	465,162	11.8	203,184,772	23,861,597	13.3	39.7	0.86

Source: U. S. Bureau of the Census and SEWRPC.

about 62,000 people during the years of the Great Depression, from 1930 to 1940, the population grew by about 173,000 people from 1940 to 1950, by about 333,000 people from 1950 to 1960—a historic peak—and by about 182,000 people from 1960 to 1970, to 1,756,086 people.

The estimated 1978 resident population of the Region was 1,770,500 people—only 14,400 people, or about 1 percent, more than the 1970 population. More importantly, the available data indicate that the population of the Region may have decreased since 1975. Between 1970 and 1975 the Region's resident population is estimated to have increased by 32,200 people to a level of 1,788,300 people, an increase of about 2 percent over the 1970 level of 1,756,100 people. Between 1975 and 1978 the resident population of the Region is estimated to have actually decreased from 1,788,300 people to 1,770,500 people—a decrease of about 1 percent. If confirmed by the 1980 national census, this would mark the first time in its recorded history that the seven-county Region, as a whole, has decreased in population.

General fertility declines partially account for the reduced rates of population growth noted. Within the Region, State, and nation, current fertility rates are among the lowest on record. Available data on births and deaths in the Region suggest that the rate of natural increase in the Region through the 1970's will be approximately equal to the 6.2 percent rate of natural increase that occurred during the 1930's, the lowest 10-year rate for the period from 1920 through 1970—the period for which reasonably reliable data on migration and natural increase are available.

Changes in resident population levels within the Region since 1970 are only partially explained by declining fertility, however. Prior to 1970, net out-migration occurred only during the 1930's—at a rate of 0.1 percent—and the 1960's—at a rate of 1.3 percent—and was substantially offset in each of these decades by natural increase. However, since 1970, and particularly since 1975, net out-migration has become the dominant component of population change in the Region. Between 1970 and 1977, net out-migration occurred at a rate of 3.3 percent and offset approximately 75 percent of the population change that was attributable to natural increase. The increased rates of net out-migration and the reduced rates of natural increase noted have combined to produce for the 1970 through 1978 period the smallest rate of total population change in the Region's history.

As shown in Table 3, the resident population of the northwest side study area in 1950 was an estimated 444,000 people—about 36 percent of the Region's resident population. During the 1950's, when large metropolitan areas of the United States

Table 3

POPULATION TRENDS IN THE REGION, MILWAUKEE AND OZAUKEE COUNTIES, THE NORTHWEST SIDE STUDY AREA, AND THE STUDY AREA MUNICIPALITIES: 1950-1975

Area	Population				Percent Change			
	1950	1960	1970	1975	1950-1960	1960-1970	1970-1975	1950-1975
Region	1,240,618	1,573,620	1,756,086	1,788,346	26.8	11.6	1.8	44.1
Milwaukee County	871,047	1,036,047	1,054,249	1,014,441	18.9	1.8	- 3.8	16.5
Ozaukee County	23,361	38,441	54,461	64,894	64.6	41.7	19.2	177.8
Study Area	444,800	517,300	515,780	499,181	16.3	- 0.3	- 3.2	12.2
Milwaukee County Portion	431,600	492,000	480,131	455,048	14.0	- 2.4	- 5.2	5.4
Ozaukee County Portion	13,200	25,300	35,649	44,133	91.7	40.9	23.8	234.3
Study Area Municipalities								
Milwaukee County								
Village of Brown Deer	- -	1,280	12,582	13,570	- -	883.0	7.9	- -
City of Glendale	- -	9,537	13,426	13,480	- -	40.8	0.4	- -
City of Milwaukee	637,392	741,324	717,372	670,663	16.3	- 3.2	- 6.5	5.2
Village of River Hills	567	1,257	1,561	1,547	121.7	24.2	- 0.9	172.8
City of Wauwatosa	33,324	56,923	58,676	55,712	70.8	3.1	- 5.1	67.2
Ozaukee County								
City of Cedarburg	2,810	5,191	7,697	9,766	84.7	48.3	26.9	247.5
Town of Cedarburg	1,568	2,248	3,774	4,619	43.4	67.9	22.4	194.6
Town of Grafton	1,225	1,996	3,127	3,165	62.9	56.7	1.2	158.4
Village of Grafton	1,489	3,748	5,998	7,983	151.7	60.0	33.1	436.1
City of Mequon	- -	8,543	12,150	14,820	- -	42.2	22.0	- -
Town of Saukville	1,185	1,306	1,516	1,517	10.2	16.1	0.1	28.0
Village of Saukville	699	1,038	1,389	2,483	48.5	33.8	78.8	255.2
Village of Thiensville	897	2,507	3,182	3,819	179.5	26.9	20.0	325.8

Source: U. S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

experienced unprecedented increases in population, the Region experienced a population increase of about 172,900 people, or about 16 percent; the City and County of Milwaukee experienced population increases of about 103,900 and 165,000 people, or about 16 and 19 percent, respectively; and the northwest side study area experienced a population increase of about 72,500 people, or about 16 percent. During the 1960's, the size of the resident population of the northwest side study area remained essentially stable. The resident population of the study area in 1970 was estimated to be 515,000 people—about 1,500 people, or less than 1 percent, less than the estimated 1960 resident population of 517,300 people.

The resident population of the northwest side study area in 1975 was estimated to be 499,200 people, or about 3 percent less than in 1970. This figure represents approximately 28 percent of the population of the entire seven-county Southeastern Wisconsin Region. The study area comprises approximately 183 square miles, or about 7 percent of the total area of the Region. The northern half of the largest civil division in the Region and the State and the thirteenth largest civil division in the nation—the City of Milwaukee—is located within the study area. In addition, the northwest side study area includes all of the Villages of Brown Deer and River Hills and the City of Wauwatosa, and a large part of the City of Glendale within its southern, or Milwaukee County, portion. The northern, or Ozaukee County, portion of the study area is composed of the City and Town of Cedarburg, the Village of Thiensville, the Village and part of the Town of Grafton, part of the City of Mequon, and parts of the Village and Town of Saukville. The boundaries of these municipalities and of the study area are shown on Map 5 in Chapter I. The area and resident population of the municipalities within the study area are shown in Table 4. The Milwaukee County portion of the study area included about 455,000 people in 1975—about 91 percent of the total

Table 4

AREAL EXTENT AND RESIDENT POPULATION OF THE NORTHWEST SIDE STUDY AREA: 1975

Area	Total Area (square miles)	Percent of Total Area Within Study Area	Total Area Within Study Area (square miles)	Percent of Study Area	Total Population	Percent of Total Population Within Study Area	Total Population Within Study Area	Percent of Study Area Population
Milwaukee County								
Village of Brown Deer .	4.35	100.0	4.35	2.4	13,570	100.0	13,570	2.7
City of Glendale	5.97	76.9	4.59	2.5	13,480	76.2	10,274	2.1
City of Milwaukee. . . .	96.63[a]	56.3	54.40	29.7	670,663	55.8	373,945	74.9
Village of River Hills . .	5.30	100.0	5.30	2.9	1,547	100.0	1,547	0.3
City of Wauwatosa . . .	13.28	100.0	13.28	7.2	55,712	100.0	55,712	11.2
Subtotal	242.66	33.8	81.92	44.7	1,014,441	44.9	455,048	91.2
Ozaukee County								
City of Cedarburg	2.84	100.0	2.84	1.6	9,766	100.0	9,766	1.9
Town of Cedarburg . . .	27.13	100.0	27.13	14.8	4,619	100.0	4,619	0.9
Town of Grafton	21.76	43.9	9.56	5.2	3,165	72.8	2,304	0.5
Village of Grafton	2.25	100.0	2.25	1.2	7,983	100.0	7,983	1.6
City of Mequon	47.08	89.2	42.00	22.9	14,820	81.5	12,079	2.4
Town of Saukville	34.41	42.3	14.57	8.0	1,517	71.2	1,080	0.2
Village of Saukville . . .	2.06	89.3	1.84	1.0	2,483	100.0	2,483	0.5
Village of Thiensville . .	1.03	100.0	1.03	0.6	3,819	100.0	3,819	0.8
Subtotal	234.99	43.1	101.22	55.3	64,894	68.0	44,133	8.8
Total	- -	- -	183.14	100.0	- -	- -	499,181	100.0

[a] *Does not include 0.02 square mile in Washington County.*

Source: Wisconsin Department of Administration and SEWRPC.

study area population level and about 45 percent of the total Milwaukee County population. The Ozaukee County portion of the study area included about 44,000 people—about 9 percent of the total study area population and about 68 percent of the total Ozaukee County population. On the basis of 1978 civil division population estimates, it appears that the resident population of the northwest side study area has continued to decrease since 1975, although the magnitude of the decrease cannot be precisely determined. Between 1975 and 1978, Ozaukee County municipalities wholly or partially within the northwest side study area experienced a collective population increase of about 5,500 people. The Milwaukee County municipalities wholly or partially within the northwest side study area, exclusive of the City of Milwaukee, experienced a collective population decrease of about 300 persons. Over half of the population of the City of Milwaukee resides within the study area. This population accounts for about 75 percent of the study area's total population. The City of Milwaukee experienced a population decline of about 50,500 people between 1975 and 1978.

While the northwest side study area has experienced a decline in population since 1960—both in an absolute sense and in its proportion of the total regional population—it continues to represent a significant concentration of population within the Region. Comprising less than 10 percent of the Region's land area, the northwest side study area is the place of residence of one of every four of the Region's residents.

Population Distribution: The spatial distribution of population is an important consideration in any transportation planning effort. While, as noted in the preceding discussion of population growth trends, the Ozaukee County portion of the study area is rapidly increasing in population, and the Milwaukee County portion of the study area is experiencing an even greater absolute population loss, the Milwaukee County portion of the study area has by far the greatest concentration of population in the study area, and thus is the largest generator and attractor of travel in the study area.

The northwest side study area in 1975 housed nearly 28 percent of the total population of the Region, with over 91 percent of that study area population residing within its Milwaukee County portion. The study area is, however, experiencing a redistribution of population. As shown in Table 5 and on Map 6, the population of the extreme southeastern portion of the study area substantially

Table 5

CHANGE IN POPULATION DISTRIBUTION IN THE NORTHWEST SIDE STUDY AREA: 1970-1975

Subarea	1970 Population	Percent of Study Area Population	1975 Population	Percent of Study Area Population	Change: 1970-1975	
					Absolute	Percent
Milwaukee County Portion						
1	37,861	7.3	33,031	6.6	- 4,830	- 12.8
2	31,476	6.1	29,188	5.8	- 2,288	- 7.3
3	7,911	1.5	7,295	1.5	- 616	- 7.8
4	20,338	4.1	20,158	4.0	- 180	- 0.9
5	48,140	9.3	44,427	8.9	- 3,713	- 7.7
6	56,714	11.0	52,270	10.5	- 4,444	- 7.8
7	30,854	6.0	28,121	5.6	- 2,733	- 8.9
8	45,931	8.9	39,047	7.8	- 6,884	- 15.0
9	23,290	4.5	19,590	3.9	- 3,700	- 15.9
10	27,894	5.4	24,678	4.9	- 3,216	- 11.5
11	46,452	9.0	43,417	8.7	- 3,035	- 6.5
12	53,636	10.4	52,092	10.4	- 1,544	- 2.9
13	17,715	3.4	18,657	3.7	942	5.3
14	6,383	1.2	6,629	1.3	246	3.9
15	1,557	0.3	1,551	0.3	- 6	- 0.4
16	17,280	3.4	19,572	3.9	2,292	13.3
17	6,699	1.3	15,325	3.1	8,626	128.8
Subtotal	480,131	93.1	455,048	91.2	- 25,083	- 5.2
Ozaukee County Portion						
18	1,065	0.2	1,188	0.2	123	11.5
19	5,439	1.1	6,092	1.2	653	12.0
20	5,805	1.1	7,179	1.4	1,374	23.7
21	1,900	0.4	2,185	0.4	285	15.0
22	7,871	1.5	10.034	2.0	2,163	27.5
23	1,636	0.3	1,838	0.4	202	12.3
24	8,152	1.6	10,468	2.1	2,316	28.4
25	1,347	0.3	1,586	0.3	239	17.7
26	1,423	0.3	1,816	0.4	393	27.6
27	1,011	0.2	1,747	0.3	736	72.8
Subtotal	35,649	6.9	44,133	8.8	8,484	23.8
Total Study Area	515,780	100.0	499,181	100.0	- 16,599	- 3.2

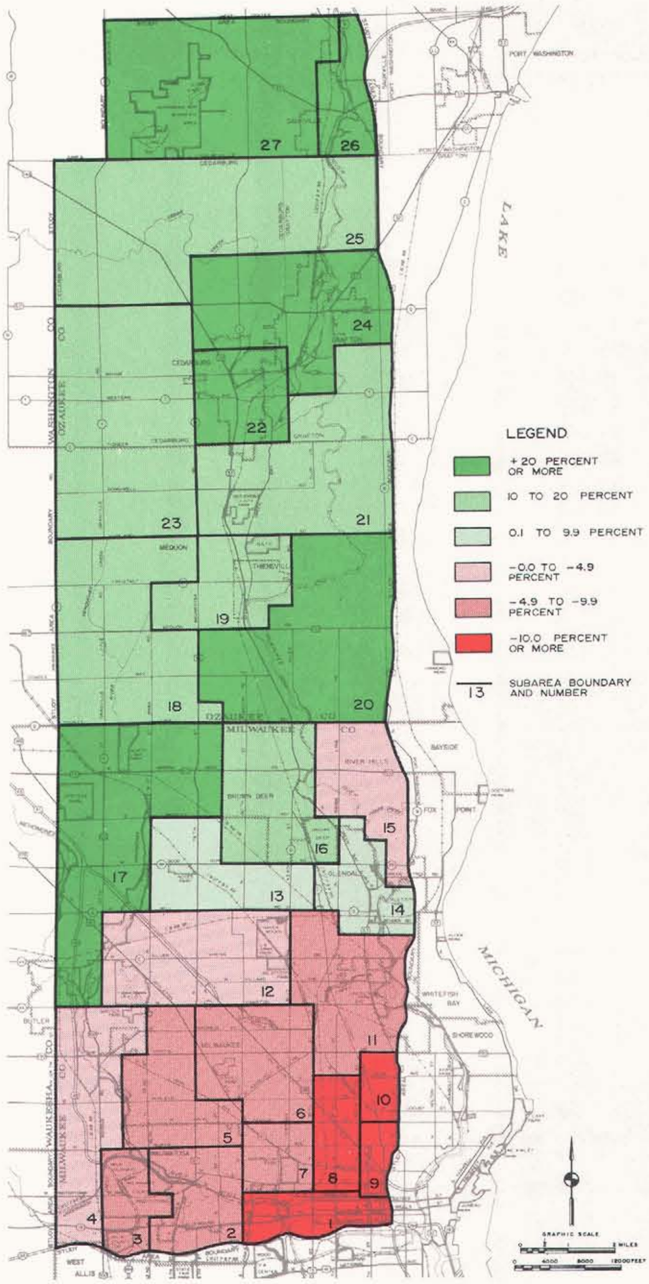
Source: U. S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

decreased, the bordering subareas experienced modest decreases, the next tier of areas underwent small decreases, and the remainder of the study area experienced population increases, including the northern portion of the Milwaukee County portion of the study area and all of the Ozaukee County portion. Increases in population from 1970 to 1975 in Milwaukee County were limited to its extreme northerly portions, with by far the largest absolute and percentage increases in the study area occurring in subarea 17, which is part of the City of Milwaukee and includes a large part of the former Town of Granville.

As a result of the population increases in the northerly section of the Milwaukee County portion of the study area, which partially offset the losses in the southerly section, Milwaukee County's proportion of the total study area population decreased by only about 2 percentage points from 1970 to 1975. Significant changes in the population distribution among the subareas of the study area did not occur during this five-year period, as shown in Table 5. Only in one of the defined subareas of the study area did the proportional share of the study area population increase by more than one percentage point during this five-year period.

Map 6

POPULATION CHANGES IN THE NORTHWEST SIDE STUDY AREA 1970-1975



The northwest side study area is experiencing a redistribution of population. From 1970 to 1975, the extreme southeastern portion of the study area has experienced a substantial population decrease, with modest decreases being experienced in bordering subareas, small decreases being experienced in the next tier of subareas, and increases in population being experienced throughout the remainder of the study area, including the northern portion of the Milwaukee County and all of the Ozaukee County portion of the study area. Increases in population from 1970 to 1975 in the Milwaukee County portion of the study area were limited to its extreme northerly portion, with by far the largest absolute and percentage population increase in the study area occurring in the County's extreme northwest corner.

Source: U. S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

Furthermore, only one subarea experienced more than a 1 percentage point decline in its proportional share of population.

Overall, gross population density decreased in the study area between 1970 and 1975, but a comparison of Maps 7 and 8 indicates that no subarea decreased in density, while a number of subareas increased. In Ozaukee County, the subareas including parts of the City of Mequon and the Village of Saukville increased to suburban density, and the subarea including the Village of Thiensville increased to urban low density. In Milwaukee County, the subarea in the extreme northwestern part of the County, which includes that part of the City of Milwaukee which was formerly a part of the Town of Granville, increased from suburban to urban low density, and the subarea which includes all of the Village of Brown Deer increased from urban low to urban medium density.

The subareas classified as urban high density are all located in the southeastern corner of the study area. Although they comprised only about 11 percent of the study area, these subareas contained over 48 percent of the study area's population in 1975.

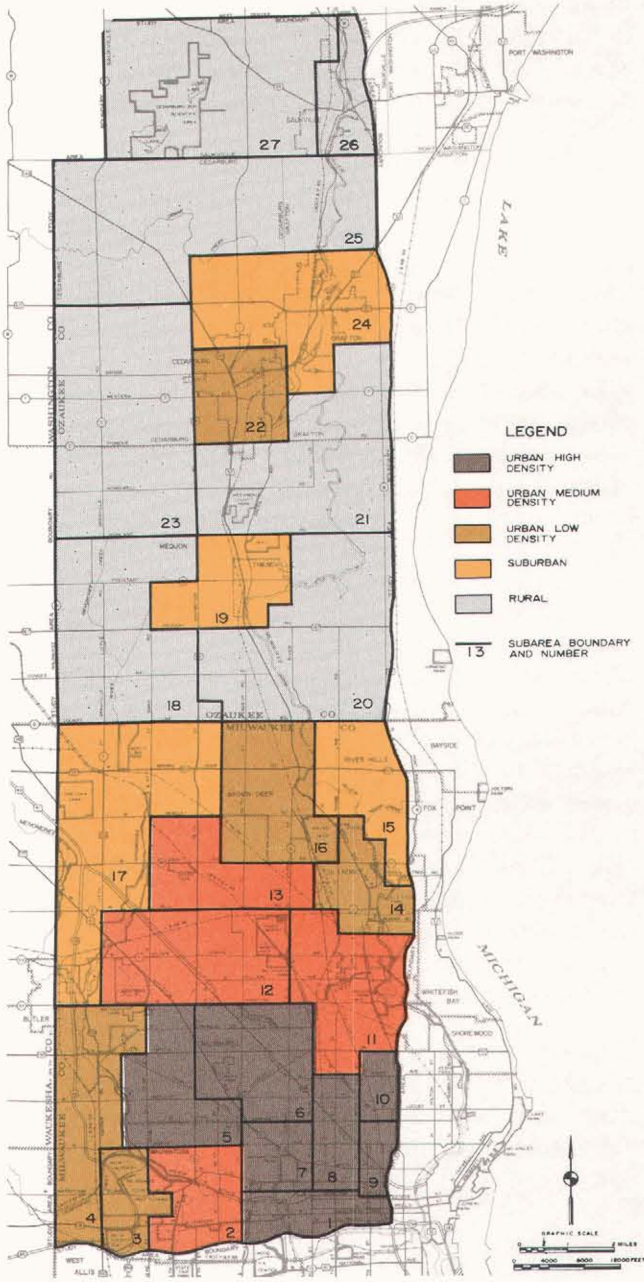
The outward spread of population from the more highly developed portion of the study area is paralleled in the Southeastern Wisconsin Region by the outward spread of population which has occurred around its three urban counties of Milwaukee, Racine, and Kenosha since the 1960's. It is important to note that the changes in population distribution within the Region and within the northwestern Milwaukee County and southwestern Ozaukee County portions of the study area are indicative of a dramatic outward dispersion of urban population. However, the most intensely developed portions of the Region—Milwaukee County—and of the study area—the southeasterly portion—still represent the dominant proportion of the total regional population and of the study area population, respectively. These intensely developed areas, while exhibiting decreases in population, still represent not only major population concentrations, but also major concentrations of high-density development within the Region and the study area.

Population Characteristics

Like population size and spatial distribution certain population characteristics, including age, race, household size, and personal income, are important to transportation planning. These population characteristics have particularly important implications for transportation planning.

Map 7

POPULATION DENSITY IN THE NORTHWEST SIDE STUDY AREA: 1970

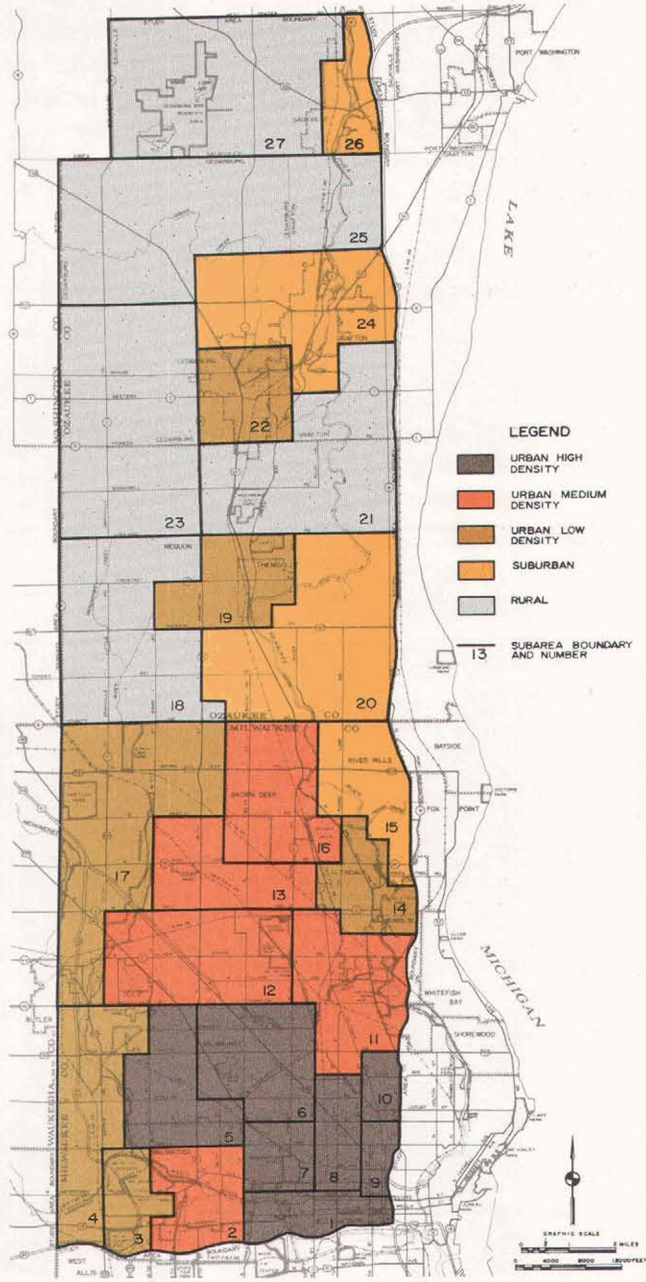


In 1970, those portions of the study area classified as high-density urban areas were concentrated in the southeastern portion of the study area. Areas classified as medium-density urban were located immediately to the north and west of the urban high-density areas. Areas classified as low-density urban were located in the Wauwatosa, Brown Deer, and River Hills sections of the Milwaukee County portion of the study area, as well as in the Cedarburg area of Ozaukee County. Areas classified as having a suburban density were located in the northwestern and northeastern sections of the Milwaukee County portion of the study area and in the Thiensville and Grafton areas of Ozaukee County. The remainder of the study area, including much of the Ozaukee County portion of the study area, was classified as having a rural density in 1970.

Source: U. S. Bureau of the Census and SEWRPC.

Map 8

POPULATION DENSITY IN THE NORTHWEST SIDE STUDY AREA: 1975



In 1975, those portions of the study area classified as high-density urban areas were all located in the southeastern corner of the study area. While comprising only 11 percent of the study area, this area contained over 48 percent of the resident population of the study area. A comparison of this map with Map 7 shows that a number of specific areas within the study area increased in density between 1970 and 1975, and that no areas showed a decrease in density. In Ozaukee County, certain areas, including parts of the City of Mequon and the Village of Saukville, changed from rural to suburban density, and that area adjacent to the Village of Thiensville changed from suburban to low-density urban. In the Milwaukee County portion of the study area, the extreme northwestern part of the County changed from suburban to low-density urban during this period, and that area adjacent to the Village of Brown Deer changed from low-density to medium-density urban. While absolute decreases in population density were found to occur in the southeastern sections of the Milwaukee County portion, these decreases were not of sufficient magnitude to drop the density classification of the specific subarea.

Source: U. S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

Information on population characteristics, however, is difficult to obtain during periods between decennial censuses, even for geographic areas the size of the Region. Because of the differential and ever-changing age-specific rates of fertility, mortality, and migration, the determination of the characteristics of the population of small areas is especially error-prone. The special censuses conducted in the study area and in the Region since the last federal census of 1970 do, however, provide some updated information on population characteristics.

Table 6

MEDIAN AGE OF THE POPULATION OF THE NORTHWEST SIDE STUDY AREA BY SUBAREA: 1970 AND 1975

Subarea	Median Age (years) 1970	1975
Milwaukee County Portion		
1	28.6	28.7
2	33.8	36.9
3	37.1	38.4
4	31.0	33.8
5	39.2	42.8
6	40.7	37.0
7	32.4	29.0
8	22.4	21.2
9	19.6	20.7
10	21.5	21.2
11	31.1	27.0
12	24.5	26.7
13	23.1	25.7
14	29.6	32.3
15	34.2	37.3
16	24.0	28.8
17	25.0	24.8
Subtotal	28.9	27.7
Ozaukee County Portion		
18	27.0	29.9
19	30.3	33.5
20	27.2	30.1
21	27.0	30.1
22	26.5	29.0
23	25.8	28.3
24	25.8	28.3
25	25.8	28.3
26	22.7	23.8
27	25.6	26.8
Subtotal	25.7	27.3
Total Study Area	28.6	27.7

Source: SEWRPC.

Age: A single measure of the relative difference in age structure between areas or time periods can be obtained by use of a median age. The median age is that age above and below which there are an equal number of persons. As indicated in Table 6, the population of the study area in 1970 was 28.6 years, as measured by median age. This was higher than that of the Region as a whole (see Table 7). The median age of the Milwaukee County portion of the study area, 28.9 years, was slightly higher than that of all of Milwaukee County, 28.6 years. Those parts of the Milwaukee County portion of the study area with a higher median age than that of the entire Milwaukee County portion of the study area were located in the suburbs, with the exception of the Village of Brown Deer, and in the central portion of the City of Milwaukee lying between the Village of Wauwatosa and the City of Glendale, as shown on Map 9. The median age of the Ozaukee County portion of the study area, 25.7 years, was only slightly higher than that of all of Ozaukee County, 25.6 years. Those parts of the Ozaukee County portion of the study area with a higher median age than that of the entire Ozaukee County portion of the study area were located in the southern half of the County. The lower median age evident in the outlying portions of the study area is reflective of the age distribution of the Region as a whole in 1970, since, of the seven counties in the Region, the three counties outlying Milwaukee County—Ozaukee, Washington, and Waukesha Counties—had the lowest median ages in 1970.

Between 1970 and 1975, when population decreased in the Milwaukee County portion of the study area and thus in the study area as a whole, the median age in the study area is estimated to

Table 7

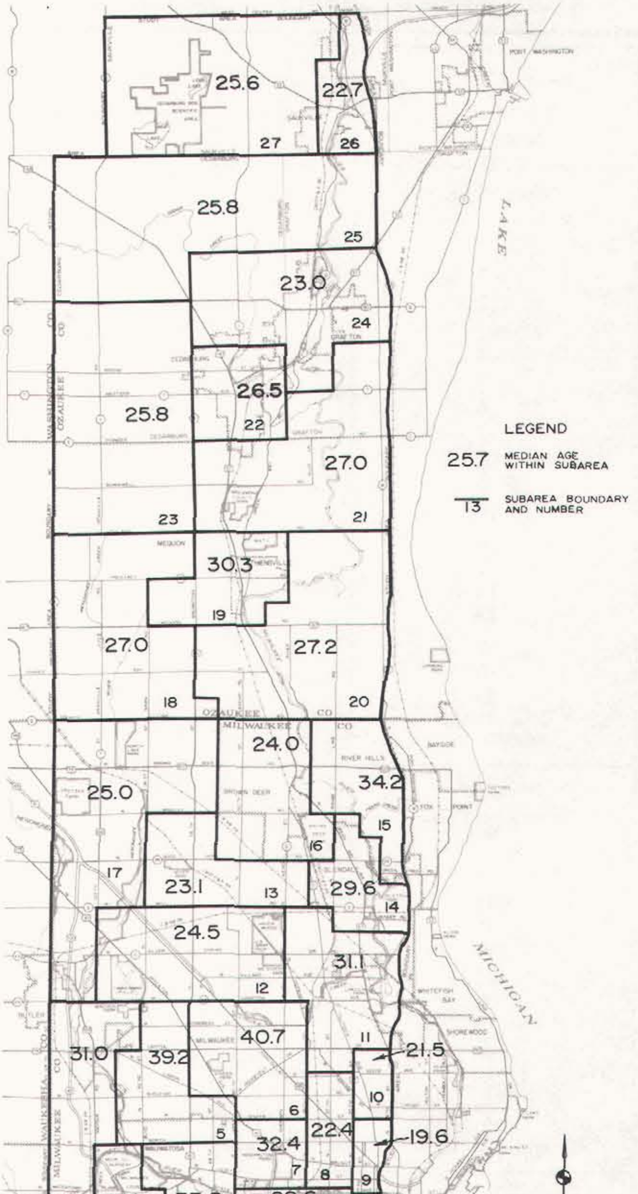
MEDIAN AGE OF THE POPULATION OF THE REGION BY COUNTY: 1970

County	Median Age (years)
Kenosha	26.9
Milwaukee	28.6
Ozaukee	25.6
Racine	26.0
Walworth.	26.4
Washington	24.9
Waukesha	25.4
Region	27.6

Source: SEWRPC.

Map 9

MEDIAN AGE OF THE POPULATION OF THE NORTHWEST SIDE STUDY AREA: 1970



The median age of the population of the northwest side study area in 1970 was 28.6 years. In the Milwaukee County portion of the study area in 1970, the median age was 28.9 years. The highest median ages in the Milwaukee County portion of the study area were found to occur in western and northern suburban areas, and in the central part of the City of Milwaukee portion of the study area. The median age of the Ozaukee County portion of the study area was 25.7 years in 1970. Those parts of the Ozaukee County portion of the study area having a higher median age than the entire Ozaukee County study portion of the study area were located in its southern half.

Source: U. S. Bureau of the Census and SEWRPC.

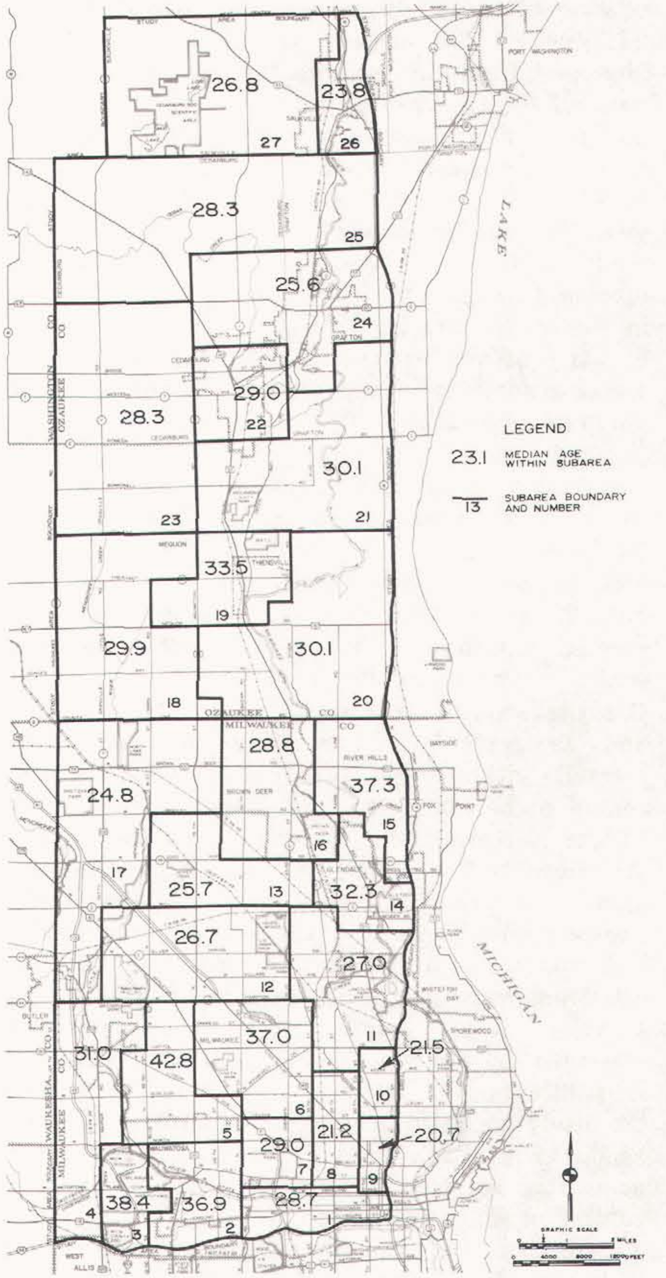
have declined to 27.7 years, as shown in Table 6. The median age of the Milwaukee County portion of the study area declined from 28.9 to 27.7 years, while the median age of the Ozaukee County portion of the study area increased from 25.7 to 27.3 years. The median age of the population increased from two and one half to three years in parts of the Ozaukee County portion of the study area except the extreme northern part of the study area comprising the Town and Village of Saukville, in which the median age increased by only one year. In the Milwaukee County portion of the study area, the median age of the population increased in all suburbs to the City of Milwaukee in the study area from 1970 to 1975, as well as in parts of the extreme southeastern and northwestern portions of the City of Milwaukee in the study area (see Map 10).

Race: The racial composition of the population of the study area is also changing, as shown in Table 8. In 1970, 18 percent of the total study area population was estimated to be nonwhite, and 22 percent of the study area population located within the City of Milwaukee was estimated to be nonwhite. In 1975, 21 percent of the total study area was estimated to be nonwhite, and 29 percent of the study area population located within the City of Milwaukee was estimated to be nonwhite. The nonwhite population of the northwest side study area included black, American Indian, Japanese, and Chinese populations and other nonwhite races; however, the overwhelming majority of the nonwhite population was composed of persons of the black race. In 1970 less than 1 percent of the population of the Ozaukee County portion of the study area was classified as nonwhite. This small percentage of nonwhite population in the outlying portions of the study area also is characteristic of the Region, as shown in Table 9. In 1970, Milwaukee County accounted for almost 88 percent of the Region's total nonwhite population. Meanwhile, less than 1 percent of the resident population of Ozaukee, Walworth, Washington, or Waukesha Counties was nonwhite. The distribution of nonwhite population within the study area in 1970 is shown on Map 11. In 1970 the nonwhite population of the study area was largely located in the southeastern portion.

Income: Personal income within the study area in 1970 was about $3,400 per capita and about $11,000 per household, somewhat lower than the average for the Southeastern Wisconsin Region as a whole, as shown in Table 10. Personal income in

Map 10

MEDIAN AGE OF THE POPULATION OF THE NORTHWEST SIDE STUDY AREA: 1975



Between 1970 and 1975—a period of overall population loss in the study area due to the substantial population loss in the Milwaukee County portion of the study area—the median age of the entire study area is estimated to have declined from 28.6 to 27.7 years. However, the median age in each subarea of the Ozaukee County portion of the study area was found to have increased over this period. In the Milwaukee County portion of the study area, the median age of the population was found to have increased in all suburban areas, as well as in the extreme southeastern and northwestern portions of the City of Milwaukee, between 1970 and 1975. The greatest declines in median age occurred in the east-central section of the Milwaukee County portion of the study area.

Source: U. S. Bureau of the Census and SEWRPC.

Table 8

RACIAL COMPOSITION OF THE POPULATION OF THE NORTHWEST SIDE STUDY AREA BY SUBAREA: 1970 AND 1975

Subarea	Percent Nonwhite Population 1970	Percent Nonwhite Population 1975
Milwaukee County Portion		
1	11.6	15.0
2	0.5	0.6
3	5.5	5.5[a]
4	0.7	0.7[a]
5	0.7	0.7
6	1.5	9.3
7	1.3	5.4
8	50.1	68.9
9	93.1	94.8
10	89.4	94.7
11	22.7	41.2
12	3.5	6.4
13	1.4	2.3
14	5.4	5.4[a]
15	1.9	1.9[a]
16	2.2	4.0
17	3.1	5.7
Subtotal	18.7	23.0
Ozaukee County Portion		
18	0.6	0.6[a]
19	0.1	0.1[a]
20	1.2	1.2[a]
21	0.6	0.6[a]
22	0.2	0.2[a]
23	0.3	0.3[a]
24	0.4	0.4[a]
25	0.3	0.3[a]
26	0.1	0.1[a]
27	0.4	0.4[a]
Subtotal	0.4	0.4[a]
Total Study Area	17.5	21.0

[a] *Limited or no data available; percentage assumed constant over time.*

Source: U. S. Bureau of the Census and SEWRPC.

the Milwaukee County portion of the study area was substantially lower than that in the Ozaukee County portion of the study area—$10,400 per household compared with $15,600 per household. The City of Milwaukee portion of the study area exhibited a per capita income of only $3,268 and a household income of only $9,700. The pattern of higher personal incomes in outlying portions

Table 9

RACIAL COMPOSITION OF THE POPULATION OF THE REGION: 1970

County	Percent Nonwhite Population
Kenosha	1.6
Milwaukee	10.8
Ozaukee	0.4
Racine	6.6
Walworth.	0.9
Washington	0.3
Waukesha	0.5
Region	7.4

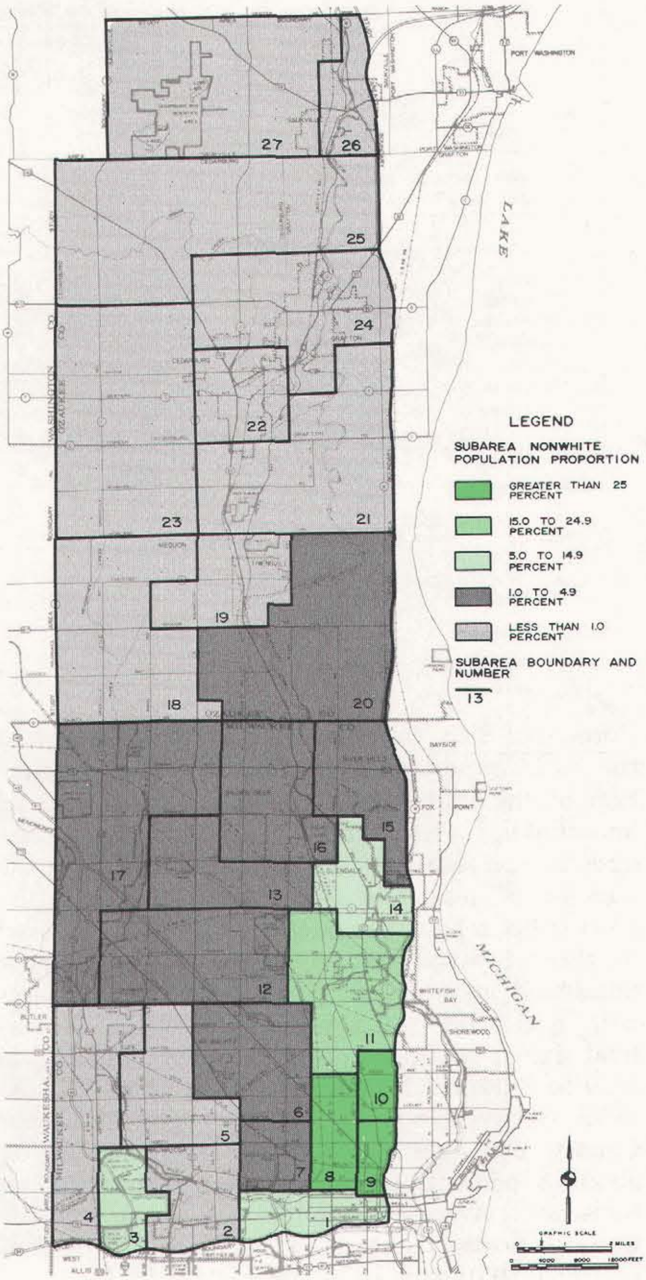
Source: SEWRPC.

observed in the study area in 1970 was also evident in the Region as a whole, with Ozaukee, Washington, and Waukesha Counties exhibiting the highest personal income levels of all counties in the Region in 1970.

From 1970 to 1975 per capita income levels in the study area increased from $3,429 to $4,745 in actual dollars, an increase of 38 percent; and from $3,429 to $3,497 in constant 1970 dollars, an increase of 2 percent. Mean household income levels in the study area similarly increased from $11,000 per year to $14,000 per year in actual dollars, an increase of 27 percent; and decreased from $11,000 per year to $10,320 in constant dollars, a 6 percent decrease. The rate of increase in household income in the study area, unadjusted for inflation, was slightly lower than that in the Region as a whole during this five-year period, resulting in an increase in the difference between study area and regional mean household income from 1970 to 1975. From 1970 to 1975, the mean household income of the Milwaukee County portion of the study area increased by about 26 percent in actual dollars, and decreased 7 percent in constant dollars; while the mean household income of the Ozaukee County portion of the study increased by over 40 percent in actual dollars and 3 percent in constant dollars. Mean household income in the City of Milwaukee portion of the study area increased 24 percent in actual dollars from 1970 to 1975, and decreased 9 percent in constant dollars.

Map 11

DISTRIBUTION OF NONWHITE POPULATION IN THE NORTHWEST SIDE STUDY AREA: 1970



The nonwhite population of the northwest side study area in 1970 included primarily Black, American Indian, Japanese, and Chinese populations. The overwhelming majority of the nonwhite population in the study area, however, was composed of persons of the Black race, and was largely located in the southeastern portion of the study area.

Source: U. S. Bureau of the Census and SEWRPC.

Table 10

PERSONAL INCOME WITHIN THE REGION BY COUNTY AND WITHIN THE NORTHWEST SIDE STUDY AREA BY COUNTY PORTION: 1970 AND 1975

Subarea	Per Capita Income					Mean Household Income				
	1970 (dollars)	1975 Actual Dollars	1975 Constant Dollars[a]	Percent Change Actual Dollars 1970-1975	Percent Change Constant Dollars 1970-1975	1970 (dollars)	1975 Actual Dollars	1975 Constant Dollars[a]	Percent Change Actual Dollars 1970-1975	Percent Change Constant Dollars 1970-1975
Milwaukee County Portion .	3,394	4,661	3,436	37.3	1.2	10,400	13,100	9,645	26.0	-7.2
Ozaukee County Portion. . .	4,215	6,168	4,546	46.3	7.9	15,600	21,900	16,140	40.4	3.5
Total	3,429	4,745	3,497	38.4	2.0	11,000	14,000	10,318	27.3	-6.2
County										
Kenosha.	3,091	4,596	3,387	48.7	8.0	10,100	14,700	10,834	45.5	7.4
Milwaukee	3,854	4,923	3,628	27.7	-5.9	11,700	13,900	10,244	18.8	-12.4
Ozaukee.	3,937	5,722	4,217	45.3	7.1	14,400	20,400	15,035	40.4	4.4
Racine.	3,302	4,798	3,536	43.1	7.1	11,100	15,700	11,571	41.4	4.2
Walworth	2,856	4,086	3,011	43.1	5.1	9,000	12,600	9,286	40.0	3.2
Washington	3,274	4,681	3,450	42.9	5.4	11,900	16,600	12,234	39.5	2.8
Waukesha	3,857	5,607	4,132	45.3	7.1	14,100	20,100	14,814	42.6	5.1
Region	3,695	4,975	3,667	34.6	-0.8	11,800	15,100	11,129	28.0	- 5.7

[a] *Converted to constant 1970 dollars based upon the All Items Consumer Price Index for the Milwaukee area.*

Source: Wisconsin Department of Revenue and SEWRPC.

Household Size: In transportation planning, one of the more important characteristics of the population of the study area is the number and size of households.[1] The number of households is more directly correlated with travel demand than is the number of residents. From 1970 to 1975, the average household size in the study area decreased by about 8 percent, from 3.20 to 2.95 persons per household, as shown in Table 11. This compares with a decrease of 5 percent in average household size in the Region over the same period, from 3.20 to 3.04 persons per household. From 1970 to 1975, the average household size in the Milwaukee County portion of the study area decreased by about 8 percent, from 3.07 to 2.82 persons per household. Average household size in the Ozaukee County portion decreased by about 4 percent between 1970 and 1975, from 3.69 to 3.55 persons per household. Decreases in overall average household size between 1970 and 1975 are evident throughout the study area, as shown on Maps 12 and 13. Also apparent from these maps are the substantial differences in household size between the central and outlying portions of the study area in both years.

It is important to note that the total number of households in the study area and in both the Milwaukee and Ozaukee County portions of the study area increased from 1970 to 1975, as shown in Table 12, despite the decrease in population experienced in the study area as a whole—and particularly in the Milwaukee County portion of the study area—over this period. The study area experienced an increase of about 6,400 households, or about 4 percent, from 1970 to 1975. The Milwaukee and Ozaukee County portions of the study area experienced increases of about 3,800 and 2,600 households, or about 2 percent and 27 percent, respectively. The southeastern portion of the study area is the only part of the study area that experienced a decrease in the number of households between 1970 and 1975. During the same time period, the Region experienced an increase of about 38,500 households, or about 7 percent. The number of households in Milwaukee and Ozaukee Counties increased by about 12,600 and 3,300, or about 4 percent and 22 percent, respectively.

[1] *A household is defined as all persons, either unrelated individuals or family members, occupying a separate dwelling unit, as opposed to persons who are inmates of institutions or who reside in other group quarters, such as dormitories or boarding houses.*

Table 11

NUMBER OF PERSONS PER HOUSEHOLD IN THE NORTHWEST SIDE STUDY AREA BY SUBAREA: 1970 AND 1975

Subarea	Number of Persons per Household		Percent Change 1970-1975
	1970	1975	
Milwaukee County Portion			
1	1.96	1.81	- 7.7
2	2.94	2.64	- 10.2
3	2.85	2.45	- 14.0
4	3.41	3.14	- 7.9
5	3.22	3.16	- 1.9
6	2.70	2.55	- 5.6
7	2.94	2.71	- 7.8
8	3.33	3.27	- 1.8
9	3.42	3.09	- 9.6
10	3.55	3.35	- 5.6
11	2.95	2.86	- 3.1
12	3.47	3.04	- 12.4
13	3.97	3.48	- 12.3
14	3.74	3.45	- 7.8
15	3.42	3.12	- 8.8
16	3.70	3.26	- 11.9
17	3.80	3.08	- 18.9
Subtotal	3.07	2.82	- 8.1
Ozaukee County Portion			
18	3.70	3.64	- 1.6
19	3.46	3.40	- 1.7
20	3.80	3.74	- 1.6
21	3.70	3.64	- 1.6
22	3.46	3.41	- 1.4
23	4.03	3.86	- 4.2
24	3.82	3.55	- 7.1
25	4.03	3.86	- 4.2
26	3.71	3.52	- 5.1
27	3.71	3.52	- 5.4
Subtotal	3.69	3.55	- 3.8
Total Study Area	3.20	2.95	- 7.8

Source: U. S. Bureau of the Census and SEWRPC.

Table 12

ESTIMATED TOTAL HOUSEHOLDS IN THE NORTHWEST SIDE STUDY AREA BY SUBAREA: 1970 AND 1975

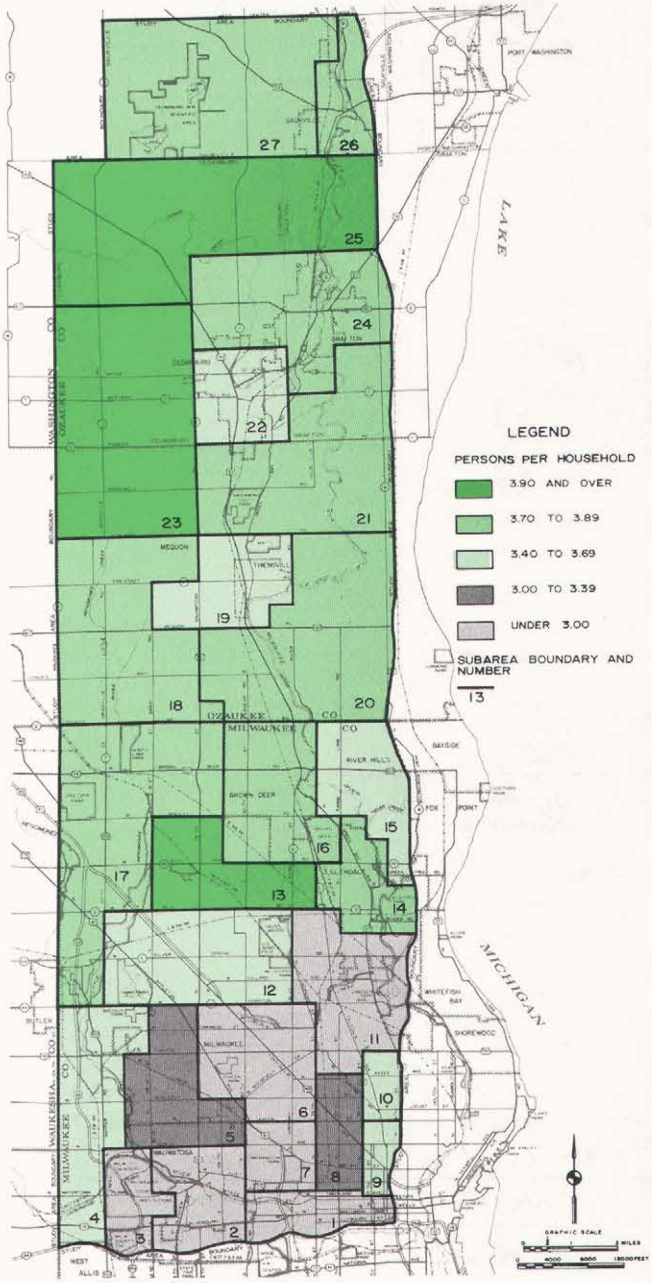
Subarea	Number of Households		Percent Change 1970-1975
	1970	1975	
Milwaukee County Portion			
1	15,300	14,300	- 6.5
2	10,400	10,500	1.0
3	1,600	1,600	- -
4	6,100	6,400	4.9
5	16,400	16,500	0.6
6	20,700	20,700	- -
7	10,400	10,400	- -
8	14,400	13,000	- 9.7
9	6,800	6,200	- 8.8
10	7,900	7,500	- 5.1
11	15,600	15,600	- -
12	15,000	15,900	6.0
13	4,300	5,200	20.9
14	1,600	1,900	18.8
15	400	500	25.0
16	4,700	5,900	25.5
17	1,900	5,200	173.7
Subtotal	153,500	157,300	2.5
Ozaukee County Portion			
18	300	300	- -
19	1,400	1,600	14.3
20	1,500	1,900	26.7
21	600	700	16.7
22	2,200	2,900	31.8
23	400	500	25.0
24	2,100	2,800	33.3
25	400	500	25.0
26	400	500	25.0
27	300	500	66.7
Subtotal	9,600	12,200	27.1
Total Study Area	163,100	169,500	3.9

Source: U. S. Bureau of the Census and SEWRPC.

As in the study area, which exhibited higher-than-average household sizes and smaller decreases in average household size from 1970 to 1975 in its outlying portions, the outlying portions of the Region, specifically Ozaukee, Washington, and Waukesha Counties, had substantially larger average household sizes in 1975 than all other portions of the Region, and had among the smallest decreases in household size from 1970 to 1975. The trend of decreasing household size has generally been apparent in all parts of the Region since 1960. Regional average household size also declined in the 1950's, but this decline was a result of a 4 percent decrease in household size in Milwaukee County, as all other counties experienced slight increases or no decrease in household size from 1950 to 1960. The decreases in average household size can be attributed to the declining birthrate and to rapid increases in the number of households, especially one- and two-person households.

Map 12

AVERAGE HOUSEHOLD SIZE IN THE NORTHWEST SIDE STUDY AREA: 1970

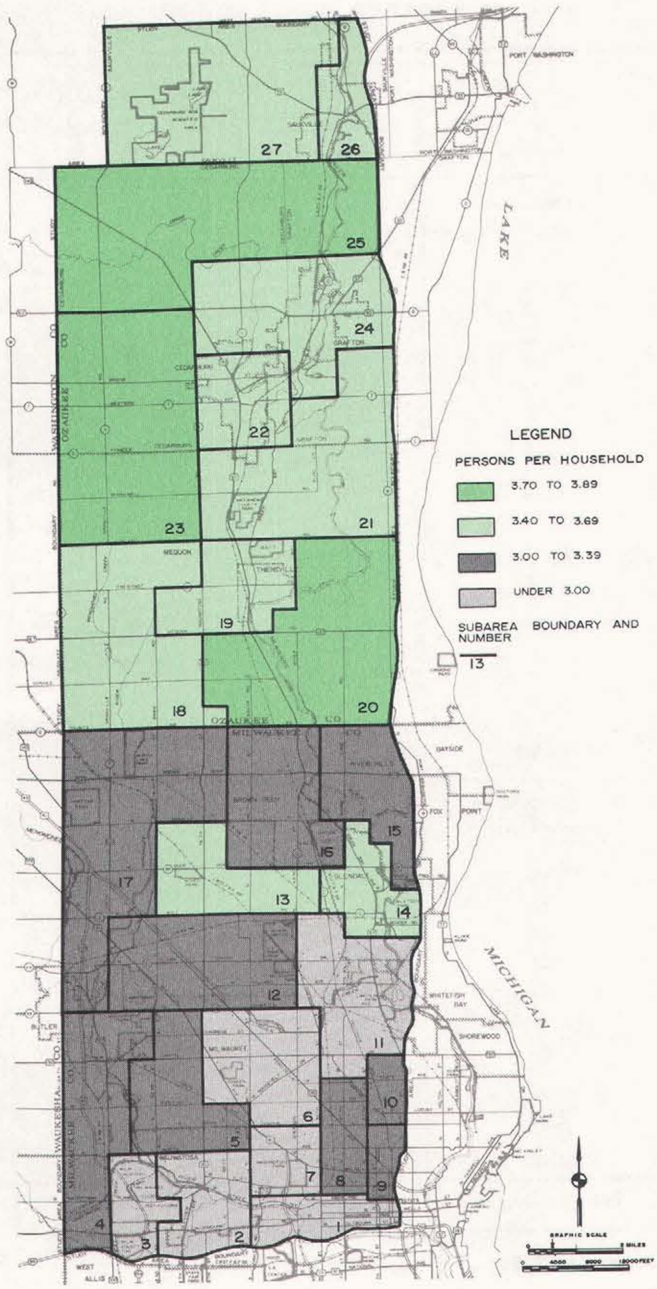


In 1970, the average household size in the study area was about 3.2 persons per household, or the same as the average household size in the Region. The Milwaukee County portion of the study area had an average household size of 3.07 persons per household, and the Ozaukee County portion of the study area 3.69 persons per household. The lowest average household sizes in the study area in 1970 were found in the far southeastern corner of the Milwaukee County portion of the study area. The highest average household sizes were found in northwestern Milwaukee County and in Ozaukee County.

Source: U. S. Bureau of the Census and SEWRPC.

Map 13

AVERAGE HOUSEHOLD SIZE IN THE NORTHWEST SIDE STUDY AREA: 1975



Between 1970 and 1975, the average household size in the study area decreased by about 8 percent—from 3.20 to 2.95 persons per household. During this period, the Milwaukee County portion of the study area also showed a decrease of about 8 percent in average household size—from 3.07 to 2.82 persons per household, and the Ozaukee County portion of the study area showed a decrease of about 4 percent—from 3.69 to 3.55 persons per household.

Source: U. S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

ECONOMIC BASE

Changes in the population of an area are generally closely related to changes in the amount of economic activity in that area. Consequently, historic population and employment trends have followed quite similar patterns in the Region.

Size of the Economy

For planning purposes, perhaps the best measure of economic activity is the number of employment opportunities or jobs available to the residents of the planning area. Employment trends in the Region, in Milwaukee and Ozaukee Counties, and in the study area are shown in Table 13. Between 1960 and 1970 total employment in the Region increased by 93,700 jobs—from 647,900 jobs to 741,600 jobs—or by about 14 percent. Between 1970 and 1975 the number of jobs in the Region increased by 37,400, or about 5 percent, to a total of 779,000 jobs in 1975. Total employment in Milwaukee County increased by 29,500 jobs, or about 6 percent, between 1960 and 1975, while total employment in Ozaukee County increased by 10,700 jobs, or about 113 percent, over this same period. Estimates of employment in the study area are not available for 1960 and 1970, but in 1975 employment in the study area was estimated at 199,330 jobs, or about 25 percent of the total regional jobs in that year. Of this amount, 188,450 jobs, or about 94 percent, were estimated to be in the Milwaukee County portion of the study area, and 10,880 jobs, or 6 percent, were estimated to be in the Ozaukee County portion of the study area.

While Milwaukee County has experienced a population decrease since 1970, employment in Milwaukee County has continued to grow. Moreover, while it is evident that employment opportunities have increased rapidly in the outlying counties of the Region, it is also clear that the great majority of job opportunities remain within Milwaukee County. In 1975 about 67 percent of all regional employment opportunities were in Milwaukee County.

Distribution of Economic Activity

The distribution of jobs in 1975 within the study area is shown in Table 14 and on Map 14. The majority of the jobs in the study area, approximately 94 percent, are located in the Milwaukee County portion, particularly in the southern half of the Milwaukee County portion in the Cities of Milwaukee, Wauwatosa, and Glendale. Employment in the Ozaukee County portion of the study area is concentrated in the City of Cedarburg and the Village of Grafton. Within the study area, large concentrations of manufacturing employment are found in subarea four—part of the City of Wauwatosa—with about 13,030 manufacturing jobs, and in subarea 11—part of the Cities of Glendale and Milwaukee—with about 21,092 manufacturing jobs in 1975. A large concentration of government services and education employment—about 12,679 jobs—is found in subarea one, a part of the City of Milwaukee.

Structure of the Economy

For transportation planning purposes the character of the economy can probably best be described in terms of its industrial structure because the

Table 13

EMPLOYMENT TRENDS IN THE REGION, MILWAUKEE AND OZAUKEE COUNTIES, AND THE NORTHWEST SIDE STUDY AREA: 1960-1975

Geographic Area	Employment			Change: 1960-1970		Change: 1970-1975		Change: 1960-1975	
	1960	1970	1975	Absolute	Percent	Absolute	Percent	Absolute	Percent
Region	647,900	741,600	779,000	93,700	14.5	37,400	5.0	131,100	20.2
Milwaukee County	486,200	510,900	515,700	24,700	5.1	4,800	0.9	29,500	6.1
Ozaukee County	9,500	17,900	20,200	8,400	88.4	2,300	12.8	10,700	112.6
Study Area	N/A	N/A	199,330	--	--	--	--	--	--
Milwaukee County Portion	N/A	N/A	188,450	--	--	--	--	--	--
Ozaukee County Portion	N/A	N/A	10,880	--	--	--	--	--	--

NOTE: N/A indicates data not available.

Source: U. S. Department of Labor, Wisconsin Department of Industry, Labor and Human Relations; and SEWRPC.

Table 14

DISTRIBUTION OF JOBS IN THE NORTHWEST SIDE STUDY AREA: 1975

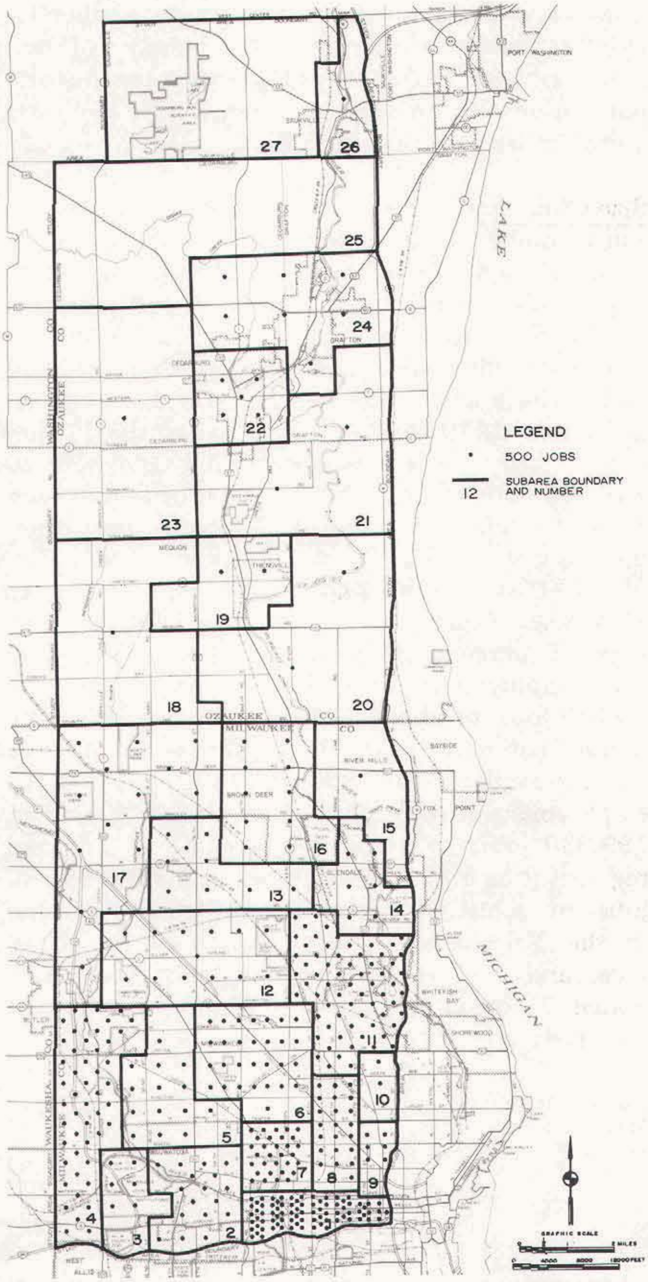
Subarea	Number of Jobs	Percent of Total
Milwaukee County Portion		
1	40,830	20.5
2	8,480	4.3
3	3,080	1.5
4	24,640	12.4
5	7,240	3.6
6	14,780	7.4
7	15,670	7.9
8	10,760	5.4
9	2,880	1.4
10	1,000	0.5
11	32,970	16.5
12	6,370	3.2
13	4,610	2.3
14	2,820	1.4
15	450	0.2
16	5,170	2.6
17	6,700	3.4
Subtotal	188,450	94.5
Ozaukee County Portion		
18	440	0.2
19	1,150	0.6
20	1,120	0.6
21	1,000	0.5
22	2,680	1.3
23	390	0.2
24	3,630	1.8
25	40	- -[a]
26	420	0.2
27	10	- -[a]
Subtotal	10,880	5.5
Total Study Area	199,330	100.0

[a] *Less than 0.1 percent.*

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

Map 14

DISTRIBUTION OF EMPLOYMENT IN THE NORTHWEST SIDE STUDY AREA: 1975



In 1975, the overwhelming majority of the jobs in the study area, approximately 94 percent, were located in the Milwaukee County portion of the study area. These jobs were concentrated largely in the southern half of the Milwaukee County portion of the study area in the Cities of Milwaukee, Wauwatosa, and Glendale. Job opportunities in the Ozaukee County portion of the study area were concentrated in the City of Cedarburg and the Village of Grafton.

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

number and types of industry directly affect transportation needs. In this regard economic activity can be classified into nine major industry groups: 1) agriculture; 2) construction and mining; 3) manufacturing; 4) wholesale trade; 5) retail trade; 6) transportation, communication, and utilities; 7) finance, insurance, and real estate; 8) private services; and 9) government services and education.

The distribution of jobs among major industry groups for the Region and the study area is quite similar, as shown in Table 15 and Figure 3. Economic activity within the study area, as in the Southeastern Wisconsin Region, is heavily concentrated in manufacturing. In 1975 about 33 percent of the total jobs in the study area were in manufacturing, compared with about 32 percent of the total jobs in the Region.

Table 15

EMPLOYMENT BY MAJOR INDUSTRY GROUP IN THE REGION AND THE NORTHWEST SIDE STUDY AREA: 1975

Major Industry Group	Region		Study Area	
	Employment	Percent of Total Employment	Employment	Percent of Total Employment
Agriculture	10,300	1.3	220	0.1
Construction and Mining	23,300	3.0	5,270	2.6
Manufacturing	248,000	31.8	66,400	33.3
Wholesale Trade	35,000	4.5	12,370	6.2
Retail Trade	125,500	16.1	35,780	18.0
Transportation, Communication, and Utilities	35,100	4.5	11,240	5.6
Finance, Insurance, and Real Estate	35,200	4.5	7,230	3.6
Private Services[a]	172,400	22.1	36,070	18.1
Government Services and Education	94,200	12.1	24,750	12.5
Total Employment	779,000	100.0	199,330	100.0

[a] *Includes the self-employed and domestic household workers.*

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

LAND USE

One of the central concepts underlying transportation planning is that land use and transportation are closely interrelated. The type, intensity, and spatial distribution of land use determine the number and variety of trips generated by an area and by each of its subareas. A complete inventory of existing land use is, therefore, essential to any transportation planning effort so that the quantitative relationships existing between land use and travel for transportation system planning can be established and used to test alternative transportation plans. Such a complete inventory of land use in southeastern Wisconsin was first conducted in 1963 to facilitate the preparation of the regional land use and transportation system plan formally adopted by the Commission in 1966. One of the first steps in the reevaluation of these initial regional plans, which began in the early 1970's, was the updating of this land use inventory to the year 1970.

This section describes and analyzes the land use information from these inventories most relevant to the northwest side study. It includes a summary of the historical urban growth of the study area and of the Southeastern Wisconsin Region to the year 1980. A discussion of the type, intensity, and spatial distribution of land use within the study area and the Region in 1970 is also included, along with a summary of changes since the first land use inventory of 1963.

Historical Urban Growth Patterns

The historical urban development patterns of the study area and of the Southeastern Wisconsin Region from 1850 to 1980 are shown on Map 15. Until 1950 urban development[2] in the Region was still relatively highly concentrated in such large urban centers as Kenosha, Milwaukee, Racine, and Waukesha, as well as in many of the smaller urban centers of the outlying portions of the Region such as Burlington, Oconomowoc, and West Bend. Within the northwest side study area, extensive urban development had already occurred in the City of Wauwatosa, the Village of Thiensville, the unincorporated village of Freistadt (now a portion of the City of Mequon), the City of Cedarburg, and the Villages of Grafton and Saukville. As of 1950, urban development in the City of Milwaukee had not yet extended into the Town of Granville portion of the study area.

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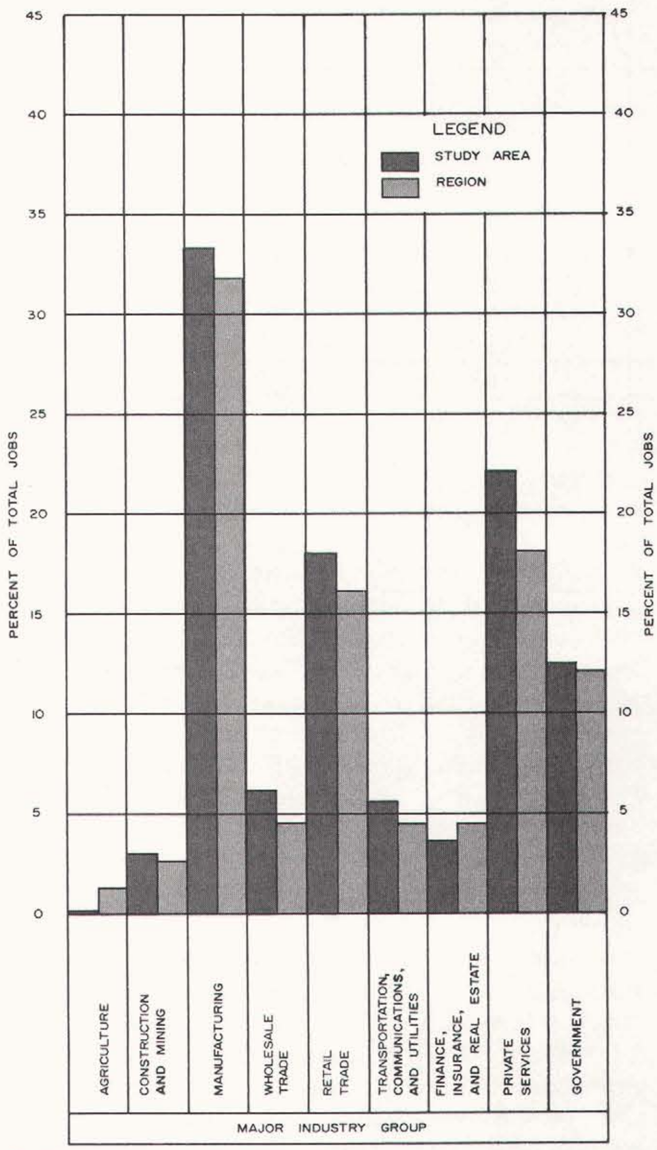
[2] *Urban development as defined for the purposes of this discussion includes those areas wherein houses or other buildings have been constructed in relatively compact groups or where a closely spaced network of minor streets has been constructed, thereby indicating a concentration of residential, commercial, industrial, governmental, or institutional land uses. The continuity of such development was considered interrupted if a quarter-mile or more of nonurban-type land uses, such as agriculture, woodlands, or wetlands, prevailed, and the above conditions were generally absent.*

Figure 3

PERCENTAGE DISTRIBUTION OF EMPLOYMENT BY MAJOR INDUSTRY GROUP IN THE REGION AND THE NORTHWEST SIDE STUDY AREA: 1975



Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

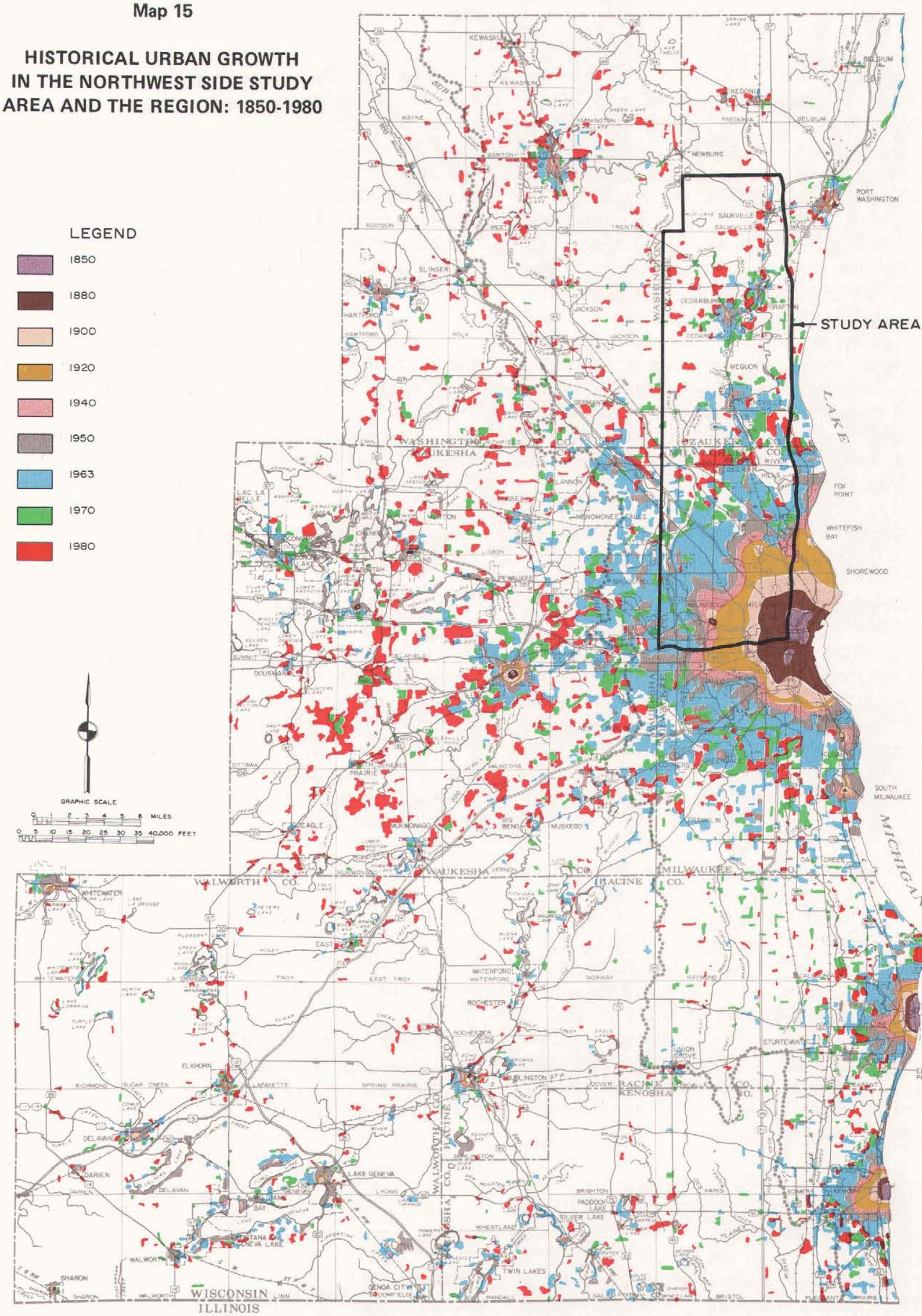
Urban development within the Region increased significantly between 1850 and 1880, between 1880 and 1920, and particularly between 1950 and 1980. The periods between 1920 and 1940, which included a severe national depression and slow recovery, and between 1940 and 1950, which included World War II, do not show marked increases in urban development in the Region. The most dramatic increases in urban development in the study area occurred between 1900 and 1920, and, as in the Region as a whole, between 1950 and 1980.

From 1850 to 1950, urban growth within the study area and the Region occurred in a fairly compact pattern of concentric rings of relatively high-density urban development contiguous to, and outward from, existing urban development. Since 1950, the character of urban growth in the Region and the study area has changed to a much more diffused pattern of development, with relatively low densities predominating and a proliferation of clusters of noncontiguous development. The result of this "urban sprawl" pattern of development since 1950 has been a rapid decline in urban population densities.

It is interesting to note that historical urban growth patterns in the Region, as well as in the study area, do not reveal the same marked influence of transportation routes on urban development patterns that can be identified in other large metropolitan areas. Urban growth in the study area and in the Region as a whole appears to have occurred more by accretion than by axial expansion and to be strongly influenced by proximity to resource amenities, although in more recent years the influence of STH 57 and IH 43 on the spatial location of urban development in the study area is clearly evident. Factors contributing to the diffusion of urban development within the study area and the entire Region over time have been, among others: the widespread availability of electric power and telephone service; the practicality of onsite water supply and sewage disposal made possible by the septic tank and electrically powered well; the development of "all-weather" highway facilities and the attendant availability and use of the automobile; and the apparent desirability of low-density residential development and the premium which the public places on space in the vicinity of its residence. Before the widespread availability of the automobile, limited transportation facilities served to constrain, to some extent, the spread of residential development and other forms of urban land use. Increasingly quick and convenient automobile travel, however, has effectively made large amounts of land accessible for development, thereby reducing the need for the intensive urban land development patterns of the past.

Map 15

HISTORICAL URBAN GROWTH IN THE NORTHWEST SIDE STUDY AREA AND THE REGION: 1850-1980



This map shows the historic urban development pattern in the study area and in the Southeastern Wisconsin Region from 1850 to 1980. Up to 1950, urban development in the Region was largely concentrated in such large urban centers as Kenosha, Milwaukee, Racine, and Waukesha, as well as in many of the smaller urban centers of the outlying portions of the Region such as Burlington, Oconomowoc, and West Bend. Within the northwest side study area, extensive urban development had already occurred in the Cities of Cedarburg and Wauwatosa, and in the Villages of Grafton, Saukville, Thiensville, and the unincorporated village of Freistadt (now a portion of the City of Mequon). Urban development in the City of Milwaukee had not yet extended into the Town of Granville portion of the study area by the year 1950. From 1850 to 1950, urban growth within the study area and the Region occurred in a fairly compact pattern of concentric rings of relatively high-density urban development contiguous to, and outward from, existing urban development. Since 1950, the character of urban growth in the Region and the study area has changed to a much more diffused pattern of development, with relatively low densities predominating, along with a proliferation of clusters of noncontiguous development. The implication of this "urban sprawl" pattern of development since 1950 has been a rapid decline in urban population densities.

Source: SEWRPC.

Existing Land Use

Less than 20 percent of the total area of the Southeastern Wisconsin Region was devoted to urban land uses in 1970, while over 47 percent of the study area was devoted to such uses in that year, as shown in Table 16. Land use in the Milwaukee County portion of the study area was nearly 80 percent urban, while land use in the Ozaukee County portion was still nearly 80 percent rural. For planning purposes, urban land is defined as land devoted to residential, commercial, industrial, governmental and institutional, transportation, and recreational uses. Nonurban land is defined as land devoted to agricultural uses and open lands, consisting of woodlands, wetlands, and unused lands. The general spatial distribution of urban land uses in the study area and Region in 1970 is shown on Map 16.

Between the initial regional land use inventory in 1963 and the land use inventory update in 1970, considerable portions of rural land uses, namely, agricultural and open lands, were converted to urban land uses within the Region and the study area. From 1963 to 1970 the amount of land devoted to agricultural uses decreased by 43,679 acres, or 4 percent, in the Region, and by 6,315 acres, or 12 percent, in the study area. Meanwhile, the amount of open lands decreased by 3,854 acres, or 1 percent, in the Region, and by 1,604 acres, or 7.6 percent, in the study area.

As shown in Table 16, urbanization has occurred at a rapid rate in the study area, with approximately 7,919 acres of land representing 6 percent of the total area of the study area being converted from rural to urban uses from 1963 to 1970. During this same period, about 3 percent of the total area of the Region was converted from rural to urban uses. The Milwaukee County portion of the study area experienced the largest absolute increase in urban lands—4,353 acres, or 11 percent. The Ozaukee County portion of the study area, however, also exhibited a sizable absolute increase—3,566 acres, or 31 percent.

Of the types of land uses considered to be urban, which in 1970 occupied about 47 percent of the study area and about 20 percent of the Region, residential land uses comprised the greatest proportion. Residential lands accounted for 22 percent, or 26,842 acres, of the study area, and about 9 percent, or 156,266 acres, of the Region. Furthermore, residential land comprised 45 and 48 percent, respectively, of the developed urban portions of the study area and the Region. Transportation, communication, and utility land uses were second in importance in both the study area and the Region, accounting for about 15 percent, or 18,336 acres, of the study area, and about 6 percent, or 109,407 acres, of the Region. Such uses comprised 32 and 33 percent, respectively, of the developed urban portions of the study area and the Region. The importance of this category reflects the large areas of land devoted to airports, parking lots, and rights-of-way for streets and highways, railroads, and utility lines in 1970. A very small area of land was devoted to urban economic activities in 1970: 3 percent of the total study area and 6 percent of the developed portion of the study area were devoted to commercial and industrial functions, compared with 1 percent and 5 percent in the Region. Yet this small area of the Region, 16,556 acres, provided the basis for more than 81 percent of the jobs in southeastern Wisconsin in 1970.

Residential Land Use

Residential land consists of both land actually occupied by a residence and vacant land either under development for residential use or immediately available for such use, including vacant building sites between existing residences and improved but still vacant residential subdivisions. As already mentioned, at the time of the 1970 land use inventory there were 26,842 acres of residential land in the study area, and these 26,842 acres accounted for nearly 22 percent of the study area's total land area (see Table 16). Over 69 percent of this residential land was in the Milwaukee County portion of the study area, which in 1970 contained over 93 percent of the total study area population. The distribution of residential land use in the study area is shown on Map 17.

Between 1963 and 1970 the amount of residential land in the study area increased by over 4,100 acres. Over 60 percent of this increase—2,521 acres—occurred in Ozaukee County. As a result, between 1963 and 1970 residential land acreage increased by 44 percent in the Ozaukee County portion of the study area, and only 10 percent in the Milwaukee County portion of the study area.

Commercial Land Use

Commercial land use consists of all retail and service-type uses, including both local and regional shopping centers, highway-oriented commercial uses, and professional and executive offices, but

Table 16

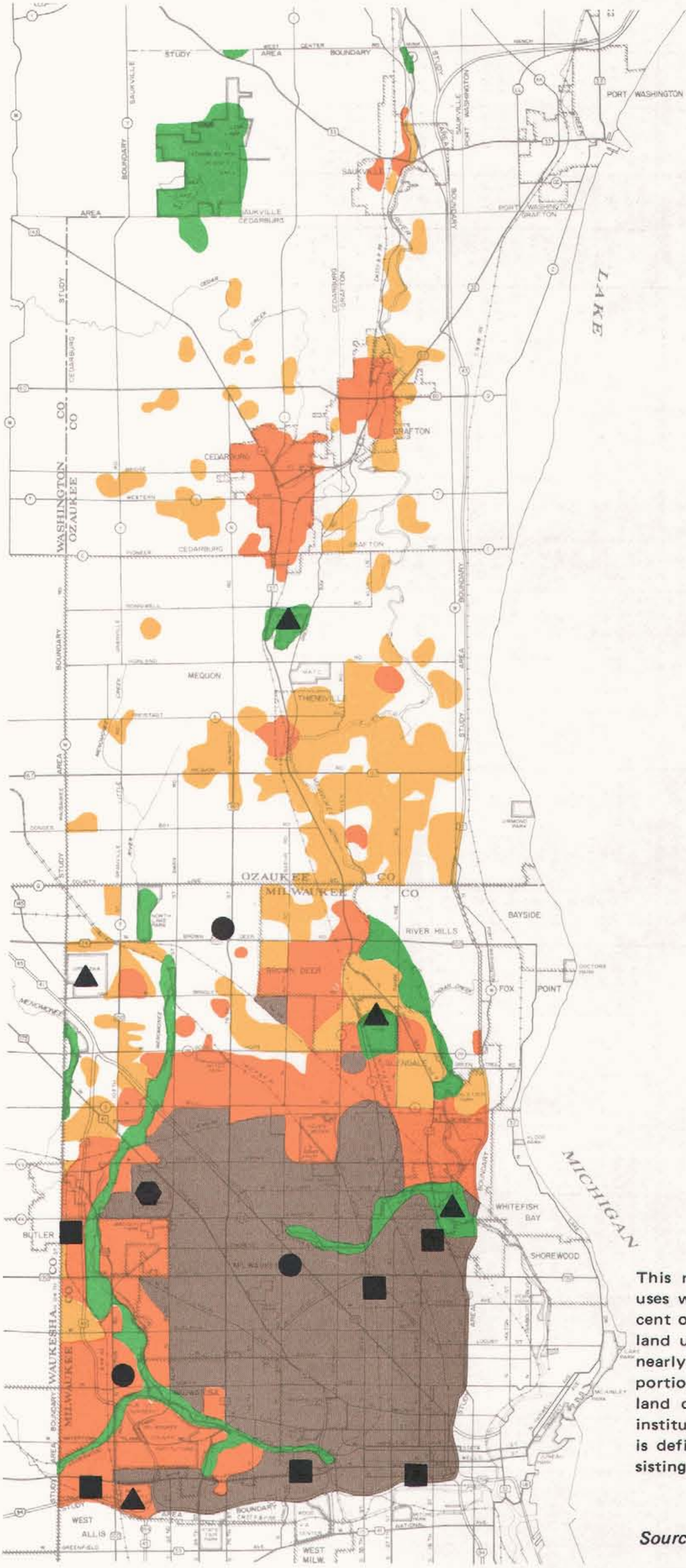
DISTRIBUTION OF LAND USE IN THE REGION AND THE NORTHWEST SIDE STUDY AREA: 1963 AND 1970

		Urban Land Uses																		*Rural Land Uses*					
		Residential			Commercial			Industrial			Governmental and Institutional			Transportation, Communication, and Utilities			Recreational			Agricultural		Open Land		Total	
Area	Year	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Percent of Developed Area	Acres	Percent of Total Area	Acres	Percent of Total Area	Acres	Percent of Total Area
Total Study Area	1963	22,698	18.4	45.2	1,157	0.9	2.3	1,826	1.5	3.6	3,498	2.8	7.0	16,482	13.4	32.9	4,506	3.7	9.0	52,113	42.3	21,014	17.0	123,295	100.0
	1970	26,842	21.8	46.2	1,334	1.1	2.3	2,374	1.9	4.1	4,116	3.3	7.1	18,336	14.9	31.6	5,084	4.1	8.8	45,798	37.1	19,410	15.7	123,295	100.0
	Change	4,144	- -	- -	177	- -	- -	548	- -	- -	618	- -	- -	1,854	- -	- -	578	- -	- -	-6,315	- -	-1,604	- -	- -	- -
	(percent)	18.3	- -	- -	15.3	- -	- -	30.0	- -	- -	17.7	- -	- -	11.2	- -	- -	12.8	- -	- -	-12.1	- -	-7.6	- -	- -	- -
Milwaukee County Portion	1963	16,903	31.3	43.7	953	1.8	2.5	1,356	2.5	3.5	3,076	5.7	7.9	12,568	23.3	32.5	3,851	7.1	9.9	8,207	15.2	6,961	12.9	53,876	100.0
	1970	18,527	34.4	43.0	1,108	2.1	2.6	1,770	3.3	4.1	3,575	6.6	8.3	13,935	25.9	32.4	4,145	7.7	9.6	5,378	1.0	5,438	10.1	53,876	100.0
	Change	1,624	- -	- -	155	- -	- -	414	- -	- -	499	- -	- -	1,367	- -	- -	294	- -	- -	-2,829	- -	-1,523	- -	- -	- -
	(percent)	9.6	- -	- -	16.3	- -	- -	30.5	- -	- -	16.2	- -	- -	10.9	- -	- -	7.6	- -	- -	-34.5	- -	-21.9	- -	- -	- -
Ozaukee County Portion	1963	5,795	8.3	50.6	204	0.3	1.8	470	0.7	4.1	422	0.6	3.7	3,914	5.6	34.2	655	0.9	5.7	43,906	63.2	14,053	20.2	69,419	100.0
	1970	8,316	12.0	55.3	226	0.3	1.5	604	0.9	5.5	541	0.8	3.6	4,401	6.3	29.3	938	1.4	6.2	40,421	58.2	13,972	20.1	69,419	100.0
	Change	2,521	- -	- -	22	- -	- -	134	- -	- -	119	- -	- -	487	- -	- -	283	- -	- -	-3,485	- -	-81	- -	- -	- -
	(percent)	43.5	- -	- -	10.8	- -	- -	28.5	- -	- -	28.2	- -	- -	12.4	- -	- -	43.2	- -	- -	-7.9	- -	-0.6	- -	- -	- -
Region	1963	129,219	7.5	46.1	5,759	0.3	2.1	8,168	0.5	5.0	13,478	0.8	4.8	100,053	5.8	35.7	23,548	1.4	8.4	1,083,800	63.0	356,990	20.7	1,721,015	100.0
	1970	156,266	9.1	47.7	6,517	0.4	2.0	10,039	0.6	3.1	16,618	1.0	5.1	109,407	6.3	33.4	28,996	1.7	8.8	1,040,121	60.4	353,136	20.5	1,721,100	100.0
	Change	27,047	- -	- -	758	- -	- -	1,871	- -	- -	3,140	- -	- -	9,354	- -	- -	5,448	- -	- -	-43,679	- -	-3,854	- -	85	- -
	(percent)	20.9	- -	- -	13.2	- -	- -	22.9	- -	- -	23.3	- -	- -	9.3	- -	- -	23.1	- -	- -	-4.0	- -	-1.1	- -	- -	- -

Source: SEWRPC.

Map 16

GENERALIZED EXISTING LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



LEGEND

- LOW DENSITY RESIDENTIAL (0.7 – 2.2 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- MEDIUM DENSITY RESIDENTIAL (2.3 – 6.9 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- HIGH DENSITY RESIDENTIAL (7.0 – 17.9 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- MAJOR RETAIL AND SERVICE
- MAJOR INDUSTRIAL
- AIRPORT
- MAJOR PUBLIC OUTDOOR RECREATION SITE
- PRIMARY ENVIRONMENTAL CORRIDOR PRESERVED THROUGH PUBLIC ACQUISITION OR PUBLIC LAND USE REGULATION
- AGRICULTURAL

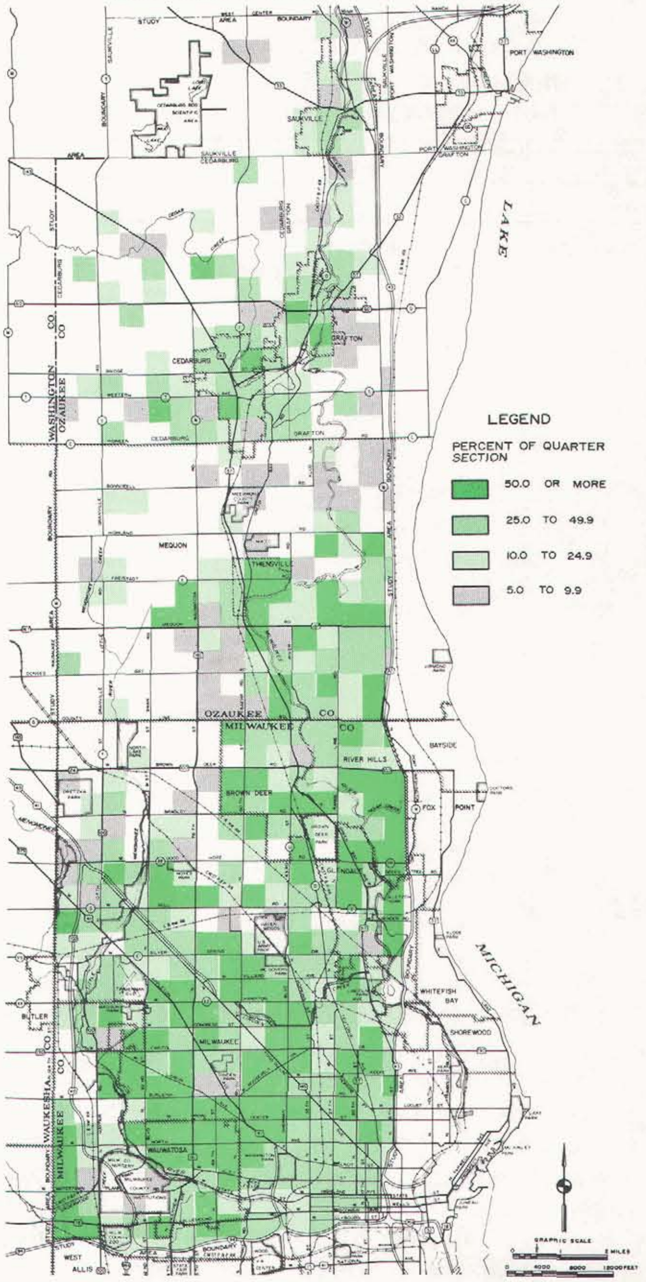
GRAPHIC SCALE
0 1/2 1 2 MILES
0 4000 8000 12000 FEET

This map summarizes the spatial distribution of the various land uses within the study area as of April 1970. By 1970 over 47 percent of the study area was devoted to urban land uses. In that year, land use in the Milwaukee County portion of the study area was nearly 80 percent urban, while land use in the Ozaukee County portion was still nearly 80 percent rural. Urban land is defined as land devoted to residential, commercial, industrial, governmental, institutional, transportation, and recreation uses. Nonurban land is defined as land devoted to agricultural uses and open lands consisting of woodlands, wetlands, and unused lands.

Source: SEWRPC.

Map 17

RESIDENTIAL LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970

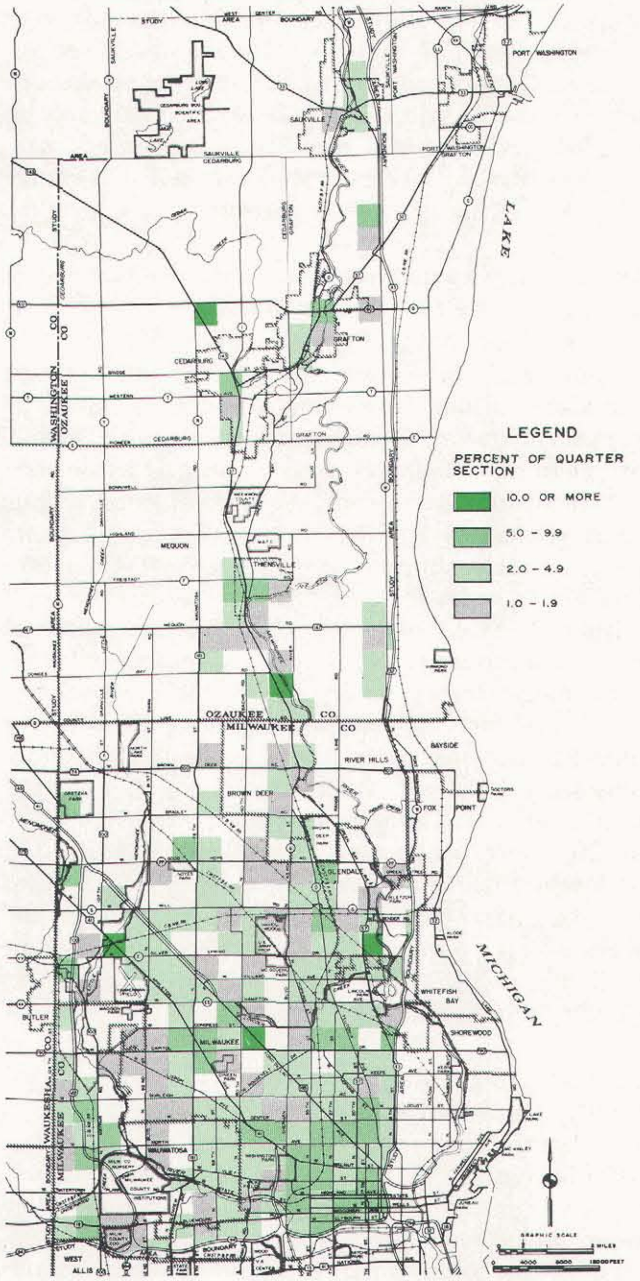


In 1970 about 26,840 acres of land, or nearly 22 percent of the study area's total land area, was devoted to residential land use, with about 34 percent, or 18,527 acres, being in the Milwaukee County portion of the study area, and about 12 percent, or 8,316 acres, being in the Ozaukee County portion of the study area. Concentrations of residential use are apparent in the south-central and eastern portions of the study area, as well as in scattered portions of Ozaukee County surrounding long-established urban centers.

Source: SEWRPC.

Map 18

COMMERCIAL LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



There were about 1,334 acres of land devoted to commercial land uses in the study area in 1970, representing nearly 1.1 percent of the total area of the study area and about 2 percent of the developed urban portion of the study area. About 83 percent of this land was located in the Milwaukee County portion of the study area. It is evident that commercial development distribution is dependent upon accessibility as well as population concentration. The axial pattern of commercial land use in 1970 approximates the pattern of major highways through the study area, as well as major concentrations of residential land.

Source: SEWRPC.

excluding off-street parking of more than 10 spaces. At the time of the land use inventory in 1970, 1,334 acres of land were devoted to commercial land uses in the study area, representing nearly 1.1 percent of the total area of the study area and 2 percent of the developed urban portion of the study area. About 83 percent of this land was located in the Milwaukee County portion of the study area, as shown in Table 16. From Map 18, which depicts the distribution of commercial land use in the study area, it is evident that commercial development is dependent upon accessibility as well as population concentration. The axial pattern of commercial land use in 1970 approximates the pattern of major highways, as well as of major concentrations of residential land.

As indicated in Table 16, between 1963 and 1970 the amount of commercial land in the study area increased by 177 acres, or 15 percent. The Milwaukee County portion of the study area showed the greatest absolute and relative increase in commercial land use, 155 acres and 16 percent, compared with an increase in the Ozaukee County portion of 22 acres, or 11 percent.

The major regional retail and service centers of the Region are an important element of commercial land use in the Region, as they significantly support and serve, and may often generate and stimulate, urban development and thus represent special generators of transportation demand. Major, or regional, retail and service centers, as defined by the Commission, are those retail and service lands within designated central business districts (CBD's), strip shopping districts, or shopping centers which meet at least five of the following six criteria: 1) two department stores; 2) 10 additional retail and service establishments; 3) combined average annual sales totaling $30 million or more; 4) a combined net site area totaling 20 acres or more; 5) the ability to attract at least 3,000 shopping trips daily; and 6) an accessibility to a population of at least 100,000 within a radius of 10 miles or 20 minutes one-way travel time. As indicated in Table 17 and on Map 19, as of 1975, three of the 12 major retail and service centers in the Region were located in the study area: Mayfair Mall Shopping Center, Capitol Court Shopping Center, and Northridge Shopping Center.

Community retail and service centers, as defined by the Commission, support and serve a smaller population than do regional centers, but still offer a variety of retail and service options and represent special transportation needs. Community retail and service centers as defined by the Commission for communities of 10,000 people or more are those retail and service lands within CBD's, contiguous strip shopping districts, and shopping centers which have a total net commercial area of at least 100,000 square feet, and meet one of the following four criteria: 1) two department stores (net size of at least 25,000 square feet each); 2) one department store (net size of at least 25,000 square feet) and one grocery store (net size of at least 15,000 square feet); 3) one grocery store (net size of at least 14,000 square feet), one variety store (net size of at least 6,000 square feet), and five additional contiguous retail and service stores; and 4) one grocery store (net size of at least 15,000 square feet), one drug store (net size of at least 13,000 square feet), and five additional contiguous retail and service stores. For those communities having a population of less than 10,000 people, community retail and service centers are defined by the Commission as those retail and service lands within CBD's, contiguous shopping districts, and shopping centers which have a total net site area of at least 50,000 square feet and also meet one of the following four criteria: 1) one department store (net size of at least 25,000 square feet); 2) one grocery store (net size of at least 15,000 square feet) and one variety store (net size of at least 6,000 square feet); 3) one grocery store (net size of at least 15,000 square feet), and one drug store (net size of at least 13,000 square feet); and 4) one grocery store (net size of at least 2,000 square feet), one variety or drug store (net size of at least 2,000 square feet), and five additional contiguous retail and service stores. In 1975 there were 19 community retail and service centers wholly or partially within the northwest side study area, 13 in Milwaukee County and six in Ozaukee County, as indicated in Table 17 and on Map 19.

Table 17

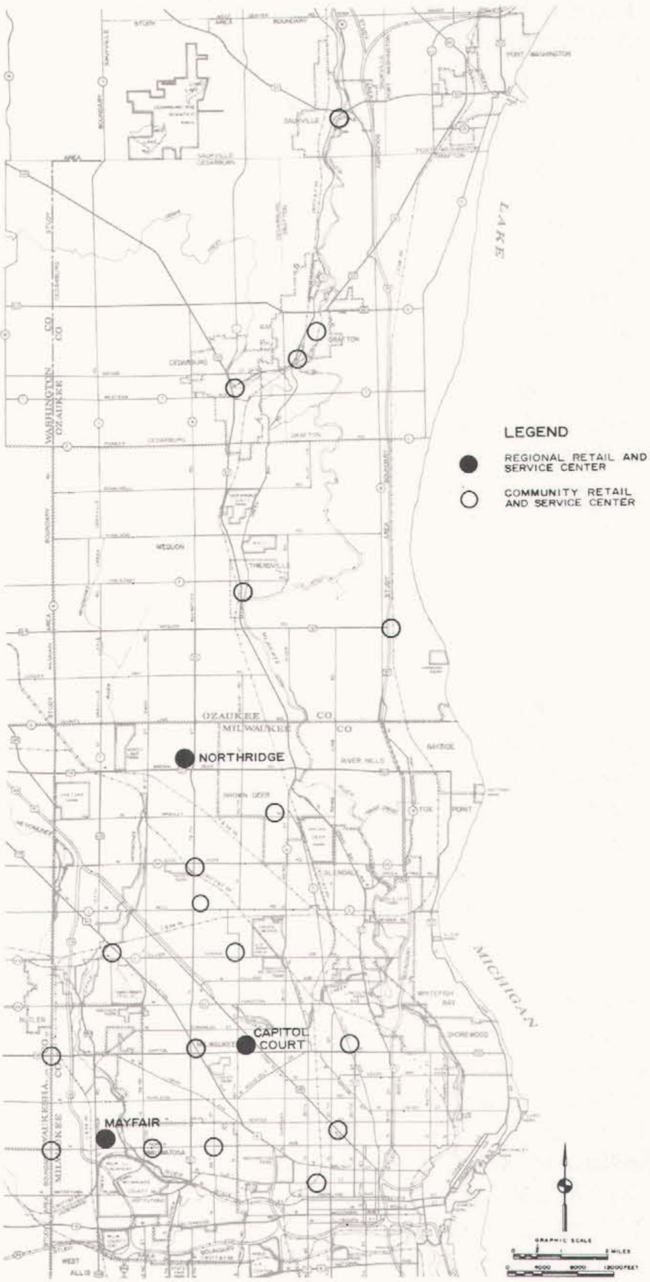
REGIONAL AND COMMUNITY RETAIL AND SERVICE CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

	Retail and Service Center	
County	Regional	Community
Milwaukee	Capitol Court Mayfair Mall Northridge	Bradley Village (Brown Deer CBD) 76th Street and Good Hope Mill Road (76th Street and Mill Road) Silver Spring and Appleton Avenue Silver Spring and 60th Street 76th Street and Appleton Avenue Teutonia Avenue and Capitol Drive 124th Street and Capitol Drive (part) Elmbrook Plaza (124th Street and North Avenue—part) North Avenue and 88th Street North Avenue and 68th Street North Avenue and 21st Street 35th Street and Vliet Street
Ozaukee	None	Saukville CBD Cedarburg CBD Grafton CBD Countryfaire Mall and Twin City Plaza Thiensville CBD Mequon Plaza

Source: SEWRPC.

Map 19

DISTRIBUTION OF REGIONAL AND COMMUNITY RETAIL AND SERVICE CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975



The major regional retail and service centers in the study area are important elements of commercial land use as they significantly support, serve, generate, and stimulate urban development and, as a consequence, are special generators of transportation demand. In 1975 three major retail and service centers were located in the study area: the Mayfair Mall, Capitol Court, and Northridge Shopping Centers. Community retail and service centers serve and support a smaller population than do regional centers, but still offer a variety of retail and service options, and represent special transportation needs. In 1975 there were 19 community retail and service centers located wholly and partially within the northwest side study area, 13 in the Milwaukee County portion of the study area and 6 in the Ozaukee County portion of the study area.

Source: SEWRPC.

Industrial Land Use

Industrial land use includes all manufacturing activities, wholesaling offices, and warehouse and storage areas, but excludes related off-street parking of more than 10 spaces. In 1970 the study area contained 2,374 acres of land devoted to industrial uses, as shown in Table 16. Although industrial development constitutes only 2 percent of the total area of the study area the spatial distribution of this land use category is of major importance, since approximately 35 percent of the study area's total employment opportunities are located in its industrial areas. Of the total amount of industrial land area in the northwest side study area, 1,770 acres, or 75 percent, are located within Milwaukee County, and 604 acres are located in Ozaukee County. Map 20 shows the concentration of industrial development in the Milwaukee and Ozaukee portions of the northwest side study area.

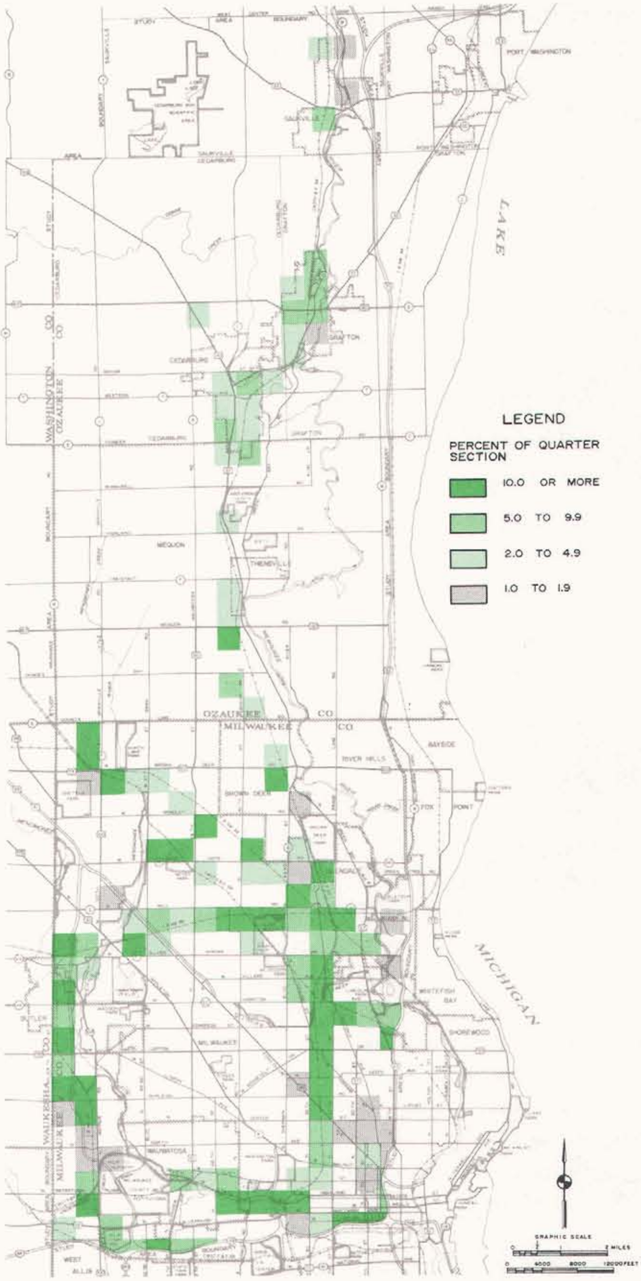
Between the 1963 land use inventory and the 1970 reinventory, the industrial lands in the study area increased by 548 acres, or 30 percent (see Table 16). In the Milwaukee County portion of the study area, industrial land use increased by 414 acres, or 30 percent. During the same period, industrial land use in the Ozaukee County portion of the study area increased by 134 acres, or 28 percent.

The major or regional industrial centers are an important element of the industrial land use of the study area. Regional industrial centers, as defined by the Commission, consist of contiguous U. S. Public Land Survey quarter sections having a total of 250 acres or more of net industrial land or a total of 3,500 or more industrial employees. As indicated in Table 18 and on Map 21, in 1975 six of the 17 regional industrial centers in the Region were entirely or partially located within the study area, and all of these six were located in Milwaukee County.

Community industrial centers are also an important element of the industrial land use of the study area, but because of their smaller size they do not have the same special transportation needs of the major industrial centers. Community industrial centers, by definition, are those industrial lands of 20 acres or more within industrial parks or strip industrial areas or providing employment for more than 300 persons. Six community industrial centers were located wholly or partially in the study area in 1975, as indicated in Table 18 and on Map 21. Four were located in Milwaukee County and two were located in Ozaukee County.

Map 20

INDUSTRIAL LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



Industrial land use includes all manufacturing activities, wholesaling offices, and warehouse and storage areas, but excludes related off-street parking of more than 10 spaces. In 1970 the study area contained 2,374 acres of land devoted to industrial uses. Although industrial development comprises only 2 percent of the total area of the study area, the spatial distribution of this land use category is of major importance, since approximately 35 percent of the study area's total employment opportunities are located in these industrial areas. Of the total amount of industrial land area in the northwest side study area, 1,770 acres, or 75 percent, are located within the Milwaukee County portion of the study area, and 604 acres are located in the Ozaukee County portion of the study area.

Source: SEWRPC.

Governmental and Institutional Land Use

Governmental and institutional land includes all land devoted to local, regional, or federal administrative, safety, or assembly functions, as well as to educational, health, and cemetery uses. In 1970, 4,116 acres of land in the study area were devoted to governmental and institutional uses, representing 3 percent of the total land use of the study area. The widespread dispersion of governmental and institutional land uses throughout the study area is apparent on Map 22.

As indicated in Table 16, 618 acres of land were developed for governmental and institutional uses between 1963 and 1970, an increase of 18 percent. Over 80 percent, or 499 acres, of this increase occurred in the Milwaukee County portion of the study area, representing an increase of 16 percent in that study area portion. The increase of 119 acres from 1963 to 1970 in the Ozaukee County portion of the study area represented a 28 percent increase.

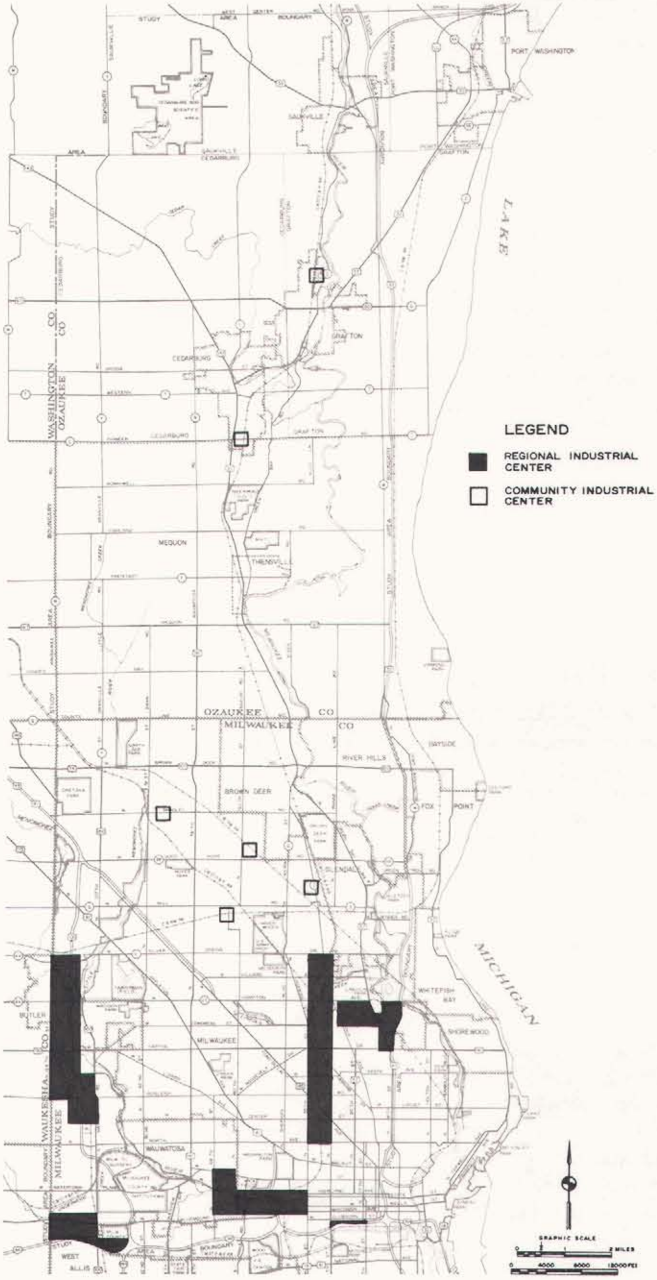
Table 19 and Map 23 delineate the regional and community governmental and institutional centers within the northwest side study area. Regional governmental and institutional centers include seats of county, state, and federal governments; medical complexes with at least 600 beds, 30 types of medical services, and 250 attending physicians; accredited universities; county-operated technical and vocational schools; large regional central libraries; and cultural-entertainment facilities having an annual attendance of at least 350,000 people. Community governmental and institutional centers include accredited colleges; senior high schools; hospitals with at least 100 beds, in- and out-patient facilities, and laboratory and clinical services; libraries other than large regional central libraries; and officially recognized city, village, and town halls. In 1975, five regional governmental and institutional centers were located in the study area, three in Milwaukee and two in Ozaukee Counties. Thirty-eight community governmental and institutional centers were wholly or partially located in the Milwaukee County portion of the study area in 1975, and 11 were wholly or partially located in the Ozaukee County portion of the study area.

Transportation, Communication, and Utility Land Use

Transportation, communication, and utility land uses include all street and highway rights-of-way; railroad rights-of-way and yards; airport, rail, ship, bus and truck terminals; communication facilities

Map 21

DISTRIBUTION OF REGIONAL AND COMMUNITY INDUSTRIAL CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

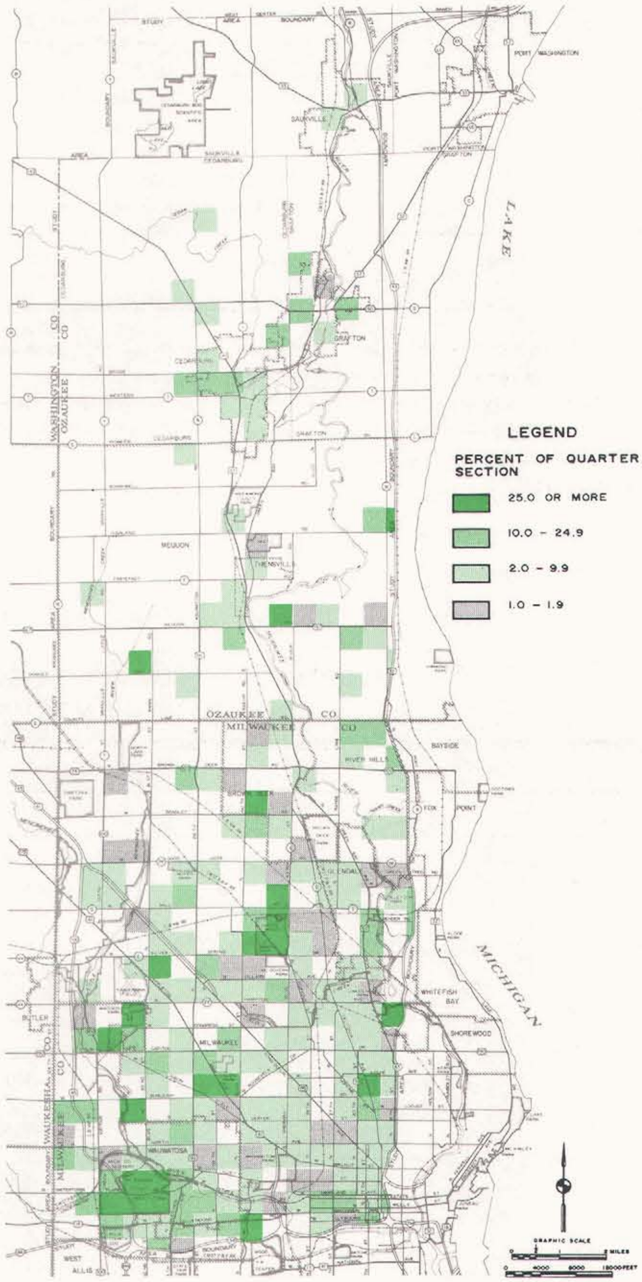


Regional industrial centers, as defined by the Commission, consist of contiguous areas having a total of 250 acres or more of net industrial land, or a total of 3,500 or more industrial employees. In 1975, seven of these regional industrial centers were located entirely or partially within the study area—all in the Milwaukee County portion. Community industrial centers are also an important element of the industrial land use of the study area but, because of their smaller size, may not have the special transportation needs of the major industrial centers. Six community industrial centers were located wholly or partially within the study area in 1975. Four were located in Milwaukee County and two were located in Ozaukee County.

Source: SEWRPC.

Map 22

GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



Lands devoted to governmental and institutional uses accounted for about 4,116 acres of land in the study area, or about 3 percent of the total land area of the study area in 1970. While there is a heavy concentration of governmental and institutional land in the major population centers of the study area, the diffused pattern indicates that such uses are common in the outlying rural portions of the study area as well.

Source: SEWRPC.

Table 18

REGIONAL AND COMMUNITY INDUSTRIAL CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

Industrial Centers		
County	Regional	Community
Milwaukee	Wauwatosa (part) Milwaukee Glendale (part) Milwaukee Menomonee Valley West (part) Milwaukee Menomonee Valley East (part) Milwaukee North West Allis West (part)	60th Street and Good Hope Road Teutonia Avenue and Green Tree Road 60th Street and Mill Road Milwaukee-Granville[a]
Ozaukee	None	Grafton Cedarburg

[a] *In 1975 the Milwaukee-Granville proposed industrial land bank area contained 170 acres of net industrial land and, therefore, while meeting the criteria for classification as a community industrial center, did not meet the criteria for classification as a regional industrial center—that is, 250 or more net industrial acres, or 3,500 industrial employees. This area, however, is proposed to be a fully developed regional industrial center by the year 2000, encompassing about 1,400 gross industrial acres.*

Source: SEWRPC.

Table 19

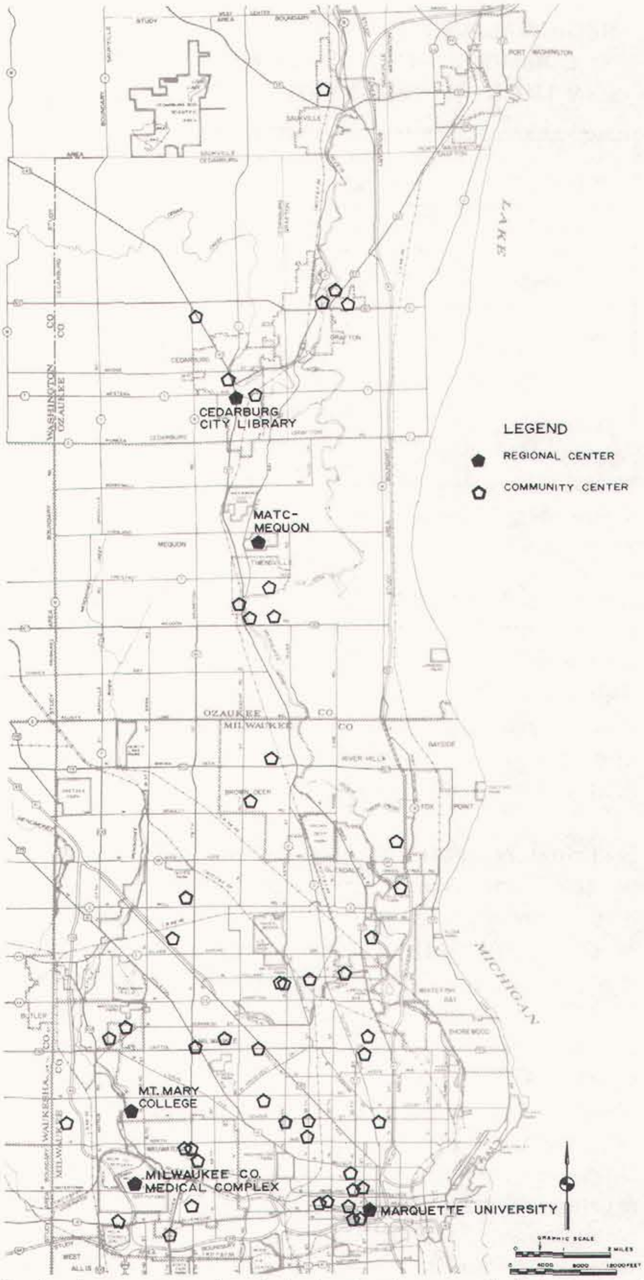
REGIONAL AND COMMUNITY GOVERNMENTAL AND INSTITUTIONAL CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

Governmental and Institutional Centers			
County	Regional	Community	
Milwaukee	Marquette University Mount Mary College Milwaukee County Medical Complex	Brown Deer High School Concordia College Custer High School Divine Savior/Holy Angels High School King High School Madison High School Marshall High School Milwaukee Lutheran High School Nicolet High School North Division High School Pius High School Washington High School Wauwatosa East High School Wauwatosa West High School West Division High School Wisconsin Lutheran High School Children's Hospital Deaconess Hospital Family Hospital	Lakeview Hospital Lutheran Hospital Milwaukee Psychiatric Hospital Misericordia Community Hospital Mount Sinai Hospital Northwest General Hospital St. Michael Hospital St. Joseph's Hospital Atkinson Library Capitol Library Center Library Finney Library Mill Road Library North Milwaukee Library Wauwatosa Library Brown Deer Village Hall Glendale City Hall River Hills Village Hall Wauwatosa City Hall
Ozaukee	Cedarburg City Library Milwaukee Area Technical College-Mequon	Cedarburg High School Grafton High School Homestead High School Grafton Library Mequon/Thiensville Library Cedarburg City Hall	Cedarburg Town Hall Grafton Village Hall Mequon City Hall Saukville Village Hall Thiensville Village Hall

Source: SEWRPC.

Map 23

DISTRIBUTION OF REGIONAL AND COMMUNITY GOVERNMENTAL AND INSTITUTIONAL CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975



Regional governmental and institutional centers include seats of county, state, and federal governments; medical complexes with at least 600 beds, 30 types of medical services, and 250 attending physicians; accredited universities; county-operated technical and vocational schools; large regional central libraries; and cultural-entertainment facilities having an annual attendance of at least 350,000 people. Community governmental and institutional centers include accredited colleges; senior high schools; hospitals with at least 100 beds, in- and out-patient facilities, and laboratory and clinical services; libraries other than large regional central libraries; and officially recognized city, village, and town halls. In 1975, four regional governmental and institutional centers—the Milwaukee County Medical Complex, Marquette University, Mount Mary College, the Cedarburg City Library, and the Milwaukee Area Technical College in Mequon—were located in the study area, three in Milwaukee County and three in Ozaukee County. Thirty-eight community governmental and institutional centers were wholly or partially located in the Milwaukee County portion of the study area in 1975, while 11 were wholly or partially located in the Ozaukee County portion of the study area.

Source: SEWRPC.

such as radio and television stations and transmission towers; utility rights-of-way and plants, such as sewage disposal and water treatment and storage facilities; and all off-street parking areas containing more than 10 spaces.

Transportation and related activities are inherently large consumers of land. Only residential land uses account for more urban development in the study area. At the time of the regional land use inventory in 1970, a total of 18,336 acres, representing 15 percent of the total land area of the study area and 32 percent of the developed portion of the study area, were devoted to transportation, communication, and utility land uses. The majority of this land use—13,935 acres—was in the Milwaukee County portion of the study area, and represented 26 percent of that study area portion in 1970. The relatively large amount of land occupied by this type of land use in the Milwaukee County portion of the study area reflects the degree of that area's urbanization. Table 16 and Map 24 delineate all transportation, communication, and utility land uses within the northwest side study area.

As indicated in Table 16, lands devoted to transportation, communication, and utility land uses in the study area increased by 1,854 acres, or 11 percent, from 1963 to 1970. The Milwaukee County portion of the study area experienced an increase of 1,367 acres, or 11 percent, and the Ozaukee County portion gained 487 acres, or 12 percent.

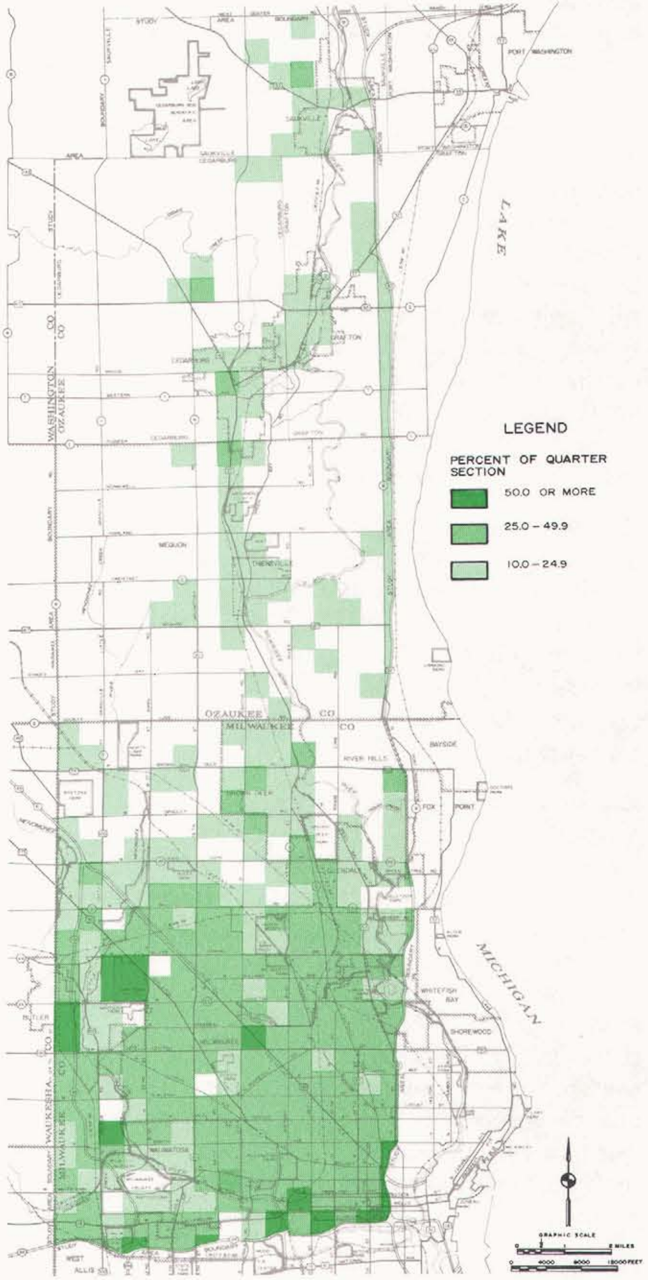
Regional transportation, communication, and utility centers, as defined by the Commission, include interregional bus and rail terminals, seaport facilities, major regional airports, sewage treatment plants, and public electric power generation facilities rated at greater than 20 megawatts annual production. In the entire northwest side study area, four such centers existed in 1975, as identified in Table 20 and on Map 25. Community transportation, communication, and utility centers include airports other than regional airports. There were two of these in the study area in 1975, both in Ozaukee County, as shown on Map 25 and in Table 20.

Recreational Land Use

Recreational land considered to be urban land includes lands devoted to active recreational uses such as playgrounds, parks, golf courses, zoos, campgrounds and picnic areas, and marinas. The 1970 land use inventory reported a total of 5,084 acres of such active recreational lands in the northwest side study area, representing 4 percent of the total area of the study area, as shown in Table 16. As indicated on Map 26, recreational land uses are well distributed throughout the study area, and are especially evident around many lakes, streams, and woodland areas.

Map 24

TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



Transportation and related land uses are inherently large consumers of land. Next to the residential land use category, the transportation, communication, and utility land use category represents the most extensive type of urban development in the study area. In 1970 a total of 18,336 acres in the study area, representing about 15 percent of the total land area of the study area and 32 percent of the developed portion of the study area, were devoted to these types of land uses. The majority of these uses were located in the Milwaukee County portion of the study area, reflecting the high degree of that subarea's urbanization.

Source: SEWRPC.

Table 20

REGIONAL AND COMMUNITY TRANSPORTATION, COMMUNICATION, AND UTILITY CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

County	Transportation, Communication, and Utility Centers	
	Regional	Community
Milwaukee	Timmerman Field	None
Ozaukee	Grafton Sewage Treatment Plant Saukville Sewage Treatment Plant Cedarburg Sewage Treatment Plant	Grob Landing Field Cedarburg Field

Source: SEWRPC.

Between 1963 and 1970, the amount of recreational land in the northwest side study area increased by 578 acres, or by 13 percent (see Table 16). The Milwaukee County portion of the study area increased by 294 acres, or 8 percent, and the Ozaukee County portion increased by 283 acres, or 43 percent.

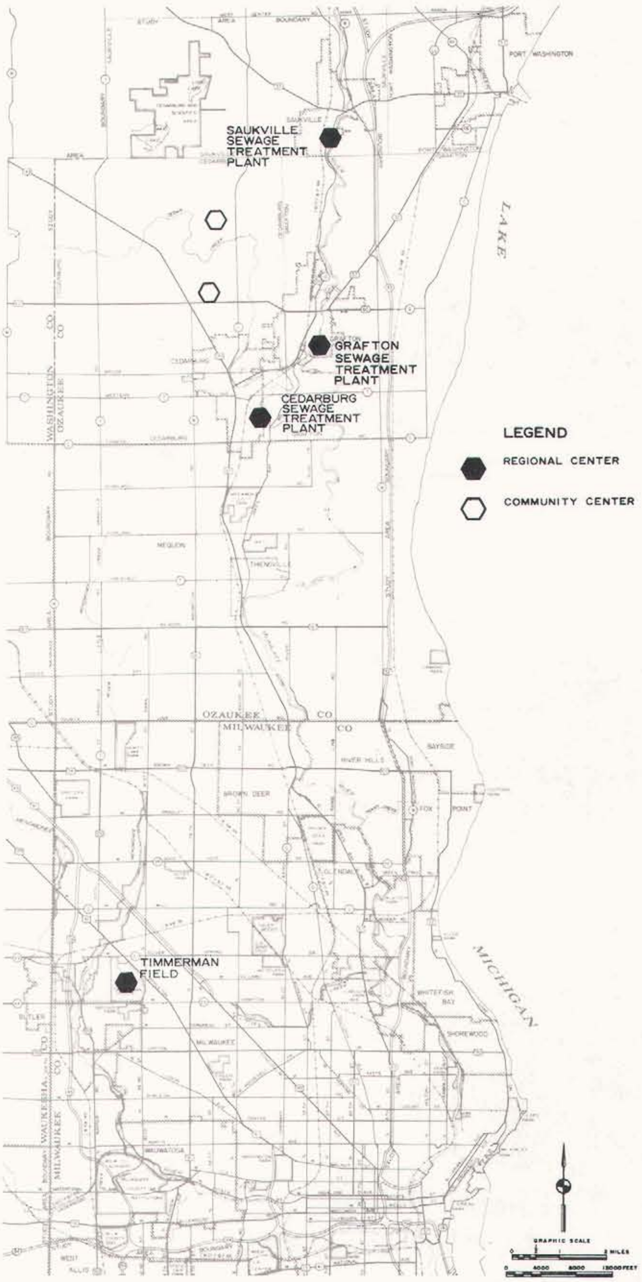
Regional recreational land use centers, as defined by the Commission, are those public multiuse outdoor recreation sites of 250 or more acres in area, or those sites with special spectator-oriented activities having an average annual attendance of at least 500,000 persons. Five such centers of this type are found in the northwest side study area, four in Milwaukee County and one in Ozaukee County (see Table 21 and Map 27). Community-recreational land use centers, as defined by the Commission, are those recreational land use centers which are community-oriented and contain typical community recreational facilities such as baseball diamonds, swimming pools, tennis courts, or golf courses. Sixteen such recreational centers existed within the study area in 1975, as listed in Table 21 and displayed on Map 27.

Open Lands

Open lands include three major types of land: woodlands, water and wetlands, and unused and other open land. As indicated in Table 22, there were 19,410 acres of open lands in the northwest side study area in 1970. More than half of this total, 51 percent, was comprised of wetlands. Woodlands accounted for another 21 percent, and 28 percent consisted of unused land.

Map 25

DISTRIBUTION OF REGIONAL AND COMMUNITY TRANSPORTATION, COMMUNICATION, AND UTILITY CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1978

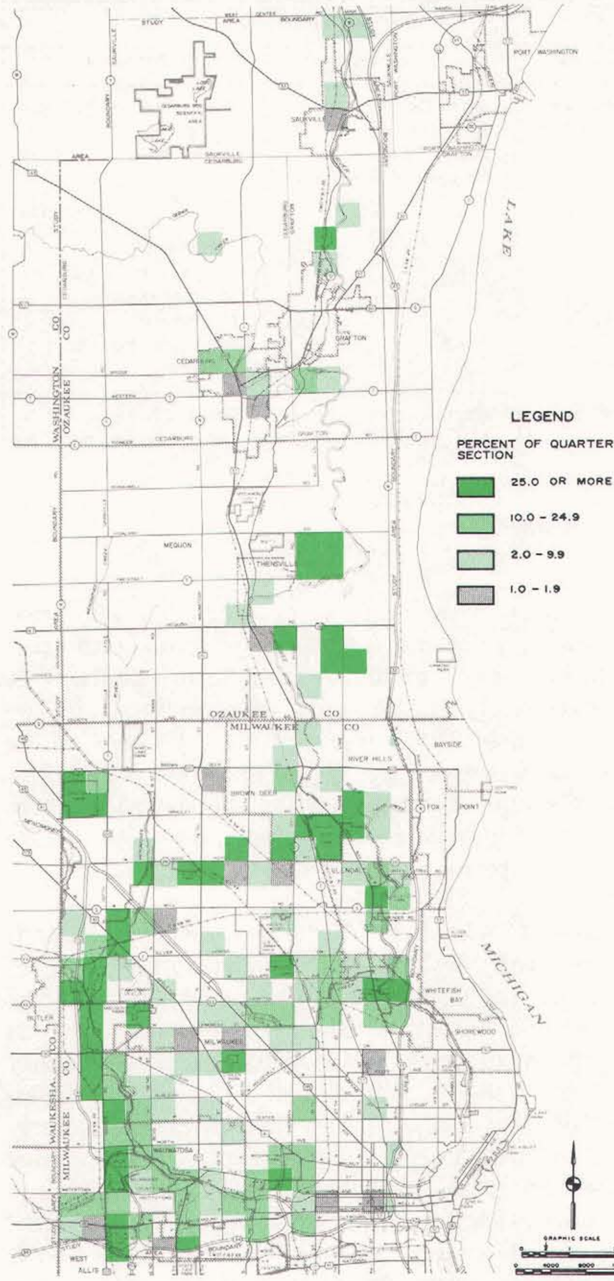


Regional transportation, communication, and utility centers as defined by the Commission include interregional bus and rail terminals, seaport facilities, major regional airports, sewage treatment plants, and public electric power generation facilities rated at greater than 20 megawatts annual production. In 1975 there were four such centers in the northwest side study area: the Timmerman Field Airport and the Cedarburg, Grafton, and Saukville Sewage Treatment Plants. Community transportation, communication, and utility centers include airports other than those which are major centers. There were two of these in the study area in 1975: the Cedarburg and the Grob landing fields, both in the Ozaukee County portion of the study area.

Source: SEWRPC.

Map 26

RECREATIONAL LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970



There were about 5,085 acres of active recreational lands in the northwest side study area in 1970, representing 4 percent of the total area of the study area.

Source: SEWRPC.

Table 21

REGIONAL AND COMMUNITY RECREATIONAL LAND USE CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

	Recreational Centers	
County	Regional	Community
Milwaukee	Brown Deer Park Dretzka Park Lincoln Park Milwaukee County Zoo	Brown Deer Village Park Currie Park Dineen Park Hart Park Hoyt/Hansen Park Kletzsch Park Madison Park Martin Luther King Park McGovern Park Noyes Park Washington Park Wick Field
Ozaukee	Mee-Kwon Park	Cedaqua Park Cedar Creek and Horn Park Grady Park Mequon City Park

Source: SEWRPC.

Map 27

DISTRIBUTION OF REGIONAL AND COMMUNITY RECREATION CENTERS IN THE NORTHWEST SIDE STUDY AREA: 1975

Regional recreational land use centers, as defined by the Commission, are those public multiuse outdoor recreation sites of 250 acres or more in area, or those sites with special spectator-oriented activities having an average annual attendance of at least 500,000 persons. Five such centers are located in the northwest side study area: Brown Deer Park, Lincoln Park, Dretzka Park, and the Milwaukee County Zoo in the Milwaukee County portion of the study area, and Mee-Kwon Park in the Ozaukee County portion of the study area. Community-oriented recreation land use centers, as defined by the Commission, are those centers which contain typical community recreational facilities, such as baseball diamonds, swimming pools, tennis courts, or golf courses. There were 16 such recreational centers located within the study area in 1975.

Source: SEWRPC.

Woodlands: This land use category includes areas of one acre or more that are covered with trees or heavy brush, including tree farms. There were approximately 4,131 acres of woodlands in the study area in 1970, representing 3 percent of the total land area of the study area (see Table 22). The Ozaukee County portion of the study area had the majority of the woodlands of the study area, 88 percent, or 3,621 acres.

Between 1963 and 1970, the amount of woodlands in both the Milwaukee and Ozaukee County portions of the study area decreased. Overall, the study area lost 214 acres, or 9 percent, of its woodlands during this period. The Ozaukee County portion of the study area lost 192 acres, or 5 percent of its woodlands, and the Milwaukee County portion lost 23 acres, or 4 percent of its remaining woodland areas. The remaining woodland areas in the northwest side study area have very important and direct values as wildlife habitat, aesthetic settings for urban development, areas for nature study, scientific areas, and outdoor recreation. They also have indirect and significant values in that they serve to reduce soil erosion, stream sedimentation, and runoff, to maintain water tables and stream and lake levels, and to promote groundwater recharge.

Wetlands: The wetlands land use category includes all inland lakes, streams, and rivers, and all open lands which are intermittently covered with water

Table 22

OPEN LANDS IN THE NORTHWEST SIDE STUDY AREA: 1963 AND 1970

Open Land Category	1963		1970		Change: 1963-1970	
	Acres	Percent of Open Lands	Acres	Percent of Open Lands	Acres	Percent
Study Area						
Woodlands	4,345	20.7	4,131	21.3	- 214	- 9.1
Wetlands	9,942	47.3	9,923	51.1	- 19	- 0.2
Unused Land	6,727	32.0	5,356	27.6	- 1,371	- 20.3
Total	21,014	100.0	19,410	100.0	- 1,604	- 7.6
Milwaukee County Portion						
Woodlands	532	7.6	510	9.4	- 22	- 4.3
Wetlands	722	10.4	789	14.5	67	9.1
Unused Land	5,707	82.0	4,139	76.1	- 1,568	- 27.5
Total	6,961	100.0	5,438	100.0	- 1,523	- 21.9
Ozaukee County Portion						
Woodlands	3,813	27.1	3,621	25.9	- 192	- 5.0
Wetlands	9,220	65.6	9,134	65.4	- 86	- 0.9
Unused Land	1,020	7.3	1,217	8.7	197	19.4
Total	14,053	100.0	13,972	100.0	- 81	- 0.6

Source: SEWRPC.

or which are wet due to a high water table. Water and wetlands are important elements of the natural resource base, providing opportunities for recreation and contributing to the ecological balance of the northwest side study area in many ways. In 1970 there were 9,923 acres of wetlands in the study area, or 8 percent of the total land area in the study area (see Table 22). The Ozaukee County portion of the study area contained 92 percent of these wetland areas, or 9,134 acres.

The extent of water and wetlands in an area may change slightly over time as a result of drainage and landfill operations as well as construction of new impoundment areas. For these reasons, wetland acreage increased in some parts of the study area between 1963 and 1970. The net effect of these changes was a decrease of less than 1 percent in wetland acreage in the study area. This overall decrease occurred despite the considerable increase of 67 acres, or 9 percent, in the Milwaukee County portion of the study area during this period. The Ozaukee County portion of the study area lost 86 acres of wetlands during this period.

Unused Land: Unused land use includes lands which are not cropped, grazed, or devoted to urban uses, and lands devoted to temporary uses such as open pits for trash or garbage disposal or quarries, either operating or nonoperating. In 1970, there were 5,356 acres of unused land in the study area, or 4 percent of its total land area (see Table 22). The Ozaukee County portion of the study area contained 1,217 acres of unused land in 1970, and the Milwaukee County portion contained 4,139 acres.

Between 1963 and 1970, there were increases in unused land in certain parts of the study area and decreases in other parts. The net effect of these changes was a decrease of 1,371 acres, or 20 percent, in unused land in the study area from 1963 to 1970. The Milwaukee County portion of the study area experienced a net loss of 1,568 acres of unused land during this period, due largely to conversion to urban uses. Conversely, the Ozaukee County portion of the study area experienced a net gain in unused land acreage of 197 acres of land during this time.

Agricultural Land Use

The agricultural land use category includes all croplands, pasturelands, orchards, nurseries, and fowl and fur farms. Agricultural land is the largest land use in the study area, occupying 37 percent of all land in the northwest side study area in 1970, or a total of 45,798 acres. The Ozaukee County portion of the study area contained 4 percent of all agricultural lands in the Southeastern Wisconsin Region and 88 percent of all agricultural land in the study area in 1970. The Milwaukee County portion of the study area contained 5,378 acres of agricultural land in 1970, representing only 1 percent of its total land use (see Table 16).

From Table 16, it is evident that a substantial conversion of agricultural lands to urban use occurred between 1963 and 1970. Largely because of this conversion to urban land use, the agricultural land base of the study area decreased by 6,315 acres during this period. During this period the Milwaukee County portion of the study area lost 35 percent of its agricultural land, or 2,829 acres, and the Ozaukee County portion lost 8 percent of its agricultural land, or 3,485 acres.

EXISTING TRANSPORTATION FACILITIES AND SERVICES

Transportation facilities and services are among the most critical elements that influence travel characteristics and shape the spatial distribution of rural and urban development within an area. The availability or lack of availability of a transportation facility or service will influence the path and mode as well as the frequency of personal travel. The accessibility of a site to population and employment concentrations and to community facilities and services, as determined by the transportation system, will influence the type and intensity of its development. Transportation facilities and services thus form the basic framework for both rural and urban development and, to a considerable degree, determine the efficiency of the other functional elements of such development. Any transportation system planning effort must, therefore, include an examination of the supply as well as of the demand for transportation facilities and services. The following sections of this chapter describe the location, capacity, and utilization of the existing arterial street and highway and public transit systems of the northwest side study area, and compare the transportation system of the study area with that of the Region.

Existing Supply of Streets and Highways

The total street and highway system of the study area in 1978 was composed of 1,396 miles of facilities, of which 439 miles, or about 32 percent, were classified by function as arterials, and 957 miles, or about 68 percent, were classified as collector and land access streets (see Map 28 and Table 23). In the Region in 1978, arterial street mileage also constituted about 32 percent, or 3,290 miles, of the total 10,440-mile system. Thus the study area, while comprising about 9 percent of the total area of the Region, contains 13 percent of the total street and highway mileage of the Region, and 13 percent of the arterial mileage. Arterials consist of those streets and highways which serve the movement of heavy volumes of through traffic between major subareas of the Region, between such subareas and points outside the Region, and through the Region. It is, therefore, this arterial street system which transportation system planning efforts such as the northwest side study must address. Freeways, expressways, certain parkways, and standard arterial streets and highways are all types of facilities having design characteristics typical of arterial streets and highways. As shown in Table 23, in 1978 freeways constituted over 11 percent of the approximately

Table 23

DISTRIBUTION OF STREET AND HIGHWAY MILEAGE IN THE REGION AND THE NORTHWEST SIDE STUDY AREA BY TYPE OF FACILITY: 1978

Area	Existing Arterials (miles)			Existing Nonarterials (miles)	Total Miles
	Freeway	Nonfreeway	Total		
Milwaukee					
Study Area Portion . . .	35.2	238.7	273.9	713.9	987.8
Total County	69.2	684.8	754.0	2,048.8	2,802.8
Ozaukee					
Study Area Portion . . .	15.3	149.9	165.2	242.9	408.1
Total County	27.6	267.9	295.5	480.6	776.1
Total Study Area	50.5	388.6	439.1	956.8	1,395.9
Region	237.7	3,056.2	3,293.9	7,141.7	10,435.6

Source: SEWRPC.

Map 28

ARTERIAL STREETS AND HIGHWAYS IN THE NORTHWEST SIDE STUDY AREA: 1978

LEGEND

FREEWAY

STANDARD ARTERIAL

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

Arterials are those streets and highways which serve the movement of heavy volumes of through traffic between major subareas of the Region, between subareas and points outside the Region, and through the Region. Freeways, expressways, certain parkways, and standard arterial streets and highways are all types of facilities having design characteristics typical of arterial streets and highways. Total street and highway system mileage in the study area in 1978 was 1,396 miles. Of this mileage, 439 miles, or about 32 percent, were classified by function as arterial, and 957 miles, or about 68 percent, were classified as collector and land access streets. The study area, while comprising about 9 percent of the total area of the Region, contained 13 percent of the total street and highway mileage of the Region and 13 percent of the arterial mileage in 1978.

Source: SEWRPC.

439 total arterial street miles in the northwest side study area, and to a large extent defined the boundaries of the study area. In the Region freeways constituted 7 percent of the total regional arterial street mileage in 1978, or 238 miles of the 3,287-mile arterial system.

The jurisdictional responsibilities for the existing arterial street and highway system of the northwest side study area are shown on Map 29 and summarized in Table 24. This jurisdictional classification establishes which level of government—state, county, or local—has responsibility for the design, construction, maintenance, and operation of each segment of the area's existing arterial street and highway system. Jurisdictional classification consequently has important implications for transportation system plan implementation. As indicated in Table 24, nearly 35 percent of the existing arterial street mileage in the northwest side study area is on the state trunk highway system, including all 50 miles of freeway in the study area. Over 16 percent, or about 74 miles, of the arterial street system in the study area is on the county trunk highway system, and is the responsibility of Milwaukee or Ozaukee County. The remaining 49 percent of the study area arterial street and highway system, or nearly 212 miles, is under the jurisdiction of cities, villages, and towns. In the Region nearly 39 percent of its arterial street mileage was on the state trunk highway system in 1978, 34 percent was on the county trunk highway system, and the remaining 27 percent was the responsibility of local cities, villages, and towns. There is a lower percentage of county trunk facilities in the study area than in the Region because of the historic dissolution of the county trunk highway system in Milwaukee County.

The arterial street and highway system of the study area can be further classified in terms of the federal aid systems which underlie it. There are four basic federal aid systems for streets and highways: the federal aid interstate system, the federal aid primary system, the federal aid secondary system and the federal aid urban system. The classification of the street and highway system by federal aid system, as it existed in 1978, is shown on Map 30 and in Table 25. About 414 miles of the study area arterial street system, or about 94 percent of the system, were part of a federal aid system. Over 32 miles, or 7 percent, of the study area arterials were on the federal aid interstate system; 88 miles, or 20 percent, were on the federal aid primary system; 269 miles, or 61 percent, were on the federal aid urban system; and 25 miles, or 6 percent, were on the federal aid secondary system.

Existing Arterial Street Utilization

The utilization of the study area arterial street and highway system was comprehensively determined for the year 1978 and is presented on Map 31 and in Table 26. Arterial streets and highways were the most heavily utilized in the Milwaukee County portion of the study area in 1978, particularly its southern half. The Milwaukee County portion of the study area accounted for over 89 percent of the approximately 7.8 million vehicle miles of travel which occurred on the study area arterial street and highway system on an average weekday

Table 24

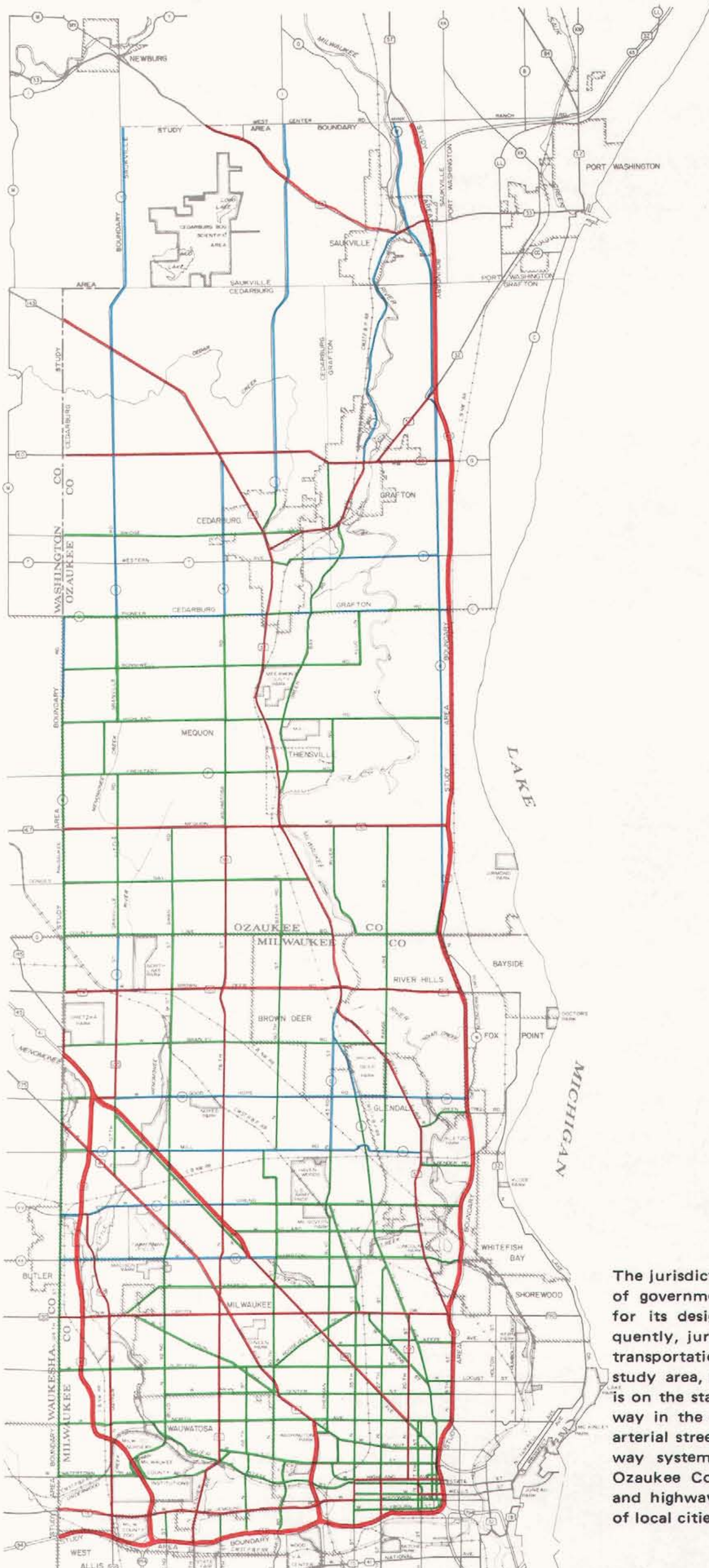
DISTRIBUTION OF STREET AND HIGHWAY MILEAGE IN THE REGION AND THE NORTHWEST SIDE STUDY AREA BY JURISDICTION: 1978

Area	Existing Arterials (miles)					Existing Nonarterials (miles)			Total Miles
	State Trunk Highway		County Trunk Highway	Local Trunk Highway	Total	County Trunk Highway	Local Trunk Highway	Total	
	Freeway	Nonfreeway							
Milwaukee									
Study Area	35.2	66.4	25.2	147.1	273.9	16.6	551.4	568.0	841.9
Total County	69.2	188.3	82.7	413.8	754.0	62.4	1,986.4	2,048.8	2,802.8
Ozaukee									
Study Area	15.3	36.6	48.6	64.7	165.2	5.8	237.2	243.0	408.2
Total County	27.6	71.8	126.7	69.4	295.5	12.9	467.4	480.6	776.1
Total Study Area	50.5	103.0	73.8	211.8	439.1	22.4	788.6	811.0	1,250.1
Region	237.7	1,036.9	1,124.8	894.5	3,293.9	428.8	6,712.9	7,141.7	10,435.16

Source: Wisconsin Department of Transportation and SEWRPC.

Map 29

JURISDICTIONAL STREET AND HIGHWAY SYSTEM IN THE NORTHWEST SIDE STUDY AREA: 1978

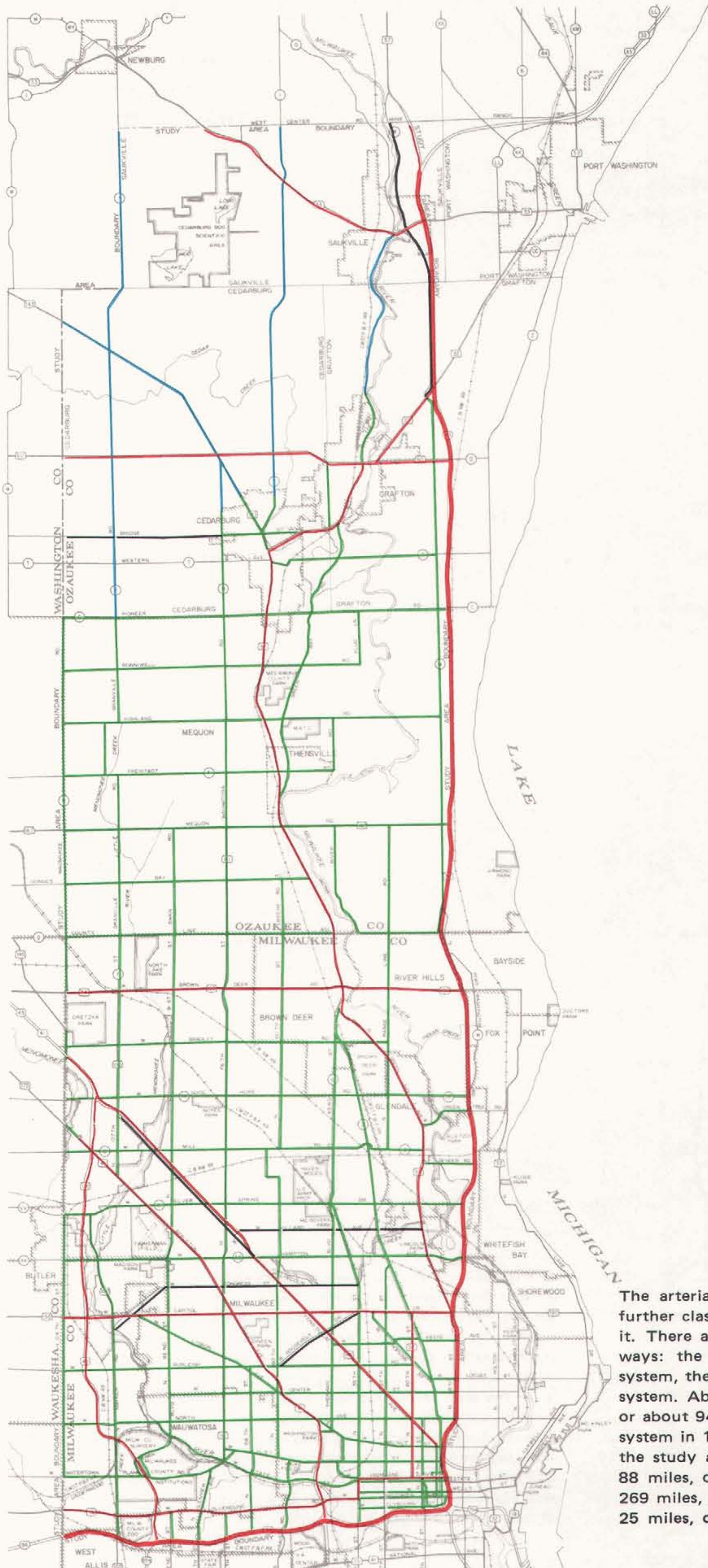


The jurisdictional classification of a roadway establishes which level of government—state, county, or local—has primary responsibility for its design, construction, maintenance, and operation. Consequently, jurisdictional classification has important implications for transportation system plan implementation. In the northwest side study area, nearly 35 percent of the existing arterial street mileage is on the state trunk highway system, including all 50 miles of freeway in the study area. Over 16 percent, or about 75 miles, of the arterial street system in the study area is on the county trunk highway system, and is the responsibility of Milwaukee County or Ozaukee County. The remaining 49 percent of the arterial street and highway system, or nearly 212 miles, is under the jurisdiction of local cities, villages, and towns.

Source: SEWRPC.

Map 30

FEDERAL AID HIGHWAY SYSTEM IN THE NORTHWEST SIDE STUDY AREA: 1978



LEGEND

- FEDERAL AID INTERSTATE
- FEDERAL AID PRIMARY
- FEDERAL AID SECONDARY
- FEDERAL AID URBAN
- NON-FEDERAL AID

GRAPHIC SCALE
0 ½ 1 2 MILES
0 4000 8000 12000 FEET

The arterial street and highway system of the study area can be further classified in terms of the federal aid systems which underlie it. There are: four basic federal aid systems for streets and highways: the federal aid interstate system, the federal aid primary system, the federal aid secondary system, and the federal aid urban system. About 414 miles of the study area arterial street system, or about 94 percent of the system, were included in the federal aid system in 1978. Of these 414 miles, over 32 miles, or 7 percent of the study area arterials, were on the federal aid interstate system; 88 miles, or 20 percent, were on the federal aid primary system; 269 miles, or 61 percent, were on the federal aid urban system; and 25 miles, or 6 percent, were on the federal aid secondary system.

Source: SEWRPC.

Table 25

ARTERIAL STREET AND HIGHWAY SYSTEM OF THE NORTHWEST SIDE STUDY AREA BY FEDERAL AID CLASSIFICATION: 1978

Subarea	Federal Aid Classification (miles)					
	Federal Aid Interstate	Federal Aid Primary	Federal Aid Secondary	Federal Aid Urban	Nonfederal Aid	Total Miles
Milwaukee County Portion	18.7	62.0	- -	176.4	16.8	237.9
Ozaukee County Portion.	14.2	25.8	24.8	92.0	8.4	165.2
Total Study Area	32.9	87.8	24.8	268.4	25.2	439.1

Source: Wisconsin Department of Transportation and SEWRPC.

in 1978. Freeways, while comprising less than 12 percent of the study area arterial street and highway mileage in 1978, carried approximately 38 percent of the total arterial travel in the area.

Relationship of System Utilization to Capacity

Each designated arterial street and highway segment within the study area in 1978 was defined in terms of its peak-hour design capacity—that is, the maximum number of vehicles which could pass a given point on the facility during the peak travel hours under existing roadway and desirable operating conditions.[3] In addition, the 24-hour design capacity of each street and highway segment was established by converting its peak-hour design capacity to a 24-hour design capacity. The peak-hour design capacity of freeways and expressways was defined as a function of the number of lanes and pavement width, modified by factors representing the presence of lateral restrictions and the percentage of trucks in the total traffic flow. The peak-hour design capacity of standard arterial streets and highways was defined as a function of the intersection approach pavement width, modified by factors reflecting the location of the intersection with respect to the intensity of urban development, the directional imbalance in the traffic flow, the intersection approach gradient, the percentage of right- and left-turning vehicle movements, the percentage of trucks in the total traffic flow, the provision for parking along the street or highway, and the percentage of the traffic signal cycle allocated to the green phase.

The peak morning hour (7:00 a.m. to 8:00 a.m.) and peak evening hour (4:00 p.m. to 5:00 p.m.) traffic utilizing particular sections of the arterial system, with the peak-hour capacity of these sections referred to as volume-to-design capacity (V/C) ratios, were compared to identify and quantify existing conditions of traffic congestion. Peak-hour traffic volumes were established for each segment

[3] *The design capacity of arterial facilities differs from their maximum capacity—that is, the maximum number of vehicles which can pass a given point on a facility under existing roadway and operating conditions—in that the design capacity requires desirable operating conditions to be maintained. This requires that the breakdown and unstable flow near breakdown conditions characteristic of maximum capacity operation do not occur. The unstable flow conditions of near-maximum-capacity operation include restricted operating speeds, necessary speed changes, momentary traffic stoppages, and some backups behind turning vehicles causing delays for more than one traffic signal cycle. Under traffic breakdown conditions stoppages are more frequent, with substantially lower operating speeds and delays for more than one traffic signal cycle. The design capacity of an arterial facility is established at some proportion of maximum capacity, usually 70 percent of maximum capacity. An arterial facility operating at design capacity does place some constraints on speed and lane changing, and there are some backups and delays behind turning vehicles at controlled intersections.*

Table 26

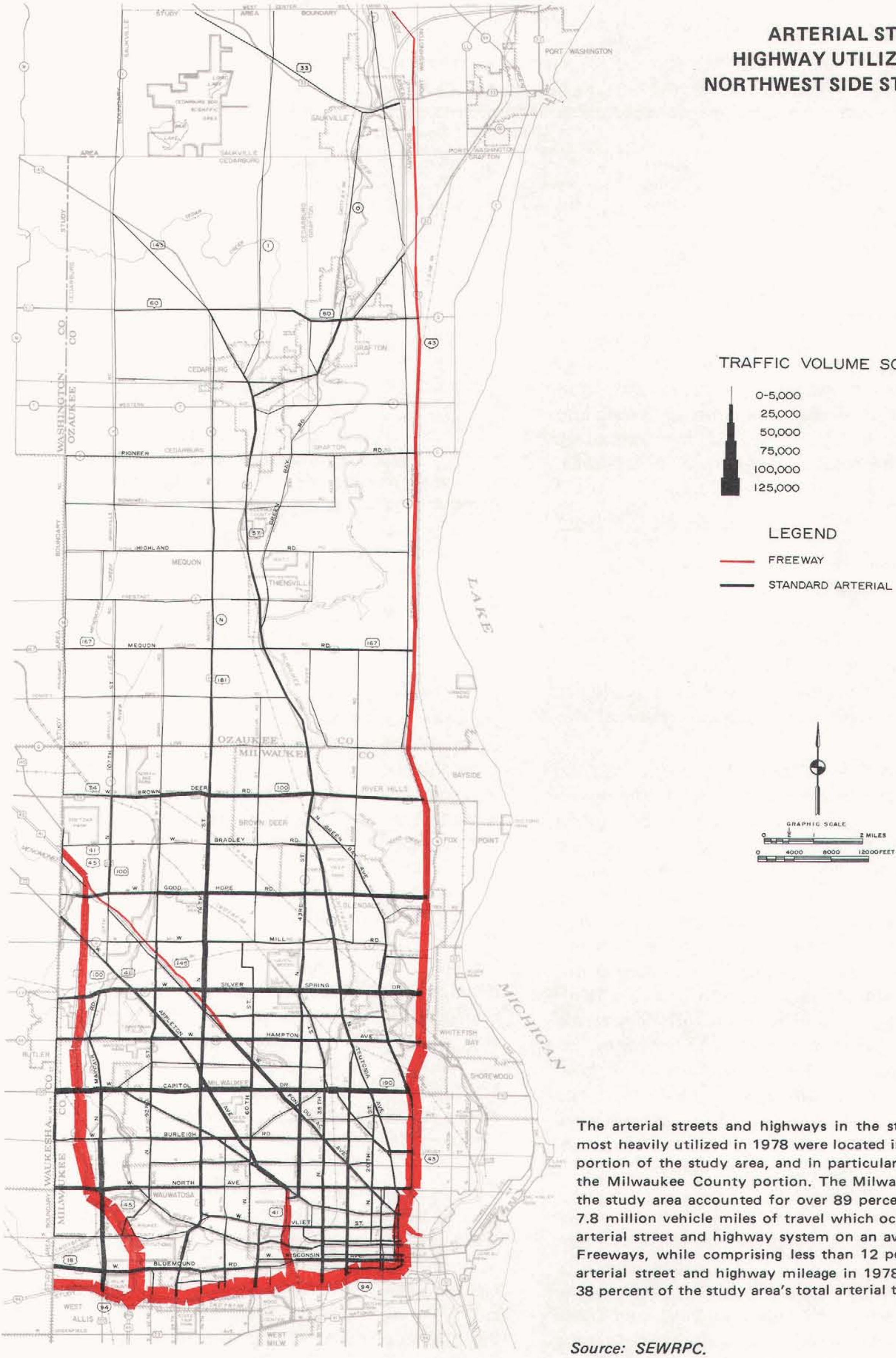
VEHICLE MILES OF TRAVEL ON AN AVERAGE WEEKDAY IN THE NORTHWEST SIDE STUDY AREA: 1978

Subarea	Freeway	Standard Arterial	Total
Milwaukee County Portion . . .	2,687,400	4,311,400	6,998,800
Ozaukee County Portion.	329,800	506,400	836,200
Total Study Area	3,017,200	4,817,800	7,835,000

Source: SEWRPC.

Map 31

ARTERIAL STREET AND HIGHWAY UTILIZATION IN THE NORTHWEST SIDE STUDY AREA: 1978



The arterial streets and highways in the study area that were the most heavily utilized in 1978 were located in the Milwaukee County portion of the study area, and in particular in the southern half of the Milwaukee County portion. The Milwaukee County portion of the study area accounted for over 89 percent of the approximately 7.8 million vehicle miles of travel which occurred on the study area arterial street and highway system on an average weekday in 1978. Freeways, while comprising less than 12 percent of the study area arterial street and highway mileage in 1978, carried approximately 38 percent of the study area's total arterial travel.

Source: SEWRPC.

of the study area arterial street system by converting the comprehensively inventoried average weekday traffic volumes for each segment to peak-hour volumes using arterial street specific factors—factors representative of each segment's directional traffic flow imbalance and proportion of average weekday traffic occurring during the morning and evening peak travel hours. Arterial street-specific factors were established based upon a representative inventory of arterial street directional imbalance and peak-hour traffic proportion in the study area, and an analysis which both identified the characteristics of the street and its surrounding area influencing the variation of such directional imbalance and peak-hour traffic proportion and determined the degree to which these characteristics were present in each element of the study area arterial system.

The V/C ratios for the morning and evening peak hours in 1978 for each segment of the arterial system in the study area are presented in Table 27 and shown on Maps 32 and 33. The V/C ratios for the study area arterial system were prepared and are available by direction of travel, although Table 27 and Maps 32 and 33 do not present this information by direction. This is both for convenience in presentation and to facilitate comparison with other characteristics of the arterial street system presented in this chapter. An arterial street segment is considered to be congested if one or both directions of travel on the facility segment are congested. The V/C ratios have been grouped into three categories: under design capacity, V/C = 0.90 or less; at design capacity, V/C = 0.91 to 1.10; and over design capacity, V/C = 1.11 or more. Those facilities operating under design capacity provide service having stable flow and few restrictions on operating speed. Those facilities operating at design capacity provide service with stable flow at higher volumes, with some restrictions on speed and lane changing, some occurrences of restricted traffic flow, and some delays at controlled intersections behind turning vehicles. Those facilities operating over design capacity experience traffic congestion at times approaching unstable flow, with restricted speeds, momentary stoppages, necessary speed changes, delays at controlled intersections for more than one traffic signal cycle, and little freedom to maneuver.

About 57 miles of arterial streets and highways, representing about 13 percent of the arterial street and highway system of the study area, were operating over design capacity; while 37 miles, or about 8 percent of the study area arterial street and highway system, were operating at design capacity in the morning peak hour. Similarly, 58 miles, or 13 percent of the study area, were operating over design capacity while 36 miles, or 8 percent, were operating at design capacity in the evening peak hour. During both the morning and evening peak hours, the extent of congested arterial facilities was much greater in the Milwaukee County portion of the study area. Nearly 95 percent of the arterial facilities operating at design capacity in the morning peak hour and 99 percent of the same in the evening peak hour were located in the Milwaukee County portion of the study area. Furthermore, nearly 99 percent of the arterial facilities operating over design capacity in the morning peak hour and 98 percent of the same in the evening peak hour were located in the Milwaukee County portion. As shown on Maps 32 and 33, these congested arterial facilities were located largely in the southern two-thirds of the Milwaukee County portion of the study area.

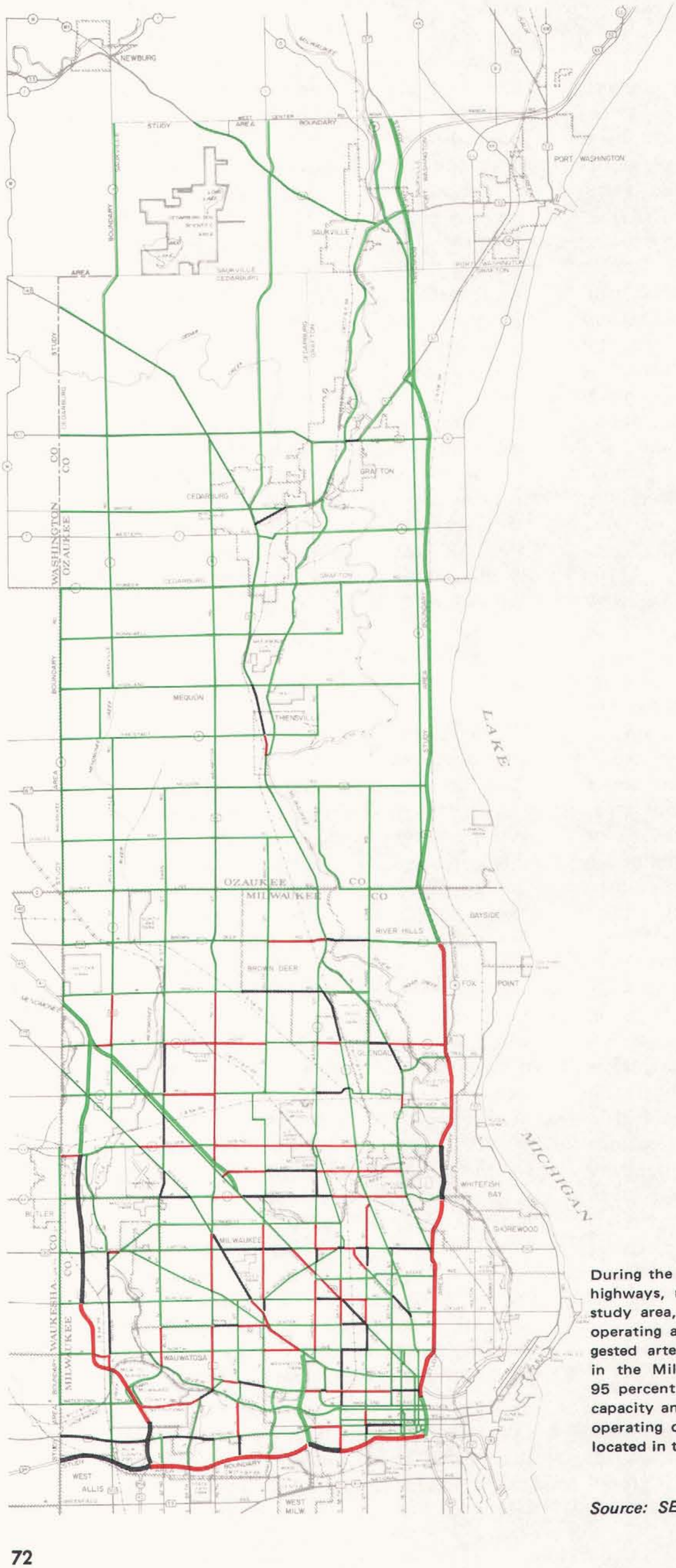
EXISTING SUPPLY AND USE OF PUBLIC TRANSIT

Public transit is an important element of the transportation system of the northwest side study area. Some form of public transportation is essential to the provision of a balanced transportation system in any large urbanized area, not only to meet the needs of that segment of the population unable to command direct use of personalized transportation, but also to provide an alternative, more efficient mode of travel for certain types of trips within urbanized areas, particularly in heavily traveled corridors. Public transit can be classified as fixed route or nonfixed route service, according to whether service is provided on regular schedules over prescribed routes or on a demand-responsive basis, respectively. Public transit can be further divided into common carrier and special carrier service, according to whether service is provided to the general public or limited to special subgroups of the general public, respectively. Thus, for analysis purposes public transit can be divided into four basic types: fixed route common carrier, fixed route special carrier, nonfixed route common carrier, and nonfixed route special carrier service. With the exception of nonfixed route common carrier service, all of these types of services were provided in the study area in 1979.

Fixed route common carrier service was by far the largest and most heavily utilized form of public transit service operating in the study area in 1979.

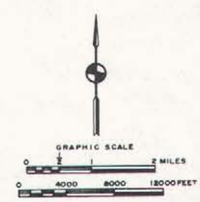
Map 32

VOLUME-TO-CAPACITY RATIOS ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE NORTHWEST SIDE STUDY AREA DURING THE MORNING PEAK HOUR: 1978



LEGEND

- FREEWAY VOLUME OVER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME OVER DESIGN CAPACITY
- FREEWAY VOLUME AT DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME AT DESIGN CAPACITY
- FREEWAY VOLUME UNDER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME UNDER DESIGN CAPACITY



During the morning peak hour, over 94 miles of arterial streets and highways, representing 21 percent of the arterial mileage of the study area, were found to be congested—that is, were found to be operating at or over design capacity—in 1978. The extent of congested arterial facilities during this time period was much greater in the Milwaukee County portion of the study area, as nearly 95 percent of the study area's arterial facilities operating at design capacity and nearly 99 percent of the study area's arterial facilities operating over design capacity during the morning peak hour were located in the Milwaukee County portion of the study area.

Source: SEWRPC.

VOLUME-TO-CAPACITY RATIOS ON THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE NORTHWEST SIDE STUDY AREA DURING THE EVENING PEAK HOUR: 1978

LEGEND

- FREEWAY VOLUME OVER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME OVER DESIGN CAPACITY
- FREEWAY VOLUME AT DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME AT DESIGN CAPACITY
- FREEWAY VOLUME UNDER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME UNDER DESIGN CAPACITY

GRAPHIC SCALE
0 ½ 1 2 MILES
0 4000 8000 12000 FEET

During the evening peak hour, about 94 miles of arterial streets and highways, representing 21 percent of the total arterial mileage of the study area, were found to be operating at or over design capacity in 1978. Nearly 99 percent of the arterial facilities operating at design capacity and nearly 98 percent of the arterial facilities operating over design capacity during the evening peak hour in 1978 were located in the Milwaukee County portion of the study area.

Source: SEWRPC.

Table 27

VOLUME-TO-CAPACITY RATIOS FOR THE ARTERIAL STREET AND HIGHWAY SYSTEM IN THE NORTHWEST SIDE STUDY AREA FOR THE MORNING AND EVENING PEAK TRAVEL HOURS: 1978

Morning Peak Travel Hour (7 a.m. to 8 a.m.)																				
	Freeway Volume to Capacity Range						Arterial Volume to Capacity Range						Total						Total	
	0.00 - 0.90		0.91-1.10		Above 1.10		0.00 - 0.90		0.91 - 1.10		Above 1.10		0.00 - 0.90		0.91 - 1.10		Above 1.10			
Subarea	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total
Milwaukee County Portion	12.9	4.7	7.2	2.6	15.1	5.6	169.4	61.8	28.1	10.3	41.2	15.6	182.3	66.6	35.3	12.9	56.3	20.5	273.9	100.0
Ozaukee County Portion	15.3	9.3	- -	- -	- -	- -	147.4	89.2	1.9	1.1	0.6	0.4	162.7	98.5	1.9	1.1	0.6	0.4	165.2	100.0
Total Study Area	28.2	6.5	7.2	1.6	15.1	3.4	316.8	72.1	30.0	6.8	41.8	9.5	345.0	78.6	37.2	8.4	56.9	12.9	439.1	100.0

Evening Peak Travel Hour (4 p.m. to 5 p.m.)																				
	Freeway Volume to Capacity Range						Arterial Volume to Capacity Range						Total						Total	
	0.00 - 0.90		0.91-1.10		Above 1.10		0.00 - 0.90		0.91 - 1.10		Above 1.10		0.00 - 0.90		0.91 - 1.10		Above 1.10			
Subarea	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total
Milwaukee County Portion	11.7	4.3	8.5	3.1	15.0	5.5	169.1	61.7	27.7	10.1	41.9	15.3	180.8	66.0	36.2	13.2	56.9	20.8	273.9	100.0
Ozaukee County Portion	15.3	9.3	- -	- -	- -	- -	148.5	89.9	0.2	0.1	1.2	0.7	163.8	99.2	0.2	0.1	1.2	0.7	165.2	100.0
Total Study Area	27.0	6.2	8.5	1.9	15.0	3.4	317.6	72.3	27.9	6.4	43.1	9.8	344.6	78.5	36.4	8.3	58.1	13.2	439.1	100.0

Source: SEWRPC.

Fixed route common carrier service was operated at the primary, secondary, and tertiary levels in the study area, as shown on Map 34. All tertiary and secondary level service, and nearly all primary level service, was limited to the Milwaukee County portion of the study area.

By definition, primary service is intended to connect the major regional activity centers—commercial, industrial, institutional, and recreational—to each other and to the various residential communities comprising the Region. Characterized by relatively high operating speeds and relatively low accessibility, primary transit service can be provided in a rapid form through exclusive, fully grade-separated rights-of-way or in a modified rapid form through operation in mixed traffic on freeways, or on exclusive, but not fully grade-separated, rights-of-way. Existing primary transit service in the study area and in the Milwaukee urbanized area is provided by modified rapid transit "Freeway Flyer" motor bus service operated over the freeway system by the Milwaukee County Transit System, the county-owned but privately managed major transit operator in the Milwaukee urbanized area. This system operates four routes in the study area and nine in all of the Milwaukee area. Wisconsin Coach Lines, Inc., a privately owned transit operator under contract to Waukesha County, operates one primary transit route in the Milwaukee County portion of the study area. This route serves a small portion of the study area near the Milwaukee central business district (CBD).

This modified rapid transit service was initiated in the study area in 1964 as a single route providing six vehicle trips during peak travel periods between the Milwaukee central business district and one privately owned outlying shopping center parking lot, Mayfair Mall Shopping Center, at Mayfair Road (STH 100) and North Avenue. This service has expanded to include 10 freeway bus routes providing 203 weekday vehicle trips in the Milwaukee area, primarily during peak travel periods, to 13 outlying park-ride lots, as shown in Table 28. Four of these 10 routes provide service to seven of the 13 outlying park-ride lots in the northwest side study area. Of the eight park-ride lots located in privately owned shopping center parking lots, four are in the study area. Of the five publicly owned and maintained transit stations specifically designed for change-of-mode operations, three are in the study area. Total ridership on the Freeway Flyers has increased from about 81,000 revenue passengers in the first year of operation to 969,600

Table 28

SELECTED CHARACTERISTICS OF PRIMARY TRANSIT PARK-AND-RIDE LOTS IN THE MILWAUKEE AREA: 1979

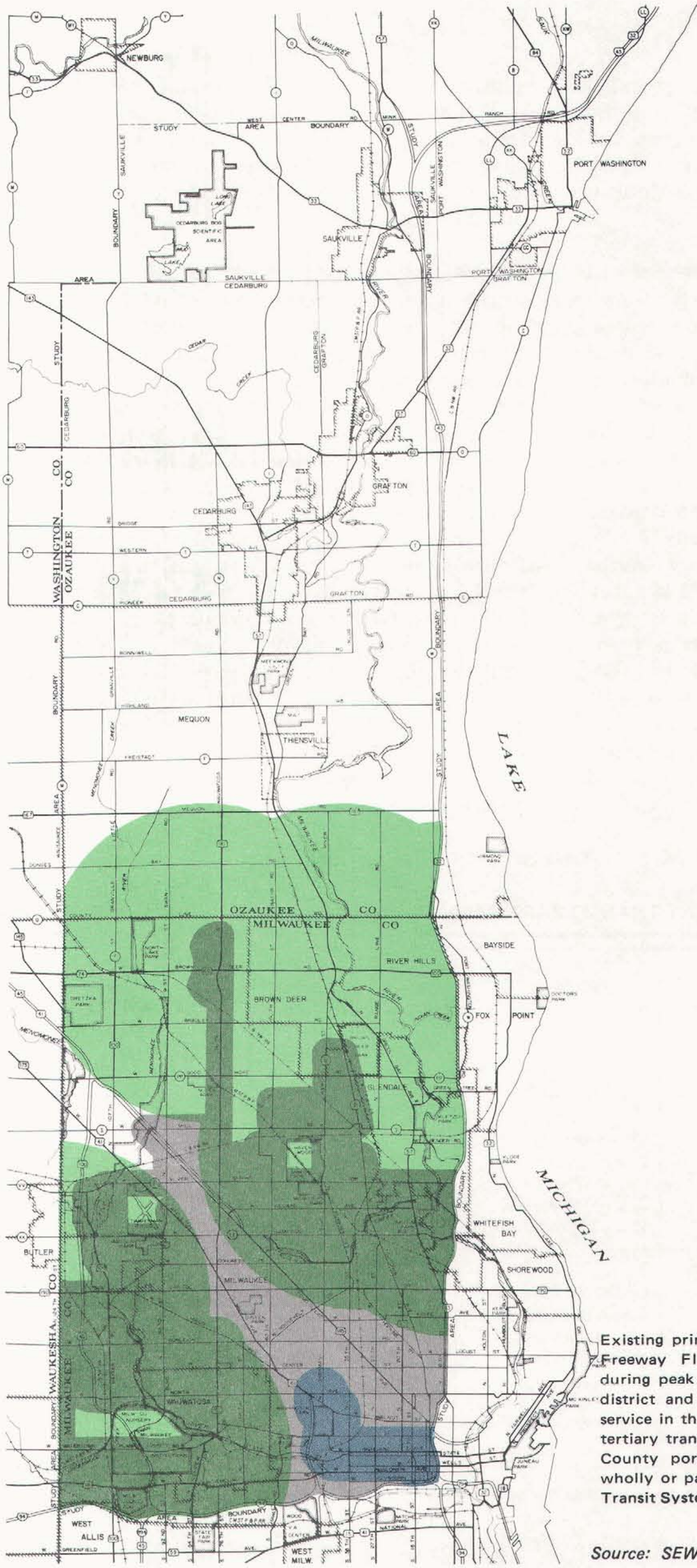
Location	Civil Division	Study Area Lot	Parking Spaces Available	Average Weekday Vehicle Trips[a] Inbound to CBD a.m.	Inbound to CBD p.m.	Outbound from CBD a.m.	Outbound from CBD p.m.
Public Transit Stations							
North-South Freeway and W. Brown Deer Road . . .	Village of River Hills	X	250	8	1	3	7
North-South Freeway and W. Silver Spring Drive . . .	City of Glendale	X	190	9	6	4	9
Zoo Freeway and W. Watertown Plank Road	City of Wauwatosa	X	200	7	3	2	8
North-South Freeway and W. College Avenue	City of Milwaukee		300	6	2	4	5
East-West Freeway and Barker Road	Town of Brookfield		200	4	1	- -	4
Shopping Center Lots							
N. 76th Street and W. Brown Deer Road.	City of Milwaukee	X	100	6	1	2	5
N. Green Bay Road and W. Brown Deer Road	Village of Brown Deer	X	100	6	1	2	5
N. Teutonia Avenue and Florist Avenue	City of Milwaukee	X	100	9	5	4	9
N. 125th Street and W. Capitol Drive.	City of Brookfield	X	140	7	2	3	8
S. 108th Street and W. Cleveland Avenue	City of West Allis		100	7	2	2	8
S. 27th Street and W. Layton Avenue.	City of Greenfield		100	7	3	4	7
S. 76th Street and W. Cold Spring Road	City of Greenfield		200	9	3	4	11
S. 108th Street and W. Grange Avenue	Village of Hales Corners		100	6	1	3	7

[a] *Service offered primarily between the hours of 6:30-8:30 a.m. and 4:00-6:00 p.m.*

Source: SEWRPC.

Map 34

PRIMARY, SECONDARY, AND TERTIARY PUBLIC TRANSIT SERVICE IN THE NORTHWEST SIDE STUDY AREA: 1978



Existing primary transit service in the study area consists of four Freeway Flyer bus routes providing weekday service primarily during peak travel periods between the Milwaukee central business district and 13 outlying park-ride lots. Existing secondary transit service in the study area consists of one express bus route. Existing tertiary transit service in the study area is limited to the Milwaukee County portion. Currently, 31 local service routes are operated wholly or partially within the study area by the Milwaukee County Transit System.

Source: SEWRPC.

revenue passengers in 1978, of which 456,500 were passengers in the study area. The current base Freeway Flyer fare on the Milwaukee County Transit System is $0.60. The bus fare for the primary service provided by Wisconsin Coach Lines is distance related.

Secondary service in the study area is composed of one express bus route operated by the Milwaukee County Transit System, as shown on Map 34. In all of the Milwaukee area, five express bus routes were operating in 1979. Secondary level service, by definition, consists of express service—that is, service provided over arterial streets with stops located only at intersecting transit routes and major traffic generators, generally no less than 1,200 feet apart. The secondary public transportation system may provide a "feeder" service to the primary system, and may provide better access to some subregional areas than does tertiary service. In the study area, an average of 23 weekday vehicle trips were made on the existing Milwaukee County Transit System express route. A total of 350 weekday vehicle trips were made on the five express bus routes in the Milwaukee area. The Milwaukee County express bus fare has, like the regular fare, been $0.50 since May 15, 1976.

Tertiary transit service provided in the northwest side study area is limited to its Milwaukee County portion, as shown on Map 34. The tertiary level of fixed route common carrier transit service, by definition, provides two basic functions: local service and collection-circulation-distribution service. Both are characterized by a high degree of accessibility and relatively low operating speeds. Local service is provided primarily over arterial and collector streets with stops for passenger pickup and discharge located no more than 1,200 feet apart. Collection-circulation-distribution service is provided for the movement of passengers within major activity centers. Currently, 31 local service routes are operated wholly or partially within the study area by the Milwaukee County Transit System, with approximately 4,300 vehicle trips being made on an average weekday on these routes. In the entire Milwaukee area, 44 local routes, providing approximately 5,107 vehicle trips, were operated on an average weekday in 1979. Ridership on the secondary and tertiary service provided in the Milwaukee area approximated 43,616,900 in 1978, including school trip passengers. Only one tertiary service route in the Milwaukee area serves other than a local service function, the shuttle service which operates primarily in the Milwaukee CBD but extends to N. 16th Street and Wisconsin Avenue into the northwest side study area. The shuttle service provides a collection-circulation-distribution function from 9:30 a.m. to 4:00 p.m. In 1978 the downtown shuttle provided 229 weekday vehicle trips and was utilized by approximately 2,900 revenue passengers per day, or 731,500 annually. Local tertiary service bus fare has been $0.50 since May 15, 1976.

Special carrier fixed route service in the northwest side study area and the Milwaukee urbanized area is currently provided by the Milwaukee County Transit System to selected public and private grade, junior high, high schools, and the University of Wisconsin-Milwaukee. The "UBUS" special carrier fixed route service provided to the University of Wisconsin-Milwaukee was begun in the fall of 1973 as a single charter route providing local transit service to the University. Currently, the Milwaukee County Transit System operates seven special carrier UBUS routes, five of which have been incorporated into the transit system as regular routes since 1973. Two of these routes are in the study area. In addition, special carrier bus service to selected public and private grade, junior high, and senior high schools—particularly Milwaukee public schools—is provided by special charter school bus service.

Special carrier service on nonfixed routes is currently provided to the elderly and handicapped in the Milwaukee urbanized area by more than 35 private and public agencies. An estimated 800,000 trips by elderly and handicapped individuals were made in special carrier service vehicles in 1976, based on a special inventory of public, private, nonprofit public, and nonprofit private providers of elderly and handicapped transportation services conducted by the Regional Planning Commission.

TRAVEL HABITS AND PATTERNS

One of the central concepts underlying any urban transportation planning effort is that personal travel is an orderly, regular, and measurable occurrence, evidenced by recognizable travel patterns. An inventory of existing personal travel is necessary to discover these patterns and disclose those aspects which demonstrate a high degree of repetitiveness. Such knowledge is essential to an understanding of likely future travel behavior and, therefore, to intelligent planning for future travel requirements. In this respect, the inventory of travel must provide a clear representation of total personal travel, while taking stock of and describing in detail each of its components.

Another concept underlying urban transportation planning, previously noted in connection with the need for land use inventory data, is that land use and transportation are closely interrelated. An inventory of existing personal travel, therefore, is also necessary in order to determine the quantitative relationships existing between land use and travel, thereby providing a basis for the derivation of future travel demand from proposed land use patterns and for the determination of the distribution of that demand over existing and proposed transportation facilities and services.

Travel inventories were conducted by the Commission in 1963 for use in the preparation of its initial regional transportation system plan, and again in 1972 for use in the reevaluation and revision of that plan. The salient findings of the 1963 and 1972 regional inventories of travel are presented in SEWRPC Planning Report No. 7, Land Use-Transportation Study, Volume One, Inventory Findings, and SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volume One, Inventory Findings, respectively. The basic travel origin-destination surveys conducted in both the 1963 and 1972 regional travel inventories were the home interview, truck and taxi, and external cordon surveys. In 1972 five other important origin-destination surveys were conducted: the public transit user survey; public transit nonuser survey; major traffic generator, interregional motor bus, rail, and car ferry survey; and weekend travel survey.

Mathematical models which can be used to simulate both existing and probable future travel habits and patterns were developed by the Commission from its 1963 inventory data and were reevaluated and refined using its 1972 inventory data. These models are available to simulate existing and probable future travel patterns, with such patterns being derived from existing or proposed land use configurations and existing or forecast population and economic activity levels and characteristics. Thus, a new inventory of travel is not required for the study. Substantial evidence exists that relationships between land use and travel are reasonably stable over time, as documented in 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.

This section presents a summary of existing travel behavior in the northwest side study area as derived from the 1972 regional travel inventory. In addition, comparisons between existing travel behavior in the study area and travel behavior in the Region are made.

Quantity of Total Travel

In 1972 approximately 4.68 million person trips [4] were made within the Region on an average weekday. Of these 4.68 million person trips, about 4.50 million, or about 96 percent of the total, were internal person trips—that is, trips having both their origin and destination within the Region. In addition to the total internal vehicle and person trips, there were about 177,000 external person trips made into, out of, or through the Region. The northwest side study area accounted for 26 percent of all regional internal tripmaking in 1972, or 1,156,700 trips, as shown in Table 29. The Milwaukee County portion of the study area accounted for over one million of these trips, or 92 percent of the total tripmaking in the study area, and the Ozaukee County portion accounted for fewer than 100,000 trips, or about 8 percent of the tripmaking in the study area in 1972.

In the Region as a whole, 2.5 internal person trips per capita, and 7.9 internal person trips per household, were made on an average weekday in 1972. In the study area in 1972, the average internal person trip generation rate per capita was somewhat lower than the rate for the Region, 2.4 trips per capita, as was the internal person trip generation rate per household, 7.4 trips per household. Trip generation rates were lower in the Milwaukee County portion of the study area than in the Region and were higher in the Ozaukee County portion of the study area than in the Region. The average person trip generation rate per capita on an average weekday in 1972 was 2.8 in the Ozaukee County portion of the study area and 2.3 in the Milwaukee County portion of the study area. The average trip generation rate per household on an average weekday in 1972 was 10.2 in the Ozaukee County portion of the study area and 7.2 in the Milwaukee County portion of the study area.

[4] *A person trip is defined herein as a one-way journey between a point of origin and a point of destination by a person five years of age or older traveling as driver or as a passenger in an auto, taxi, truck, motorcycle, or school bus or other public transit carrier. To be considered, the trip's length must be at least the equivalent of one full city block.*

Table 29

AVERAGE WEEKDAY PERSON TRIPS IN THE NORTHWEST SIDE STUDY AREA: 1972

Area	Total Person Trips	Percent of Total
Study Area.	1,156,684	25.7
Milwaukee County Portion . . .	1,058,692	23.5
Ozaukee County Portion	97,992	2.2
Region	4,504,900	100.0

Source: SEWRPC.

Map 35 shows the variation in the household trip generation rate in the study area on an average weekday. Evident is the low tripmaking rate in the part of the study area in the central area of the City of Milwaukee and in a few scattered rural areas in 1972, as well as the higher-than-average tripmaking rates in the suburban and rural-urban fringe areas of the study area. Differences in automobile availability, household size, and household income explain some of these differences in tripmaking, as shown in Tables 30 through 32. As also shown in these tables, increases in the number of automobiles available per household, the number of persons per household, and the income per household were found to be correlated with increases in tripmaking per household on an average weekday.

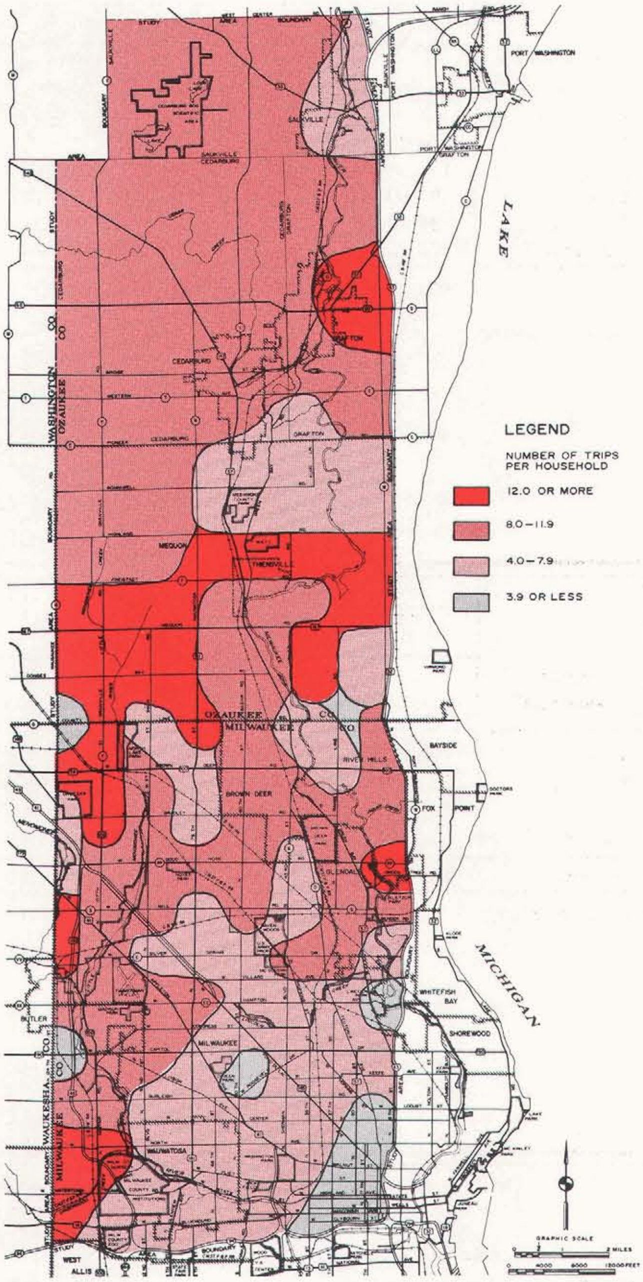
Vehicle Travel

The 1.16 million person trips attributed to the study area in 1972 represented 836,500 vehicle trips by automobile, truck, and taxi. Of these 836,500 trips, about 89 percent were made by automobiles, about 5 percent were made by light trucks and taxis, and about 6 percent were made by medium and heavy trucks, as shown in Table 33. These percentages are very similar to those for vehicle trips by each of these modes within the Region in 1972, when 88 percent of all vehicle trips were made by automobiles, 6 percent were made by light trucks and taxis, and 6 percent were made by medium and heavy trucks.

The percentages for vehicle trips made in the Milwaukee County portion of the study area are virtually identical to those for the entire study area. In the Ozaukee County portion, the percentage of total vehicle trips made by light trucks and taxis was somewhat lower than the corresponding percentage in both the study area and the Region.

Map 35

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE NORTHWEST SIDE STUDY AREA: 1972



This map shows the variation within the study area in household trip generation on an average weekday in 1972. A low tripmaking rate is evident in the central area of the City of Milwaukee and in a few scattered rural areas, and higher than average tripmaking rates are evident in the suburban and rural-urban fringe areas of the study area. Differences in automobile availability, household size, and household income between these areas explain these differences in tripmaking.

Source: SEWRPC.

Table 30

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY FAMILY SIZE: 1963 AND 1972

Family Size	1963				1972				Person Trips per Household	
	Households		Person Trips		Households		Person Trips			
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	1963	1972
1	60,000	12.2	114,600	3.2	98,700	17.4	234,800	5.2	1.9	2.4
2	136,300	27.7	685,000	19.0	164,200	28.9	903,200	20.1	5.0	5.5
3	87,800	17.9	668,400	18.6	92,400	16.3	762,100	16.9	7.6	8.2
4	84,000	17.1	807,100	22.4	86,600	15.3	904,700	20.1	9.6	10.4
5 or More . .	123,300	25.1	1,327,900	36.8	125,800	22.1	1,700,100	37.7	10.8	13.5
Region	491,400	100.0	3,603,000	100.0	567,700	100.0	4,504,900	100.0	7.3	7.9

Source: SEWRPC.

Table 31

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY AUTOMOBILE AVAILABILITY: 1963 AND 1972

Autos Available	1963				1972				Person Trips per Household	
	Households		Person Trips		Households		Person Trips			
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	1963	1972
0	90,700	18.4	193,900	5.4	95,600	16.8	182,500	4.1	2.1	1.9
1	284,600	57.9	2,107,800	58.5	279,200	49.2	1,964,900	43.6	7.4	7.0
2	103,000	21.0	1,123,900	31.2	161,300	28.4	1,851,000	41.1	10.9	11.5
3 or More . .	13,100	2.7	177,400	4.9	31,600	5.6	506,500	11.2	13.5	16.0
Region	491,400	100.0	3,603,000	100.0	567,700	100.0	4,504,900	100.0	7.3	7.9

Source: SEWRPC.

Table 32

AVERAGE WEEKDAY INTERNAL PERSON TRIPS PER HOUSEHOLD IN THE REGION BY INCOME GROUP: 1972

Income Range	Households[a]		Person Trips		Person Trips per Household
	Number	Percent of Total	Number	Percent of Total	
$ 0 to 3,999	51,600	13.2	145,300	4.2	2.8
4,000 to 7,999	67,100	17.2	384,400	11.2	5.7
8,000 to 11,999	117,300	30.1	1,043,200	30.5	8.9
12,000 to 15,999	75,600	19.4	854,700	25.0	11.3
16,000 to 24,999	60,200	15.4	741,800	21.7	12.3
25,000 or More	18,200	4.7	252,300	7.4	13.9
Total Reporting Households	390,000	100.0	3,421,700	100.0	8.8

[a] *Approximately 31 percent of total households did not provide household annual income data.*

Source: SEWRPC.

Table 33

AVERAGE WEEKDAY INTERNAL VEHICLE TRIPS BY MODE IN THE NORTHWEST SIDE STUDY AREA AND THE REGION: 1972

Mode	Study Area		Milwaukee County Portion		Ozaukee County Portion		Region	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Automobile	745,600	89.1	684,100	89.1	61,500	89.2	2,897,000	88.3
Light Truck and Taxi	42,700	5.1	39,800	5.7	2,900	4.2	200,100	6.1
Medium or Heavy Truck	48,200	5.8	43,700	5.7	4,500	6.5	185,200	5.6
Total Vehicle Trips	836,500	100.0	767,600	100.0	68,900	100.0	3,282,300	100.0

Source: SEWRPC.

Trip Purpose

Home-oriented travel within the northwest side study area accounted for the largest proportion of total internal person travel on an average weekday, as shown in Table 34. The importance of the home as a generator of person trips is apparent, as trips to home accounted for over 41 percent of total person trips in the study area on an average weekday in 1972. As a consequence, trips having either an origin or a destination at home constituted over 82 percent of total person travel within the study area in 1972. Home also accounted for about 82 percent of total travel in the Region in 1972. It is thus apparent that future transportation facility and service requirements within the study area must be determined in large measure by the amount and location of residential development.

Next in importance of trip purpose categories in both the study area and the Region are trips to work, which accounted for 17 percent of the total trips in the study area in 1972, or 196,500 trips on an average weekday. Like trips to home, the relative importance of work trips is about the same in the study area and the Region. Of the remaining trip purpose categories, personal business trips accounted for about 14 percent of total study area tripmaking on an average weekday in 1972; shopping trips for about 12 percent of total tripmaking; social and recreational trips for about 11 percent of total tripmaking; and trips to attend school for the remaining 4 percent of total tripmaking. The distribution of regional tripmaking among these trip purposes was about the same, as shown in Table 34.

Travel Mode

The opportunity to select a particular mode of travel, principally automobile or public transit, is not available to all residents of the study area or the Region. Many households are located in areas not served by public transit, and are thus dependent on the automobile. Many other households do not have automobiles available because of age, income, personal disability, or choice, and are thus dependent almost entirely on public transit.

Table 34

DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION AND THE NORTHWEST SIDE STUDY AREA BY TRIP PURPOSE AT DESTINATION: 1972

Trip Purpose at Destination	Person Trips: Region		Person Trips: Study Area	
	Number	Percent of Total	Number	Percent of Total
Home	1,836,200	40.8	476,100	41.2
Work	740,800	16.4	196,500	17.0
Personal Business	654,900	14.5	167,600	14.5
School	220,000	4.9	50,900	4.4
Social-Recreational	508,100	11.3	131,700	11.4
Shopping	544,900	12.1	132,900	11.5
Total	4,504,900	100.0	1,155,700	100.0

Source: SEWRPC.

In 1972 automobile travel on an average weekday accounted for the vast majority of person trips attributed to the study area. Automobile driver trips in the study area accounted for 745,400 person trips, or 64 percent of all trips in 1972; and automobile passenger trips in the study area accounted for 311,400 person trips, or 27 percent of all such trips. As shown in Table 35, the percentages of total regional travel attributed to each of these modes were virtually identical to those for the study area. Within the Milwaukee County portion of the study area, auto driver trips accounted for 65 percent of all person trips and auto passenger trips accounted for 27 percent. Within the Ozaukee County portion of the study area, auto driver trips accounted for 63 percent of all person trips and auto passenger trips accounted for 26 percent.

Table 35

AVERAGE WEEKDAY INTERNAL PERSON TRIPS BY MODE IN THE REGION AND THE NORTHWEST SIDE STUDY AREA: 1972

Area	Average Weekday Internal Person Trips								
	Automobile Driver		Automobile Passenger		Transit Passenger		School Bus Passenger		Total
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips
Total Study Area	745,437	64.4	311,406	26.9	72,104	6.2	27,737	2.4	1,156,684
Milwaukee County Portion. .	683,978	64.6	285,614	27.0	71,927	6.8	17,173	1.6	1,058,692
Ozaukee County Portion . . .	61,459	62.7	25,792	26.3	177	0.2	10,564	10.8	97,992
Region	2,885,270	64.7	1,217,254	27.3	184,651	4.1	170,074	3.8	4,457,249

Source: SEWRPC.

Of the remaining modes, public transit passenger trips accounted for 6 percent of total travel within the study area, as compared with 4 percent of total travel in the Region. Within the Milwaukee County portion of the study area, where nearly all transit service in the study area was provided, 7 percent of all travel on an average weekday was made by public transit. Within the Ozaukee County portion of the study area, less than 1 percent of all travel was made by public transit. Public transit utilization, in terms of the percentage which transit tripmaking comprises of all tripmaking in parts of the study area, is shown on Map 36. The greatest concentrations of transit use in 1972 were located in the southeastern portion of the study area, where 10 to 20 percent of all trips were made using public transit. Transit use declined rapidly with distance from the southeastern corner of the study area.

School bus passenger trips accounted for over 2 percent of all trips made within the study area in 1972, as compared with almost 4 percent of total regional trips. School bus passenger trip activity in the Milwaukee County portion of the study area accounted for 1.6 percent of all trips, as compared with almost 11 percent of all tripmaking in the Ozaukee County portion of the study area.

Location of Travel

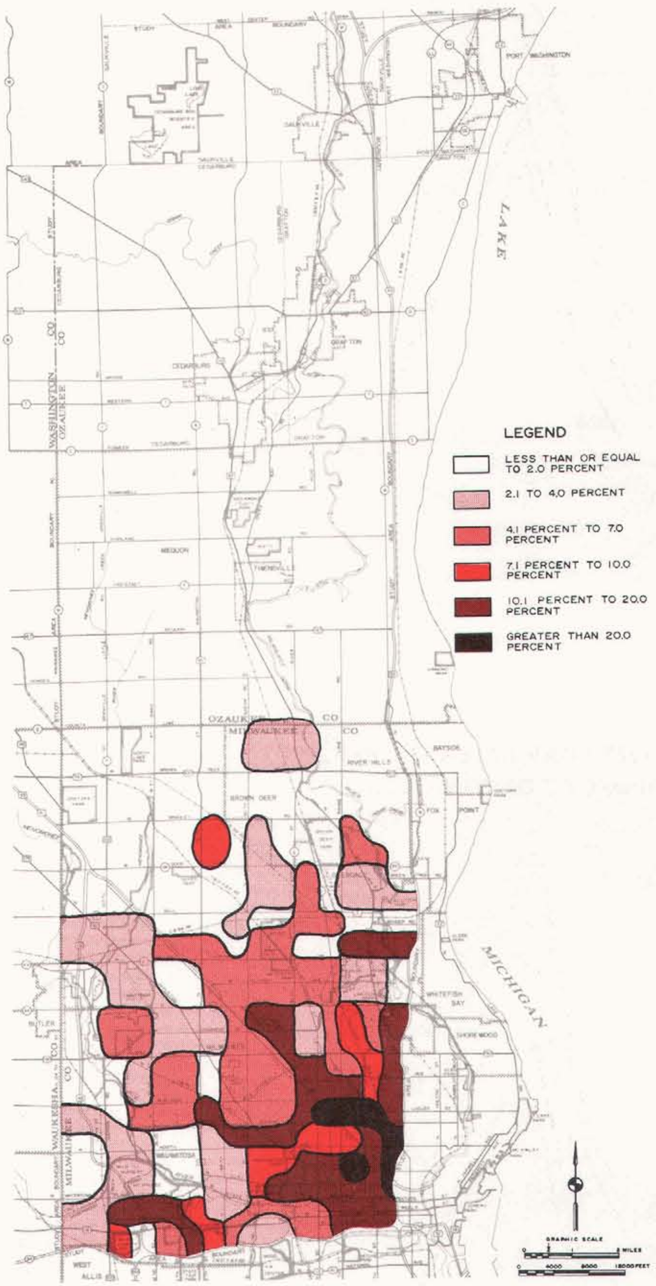
The amount of travel generated by and attracted to a given area is largely determined by the amount, type, and intensity of development in that area. Map 37 shows the spatial distribution of travel within the northwest side study area in 1972 on an average weekday. The highest concentration of tripmaking in the study area in 1972 occurred in its major commercial and industrial parts, and to a lesser extent in its highly developed residential areas. Significant concentrations of tripmaking, however, are also found in many smaller communities throughout the study area.

Hourly Patterns of Internal Person Travel

The hourly distribution of person trips in the study area by trip purpose at destination in 1972 is shown in Figure 4. This figure is a graphic representation of the changes in the amount of travel that occur in the study area on an average weekday. The figure indicates a pattern of relative inactivity in the early morning hours followed by a sharp peak around 7:00 a.m. as trips to work and school begin. Trips for shopping, personal, business, and social-recreational purposes begin during the early morning hours and continue fairly steadily until midafternoon. The afternoon peak period beginning at 3:00 p.m. is longer and more sustained than the morning peak hour, and is characterized predominantly by trips to return home. The sharp decline in person trip activity after the afternoon peak is slowed in the early evening hours, as trips for shopping and social-recreational purposes reach their maximum hourly volumes for the day. The hourly distribution of person travel for the northwest side study area is quite similar to that for the Region, as shown in Figure 5.

Map 36

PERCENTAGE TRANSIT TRIPMAKING IN THE NORTHWEST SIDE STUDY AREA: 1972

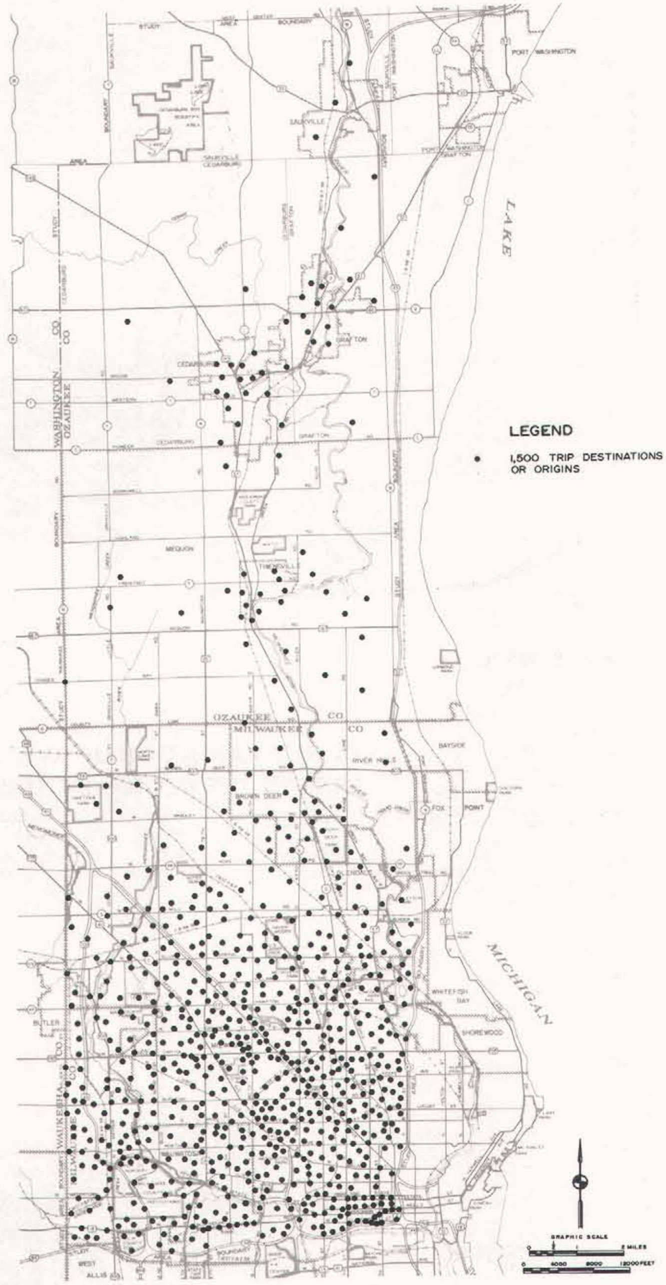


This map shows that percentage of all tripmaking in the study area that is comprised of public transit utilization. The greatest concentrations of high rates of transit use in 1972 were found in the southeastern portion of the study area, where 10 to 20 percent of all tripmaking was made using public transit. Transit use was found to decline rapidly with distance from the southeastern corner of the study area.

Source: SEWRPC.

Map 37

AVERAGE WEEKDAY INTERNAL PERSON TRIP ORIGINS AND DESTINATIONS IN THE NORTHWEST SIDE STUDY AREA: 1972

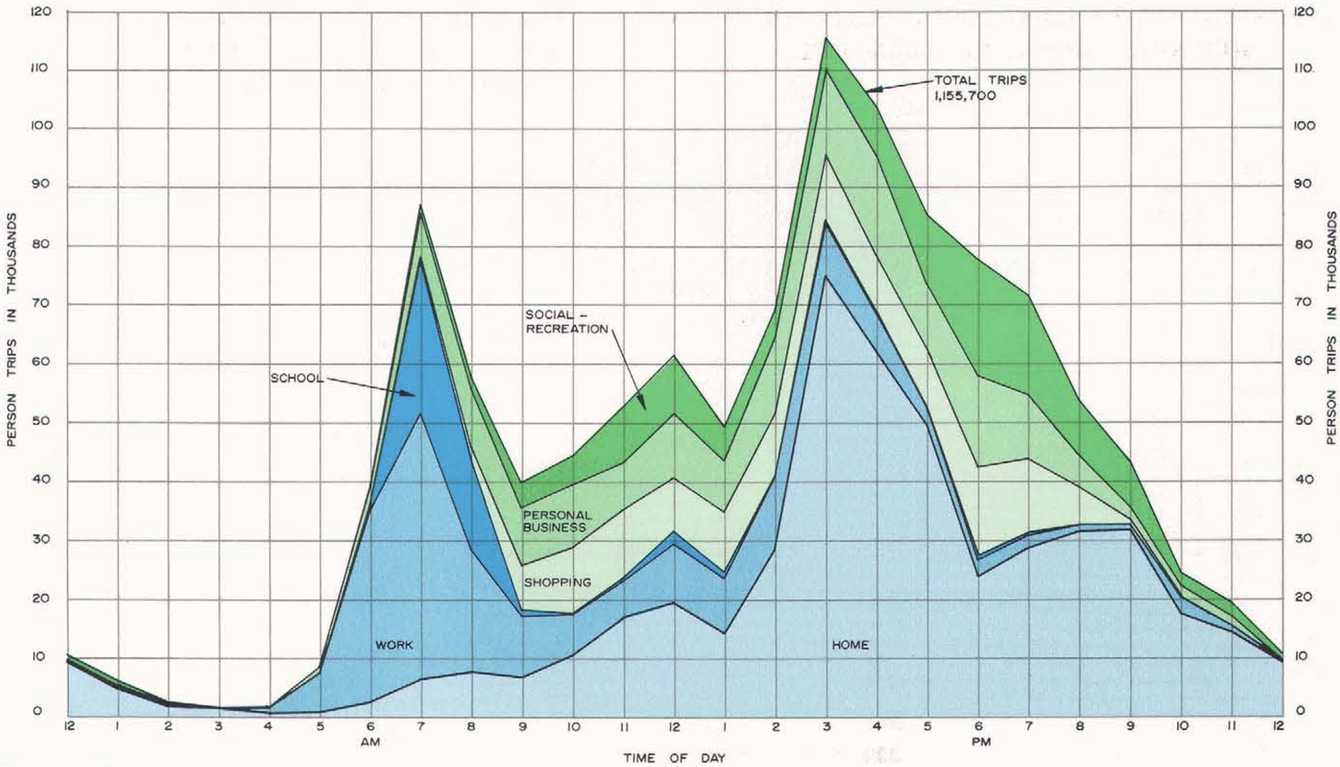


The highest concentration of tripmaking in the study area in 1972 occurred in the major commercial and industrial areas of the study area, and to a lesser extent in its highly developed residential areas. Significant concentrations of tripmaking, however, were also found in many smaller communities throughout the study area.

Source: SEWRPC.

Figure 4

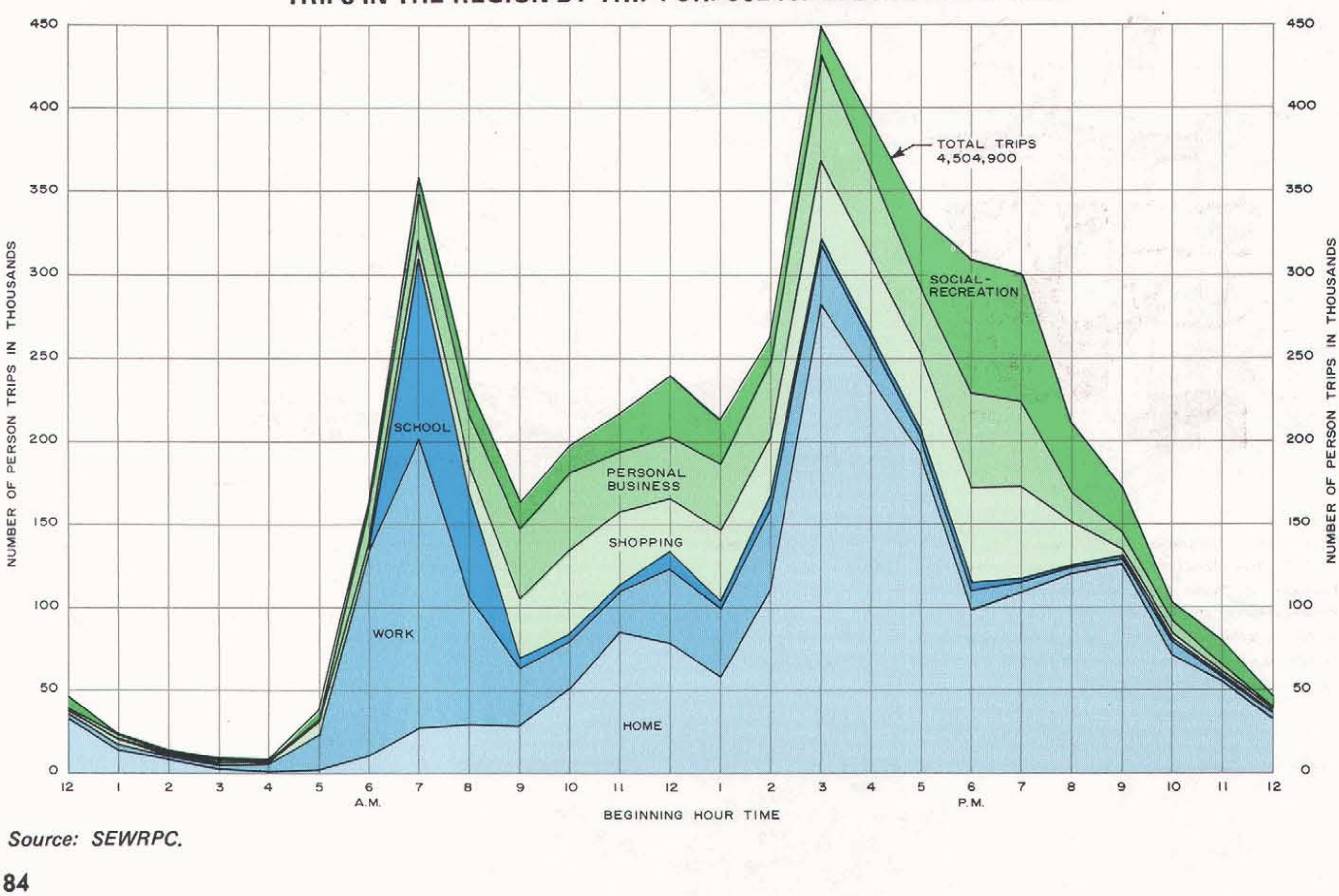
HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE NORTHWEST SIDE STUDY AREA BY TRIP PURPOSE AT DESTINATION: 1972



Source: SEWRPC.

Figure 5

HOURLY VARIATION OF AVERAGE WEEKDAY INTERNAL PERSON TRIPS IN THE REGION BY TRIP PURPOSE AT DESTINATION: 1972



Source: SEWRPC.

SUMMARY AND CONCLUSIONS

The primary purpose of the Milwaukee Northwest Side/Ozaukee County transportation improvement study is to find the best means of meeting the existing and probable future transportation needs of northwestern Milwaukee County and southern Ozaukee County in the absence of the Park Freeway-West and the Stadium Freeway-North "gap closure." The intelligent identification of the existing and probable future transportation problems of the area, the formulation of alternative means to resolve these problems, and the selection of the best means from among the alternatives considered all require a careful inventory of the transportation system of the study area and of the factors affecting the utilization of that system. Accordingly, the first operational step in the northwest side study was the assembly of pertinent information on existing levels of, and historic trends in, population and economic activity, land use development, transportation facility capacity and use, and travel habits and patterns. Similar information was assembled for the Southeastern Wisconsin Region, because sound transportation system planning for the study area must consider the larger socioeconomic unit of which the northwest side study area is only a part. The factors which influence land use development, travel habits and patterns, and transportation system utilization in the study area all operate over the entire seven-county Southeastern Wisconsin Region. The inventory data presented in this chapter have been collated largely from the comprehensive planning data bank assembled under the Regional Planning Commission's continuing, comprehensive areawide planning program, and have been updated as necessary and possible.

The most important and basic findings of the inventory are the following:

1. The population of the northwest side study area has been declining since the 1960's. The population of the area in 1960 was 517,300 people and in 1975 was estimated to be 499,200 people. Over the same period the population of the Southeastern Wisconsin Region increased by over 13 percent, from 1,573,600 people in 1960 to 1,788,300 people in 1975. In spite of this long-term decline in population, the northwest side still represented a substantial portion of the resident population of the Region in 1975, accounting for about 28 percent of the population of the entire seven-county Region. The study area comprises 183 square miles, or 7 percent of the total area of the Region, and about 58,086 acres of developed urban land, or 18 percent of the total developed urban land in the Region.

2. The spatial distribution of population in the northwest side study area, like that in the Region, has been changing since the 1960's, with a diffusion of population into the outlying portions of the study area. The Ozaukee County portion of the study area experienced population increases of over 40 percent from 1960 to 1970, and of over 23 percent from 1970 to 1975. The population of the Milwaukee County portion of the study area decreased by about 2 percent from 1960 to 1970 and by over 5 percent from 1970 to 1975. The Milwaukee County portion of the study area, however, still represented over 91 percent of the total resident population of the study area in 1975. Moreover, not all of the Milwaukee County portion of the study area has been experiencing population decline; rather, the population of the southeastern half of the Milwaukee County portion of the study area has generally decreased while the population of the northwestern half has generally increased. That part of the study area which experienced the largest absolute and percentage population increase since 1970 is a large section of the former Town of Granville in the northwestern portion of Milwaukee County.

3. The characteristics of the populations of the Milwaukee County and Ozaukee County portions of the study area vary substantially. In 1970 the median age of the population in the Milwaukee County portion of the study area was 28.6 years, compared with 25.7 years in the Ozaukee County portion. Furthermore, the Milwaukee County portion had a greater nonwhite composition, 19 percent, compared with less than 1 percent in the Ozaukee County portion, and a smaller average household size, 3.07 persons, compared with 3.69 persons in the Ozaukee County portion. Finally, the Milwaukee County portion had a lower household and per capita income, $10,400 and $3,400, respectively, compared with $15,600 and

$4,200, respectively, in the Ozaukee County portion. Similar differences are exhibited between the newly developing outlying portions of the Region and its highly developed portions. Between 1970 and 1975 the age and household size in the study area declined while the nonwhite population and actual personal income increased.

4. Employment opportunities in the study area in 1975 were estimated at 199,330 jobs, or about 25 percent of the total jobs available in the Region. Nearly 94 percent of these jobs were located in its Milwaukee County portion. The distribution of jobs in the study area among major industry groups was similar to that in the Region as a whole, with about 33 percent of total study area jobs being in manufacturing, approximately 13 percent being in government services and education, and 18 percent being in private services.

5. Urban development within the study area increased significantly between 1920 and 1940, and again between 1950 and 1980. From 1850 to 1950, urban growth within the study area and the Region occurred in a fairly compact pattern of concentric rings of relatively high-density urban development located contiguous to, and outward from, existing urban development. Since 1950, the character of urban growth in the Region and the study area has changed to a much more diffused pattern of development, with predominantly low population densities and a proliferation of clusters of noncontiguous urban development. The implication of this "urban sprawl" pattern of development since 1950 has been a rapid decline in the population density of the developed urban areas of the Region.

6. Less than 20 percent of the total area of the Region was devoted to urban land uses in 1970, while over 47 percent of the study area was devoted to such uses in that year. Land use in the Milwaukee County portion of the study area was nearly 80 percent urban, while land use in the Ozaukee County portion was still nearly 80 percent rural. Three of the Region's 12 major commercial centers are located in the study area, as are six of the Region's 17 major industrial centers. Of the urban land uses in the study area, residential land comprised the largest proportion, 22 percent of the total study area and 46 percent of the urban land in the study area; followed by transportation, communication, and utility land uses, which comprised 15 percent of the total land in the study area and 32 percent of the urban land in the study area. Commercial and industrial land uses comprised only 3 percent of the total land in the study area and 6 percent of the urban land in the study area.

7. In 1978 the arterial street system in the study area comprised about 32 percent of the study area's total street and highway system, or 439 miles of 1,396 miles of streets and highways. In the Region, arterial street mileage constituted 32 percent, or 3,290 miles, of the total 10,440-mile street and highway system. Nearly 35 percent of the study area arterial system was on the state trunk highway system, 16 percent was on the county trunk highway system, and 49 percent was under the jurisdiction of cities, villages, and towns. In the Region, a somewhat larger proportion of the arterial system was under the jurisdiction of counties, 34 percent; and a smaller proportion, 28 percent, was under the jurisdiction of cities, villages, and towns. Nearly 94 percent of the arterial system in the study area was part of a federal aid system, with 7 percent being on the federal aid interstate system, 20 percent on the federal aid primary system, 61 percent on the federal aid urban system, and 6 percent on the federal aid secondary system.

8. Approximately 7.8 million vehicle miles of travel occurred on the study area arterial street system on an average weekday in 1978, with over 89 percent of this utilization occurring in the Milwaukee County portion of the study area. Freeways, while comprising less than 12 percent of the study area arterial street mileage in 1978, carried approximately 38 percent of the total arterial travel in the study area. Thus, within the study area on an average weekday in 1978 about 17,800 vehicle miles of travel occurred per mile of arterial street, with 60,400 vehicle miles per mile of freeway and 12,400 vehicle miles per mile of standard arterial. Within the Region in 1972, about 6,400 vehicle miles of travel occurred on an

average weekday per mile of arterial street, with approximately 26,200 vehicle miles of travel per mile of freeway and 4,600 vehicle miles of travel per mile of standard arterial.

9. In 1972, 9 percent of the arterial facilities in the Milwaukee County portion of the study area were operating over design capacity and experiencing congestion on an average weekday, and 17 percent were operating at design capacity. Morning and evening peak-travel-severe in 1978, with approximately 20 percent of the arterial street system operating over design capacity during morning and evening peak travel hour, and approximately 13 percent operating at design capacity during the morning and evening peak hours. Nearly 99 percent of the study area's more severely congested arterial facilities operating over design capacity during the morning peak hour and 98 percent operating over design capacity during the evening peak hour were located in its Milwaukee County portion.

10. Within the Milwaukee urbanized area and the study area, transit service is provided at three levels: primary, secondary, and tertiary. Primary, or rapid or modified rapid, service is provided principally by the Milwaukee County Transit System. Four of its 10 "Freeway Flyer" routes in the Milwaukee area provide primary transit service to the study area. Seven of the 13 outlying park-ride lots in the Milwaukee area that are served by Freeway Flyer routes during peak travel periods are located within or immediately adjacent to the study area. Of the five secondary, or express, bus routes in the Milwaukee area, only one operates in the study area—in its extreme southeastern portion. Tertiary, or local, transit service is provided only within the Milwaukee County portion of the study area. Thirty-one of the 44 local routes operated in the Milwaukee area provide service to the study area. About 4,300 of the over 5,100 transit vehicle trips made in the Milwaukee area on an average weekday in 1978 were made on these routes.

11. The study area accounted for nearly 26 percent of the 4.5 million internal person trips made within the Region on an average weekday in 1972. About 92 percent of this tripmaking was attributable to the Milwaukee County portion of the study area. Automobile travel in the study area accounted for the majority of this travel, with 64 percent being attributable to automobile driver trips and 27 percent to automobile passenger trips. Public transit passengers accounted for only about 6 percent of total tripmaking. However, in the southeastern portion of the study area, over 10 percent of all trips made were using public transit. In the Region as a whole, 65 percent of all tripmaking was by automobile drivers, 27 percent by automobile passengers, and 4 percent by public transit passengers.

Thus, the northwestern Milwaukee County and southern Ozaukee County study area represents a substantial and highly developed part of the Southeastern Wisconsin Region. Historically, it has had more severe transportation problems than has the remainder of the Region. Recent changes in the land use development of the area would point toward the continuation of these problems. Although it includes less than 7 percent of the total regional land area, the study area in 1975 accounted for 25 percent or more of the Region's population, households, employment opportunities, major industrial centers, and major retail and service centers. In 1972 the proportion of arterial facilities that was congested on an average weekday in the Milwaukee County portion of the study area, 26 percent, was 50 percent greater than that for all of Milwaukee County. About 65 percent of the congested facilities in the Milwaukee County portion of the study area were operating at design capacity, and the remaining 35 percent were operating over design capacity. Nearly 65 percent of all congested arterial facilities in Ozaukee County were located in the Ozaukee County portion of the study area in 1972. About 23 percent of the congested facilities in the Ozaukee County study area portion were operating over design capacity. Detailed analyses of morning and evening peak-travel-hour arterial facility use updated to the year 1978 indicate that congestion in the study area, particularly its Milwaukee County portion, is extreme during current peak hours of travel. Over 33 percent of the arterial facilities in the Milwaukee County portion of the study area were considered congested during peak hours of travel in 1978, with over 60 percent of these congested facilities operating over design capacity. The overwhelming majority of these congested facilities are located within the southern two-thirds of the Milwaukee County portion of the study area. Parts of this portion of the study area have been losing population since 1970, and in some cases since the 1960's. However, this part of the study area continues to be the highly developed and populated portion of the Region it historically has been, and although population in parts of this area has been significantly decreasing, the number of households has not. Because the remainder of the study area has shown a rapid rate of population increase, it may be expected that the transportation problems of northwestern Milwaukee County and southern Ozaukee County will continue to be severe.

Chapter IV

EXISTING TRANSPORTATION SYSTEM PROBLEMS AND DEFICIENCIES

INTRODUCTION

This chapter identifies current problems and deficiencies of the transportation system of the Milwaukee Northwest Side/Ozaukee County transportation improvement study area. The undertaking of the Milwaukee Northwest Side/Ozaukee County transportation improvement study was prompted by the need to find solutions to the existing transportation system problems in the study area, in view of recent trends in urban growth into the northern half of this area, and in view of the deletion of the Park Freeway-West and the Stadium Freeway-North "gap closure" from the regional transportation system plan. The removal of these two facilities from the plan affected not only the extent to which, and the means whereby, probable future transportation needs in the area may be expected to be met, but also the extent to which and the means whereby current needs can be met.

The identification of existing transportation system problems and deficiencies in this chapter is a particularly important step in the overall study. The short-range transportation system improvement plans to be prepared under the study are intended to alleviate identified existing problems. The identification of these problems in the study area was accomplished through a two-stage process consisting first of a preliminary identification based upon a quantitative evaluation of the performance of the existing transportation system against the agreed-upon transportation system management and development objectives. The second stage consisted of public review and comment on these problems, a step that involved not only the advisory committee structure for the study, but three public informational meetings held within the study area. These meetings were supported by the prior preparation and distribution of summaries of the initial identified transportation problems. The public involvement process resulted in the refinement of the initially identified problems, and in a final, agreed-upon identification of the existing transportation system problems of the study area which could be used with some confidence as a basis for alternative plan preparation.

OBJECTIVE DEFINITION OF STUDY AREA TRANSPORTATION PROBLEMS

The existing transportation problems of the study area were first identified objectively by evaluating the performance of the existing transportation system of the study area against the agreed-upon study objectives and supporting standards as set forth in Chapter II of this report. These objectives and standards, as indicated in Chapter II, represent a formal definition of the basic transportation needs of the study area; therefore, an objective determination of the degree to which the area's existing transportation system meets these objectives and standards should indicate the degree to which the area's transportation needs are now being or not being met—the latter indicating the existence of a system deficiency or problem.

As noted in Chapter II of this report, the ability of the existing transportation system of the study area to achieve the agreed-upon objectives can be determined through the application of the supporting standards to the performance of the existing system. A number of standards were formulated for each objective; together, these standards are intended to encompass all relevant and important measures for the attainment of each objective, and therefore should provide a sound means of identifying existing transportation system problems in the study area.

Deficiencies of the Existing Transportation System in Serving the Land Use Pattern of the Milwaukee Northwest Side/Ozaukee County Area

The first transportation system management and development objective formulated under the study identifies the need for an integrated transportation system which, through its location, capacity, and design, will effectively serve the existing land use pattern of northwestern Milwaukee County and southern Ozaukee County, promote implementation of the regional land use plan, and meet the current travel demand generated by that area's existing land uses. This objective is supported by two standards—one relating to maximum travel times between residential areas and major land use activity centers, and the other relating to overall accessibility of residential areas to all urban land use activity.

Accessibility to Major Land Use Activities: The first standard under this objective specifies that the transportation system should provide service, both by public transit and by private automobile, that will maximize the number of residents within the urbanized portion of the study area that are within the specified overall travel times of 40 percent of the Milwaukee urbanized area's employment opportunities; three of the Region's major retail and service centers; one of the Region's major medical centers, hospitals, and/or medical clinics; one of the Region's major parks and outdoor recreation areas; one of the Region's technical or vocational schools, colleges, or universities; and one of the Region's scheduled air transport facilities. This standard is intended to measure the level of travel time accessibility to major land uses within the urbanized portion of the study area. The accessibility levels set forth in the standard are considered essential to the support of the land uses within the urbanized portion of the study area. It should be recognized, however, that because of the population, land use, and tripmaking characteristics, certain of the suggested accessibility levels will be of greater importance to some portions of the study area than to others.

The spatial distribution of employment in the Region is shown on Map 38. Map 39 depicts the distribution of the major activity centers of the Region. Both employment and major centers are concentrated in the highly developed portions of the Milwaukee urbanized area.

As shown on Map 40, those parts of the urbanized portion of the study area which meet the highway accessibility standard for employment—that is, are within 30 minutes travel time by highway of at least 40 percent of the employment opportunities in the Milwaukee urbanized area—include all of Milwaukee County and the southern and eastern parts of the City of Mequon in Ozaukee County, representing over 95 percent of the population of the urbanized portion of the study area (see Table 36). The percentage of personal employment opportunities within 30 minutes travel time by arterial highway rapidly decreases in the northern extremes of the study area. The City of Cedarburg and Village of Grafton are within 30 minutes travel time by highway of between only 10 and 20 percent of the urbanized area's employment opportunities. A major reason for the limited accessibility to employment in the northern parts of the urbanized portion of the study area is the spatial distribution of employment in the study area and in the Region. Employment opportunities in the study area are the most concentrated in and around the City of Milwaukee central business district (CBD), as shown on Map 38. Lower densities of employment opportunities are found throughout the developed portions of the Milwaukee urbanized area and certain outlying municipalities within the Region, including the City of Cedarburg and the Village of Grafton in the study area. However, consideration of accessibility by transit to employment opportunities in the study area is limited in this study to employment opportunities in the Milwaukee urbanized area, the area to which transit service in the Milwaukee area should be logically limited.

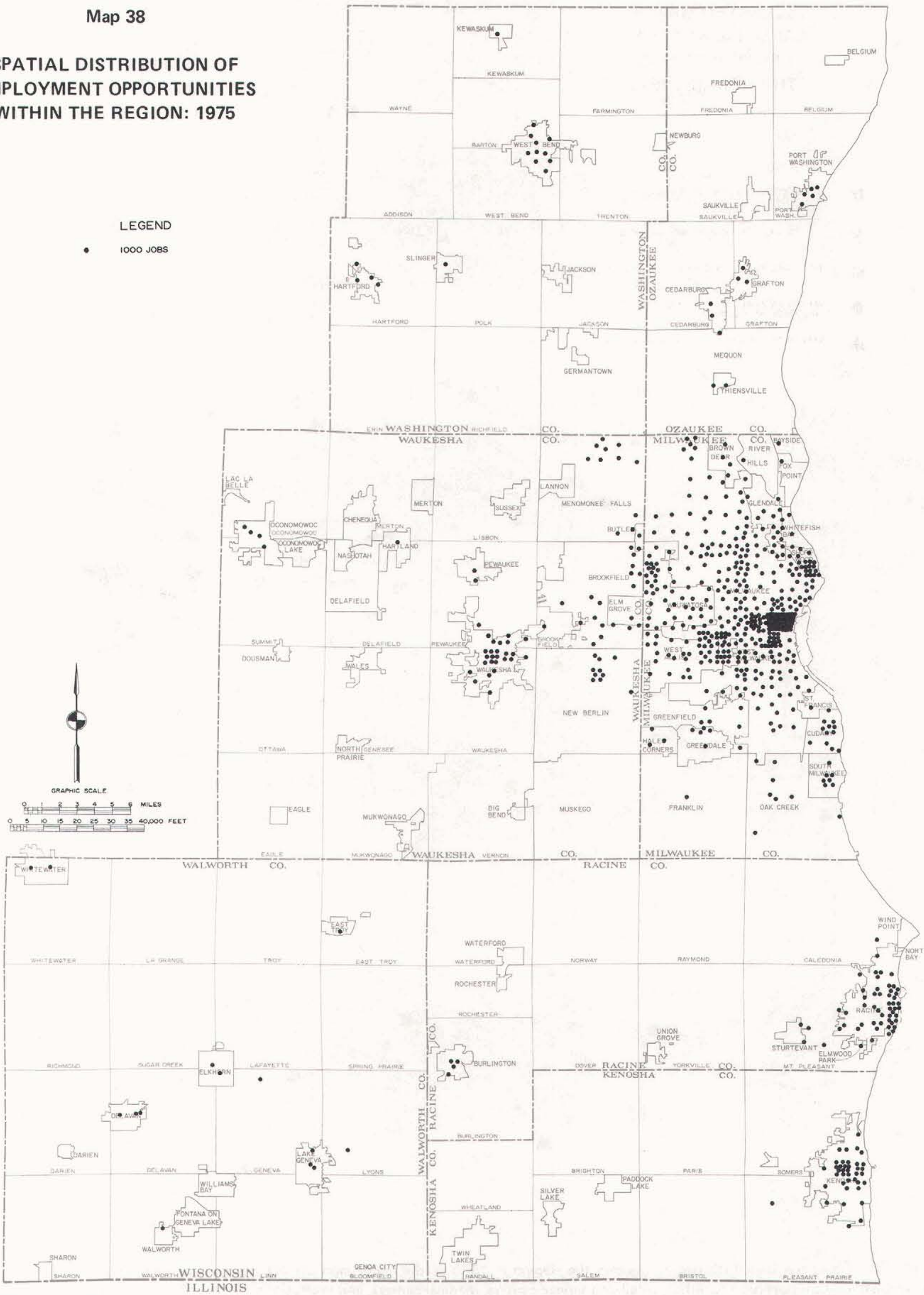
As shown on Map 41 and in Table 36, no part of the urbanized portion of the study area meets the standard for transit; that is, no part of the area is within 30 minutes by transit of 40 percent of the Milwaukee urbanized area's total employment opportunities. The part of the study area which is most accessible by transit to employment opportunities is the extreme southeastern portion of the study area, generally adjacent to the northwest portion of the Milwaukee central business district. This area is within 30 minutes travel time by transit of 30 to 39 percent of the urbanized area's employment opportunities. The percentage of employment opportunities in the study area accessible within 30 minutes by transit decreases rapidly in outward tiers, with the outer portions of the study area within the Milwaukee local transit service area and within nearly all of the primary transit service area being within 30 minutes travel time by transit of less than 10 percent of all Milwaukee urbanized area employment opportunities.

All of the urbanized portion of the study area meets the highway accessibility standard for major retail and service centers—namely, that three centers be accessible within 35 minutes travel time by highway, as shown on Map 42 and in Table 36. As shown on Map 39, this standard is met in the urbanized parts of the study area primarily because three such centers are located within the study area and two are located immediately adjacent to the study area.

Only a small part of the study area is within 35 minutes by public transit of three or more major retail and service centers and, therefore,

Map 38

SPATIAL DISTRIBUTION OF EMPLOYMENT OPPORTUNITIES WITHIN THE REGION: 1975



In 1975, 66 percent of the employment opportunities in the Southeastern Wisconsin Region were located in Milwaukee County. Eighty-two percent of all economic activity in the Region was located in the three urban counties of Kenosha, Milwaukee, and Racine.

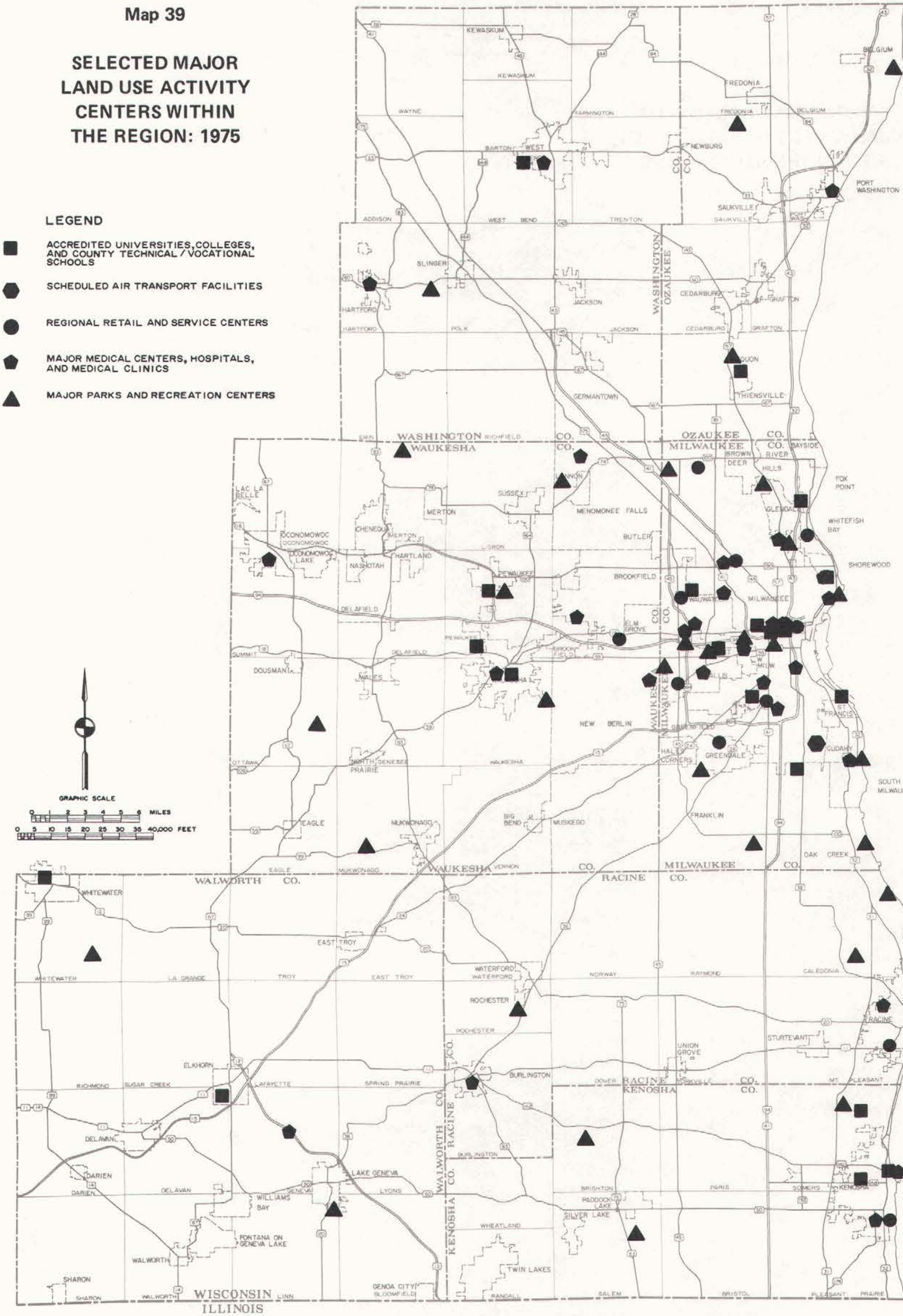
Source: SEWRPC.

Map 39

SELECTED MAJOR LAND USE ACTIVITY CENTERS WITHIN THE REGION: 1975

LEGEND

- ■ ACCREDITED UNIVERSITIES, COLLEGES, AND COUNTY TECHNICAL / VOCATIONAL SCHOOLS
- ⬢ SCHEDULED AIR TRANSPORT FACILITIES
- ● REGIONAL RETAIL AND SERVICE CENTERS
- ⬟ MAJOR MEDICAL CENTERS, HOSPITALS, AND MEDICAL CLINICS
- ▲ MAJOR PARKS AND RECREATION CENTERS

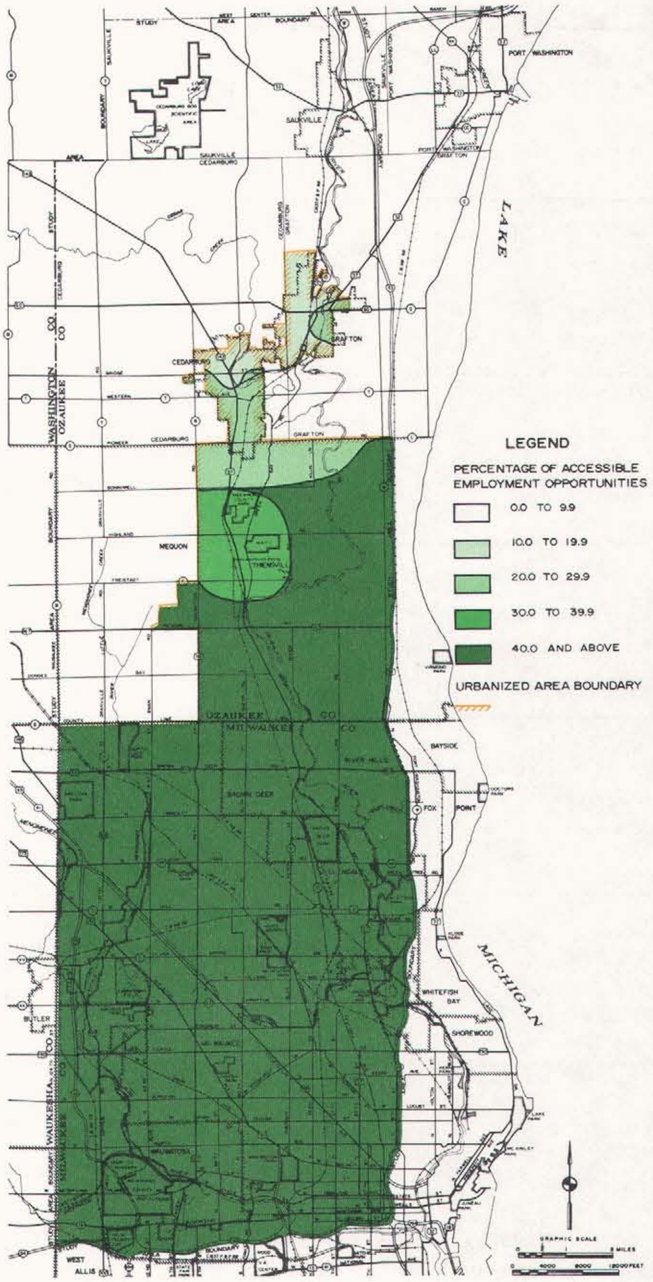


This map shows the spatial distribution within the Region in 1975 of the major land use activity centers, including educational institutions, scheduled air transportation facilities, retail and service centers, medical centers, and recreational centers. As shown on this map, major activity centers within the Region were concentrated in the highly developed portions of the Milwaukee urbanized area.

Source: SEWRPC.

Map 40

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE URBANIZED AREA EMPLOYMENT OPPORTUNITIES BY HIGHWAY: 1978

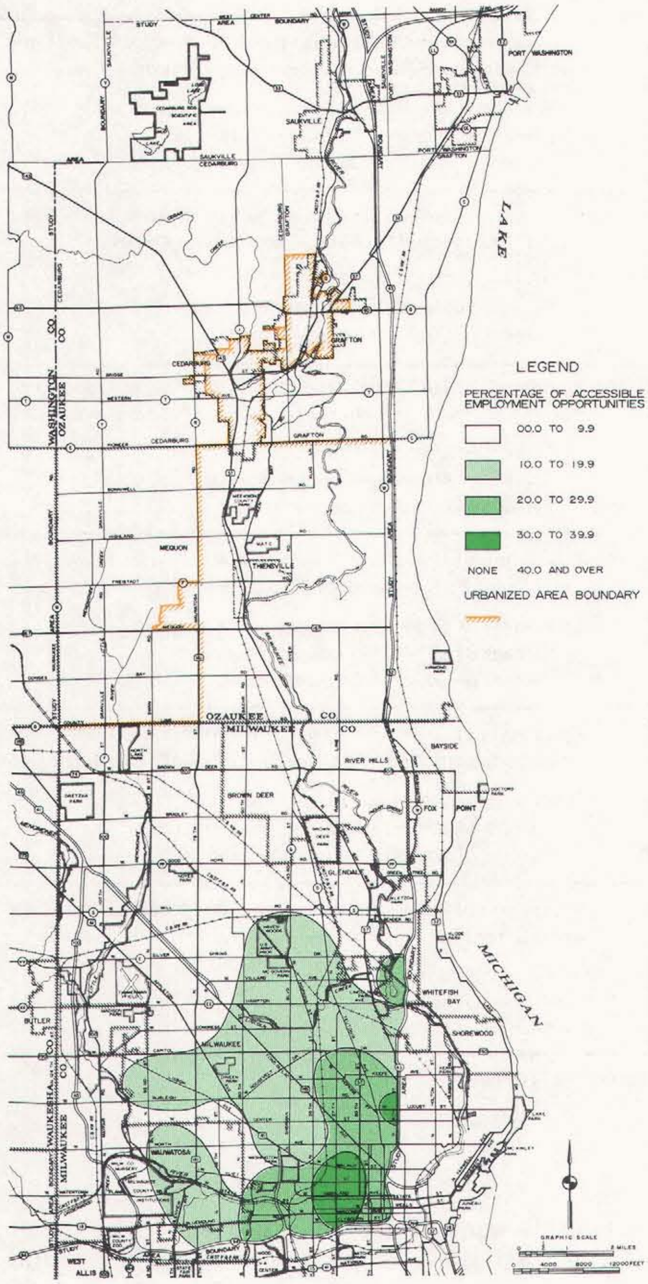


Those areas of the urbanized portion of the northwest side study area which meet the highway accessibility standard for employment—that is, those areas which are within 30 minutes travel time by highway of at least 40 percent of the employment opportunities in the Milwaukee urbanized area—included all of that portion of the study area within Milwaukee County and that portion of the study area in the southern and eastern portions of the City of Mequon in Ozaukee County. Over 93 percent of the total population of the study area resided within the portion of the area meeting this service standard. The percentage of employment opportunities meeting this standard is substantially lower in the northern extreme of the study area. In the northern portion of the City of Cedarburg and Village of Grafton, the percentage of employment opportunities within 30 minutes travel time is limited to between 10 and 20 percent.

Source: SEWRPC.

Map 41

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE URBANIZED AREA EMPLOYMENT OPPORTUNITIES BY TRANSIT: 1978



No part of the urbanized portion of the study area was within 30 minutes by transit of 40 percent of the Milwaukee urbanized area's total employment opportunities. The part of the study area which is most accessible to employment opportunities by transit is the extreme southeastern portion of the study area, generally adjacent to the northwest portion of the Milwaukee central business district. This area is within 30 minutes travel time by public transit of 30 to 40 percent of the urbanized area's employment opportunities.

Source: SEWRPC.

Table 36

ACCESSIBILITY OF THE POPULATION OF THE URBANIZED PORTION OF THE STUDY AREA TO EMPLOYMENT AND SELECTED MAJOR LAND USE ACTIVITY CENTERS BY ARTERIAL HIGHWAY AND PUBLIC TRANSIT: 1978

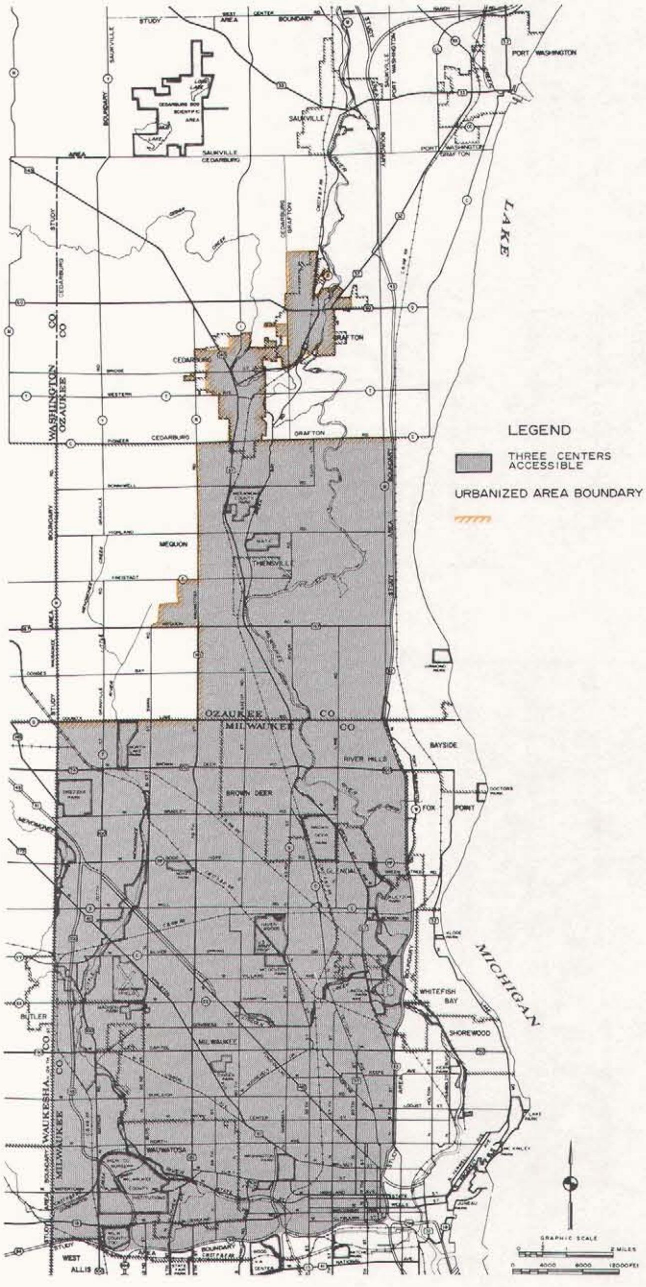
Accessibility of Population	Mode	
	Arterial Highway	Public Transit
Population of Urbanized Area Within 30 Minutes Travel Time of 40 Percent of Regional Employment Opportunities	464,887	- -
Percent of Urbanized Area	95.0	- -
Percent of Milwaukee County Portion	100.0	- -
Percent of Ozaukee County Portion	28.7	- -
Population of Urbanized Area Within 35 Minutes Travel Time of Three or More Major Retail and Service Centers	489,316	101,029
Percent of Urbanized Area	100.0	20.6
Percent of Milwaukee County Portion	100.0	22.2
Percent of Ozaukee County Portion	100.0	0.0
Population of Urbanized Area Within 30 Minutes Travel Time of a Major Medical Center, Hospital, or Medical Clinic	489,316	375,218
Percent of Urbanized Area	100.0	76.7
Percent of Milwaukee County Portion	100.0	82.5
Percent of Ozaukee County Portion	100.0	0.0
Population of Urbanized Area Within 40 Minutes Travel Time of a Major Park or Outdoor Recreation Area	489,316	260,003
Percent of Urbanized Area	100.0	53.1
Percent of Milwaukee County Portion	100.0	57.1
Percent of Ozaukee County Portion	100.0	0.0
Population of Urbanized Area Within 40 Minutes Travel Time of an Accredited University, College, or County Technical/Vocational School	489,316	387,220
Percent of Urbanized Area	100.0	79.1
Percent of Milwaukee County Portion	100.0	85.1
Percent of Ozaukee County Portion	100.0	0.0
Population of Urbanized Area Within 60 Minutes Travel Time of a Scheduled Air Transport Facility	489,316	63,040
Percent of Urbanized Area	100.0	12.9
Percent of Milwaukee County Portion	100.0	13.9
Percent of Ozaukee County Portion	100.0	0.0

Source: SEWRPC.

meets this standard (see Map 43). Only 21 percent of the total study area population resides within this area, as shown in Table 36. The portion of the study area meeting the standard is located primarily in the extreme southeastern portion, and in a small area in the central part of the Milwaukee County portion. The central part of the Milwaukee County portion of the study area is situated in proximity to the three major retail and service centers within the study area: the Northridge, Capitol Court, and Mayfair Mall Shopping Centers. In general, the number of centers accessible within 35 minutes by transit decreases with distance from the Milwaukee central business district. However, some areas of the study area, although accessible within 35 minutes by public transit to only one retail and service center, are surrounded by areas accessible by transit to two and even three retail and service centers within the same travel time, as shown on Map 42. The only parts of the study area within the local transit service area which are not within 35 minutes travel time of even one center are located at the fringes of that transit service area.

Map 42

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL MAJOR RETAIL AND SERVICE CENTERS BY HIGHWAY: 1978

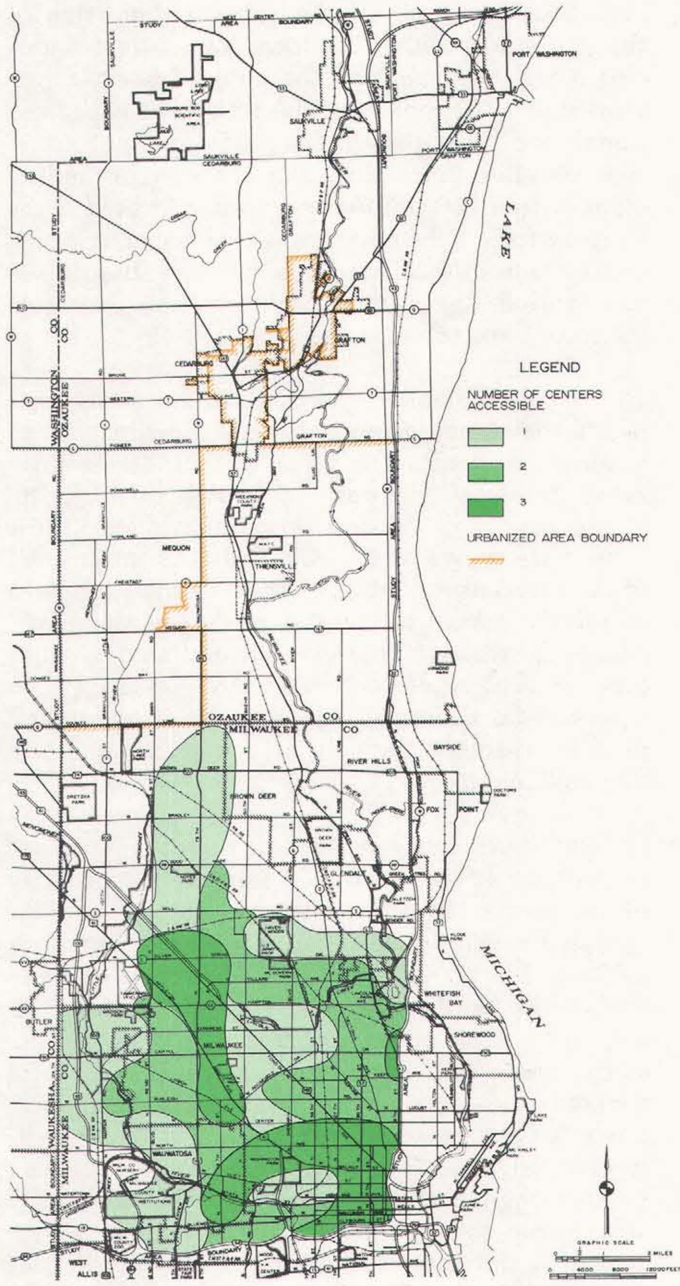


The highway accessibility standard for major retail service centers within the study area—namely, that three centers be within 35 minutes travel time by highway—was met in 1978 in the entire urbanized portion of the study area. This standard was met throughout the urbanized portion of the study area, in part, because three such service centers were located within the study area and two more were located immediately adjacent to the study area.

Source: SEWRPC.

Map 43

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL MAJOR RETAIL AND SERVICE CENTERS BY PUBLIC TRANSIT: 1978



The transit accessibility standard for major retail and service centers was met within only a small part of the study area in 1978. In general, this standard was met in the extreme southeastern portion of the study area and in a small area in the central part of the Milwaukee County portion. Also, the number of centers within 35 minutes by transit decreases with distance from the Milwaukee central business district. The parts of the study area within the local transit service area which are not within 35 minutes travel time of even one center were limited to those at the outer fringes of that service area. About 20 percent of the total population of the study area resides within the portions of the area meeting this service standard.

Source: SEWRPC.

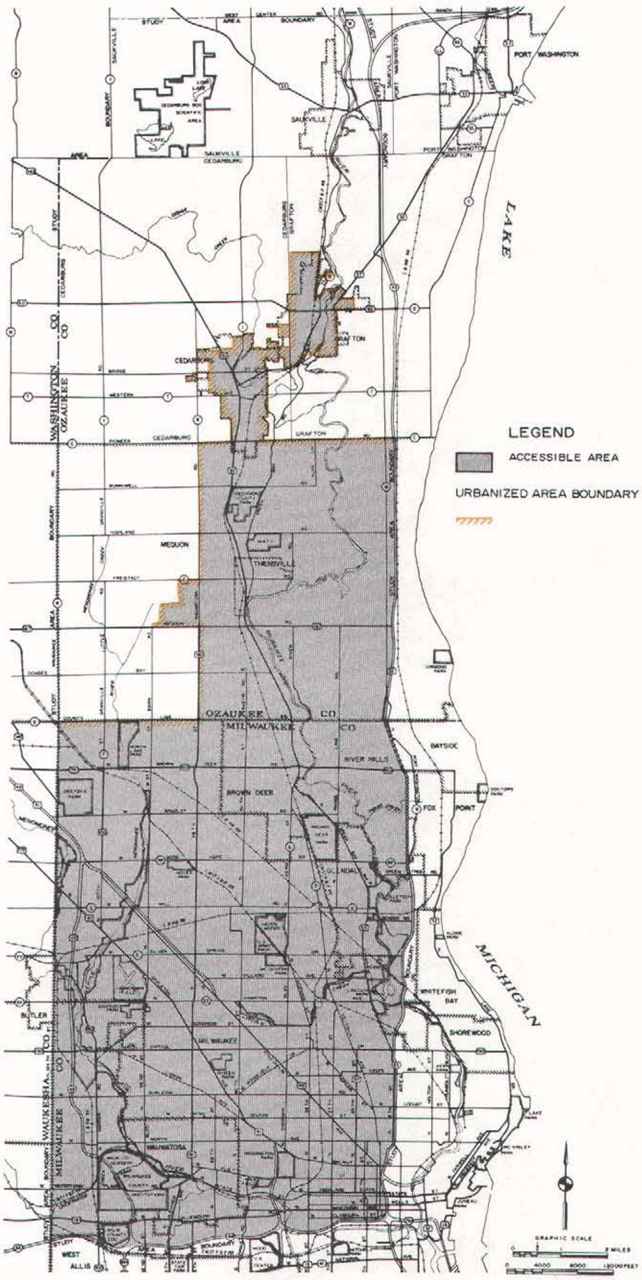
All of the urbanized portion of the study area meets the standard requiring that a hospital, major medical center, or medical clinic be within 30 minutes by arterial highway, as shown in Table 36 and on Map 44. The locations of such medical facilities in the Region are shown on Map 39. Nearly all of the urbanized portion of the study area within the local transit service area also meets this standard for public transit, representing over 76 percent of the study area urbanized population. That part of the study area not accessible to a hospital, major medical center, or medical clinic within 30 minutes by transit is located in the fringes of the Milwaukee transit service area, which require automobile access to primary transit service, and in the extreme northwestern corner of the local transit service area (see Map 45).

All of the urbanized portion of the study area meets the standard requiring that a major park or outdoor recreation area be within 40 minutes travel time by highway, as shown on Map 46. Major park and outdoor recreation sites in the Region are shown on Map 39. Only the eastern half of the Milwaukee County portion of the study area within the transit service area meets this standard—that is, is within 40 minutes travel time of a major park or outdoor recreation site by public transit—representing about 53 percent of the population of the urbanized portion of the study area (see Table 36 and Map 47).

All of the urbanized portion of the study area was also found to be within 40 minutes by highway of an accredited university, college, or county-operated technical or vocational school, as shown on Map 48 and in Table 36. The extent of these educational facilities in the Region is shown on Map 39. Most of the urbanized portion of the study area that is within the Milwaukee local transit service area is also accessible to such educational facilities within 40 minutes by public transit, representing over 79 percent of the total study area population. Only the northern part of the study area within the existing Milwaukee transit service area does not meet this standard for transit; this area is only provided primary transit service (see Map 49).

Map 44

ACCESSIBILITY WITHIN THE STUDY AREA TO A MAJOR MEDICAL FACILITY BY HIGHWAY: 1978



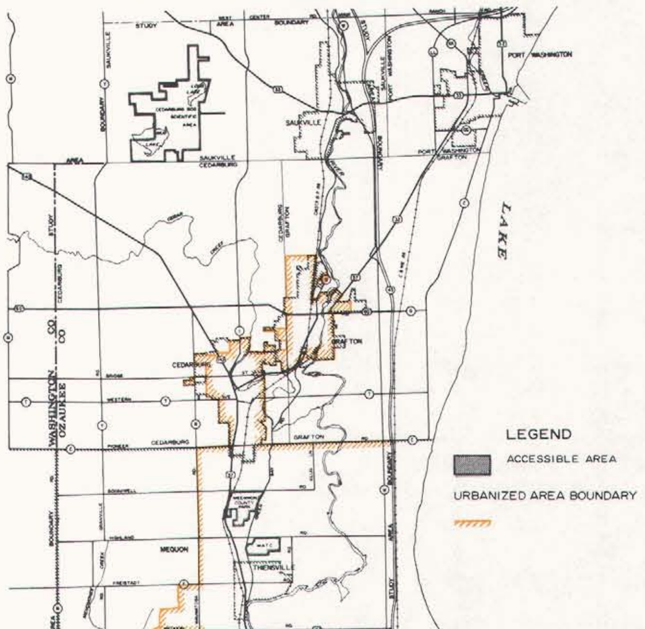
In 1978, all of the urbanized portion of the study area met the accessibility standard which requires that a hospital, major medical center, or medical clinic be within 30 minutes travel time by arterial highway.

Source: SEWRPC.

All of the urbanized portion of the study area was found to be within 60 minutes travel time by highway of General Mitchell Field, the only major scheduled air transport terminal in the Region, as shown on Map 50 and in Table 36. Only a very small portion of the urbanized portion of the study area, however, is within 60 minutes travel time of General Mitchell Field by public transit, representing less than 13 percent of the study area population (see Map 51). The areas meeting the transit accessibility standard were located exclusively on the eastern boundary of the study area in the southern half of the Milwaukee County portion of the study area. Transit accessibility to General

Map 45

ACCESSIBILITY WITHIN THE STUDY AREA TO A MAJOR MEDICAL FACILITY BY PUBLIC TRANSIT: 1978

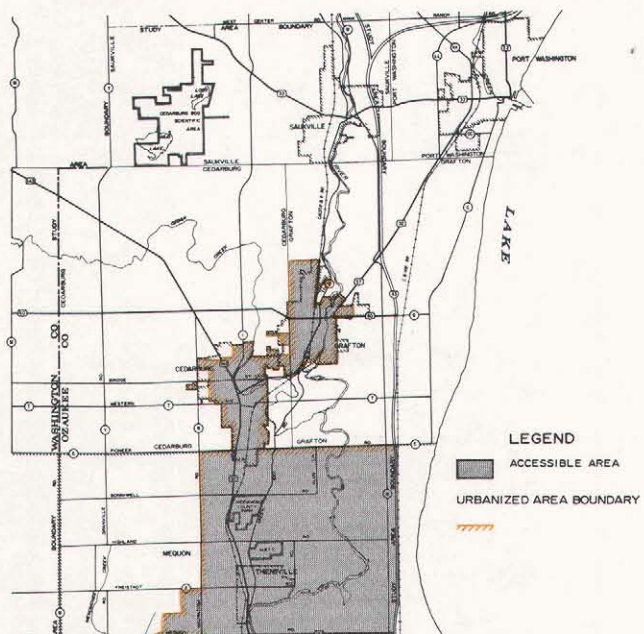


In 1978, nearly all of the urbanized portion of the study area within the local transit service area met the accessibility standard which requires that a hospital, major medical center, or medical clinic be within 30 minutes travel time by transit. Those parts of the study area not meeting this accessibility standard were located in the outer fringe areas of the Milwaukee transit service area, which require automobile access to primary transit service, and in the extreme northwestern corner of the local transit service area. About 75 percent of the total population of the study area resided within those portions of the area that met this service standard.

Source: SEWRPC.

Map 46

ACCESSIBILITY WITHIN THE STUDY AREA TO A MAJOR PARK OR OUTDOOR RECREATIONAL AREA BY HIGHWAY: 1978

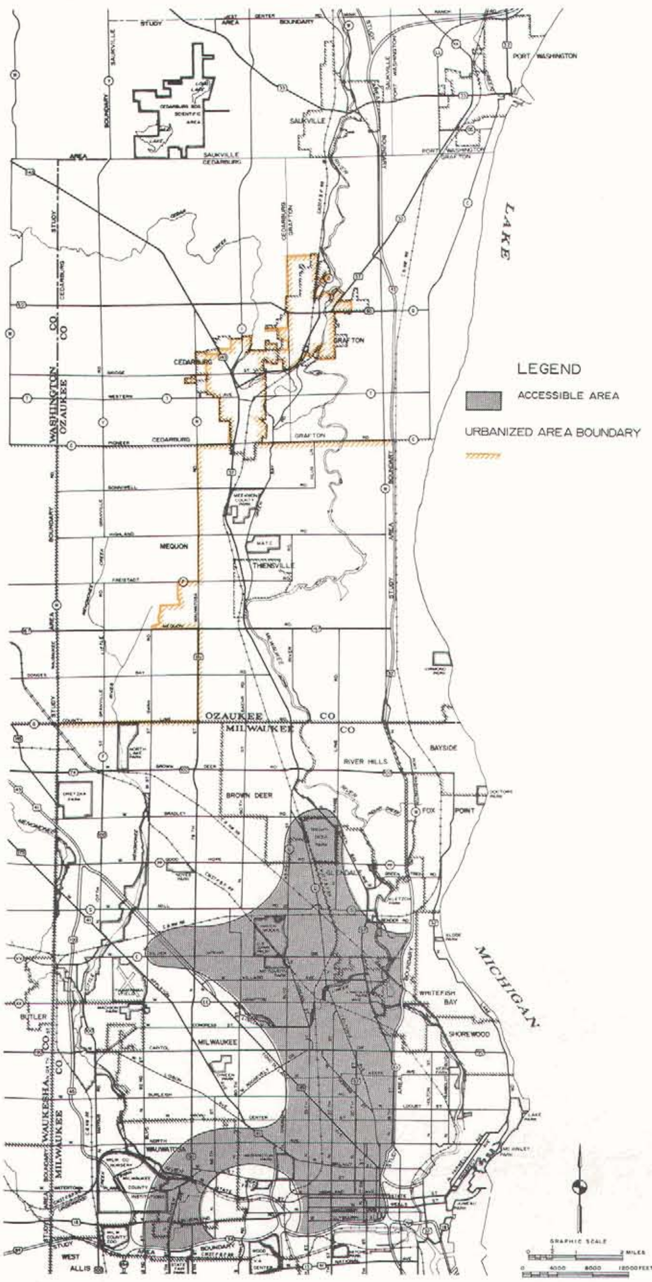


In 1978 all of the urbanized portion of the northwest side study area was found to meet the accessibility standard which requires that a major park or recreation area be within 40 minutes travel time by highway.

Source: SEWRPC.

Map 47

ACCESSIBILITY WITHIN THE STUDY AREA TO A MAJOR PARK OR OUTDOOR RECREATIONAL AREA BY PUBLIC TRANSIT: 1978

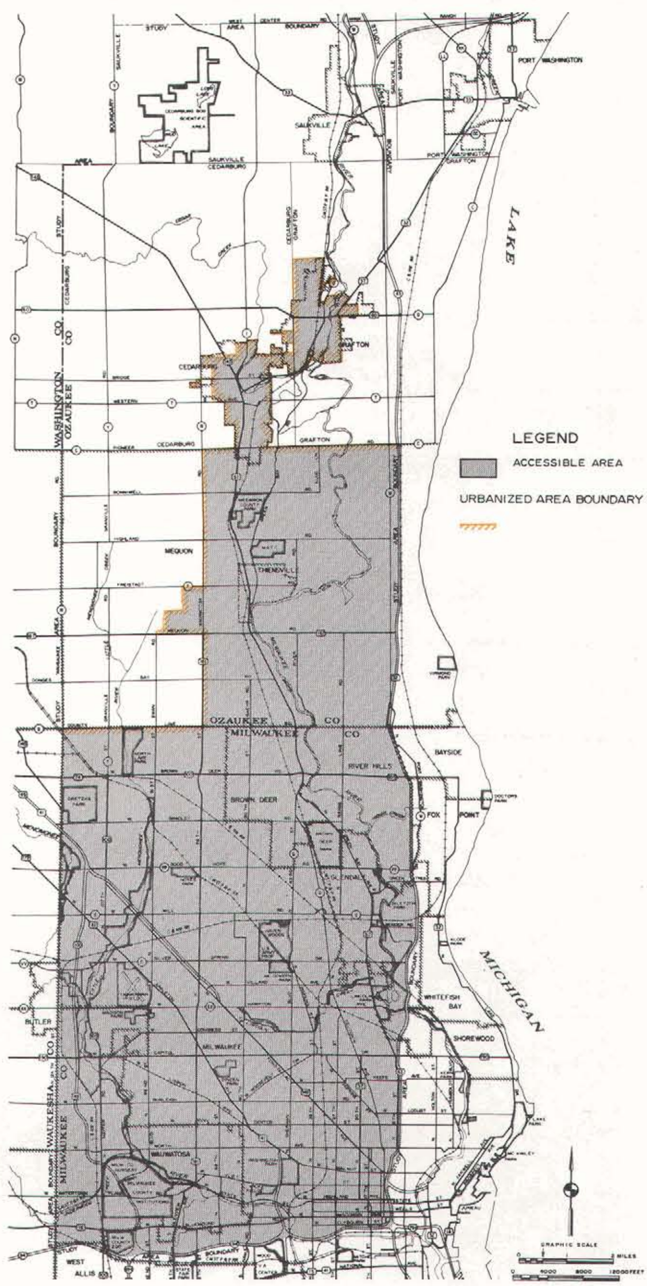


In 1978 only the eastern half of the Milwaukee County portion of the northwest side study area within the transit service area was found to meet the accessibility standard which requires that a major park or recreation area be within 40 minutes travel time by public transit. About 53 percent of the population of the urbanized portion of the study area resides within those portions of the area meeting this service standard.

Source: SEWRPC.

Map 48

ACCESSIBILITY WITHIN THE STUDY AREA TO A MAJOR EDUCATIONAL FACILITIES BY HIGHWAY: 1978

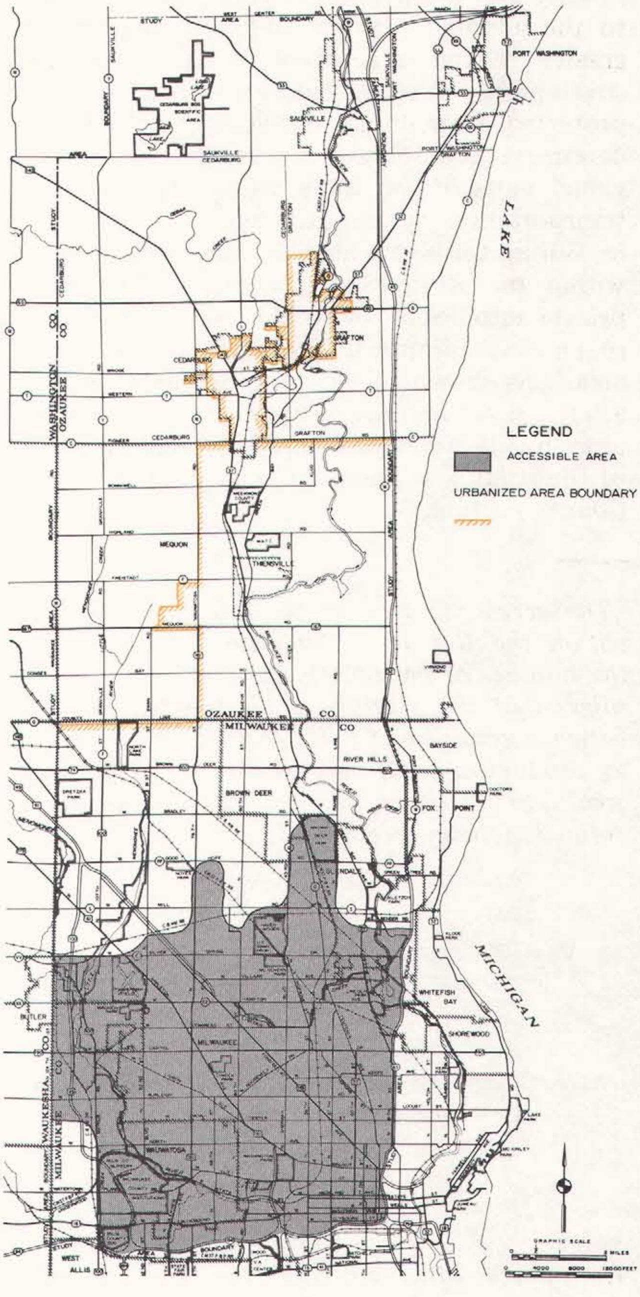


In 1978 all of the urbanized portion of the study area was found to meet the accessibility standard which requires that an accredited university, college, or county-operated technical or vocational school be within 40 minutes highway travel time.

Source: SEWRPC.

Map 49

ACCESSIBILITY WITHIN THE STUDY AREA TO MAJOR EDUCATIONAL FACILITIES BY PUBLIC TRANSIT: 1978

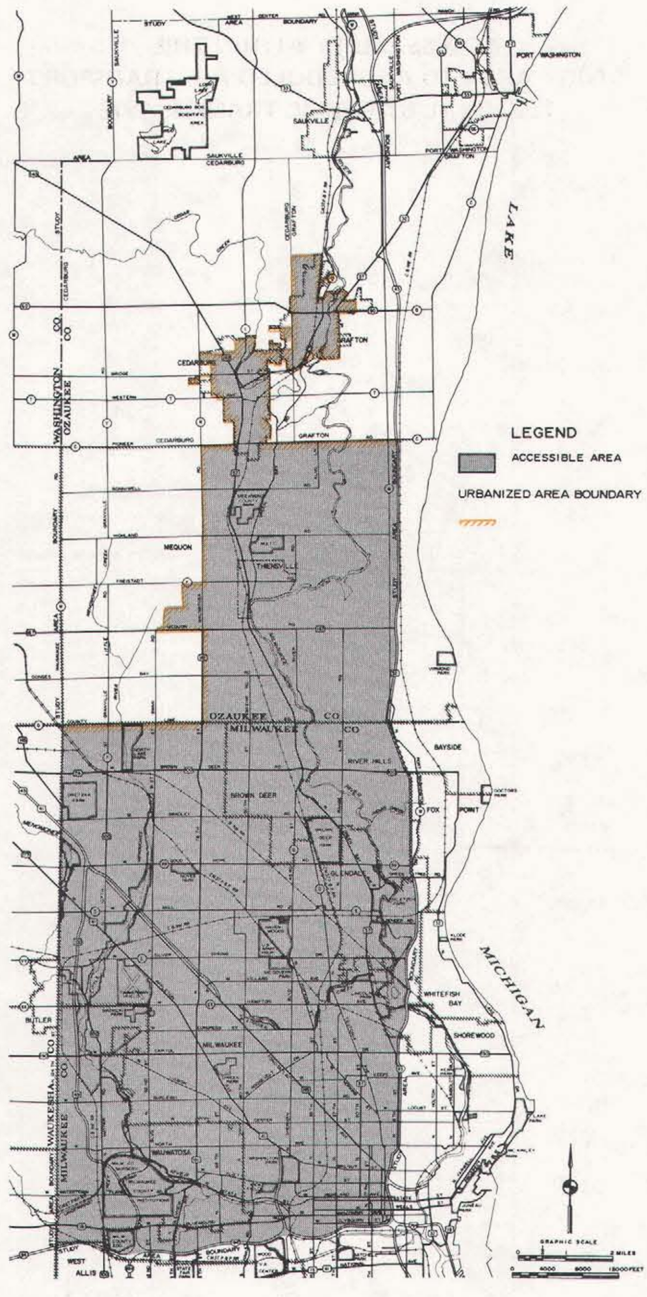


In 1978 most of the urbanized portion of the study area within the Milwaukee transit service area was found to meet the accessibility standard which requires that an accredited university, college, or county-operated technical or vocational school be within 40 minutes travel time by transit. This accessible area included over 79 percent of the total study area population. Of that portion of the study area within the Milwaukee transit service area, only the northern part does not meet this accessibility standard for public transit. This area is only served by primary public transit service.

Source: SEWRPC.

Map 50

ACCESSIBILITY WITHIN THE STUDY AREA TO A SCHEDULED AIR TRANSPORT TERMINAL BY HIGHWAY: 1978



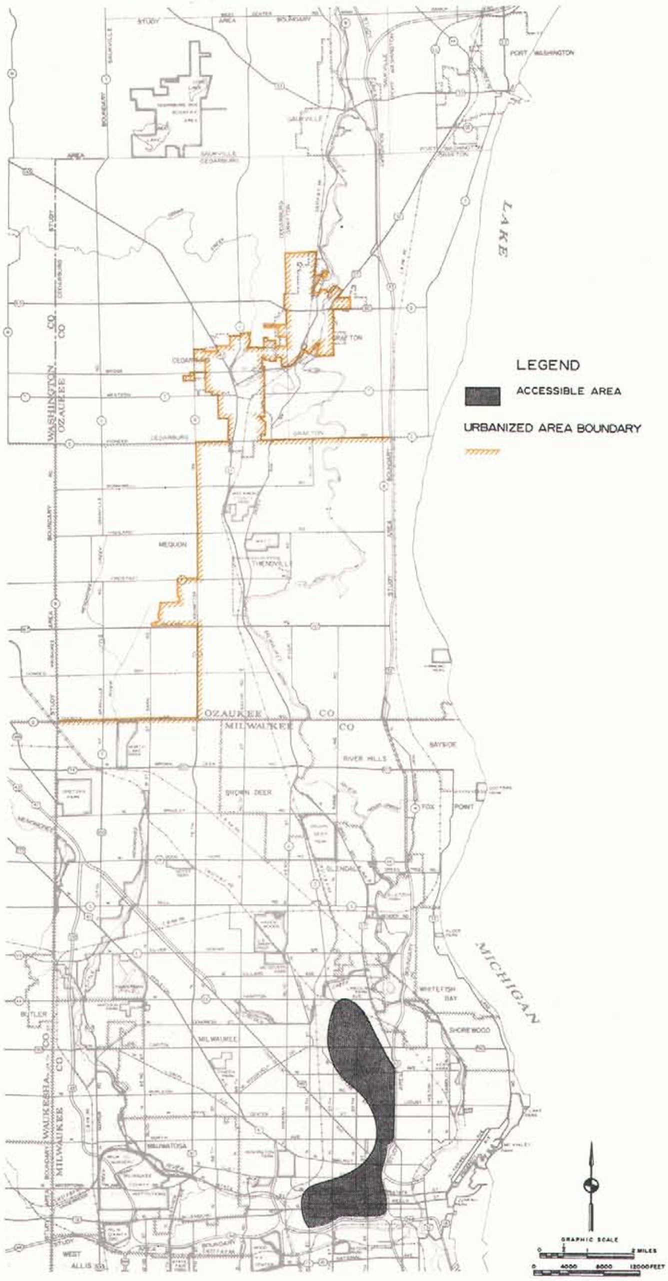
In 1978 all of the urbanized portion of the study area was found to meet the highway accessibility standard for a major commercial airport—that is, was found to be within 60 minutes travel time by highway to General Mitchell Field, the only major scheduled air transport terminal in the Region.

Source: SEWRPC.

Mitchell Field is low because the airport is directly served from the north by only one transit route. The parts of the study area meeting the transit accessibility standard are adjacent or in proximity to this route.

Map 51

ACCESSIBILITY WITHIN THE STUDY AREA TO A SCHEDULED AIR TRANSPORT TERMINAL BY PUBLIC TRANSIT: 1978



In 1978 only a very small part of the urbanized portion of the northwest side study area was found to meet the transit accessibility standard for commercial airports—that is, was found to be within 60 minutes travel time by public transit of General Mitchell Field Airport. This accessible area encompassed less than 13 percent of the study area population. The areas meeting the transit accessibility standard were located exclusively on the eastern boundary of the study area in the southern half of the Milwaukee County portion.
Source: SEWRPC.

Deficiencies of the Existing Transportation System in Providing Accessibility in Support of the Land Use Plan

The second standard under this objective requires that the relative accessibility provided by the transportation system of northwestern Milwaukee County and southern Ozaukee County be adjusted to the adopted regional land use plan, providing greater relative accessibility to areas in which development is to be induced than to areas to be protected from urban development. In order to determine the relative accessibility of the individual parts of the study area under the existing transportation system, an index of accessibility measuring the ease with which the land use activity within the Region can presently be reached by private automobile and public transit from a given origin was computed for subareas of the study area.[1] As shown on Map 52, accessibility by the arterial street and highway system is greater in the more highly developed Milwaukee County portion of the study area than in the largely rural Ozaukee County portion.

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[1] *The accessibility index for any given subarea, i, within the Region is determined by multiplying the number of person trips attracted in each other subarea of the Region, j, by the friction factor between zones i and j. These products are summed to produce a total accessibility index from subarea i to all other subareas. The index may be defined mathematically as:*

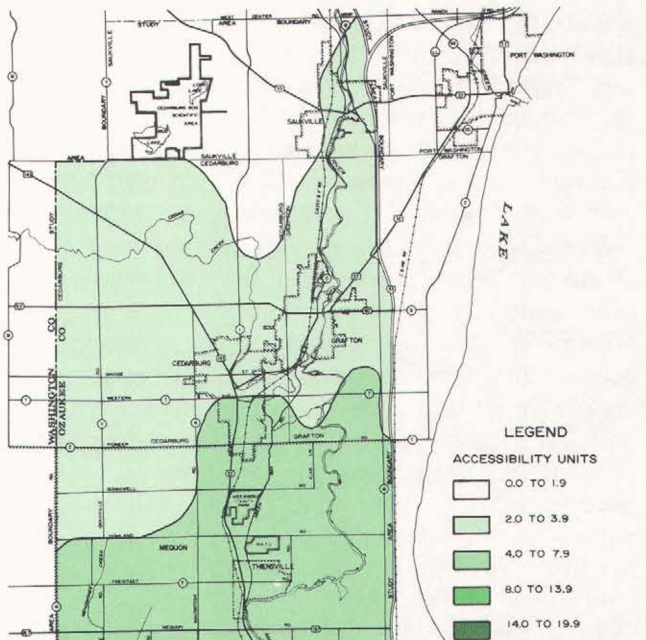
$$V_i = \sum_{J=1}^{N} A_j (Fij)$$

where: V_1 = *the accessibility index for subarea i.*
A_j = *the trip attractions in subarea j.*
F_{ij} = *the friction factor for travel between subareas i and j.*
N = *the number of subareas in the Region.*

The number of person trip attractions in a subarea quantifies the degree of employment, shopping, social-recreational, medical, and other land use activity in a subarea, with a higher number of trip attractions reflecting a greater amount of land use activity. The friction factor reflects the ease of travel between the subareas of the Region, with a higher friction factor representing a greater ease of travel. The friction factor can be represented mathematically as the inverse of the door-to-door travel time between two subareas of the Region, with the travel time being raised to some power.

Map 52

ARTERIAL HIGHWAY ACCESSIBILITY TO LAND USE ACTIVITY WITHIN THE STUDY AREA: 1978



In 1978 the arterial street and highway system within the northwest side study area was found to provide a greater degree of accessibility in the more highly developed Milwaukee County portion of the study area than in the largely rural Ozaukee County portion of the study area. The areas of greatest arterial highway accessibility in the study area were found in the south-central and western parts of the Milwaukee County portion, within the Cities of Milwaukee and Wauwatosa. Accessibility levels by arterial highway were found to decline to the north as the study area becomes less urban, and to the southeast as the intensity of the development of the study area increases and reaches its peak.

Source: SEWRPC.

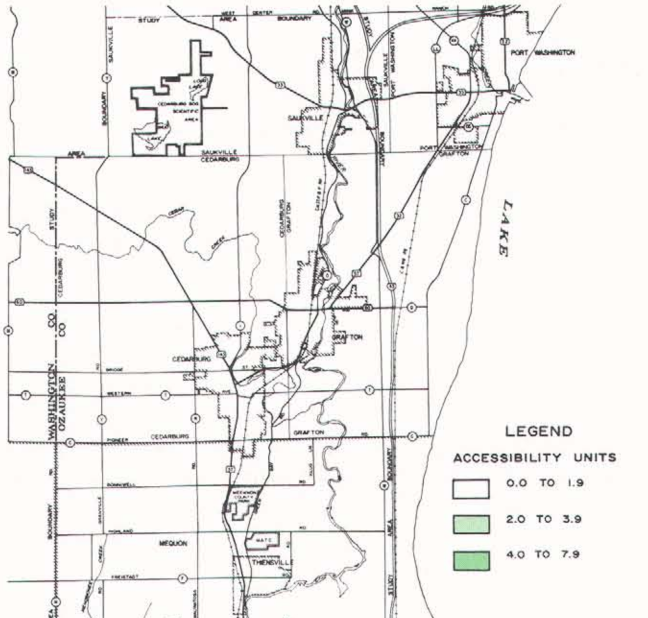
The areas in the study area having the greatest accessibility by arterial highway are found in the south-central and western parts of the Milwaukee County portion of the study area in the Cities of Milwaukee and Wauwatosa. Accessibility levels by arterial highway decline from this area to the north as the study area becomes less urban, and to the southeast as the intensity of the development of the study area increases and reaches its peak.

The areas of greatest transit accessibility are scattered throughout the study area (see Map 53). These areas are generally located near park-ride lots in the study area served by primary transit, or in the more intensively developed portions of the study area in which transit routes are closely spaced, including some diagonal routes. The remainder of the Milwaukee local transit service area within the study area has about the same level of accessibility, which is only slightly lower than the levels in the areas having the greatest transit accessibility.

The adopted regional land use plan for the year 2000 for the study area is shown in summary form on Map 54. Generally, the standard requiring that the accessibility provided by the existing transportation system be adjusted to the adopted regional land use plan is met in the Milwaukee County portion of the study area, but not in the Ozaukee County portion. The plan recommends that the high-density development within the study area be located within the area of the study area having the two highest levels of arterial highway accessibility. An exception is the southeastern corner of the study area, which is recommended for high-density development but is provided only the third highest level of arterial highway accessibility in the study area, equal to that provided in the most outlying portion of Milwaukee County, which is recommended for medium-density development. The southeastern corner of the study area, however, is provided the highest level of transit accessibility in the study area. Generally, transit service is available only to those parts of the study area that are recommended for high-density development. However, transit service is also provided to the southwestern and northeastern parts of the Milwaukee County portion of the study area—areas having the highest arterial highway accessibility levels and recommended generally for medium-density development.

Map 53

PUBLIC TRANSIT ACCESSIBILITY TO LAND USE ACTIVITY WITHIN THE STUDY AREA: 1978



The areas within the northwest side study area that are afforded the greatest accessibility by the public transit system were found to be located near park-ride lots in the study area served by primary transit, and in those areas of the more intensely developed portions of the study area having a close spacing of transit routes, including some diagonal routes. The remainder of the Milwaukee local transit service area within the study area was found to have about the same level of general accessibility, determined to be just lower than the highest transit accessibility levels in the study area.

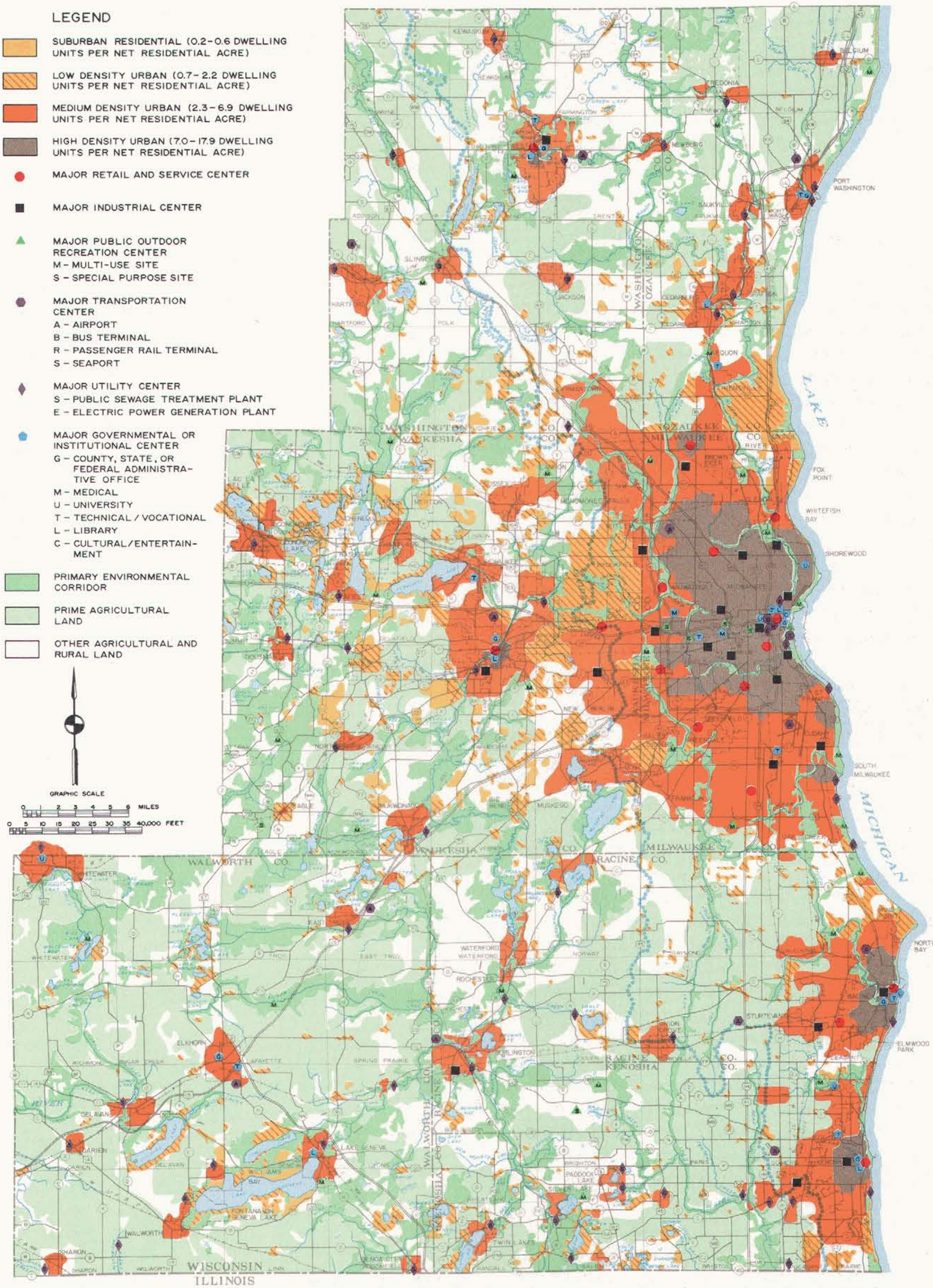
Source: SEWRPC.

Within the Ozaukee County portion of the study area, medium-density development is recommended in the plan generally in and around the Villages of Grafton, Thiensville, and Saukville, and the City of Cedarburg, as well as between the Village of Thiensville and the Milwaukee/Ozaukee County line in the City of Mequon. Low-density development is recommended principally in the eastern half of the City of Mequon, and to a much lesser extent throughout the remainder of the City of Mequon and the Towns of Cedarburg and Grafton. The level of accessibility by arterial highway in the Ozaukee County portion of the study area, however, generally decreases with distance from the Milwaukee/Ozaukee County line, although the accessibility level in the eastern half of the study area is, in certain areas, higher than in the western half. As a consequence, the medium-density development recommended in the Ozaukee County portion of the study area is currently provided with a much lower accessibility than is medium-density development in the Milwaukee County study area portion. Furthermore, areas in Ozaukee County that are located around the areas recommended for medium-density development and that are recommended for only scattered suburban-density development or for protection from development are generally provided the same level of accessibility by the current transportation system as the areas recommended for medium-density development. An exception is the area including and surrounding the Cedarburg Bog, where protection from development is recommended in the adopted land use plan, and where highway accessibility is the lowest in the study area.

Summary and Conclusions: The first transportation system management and development objective formulated under the study sets forth the need for a transportation system that will serve the existing land uses of the study area, and promote the implementation of the adopted regional land use plan for the study area. A major deficiency of the existing study area transportation system with respect to the attainment of this objective has been identified: the inadequate level of accessibility provided by its public transit component to major land use activities. Only in small parts of the urbanized portion of the study area, which represent only portions of the existing local transit service area in the study area, does the existing public transit system provide the suggested accessibility to major retail and service centers, outdoor park and recreation areas, and a scheduled air transport facility. No part of the study area is

Map 54

ADOPTED REGIONAL LAND USE PLAN FOR SOUTHEASTERN WISCONSIN: 2000



The adopted regional land use plan for the year 2000 envisions converting about 113 square miles of land from rural to urban use over the period of 1970 to 2000 to accommodate the forecast 460,000-person increase in the regional population expected over this 30-year period. The degree of centralization of the recommended plan is indicated by the fact that over 60 percent of all new urban residential land and about 49 percent of the incremental resident population would be located within 20 miles of the central business district of the City of Milwaukee. Generally, the standard requiring that the general accessibility provided by the existing transportation system should be adjusted to the adopted regional land use plan was found to have been met in the Milwaukee County portion of the study area, but not in the Ozaukee County portion of the study area.

Source: SEWRPC.

accessible by public transit within the specified 30 minutes travel time to 40 percent of the Milwaukee urbanized area's employment opportunities. This deficiency may be expected to become even more important if motor fuel costs and availability problems are exacerbated, as may also be expected.

Problems were also identified with respect to the conformance of the accessibility provided by the existing transportation system with the intensity of development recommended under the adopted regional land use plan. The southeastern portion of the study area, which currently is, and is recommended to continue to remain, in high-density development, is now provided with a lower level of overall highway accessibility than the areas recommended for high-density development, and with a level that is equal to that currently provided to the outlying portions of the Milwaukee County part of the study area, which are recommended for medium- or low-density development. In the Ozaukee portion of the study area, the relative level of highway accessibility currently provided to areas recommended for medium-density development is generally the same as that provided to areas to be protected from development.

Deficiencies of the Existing Transportation System in Terms of Cost and Energy Use

The second transportation systems management and development objective formulated under the study identifies the need for a transportation system which is economical and efficient, satisfying all other objectives at the least possible cost. This objective is supported by four standards. The first requires that total transportation system operating and capital costs be minimized. The second requires that the direct benefits of transportation improvements exceed direct costs. The third stipulates that full utilization of existing transportation facilities should be made through low- and noncapital intensive actions before capital-intensive measures are proposed as transportation alternatives. The fourth standard specifies that energy use in the operation of the transportation system should be minimized. Only two of these standards, the first and last, are appropriate in a limited manner for identifying deficiencies in the existing transportation system with respect to attaining this objective.

System Operating and Capital Costs: The first standard requires that the sum of transportation system operating and capital investment costs be minimized. However, whether this sum is now being minimized in the study area can be determined only if alternative transportation system plans are designed and then evaluated with respect to cost. Therefore, whether this standard is being met cannot be determined on the basis of the existing problem identification. Instead, the manner in which transportation system operating costs vary within the Region and the study area will be determined. Average operating costs per mile and per trip to the user of the arterial street system and transit system are shown on Maps 55, 56, 57, and 58, respectively. Arterial street system user costs have been defined to include "out-of-pocket" costs of automobile operation, principally motor fuel, and costs associated with time spent in travel.[2] Map 55, which illustrates user costs on a per-mile basis, can be interpreted as indicating largely an average travel speed for parts of the study area, because the basic operating cost components are travel time converted to dollars through an average value of time estimated at $4.00 per hour,[3] and out-of-pocket costs which, because they consist largely of motor fuel consumption, are also a function of travel speed. As shown on Map 55, arterial street system user costs per mile are highest in the southeastern portion of the study area. This difference in arterial user costs

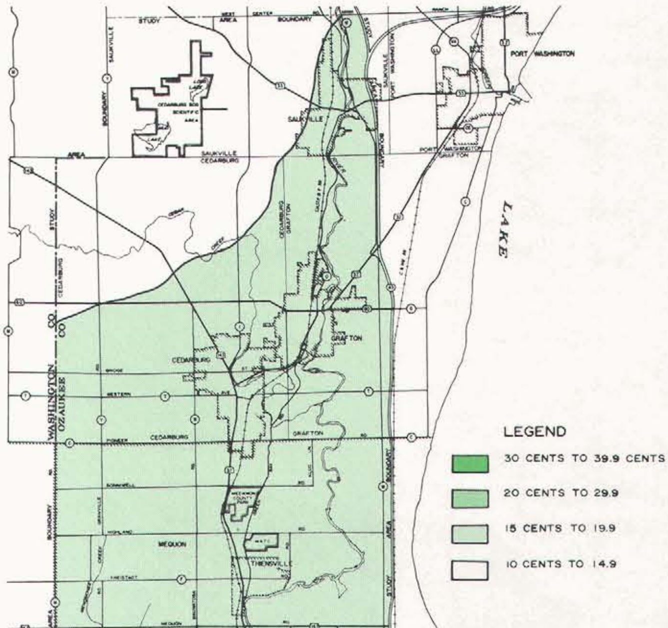
[2] *Out-of-pocket costs of automobile operation as perceived by the automobile user are defined to include all motor fuel costs, all parking costs at trip destination, and only a small percentage of other costs including purchase, routine and major maintenance, and insurance. Total costs of highway trips originating in a given zone to all other zones in the southeastern Wisconsin Region are a function of:*

(travel time x time cost) + (trip distance x out-of-pocket cost).

[3] *The value of time used to identify the average cost of travel differences between subareas of the study area is $4.00 per hour, the average hourly manufacturing employee wage in the Region in 1970. It is recognized that such an average wage is an approximation of the value of time, but it should be noted that it is used in a comparative manner, allowing the combination of time and out-of-pocket costs. Consequently, the relative variation in total transportation system user operating costs is properly illustrated for the various parts of the study area.*

Map 55

USER COSTS PER MILE OF THE ARTERIAL STREET AND HIGHWAY SYSTEM WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY: 1978

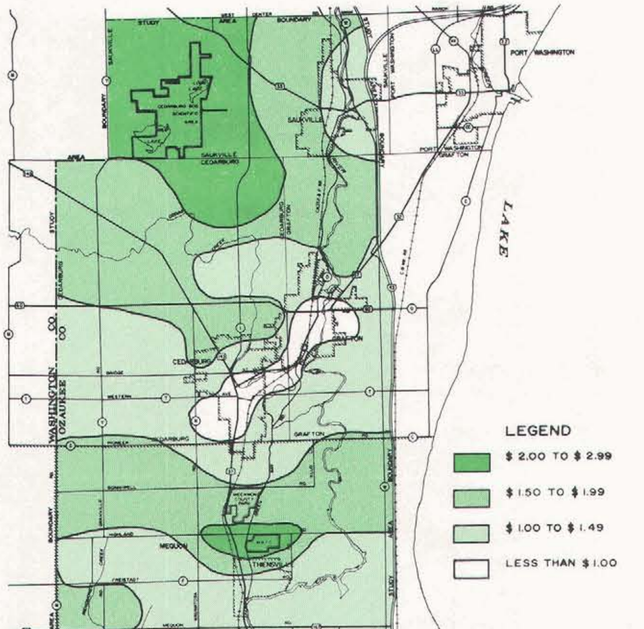


Arterial street system user costs per mile were found to be highest in the southeastern portion of the northwest side study area, being up to 170 percent higher than costs in the rest of the study area. This difference in arterial user costs can be attributed to lower operating speeds and consequent shorter operating times on arterial facilities in this portion of the study area.

Source: SEWRPC.

Map 56

USER COSTS PER TRIP ON THE ARTERIAL STREET AND HIGHWAY SYSTEM WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY: 1978

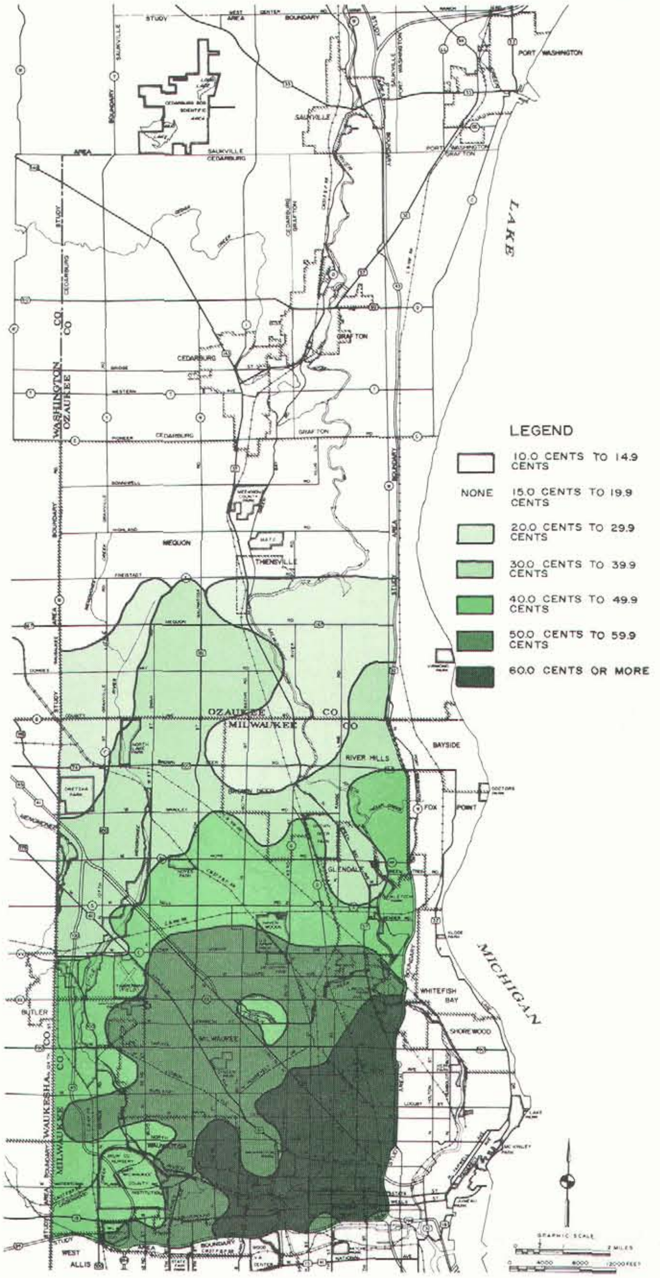


Arterial street system user costs per trip were found to be highest in the areas near the Milwaukee Area Technical College-Mequon and near the Northridge Shopping Center in 1978, and were found to be lowest in the areas near the N. 76th Street and N. 43rd Street corridors and in the Cedarburg-Grafton area. These differences in costs—ranging up to 500 percent—are due in part to the longer home-based shopping and home-based work trips associated with the regionally oriented MATC-Mequon and Northridge centers, and to the shorter or community-oriented home-based work and shopping trips associated with the Cedarburg and Grafton areas and the N. 76th Street and N. 43rd Street corridors.

Source: SEWRPC.

Map 57

USER COSTS PER MILE ON THE PUBLIC TRANSIT SYSTEM WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY: 1978

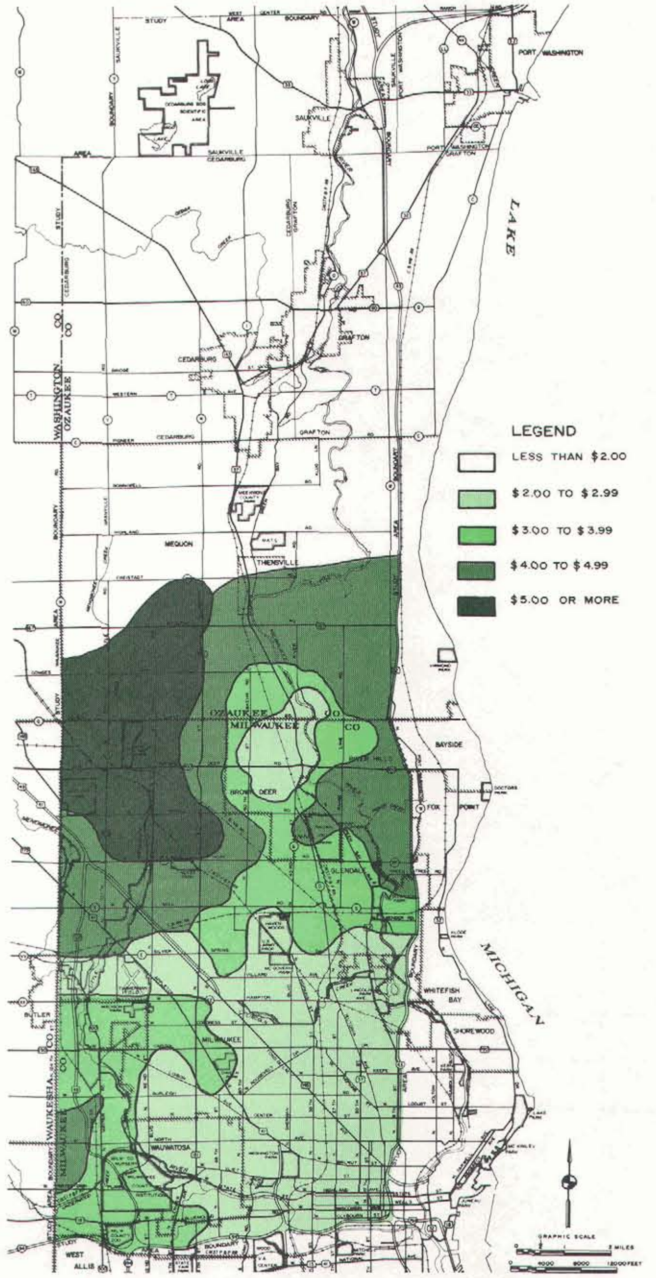


Transit user costs per mile were found to be highest in the southeastern corner of the study area in 1978—being up to 300 percent higher than in the rest of the study area—and generally were found to decrease uniformly with distance from the most intensely developed urban portion of the study area. Higher transit user costs per mile in the southeastern portion of the study area can be attributed to lower motor bus operating speeds in this intensely developed area, shorter lengths of trips made on public transit which make the fixed transit fare a larger factor in the per mile cost, and the predominant use of local transit service in this part of the study area. The lowest transit user cost per mile was found in the northern fringe of that part of the study area within the Milwaukee transit service area, where only primary public transit service is provided.

Source: SEWRPC.

Map 58

USER COSTS PER TRIP ON THE PUBLIC TRANSIT SYSTEM WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY: 1978



Average public transit user costs per trip were found to be highest in the outer fringes of the Milwaukee transit service area in 1978—ranging up to 150 percent of the costs in the rest of the study area—and were progressively lower with decreasing distance to the southeastern portion of the study area, with the exception of an elongated area of less costly travel northward from the central city area along the N. 60th and N. 43rd Street corridors to the Milwaukee/Ozaukee County line. This pattern of per trip costs can be attributed to longer travel times per trip in those areas where transit service is less available, and to the predominance of longer trips in these outlying areas.

Source: SEWRPC.

may be attributed to the lower operating speeds and consequent shorter operating times on arterial facilities in this portion of the study area. Map 56 indicates these same user operating costs on a per-trip basis. This map represents the average cost per trip of all person trips originating from a given zone in the study area to all other zones in the Region. As shown on Map 56, arterial street system user costs per trip are highest in small areas centered on the Milwaukee Area Technical College (MATC)—Mequon and on Northridge Shopping Center; and are lowest in areas along the N. 76th Street and N. 43rd Street corridors and in the Cedarburg/Grafton area. These differences in costs are due in part to the longer home-based shopping and home-based work trips associated with the regionally oriented MATC and Northridge Shopping Center, and to the shorter, more community-oriented home-based work and shopping trips associated with the Cedarburg/Grafton area and the N. 76th Street and N. 43rd Street corridors.

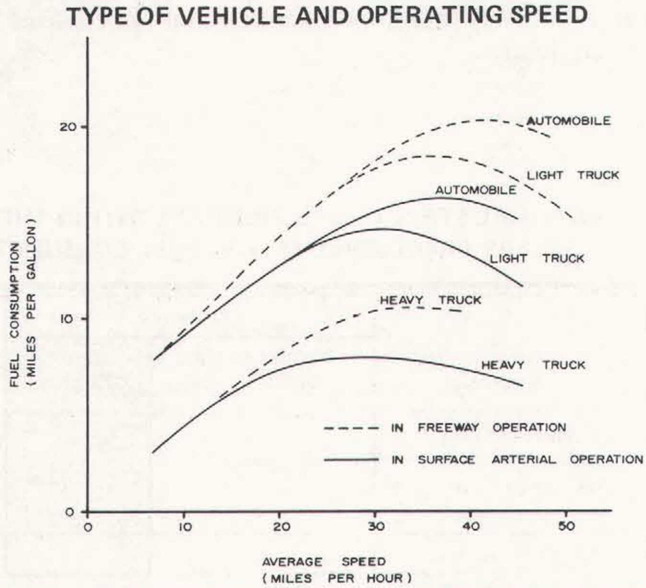
Public transit system user costs consist of the transit fare and the costs associated with the time spent traveling.[4] The average user cost per transit trip per mile and per transit trip are shown on Maps 57 and 58, respectively. The average user cost per mile shown on Map 57 reflects the same general pattern as arterial highway user costs per mile. Transit user costs per mile are highest in the southeastern corner of the study area and generally decrease uniformly with distance from this most intensively developed part of the study area. The higher transit user costs in the southeastern portion of the study area may be attributed to the lower motor bus operating speeds in this area, the shorter lengths of trips made on transit, which make the fixed transit fare a larger factor in the per-mile costs, and the predominant use of local transit service in this part of the study area. The lowest transit user cost per mile is found in the northern fringe of that part of the study area within the Milwaukee transit service area, where only primary transit service is provided.

As shown on Map 58, average transit user costs per trip are highest in the outer fringes of the Milwaukee transit service area, and are progressively lower with increasing distance to the southeastern portion of the study area, with the exception of an area of less costly travel northward to the county line along the N. 60th and N. 43rd Street corridors in northern Milwaukee County. This pattern may be attributed to longer overall travel times per trip in those areas where service is more sporadic and more widely spaced, as well as to longer trips and more out-of-vehicle time in these outlying areas.

Energy Use: The fourth standard under this objective requires that the amount of energy utilized in operating the transportation system, particularly petroleum-based motor fuels, be minimized. Unless alternative transportation system plans for the northwest side study area are designed and tested with respect to energy use, a determination as to attainment of this standard cannot be made. For the purpose of identifying energy use problems of the existing transportation system, however, it is important to identify those arterial facilities whose current utilization and operating speeds on an average weekday do not permit efficient motor vehicle operation. Figure 6 illustrates average fuel con-

Figure 6

MOTOR FUEL CONSUMPTION RATES BY TYPE OF VEHICLE AND OPERATING SPEED



Source: U. S. Department of Transportation, Transportation System Management State of the Art, February 1977.

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[4] *Specifically, transit system of user costs are defined as:*

(transit fare) + (transit travel time x cost of time)

where: transit fare is calculated on an exact fare matrix, with fare equal to $0.50 plus appropriate zone charges, and

cost of time is equal to $4.00 per hour.

sumption rates as a function of operating speed for automobile and light and heavy truck operation on freeway and standard arterial facilities. The most inefficient range of fuel consumption rates for all vehicle types considered together would appear to occur with operating speeds of less than 30 miles per hour (mph).

About 30 percent of the study area's arterial streets and highways, or 132 miles, had operating speeds of less than 30 mph on an average weekday in 1978, as shown on Map 59 and in Table 37. These arterial facilities were principally located in the Milwaukee County portion of the study area, in which they represented about 41 percent of the arterial streets and highways. These lower-speed arterial facilities were concentrated in the southeastern and central parts of the Milwaukee County portion of the study area. Only in the developed parts of the villages and cities of Ozaukee County did arterial facilities have operating speeds below 30 mph.

Summary and Conclusions: Because alternative transportation plans have not been designed and tested, it cannot be determined whether the existing transportation system in the study area is economical and efficient, satisfying all other objectives at the lowest cost and with a minimum amount of energy use. However, it is apparent that both operating costs to the user of the transportation system and energy utilization on the arterial street and highway system vary widely within the study area. The highest operating costs for both arterial street and public transit systems, and the highest rates of energy use, are currently found in the intensively developed southeastern portion of the study area.

Deficiencies of the Existing Transportation System in Providing a Balanced System at an Adequate Level of Service

The third transportation systems management and development objective formulated under the study specifies the need for the achievement of a flexible, balanced transportation system which provides the appropriate types of transportation needed by all residents of the northwestern portion of Milwaukee County and southern Ozaukee County at an adequate level of service. This objective is supported by 13 standards, all but the first of which are related to public transit service.

Arterial Street Spacing: The first standard under the objective suggests that arterial streets and highways in the study area be provided at intervals of no more than one-half mile in each direction in urban high-density areas, at intervals of no more than one mile in each direction in urban medium-density areas, and at intervals of no more than two miles in urban low-density areas, suburban-density areas, and rural areas. The intent of this standard is two-fold. First, the standard recognizes that arterial streets should bound, and not penetrate, residential neighborhoods. Arterial streets should be spaced at the specified intervals for the various densities of development in order that the related residential units will be of sufficient size to support certain facilities, such as neighborhood parks, elementary schools, and community and commercial facilities necessary to support the day-to-day life of the family in proximity to its place of residence. The other reason for this standard is that residential development generates travel demand; to adequately meet that demand on adjacent arterial facilities and to assure that internal local streets of the residential unit are not being used by through

Table 37

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA WITH AVERAGE WEEKDAY OPERATING SPEEDS PRECLUDING MOTOR FUEL CONSUMPTION-EFFICIENT MOTOR VEHICLE OPERATION: 1978

Subarea	Freeways		Standard Arterials		Total System	
	Number of Miles Under 30 mph	Percent	Number of Miles Under 30 mph	Percent	Number of Miles Under 30 mph	Percent
Milwaukee County Portion	--	--	112.3	47.0	112.3	41.0
Ozaukee County Portion	--	--	19.3	12.9	19.3	11.7
Total Study Area	--	--	131.6	30.0	131.6	30.0

Source: SEWRPC.

Map 59

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA WITH AVERAGE WEEKDAY OPERATING SPEEDS PRECLUDING MOTOR FUEL CONSUMPTION-EFFICIENT MOTOR VEHICLE OPERATION: 1978

LEGEND

PORTIONS OF THE ARTERIAL STREET AND HIGHWAY SYSTEM OPERATING AT SPEEDS UNDER 30 MPH

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

In 1978 about 132 miles, or about 30 percent, of the arterial streets and highways of the study area were found to display average operating speeds of less than 30 miles per hour on an average weekday, thus precluding energy-efficient operation. These arterial facilities were principally located in the Milwaukee County portion of the study area, where they represented about 41 percent of the total arterial street and highway system. Arterial facilities with substandard operating speeds were found to be especially concentrated in the southeastern and central parts of the Milwaukee County portion of the study area. Only in the most highly developed portions of the cities and villages within the Ozaukee County portion of the study area did any arterial facilities display operating speeds below 30 miles per hour.

Source: SEWRPC.

traffic generated from within or outside the residential unit, a maximum desirable spacing of arterial facilities must be observed.

The majority of the area within the study area meets this arterial street spacing standard, as shown on Map 60. The majority of the population of the study area, 73 percent, or 362,200 people, resides within the areas meeting the standard. Those parts of the Milwaukee County portion of the study area which do not meet the standard are all within the City of Milwaukee and comprise areas of high-density residential development where one-half mile spacing of arterial streets is suggested. The largest part of this area not meeting the standard is in the south-central part of the Milwaukee County portion of the study area. Arterials in a north-south direction in this area, namely 43rd, 60th, 76th, and 92nd Streets, are spaced at one-mile intervals. The presence of diagonal arterial streets in this area, however, does reduce somewhat the need for one-half-mile spacing of arterial facilities. In the Ozaukee County portion of the study area, there are two large areas which do not meet this standard—one in the north corner of the City of Mequon; and the other in the northeast part of the Town of Grafton, northwest part of the Town of Cedarburg, and southeast part of the Town of Saukville. Both have a mixture of urban low- and suburban-density development and rural development, all of which require two-mile spacing of arterial facilities in each direction.

Primary and Secondary Public Transit Service Provision: The second standard under the objective specifies that primary and secondary public transit routes in the study area should connect and serve areas of concentrated land use activities, including major retail and service centers; major industrial centers; major medical centers, hospitals, and/or medical clinics; major parks and outdoor recreational areas; major educational institutions, including accredited universities, colleges, and county technical or vocational schools; scheduled air transport facilities; and high-density residential areas. Primary and secondary transit routes should be provided to serve such centers of concentrated land use activities, because these centers are the larger, more intense generators of travel in the area. Rapid or express public transit can provide system capacity to efficiently and attractively accommodate travel to and from these high-density areas, alleviating peak loadings on arterial highway facilities.

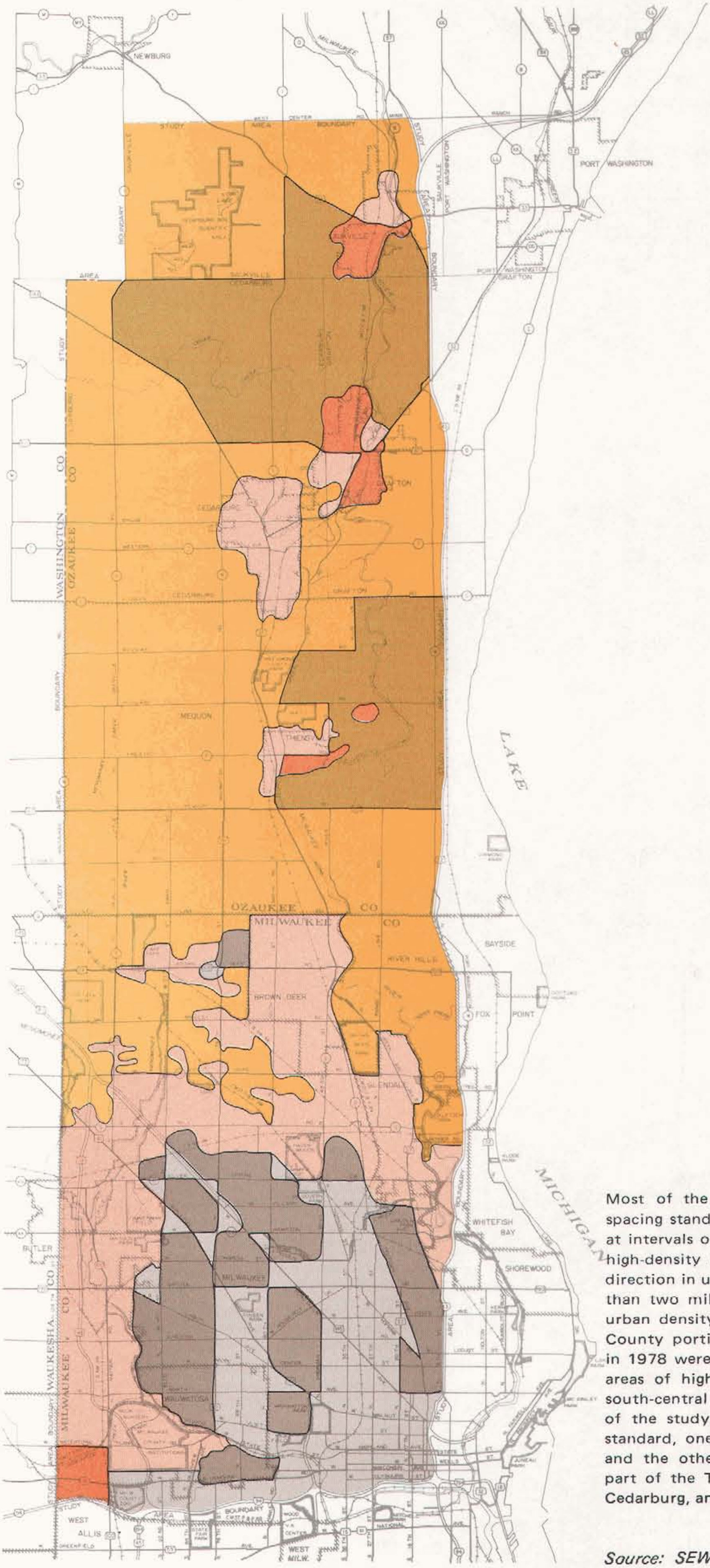
Important to the consideration of the extent to which this standard is now being met is a detailed understanding of the extent and characteristics of primary and secondary transit service within the study area. As summarized in Chapter III of this report, primary transit service within the study area is provided by four motor bus routes operating in mixed traffic on freeways. These routes are designed to transport people between outlying suburban park-ride lots and the Milwaukee central business district. As shown on Map 61, three of the four routes in the study area make stops along arterial streets or at a number of park-ride lots before entering the line-haul portion of their trip via the freeway system. Two of the routes have feeder route extensions of the primary transit service, on which they pick up and drop off passengers. Two of the routes operate along arterial streets directly between a park-ride lot and the freeway they use, and pick up and drop off passengers along those streets. These parts of the primary transit routes in the study area will be considered in this standard as part of the primary transit system because the level of service provided in these parts of the primary transit routes is, if not primary service, then express or secondary service, and a difference between express and primary service is not made in this planning standard.

With one exception, all four routes operate only during weekday morning and afternoon peak travel periods. All routes carry revenue passengers, both with and against the direction of peak-period travel, thus serving travel from outlying areas to the CBD, and from the CBD to outlying areas during all hours of operation. Hourly midday service is provided during weekdays only between the Milwaukee CBD and two of the seven park-ride lots in the study area. In addition, not all vehicle trips on the routes operate over the entire length of the route. Therefore, it is important to recognize in the consideration of this standard that primary transit service connects and serves major land use activities, and that the current "Freeway Flyer" service has limited hours and frequency of operation and makes limited stops.

Secondary or express transit service within the study area is limited to a single route. This service is provided along a local transit route only during weekday peak travel periods and only in the peak travel direction. Thus, during weekend or off-peak travel periods of the weekday, the primary and secondary transit system in the study area does not

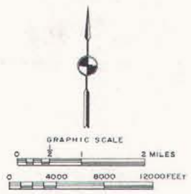
Map 60

PARTS OF THE STUDY AREA NOT MEETING SUGGESTED ARTERIAL STREET SPACING STANDARDS



LEGEND

- HIGH-DENSITY URBAN AREA WHERE 1/2 MILE ARTERIAL SPACING IS MET
- HIGH-DENSITY URBAN AREA WHERE 1/2 MILE ARTERIAL SPACING IS NOT MET
- MEDIUM-DENSITY URBAN AREA WHERE 1 MILE ARTERIAL SPACING IS MET
- MEDIUM-DENSITY URBAN AREA WHERE 1 MILE ARTERIAL SPACING IS NOT MET
- LOW URBAN, SUBURBAN OR RURAL DENSITY AREA WHERE 2 MILE ARTERIAL SPACING IS MET
- LOW URBAN, SUBURBAN OR RURAL DENSITY AREA WHERE 2 MILE ARTERIAL SPACING IS NOT MET

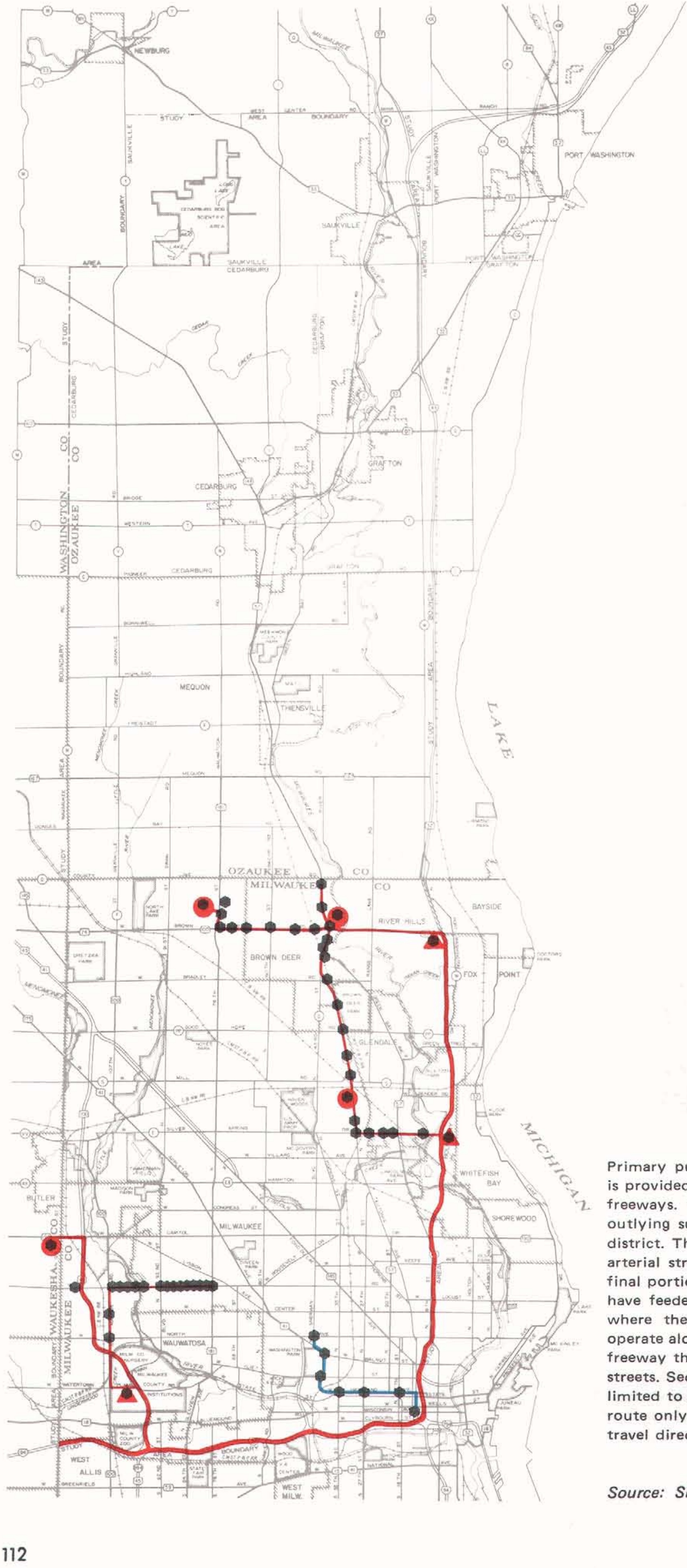


Most of the northwest side study area meets the arterial street spacing standards—that is, arterial streets and highways are provided at intervals of no more than one-half mile in each direction in urban high-density areas, at intervals of no more than one mile in each direction in urban medium-density areas, and at intervals of no more than two miles in each direction in urban low-density areas, suburban density areas, and rural areas. Those parts of the Milwaukee County portion of the study area found not to meet this standard in 1978 were all within the City of Milwaukee and were located in areas of high-density residential development concentrated in the south-central part of this portion. In the Ozaukee County portion of the study area, two large areas were found not to meet this standard, one in the northernmost section of the City of Mequon and the other in that contiguous area centered on the northeast part of the Town of Grafton, the northwest part of the Town of Cedarburg, and the southeast part of the Town of Saukville.

Source: SEWRPC.

Map 61

PRIMARY AND SECONDARY TRANSIT ROUTES IN THE STUDY AREA: 1979



LEGEND

- ▲ PRIMARY TRANSIT STATION
- ● SHOPPING CENTER LOT
- PRIMARY TRANSIT ROUTE ON FREEWAY
- PRIMARY TRANSIT ROUTE ON STANDARD ARTERIAL
- SECONDARY TRANSIT ROUTE ON STANDARD ARTERIAL
- ● PASSENGER STOP

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

Primary public transit service within the northwest side study area is provided by four motor bus routes operating in mixed traffic on freeways. These routes are designed to transport people between outlying suburban park-ride lots to the Milwaukee central business district. Three of the four routes in the study area make stops along arterial streets or at a number of park-ride lots before entering the final portion of their trip via the freeway system. Two of the routes have feeder extensions to the primary service portion of the route where they pick up and drop off passengers. The other routes operate along arterial streets directly between a park-ride lot and the freeway they use, and pick up and drop off passengers along those streets. Secondary or express transit service within the study area is limited to a single route. This service is provided along a local transit route only during weekday peak travel periods and only in the peak travel direction.

Source: SEWRPC.

provide the degree of service between major land use activities required to meet this standard. The following discussion, therefore, will focus on the degree to which this standard is met during weekday peak travel periods.

Three major retail and service centers are located within the study area: the Capitol Court, Mayfair Mall, and Northridge Shopping Centers. As shown on Map 62, only the Capitol Court Shopping Center is not considered to be served by primary or secondary public transit, because it is not within a one-half-mile walking distance of a primary or secondary transit stop.

There are six major industrial areas located within the study area, as shown on Map 63. These include Wauwatosa (part), Milwaukee Menomonee Valley West (part), Milwaukee Menomonee Valley East (part), Milwaukee North, Milwaukee Glendale (part), and West Allis West (part). The southern half of the Wauwatosa industrial area and the northern fringe of the Milwaukee North industrial area are served by primary transit. Parts of the Menomonee Valley East and the Menomonee Valley West industrial areas are within or adjacent to the secondary transit service area in the study area. The Milwaukee Glendale and West Allis West industrial areas are not connected and served by primary or secondary public transit.

There are 11 major medical centers, hospitals, or medical clinics located within the study area. Ten are hospitals: St. Michael, Northwest General, St. Joseph's, St. Camillus and Lakeview, Milwaukee Psychiatric, Lutheran Mount Sinai Medical Center, Deaconess, Children's, Family, and Misericordia Hospitals. The Milwaukee County Medical Complex is also located within the study area. As shown on Map 64, four of the hospitals are not served by primary or secondary public transit: Northwest General, St. Joseph's, St. Camillus and Lakeview, and Milwaukee Psychiatric Hospitals. The County Medical Complex is also not served by primary or secondary transit.

Four major park and outdoor recreational areas are located within the study area—Brown Deer, Dretzka, Lincoln, and Mee-Kwon parks—as shown on Map 65. All four are public multi-use parks, and all are within the Milwaukee County portion of the study area except Mee-Kwon Park, which is located in the urbanized part of the Ozaukee County portion of the study area. Brown Deer Park is the only one of these parks now served by either primary or secondary transit.

Three major education facilities—either county-operated technical or vocational schools, accredited four-year colleges, or universities—existed within the study area in 1975 (see Map 66). One is Marquette University, which is located in the extreme southeastern corner of the study area adjacent to downtown Milwaukee, and which is served by both primary and secondary service. Another is Mount Mary College, which is served by primary transit service only. Only the North Campus of the Milwaukee Area Technical College, located between the Village of Thiensville and the City of Cedarburg in the Ozaukee County portion of the study area, is not served by primary or secondary transit.

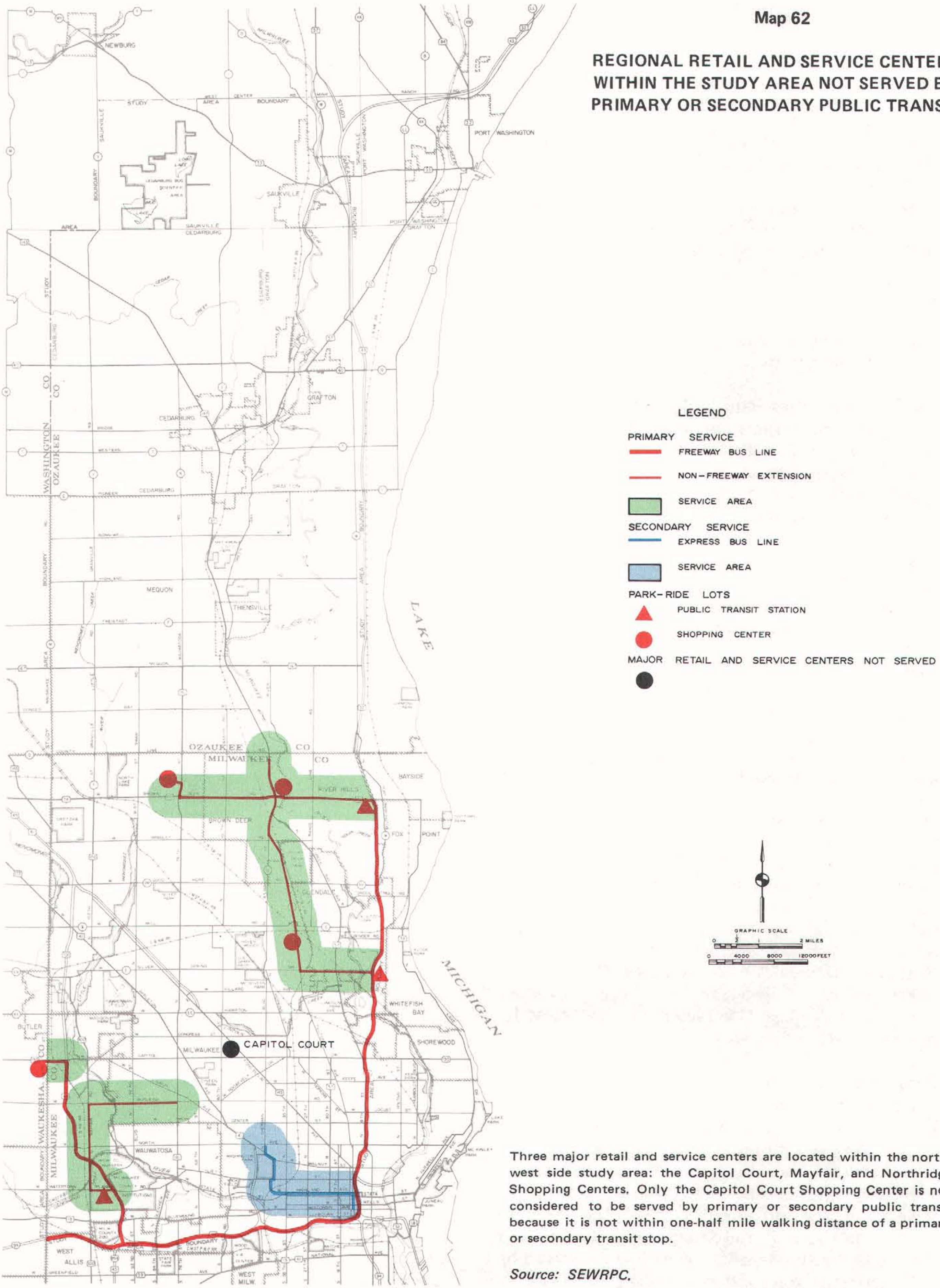
There are no scheduled air transportation terminals in the study area, and the closest to the study area is General Mitchell Field, to which there is no primary or secondary public transit from the study area.

A significant amount of high-density residential development within the study area is not served by primary or express transit service, as shown on Map 67. It should be noted that because this element of the standard involves place of residence, the transit service area for primary service park-ride lots is defined by the standard as a three-mile driving distance. The unserved high-density residential development within the study area is in the southeastern corner of the study area and in a corridor connected to and situated northwest of this unserved area.

Local Transit Route Spacing: The third standard under the objective requires that local public transit service have route spacings not exceeding one mile in low-density areas, and one-half mile in medium-density and high-density areas. As shown on Map 68, much of the high-, medium-, and low-density development in the urbanized portion of the study area does not meet this route spacing standard; however, that portion of the study area north of Good Hope Road is generally of noncontiguous residential development and should not be considered as being required to meet this standard. Of that portion of the study area south of Good Hope Road, most of the development is of medium or high density except at the northern fringe of the study area, where low-density development is predominant. Very little of the low-density development can be considered to be served by one-mile transit route spacing, even when the special characteristics of an area are taken into account, such as large amounts of

Map 62

REGIONAL RETAIL AND SERVICE CENTERS WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT

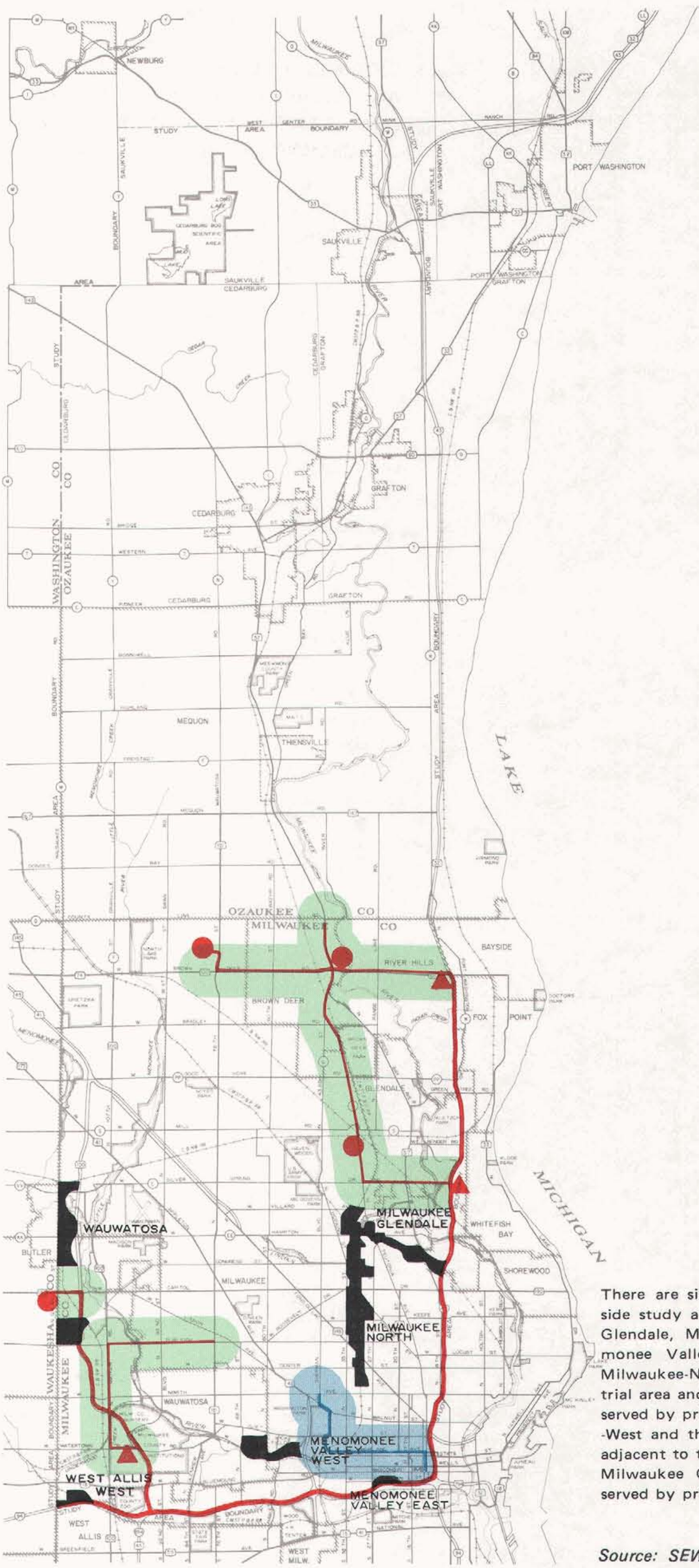


Three major retail and service centers are located within the northwest side study area: the Capitol Court, Mayfair, and Northridge Shopping Centers. Only the Capitol Court Shopping Center is not considered to be served by primary or secondary public transit because it is not within one-half mile walking distance of a primary or secondary transit stop.

Source: SEWRPC.

Map 63

REGIONAL INDUSTRIAL AREAS WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT

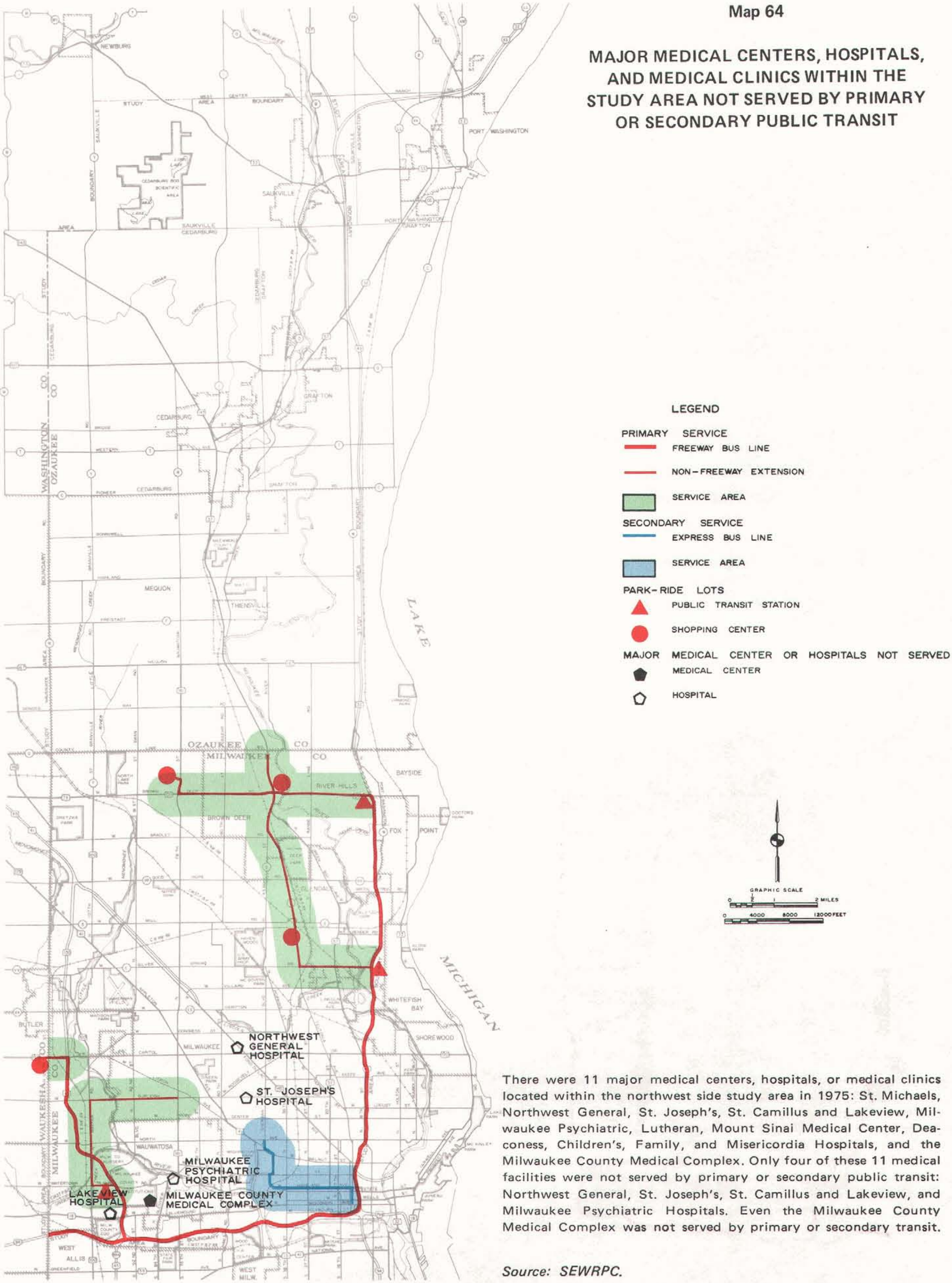


There are six major industrial areas located within the northwest side study area. These include parts of the Wauwatosa, Milwaukee Glendale, Milwaukee Menomonee Valley-West, Milwaukee Menomonee Valley-East, and West Allis-West areas, and all of the Milwaukee-North area. The southern half of the Wauwatosa industrial area and the northern fringe of the Milwaukee-North center are served by primary transit. Parts of the Menomonee Valley-East and -West and the Milwaukee-Near North industrial areas are within or adjacent to the secondary transit service area in the study area. The Milwaukee Glendale industrial area is neither connected to nor served by primary or secondary public transit.

Source: SEWRPC.

Map 64

MAJOR MEDICAL CENTERS, HOSPITALS, AND MEDICAL CLINICS WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT



There were 11 major medical centers, hospitals, or medical clinics located within the northwest side study area in 1975: St. Michaels, Northwest General, St. Joseph's, St. Camillus and Lakeview, Milwaukee Psychiatric, Lutheran, Mount Sinai Medical Center, Deaconess, Children's, Family, and Misericordia Hospitals, and the Milwaukee County Medical Complex. Only four of these 11 medical facilities were not served by primary or secondary public transit: Northwest General, St. Joseph's, St. Camillus and Lakeview, and Milwaukee Psychiatric Hospitals. Even the Milwaukee County Medical Complex was not served by primary or secondary transit.

Source: SEWRPC.

Map 65

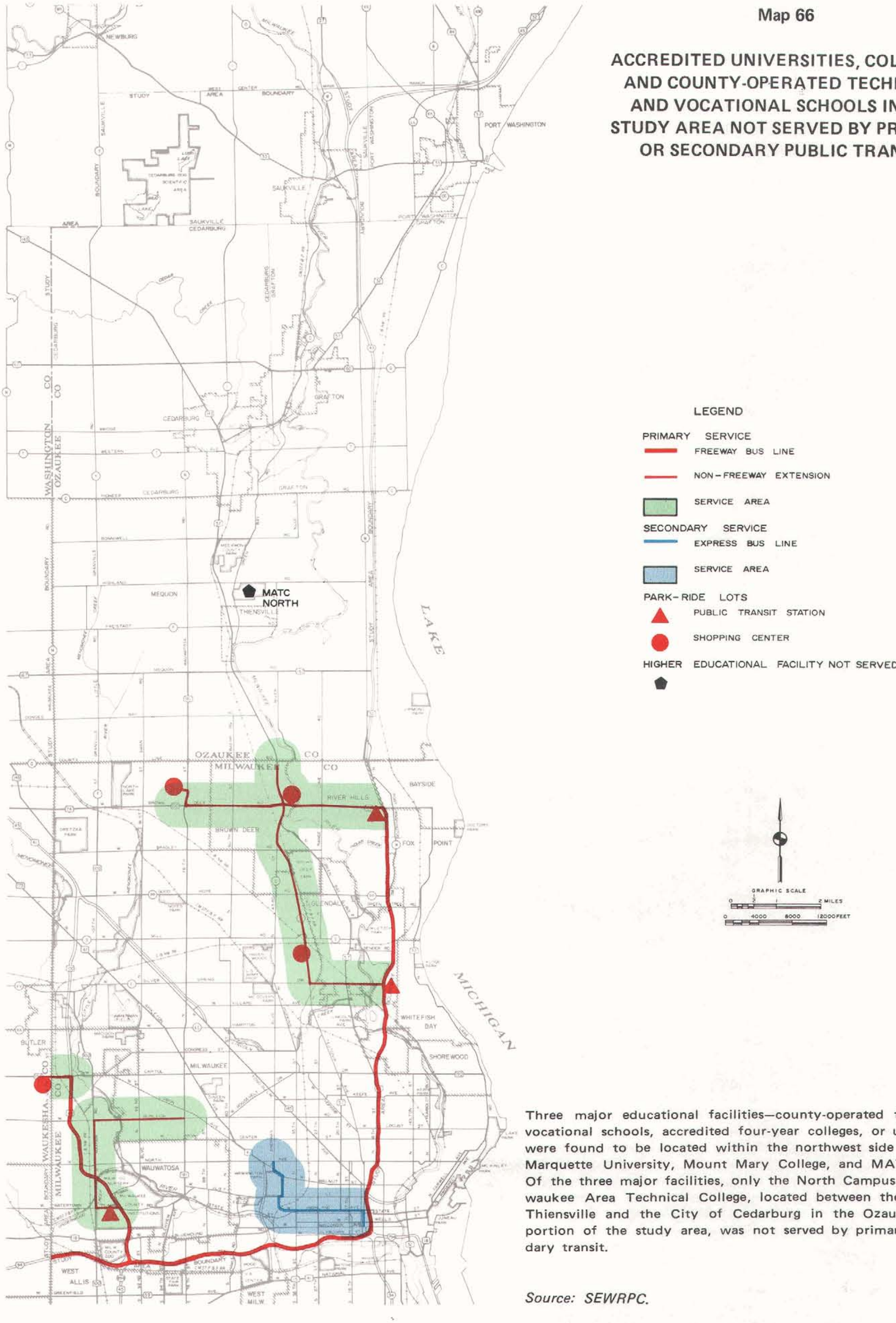
REGIONAL PARK AND OUTDOOR RECREATIONAL AREAS IN THE STUDY NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT

Four major park and outdoor recreational areas are located within the northwest side study area: Brown Deer, Lincoln, and Dretzka and Me-Kwon Parks. Brown Deer Park was the only one of these four major parks and recreational areas served by either primary or secondary transit.

Source: SEWRPC.

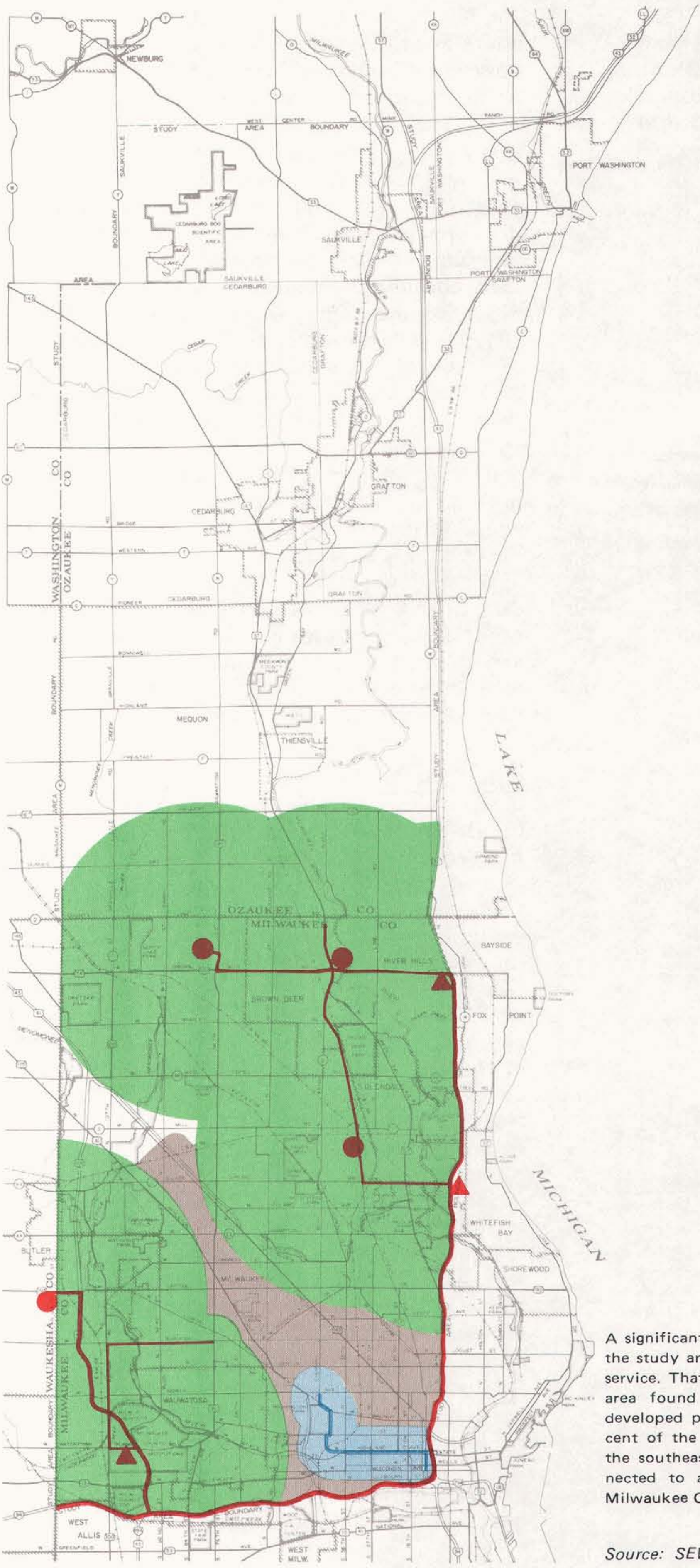
Map 66

ACCREDITED UNIVERSITIES, COLLEGES, AND COUNTY-OPERATED TECHNICAL AND VOCATIONAL SCHOOLS IN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT



Three major educational facilities—county-operated technical or vocational schools, accredited four-year colleges, or universities—were found to be located within the northwest side study area: Marquette University, Mount Mary College, and MATC-Mequon. Of the three major facilities, only the North Campus of the Milwaukee Area Technical College, located between the Village of Thiensville and the City of Cedarburg in the Ozaukee County portion of the study area, was not served by primary or secondary transit.

Source: SEWRPC.



Map 67

AREAS OF HIGH-DENSITY RESIDENTIAL DEVELOPMENT IN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT

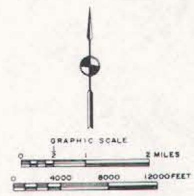
LEGEND

PRIMARY SERVICE
- FREEWAY BUS LINE
- NON-FREEWAY EXTENSION
- SERVICE AREA

SECONDARY SERVICE
- EXPRESS BUS LINE
- SERVICE AREA

PARK-RIDE LOTS
- PUBLIC TRANSIT STATION
- SHOPPING CENTER

HIGH DENSITY URBAN RESIDENTIAL AREA NOT SERVED

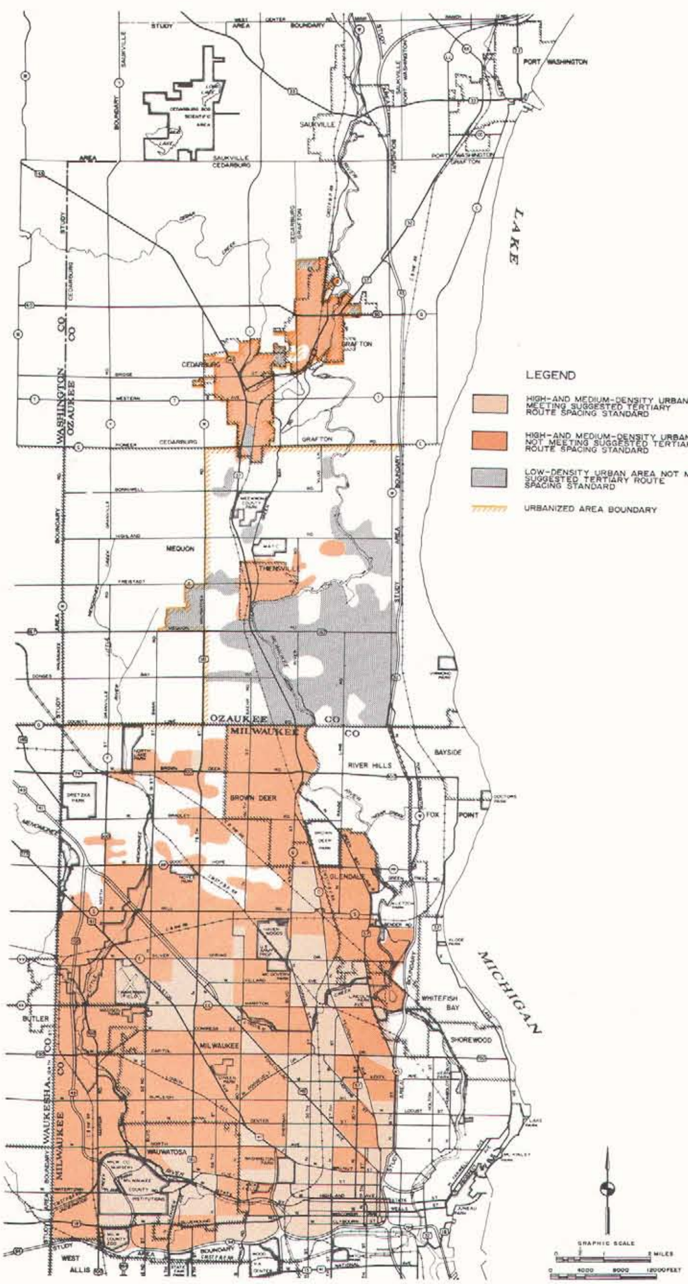


A significant amount of high-density residential development within the study area is not served by primary or secondary public transit service. That high-density residential development within the study area found not to be served—totaling over 10 percent of the developed portion of the study area and comprising about 22 percent of the resident population of the study area—was located in the southeastern corner of the study area and in the corridor connected to and situated northwest of this unserved area in the Milwaukee County portion of the study area.

Source: SEWRPC.

Map 68

AREAS OF HIGH-, MEDIUM-, AND LOW-DENSITY RESIDENTIAL DEVELOPMENT IN THE STUDY AREA NOT MEETING SUGGESTED TERTIARY PUBLIC TRANSIT ROUTE SPACING STANDARDS: 1978



Much of the high-, medium-, and low-density development in the urbanized portion of the northwest side study area does not meet that route spacing standard which specifies that local public transit service should have route spacings not exceeding one mile in low-density areas and one-half mile in medium-density and high-density areas. The principal reason that the majority of the medium- and high-density development does not meet this one-half mile spacing standard is that the north-south arterial streets in the southern Milwaukee County portion of the study area—including N. 107th Street, N. 92nd Street, N. 76th Street, N. 60th Street, and N. 43rd Street—are generally spaced one mile apart, and thus the transit routes which must operate over these streets are spaced one mile apart. Between 43rd Street and 27th Street, one-half mile spacing is provided at 35th Street, but one-mile spacing is again found between 27th Street and 12th Street.

Source: SEWRPC.

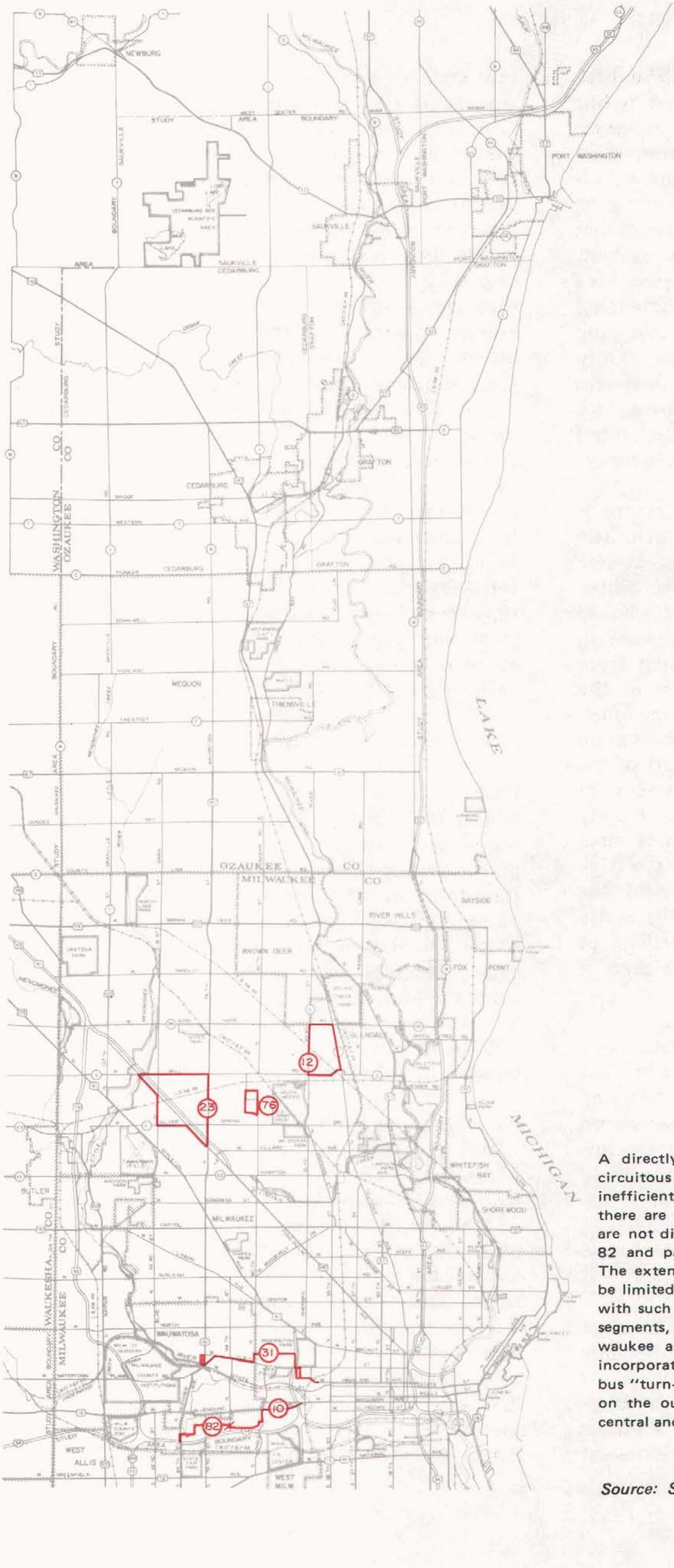
nonresidential land use in or near an area or the presence of physical barriers which block logical route extensions or additions.

The one-half-mile transit route spacing standard is met in only three limited corridors within the contiguous high- and medium-density residential development located in the southern part of the Milwaukee County portion of the study area. One such corridor is located along 35th Street from Silver Spring Drive to the East-West Freeway (IH 94). Of the other two, one is located south of Wisconsin Avenue from 68th Street to 27th Street, and the other is located along 12th Street from Burleigh Street to the East-West Freeway (IH 94). The majority of this medium- and high-density development does not meet this one-half-mile spacing standard because arterial streets, and consequently transit routes in the north-south direction in this area, are generally spaced one mile apart, beginning with Mayfair Road and 107th Street, and including 92nd Street, 76th Street, 60th Street, and 43rd Street. Between 43rd Street and 27th Street, one-half-mile spacing is provided at 35th Street, but one-mile spacing is again provided between 27th Street and 12th Street.

Public Transit Route Alignment: The fourth standard under the objective specifies that public transit routes be direct in alignment with a minimum number of turning movements. A directly aligned transit route does not include circuitous paths or loops. Circuitous paths or loops are generally inefficient in serving travel on the route. As shown on Map 69, within the study area there are five routes, not including school-day-only routes, which possess at least one of these two characteristics—i.e., circuitous or loop routing. (Such school-oriented routes by design include circuitous paths or loops for the collection and distribution of students and delivery of the students to their school.) Three of the five standard local service routes have segments with circuitous paths: Routes 31 and 82 and part of Route 10. The extent of such paths on these routes, however, is limited, and it would appear that the routes have been designed with such paths so as not to duplicate other transit routes in some segments, and to make service more available to parts of the Milwaukee area. Two routes within the study area incorporate loops that are too large to be considered simple motor bus "turn-back" loops at the end of a route. The loops are located on the outermost ends of Route 12 and Route 23 in the north-central and northwestern parts of Milwaukee County. Such loops do not directly or conveniently serve travel.

Map 69

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA THAT ARE NOT DIRECT IN ALIGNMENT: 1978



LEGEND

(82) PORTION OF ROUTE NOT DIRECT IN ALIGNMENT AND ROUTE NUMBER

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

A directly aligned transit route is one which does not include circuitous paths or loops. Circuitous paths or loops are generally inefficient in serving travel on the route. Within the study area there are five routes, not including school-day-only routes, which are not directly aligned. Three of these five routes—Routes 31 and 82 and part of Route 10—have segments with circuitous routes. The extent of such paths on these routes, however, was found to be limited, and it would appear that these routes have been designed with such paths so as not to duplicate other transit routes in some segments, and to make service more available to parts of the Milwaukee area. Two routes within the study area were found to incorporate loops that are too large to be considered simple motor bus "turn-back" loops at the end of a route. The loops are located on the outermost ends of Route 12 and Route 23 in the north-central and northwestern parts of Milwaukee County.

Source: SEWRPC.

Duplication of Public Transit Service: The fifth standard under the objective asserts that public transit routes should be arranged to minimize duplication of service. Duplication with respect to local service means service area overlap, not including the overlap which occurs at the meeting or crossing of routes, which provides transfer points between routes necessary for any transit system. Two types of local transit route service area overlapping are shown on Map 70, the overlapping between standard local routes and the overlapping between standard routes and school routes. Only the overlapping between standard local routes within the study area is of concern, because school routes serve a special purpose and make a limited number of trips per day at minimal frequency.

An overlapping between standard local routes is found in only two parts of the study area. The largest amount of overlap occurs at the extreme southeastern portion of the study area, where routes provide access to and from the Milwaukee central business district. Avoiding such duplication of service is difficult as routes originating from outlying areas approach the central area of the City. The second major area, although having much less service overlap than the first, as shown on Map 70, is located in the north-central part of the Milwaukee County portion of the study area. In this area, five north-south transit lines closely parallel each other to create the service area overlap. Several small areas of overlapping service are scattered throughout the remainder of the Milwaukee local transit service area in the study area. There is no duplication of secondary or express service in the study area because there is only one express route in the study area.

Duplication in the existing primary transit service in the study area, which consists of motor bus service between the Milwaukee CBD and outlying park-ride lots, is identified on Map 71. Shown on Map 71 are the overlaps in the three-mile radius surrounding the outlying park-ride lots in the study area, which is considered to be the extent of the area served by each lot. Significant overlap is apparent in the primary transit service provided to the northeastern portion of the study area.

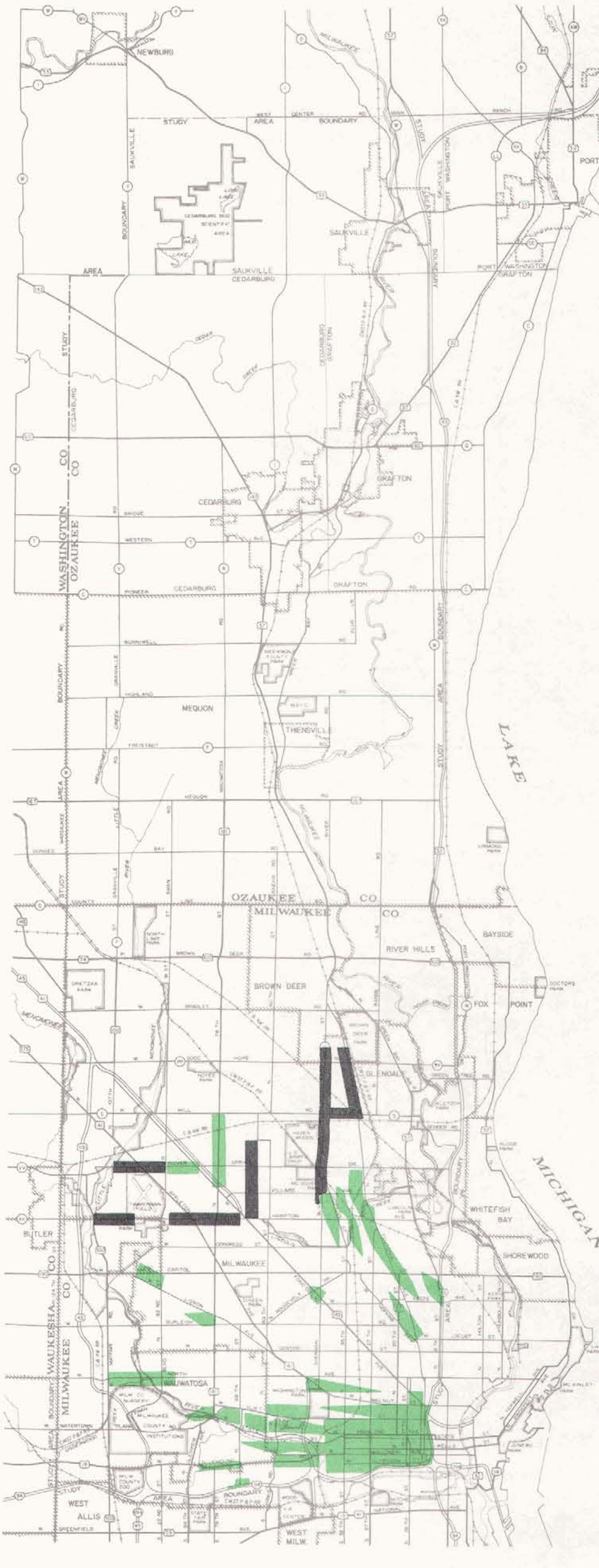
Transfer Utilization on Public Transit: The sixth standard under the objective requires that public transit routes be arranged so that the number of transfers required for system utilization is minimized. Transfers reduce the attractiveness of public transit, not allowing the provision of a one-seat ride and, in some cases, resulting in more than one wait per transit ride for utilization. A determination as to whether this standard is now being met cannot be made without prior design and evaluation of alternative transit systems. However, information concerning the current number of transfers required in the use of the existing transit system within the study area can be used to ascertain the degree to which transfers are now necessary throughout the study area. Map 72 shows the average number of transfers required on the present transit system per transit trip originating from subareas within the study area, as measured in the Commission's last on-board public transit survey in the Milwaukee area. Transit trips generated in nearly all parts of the study area within the Milwaukee local transit service area require, on the average, less than one transfer per transit trip. In a large part of this area, located primarily in its eastern half, less than one transfer is required for every two transit trips. Only in a few small and isolated parts of the study area at the fringes of the local transit service area, and on the eastern and southern boundaries of the study area which are defined by the East-West Freeway and the North-South Freeway, does the average number of transfers required per transit trip exceed one.

Primary Transit Stop Spacing: The seventh, eighth, and ninth standards under the objective specify desirable locations for, and distances between, passenger stops along primary, secondary, and local transit routes. The seventh standard requires that passenger stop locations along primary transit routes be located at the termini or ends of the route, and at distances of at least one-half mile along the primary transit route. Minimum distances between stops along public transit routes are necessary to ensure that the route serves its intended rapid or modified rapid transit function.

As shown on Map 73, there are four primary transit routes within the study area—Routes 41, 42, 45, and 49. Two do not meet the passenger stop location standards for primary transit, Routes 42 and 49. Route 49 connects and serves three park-ride lots and the Milwaukee CBD. Between two of the park-ride lots, there are five passenger stops. Three stop spacings between these stops are less than one-half mile. The transit service provided between these park-ride lots, however, is not truly primary service, as it is provided over a standard arterial street. Route 42 also does not meet the passenger stop standard for primary service. Route 42 connects and serves the Milwaukee CBD

Map 70

DUPLICATION OF LOCAL PUBLIC TRANSIT SERVICE WITHIN THE STUDY AREA: 1978



LEGEND

OVERLAPPING LOCAL (TERTIARY) TRANSIT SERVICE AREAS

REGULAR ROUTES

REGULAR AND SCHOOL ROUTES

GRAPHIC SCALE

0 ½ 1 2 MILES

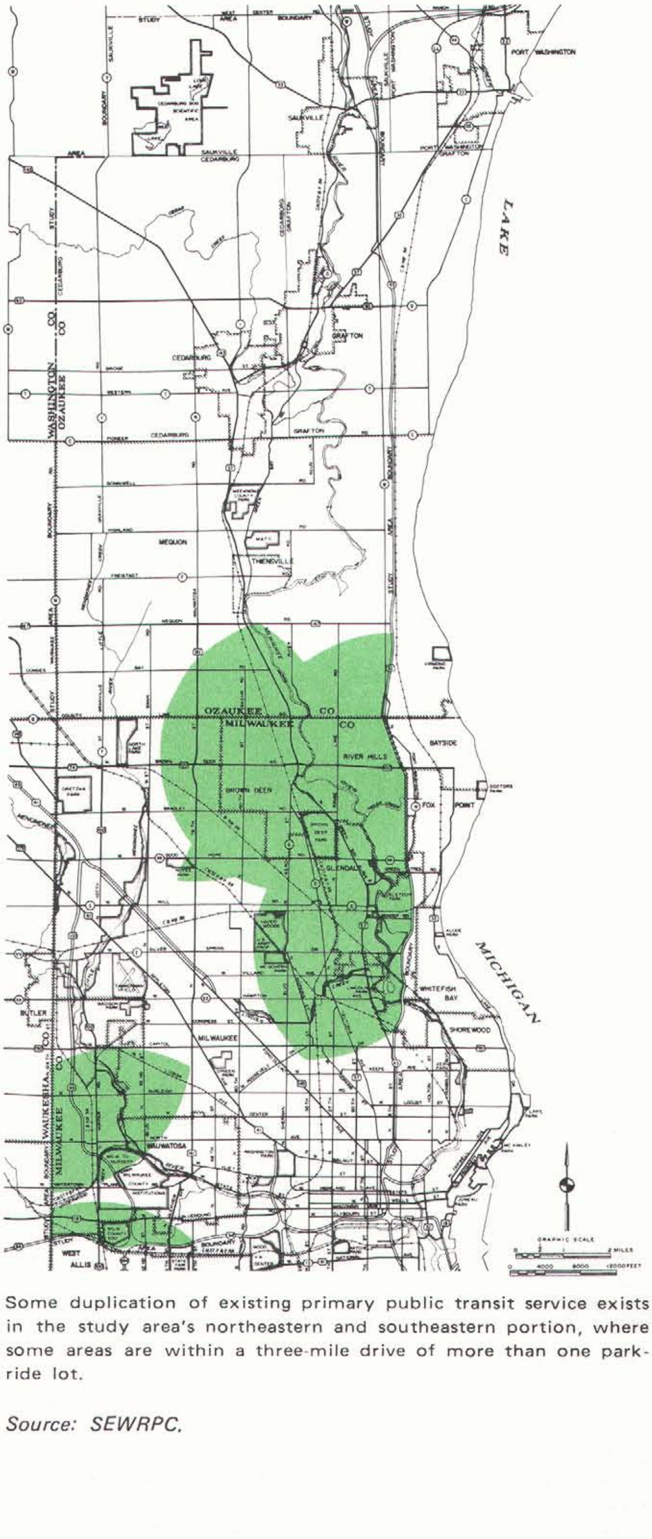
0 4000 8000 12000 FEET

Duplication of local public transit service consists of service area overlap, not including the overlap which occurs at the meeting of crossing routes. Overlapping between standard local routes was found only in two portions of the northwest side study area in 1978. The largest amount of route overlapping was found to occur at the extreme southeastern portion of the study area, where public transit routes provide access to and from the Milwaukee central business district. The second major area of overlapping, although having much less service overlap than the first, is located in the north-central part of the Milwaukee County portion of the study area.

Source: SEWRPC.

Map 71

DUPLICATION OF PRIMARY PUBLIC TRANSIT SERVICE WITHIN THE STUDY AREA: 1978

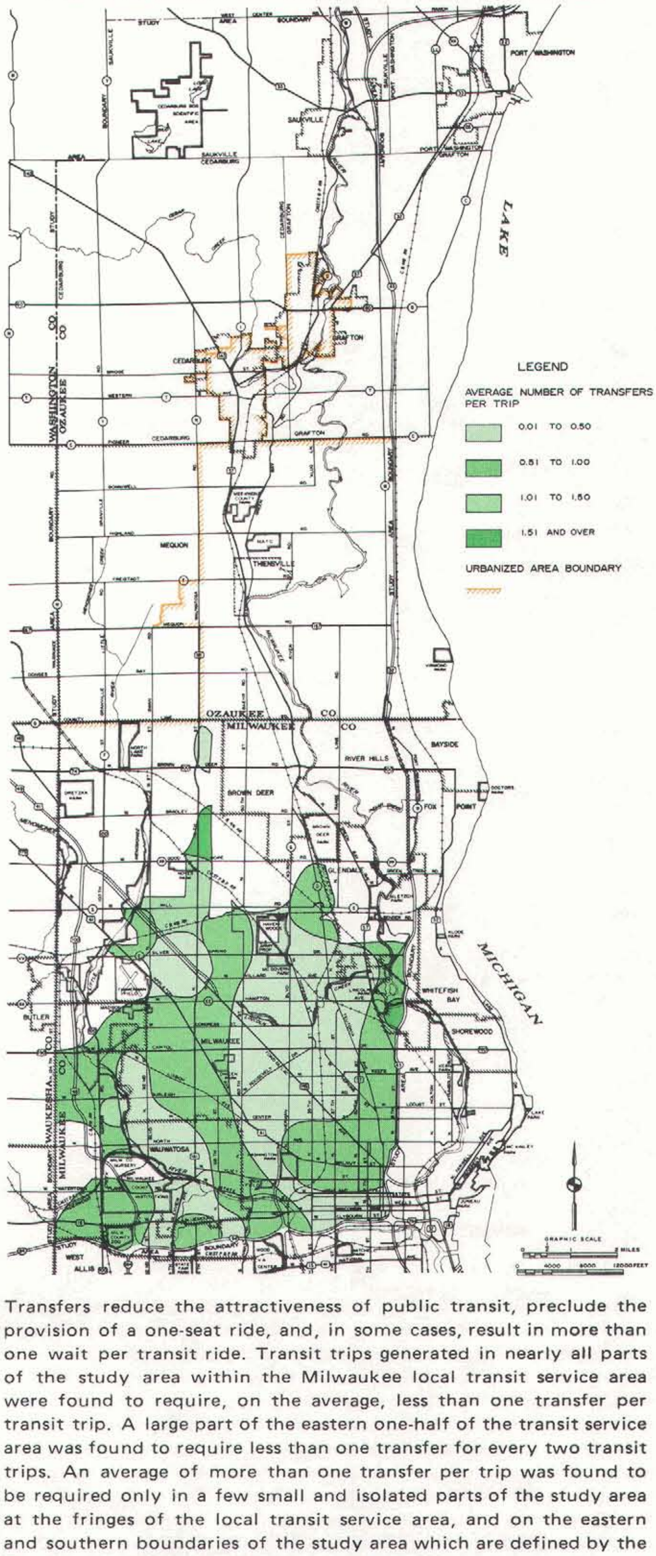


Some duplication of existing primary public transit service exists in the study area's northeastern and southeastern portion, where some areas are within a three-mile drive of more than one park-ride lot.

Source: SEWRPC.

Map 72

AVERAGE NUMBER OF TRANSFERS REQUIRED PER TRANSIT TRIP WITHIN THE STUDY AREA



Transfers reduce the attractiveness of public transit, preclude the provision of a one-seat ride, and, in some cases, result in more than one wait per transit ride. Transit trips generated in nearly all parts of the study area within the Milwaukee local transit service area were found to require, on the average, less than one transfer per transit trip. A large part of the eastern one-half of the transit service area was found to require less than one transfer for every two transit trips. An average of more than one transfer per trip was found to be required only in a few small and isolated parts of the study area at the fringes of the local transit service area, and on the eastern and southern boundaries of the study area which are defined by the East-West Freeway and the North-South Freeway.

Source: SEWRPC.

Map 73

PRIMARY PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA NOT MEETING SUGGESTED PASSENGER STOP SPACING STANDARDS: 1978

Minimum distances between stops along primary public transit routes are necessary to ensure that primary public transit serves its intended rapid or modified rapid transit function. In 1978 there were four primary transit routes within the study area: Routes 41, 42, 45, and 49. Two of these routes, Routes 42 and 49, were found not to meet the passenger stop location standards for primary transit.

Source: SEWRPC.

and two outlying park-ride lots. Between the two park-ride lots that it serves, Route 42 makes six stops. Five stop spacings along this part of the route, which is on an arterial street, are less than one-half mile apart and, therefore, do not meet primary stop spacing standards. In addition, Route 42 extends beyond the farthest outlying park-ride lot along its route for about three miles and operates as a feeder bus. Passenger stop locations along this feeder route are generally one-half mile apart, but a number of stop spacings are less. Route 41 also includes a feeder bus route which, as shown on Map 73, operates along North Avenue and Mayfair Road (STH 100) to a park-ride lot which is connected by nonstop primary transit service to the Milwaukee CBD. Stops along the North Avenue feeder route portion are at local service spacing, and along Mayfair Road approach express service spacing. True primary transit service is provided only between the park-ride lot and the CBD on Route 41; the service along this portion of the route meets the primary transit stop spacing standard. Route 45, as shown on Map 73, connects and serves one outlying park-ride lot and the Milwaukee CBD. Direct, nonstop service is provided which meets stop spacing standards for primary public transit service.

Secondary Transit Stop Spacing: The eighth standard specifies that passenger stop locations along secondary public transit routes should be located at route termini and at intersections with other transit routes, or at intersections adjacent to major land use activities. Again, such limitations on the number of stop locations are necessary to ensure that the intended express service of these routes is provided. There is only one secondary, or express, transit route within the Milwaukee Northwest Side/Ozaukee County area, Route 30 in the southeastern corner of the study area. On an average weekday during peak travel periods, about 23 express vehicle trips are made along this route. The passenger stop location standard is currently met along this route, as stops are made at route termini, at intersections with other transit routes, and at signalized intersections.

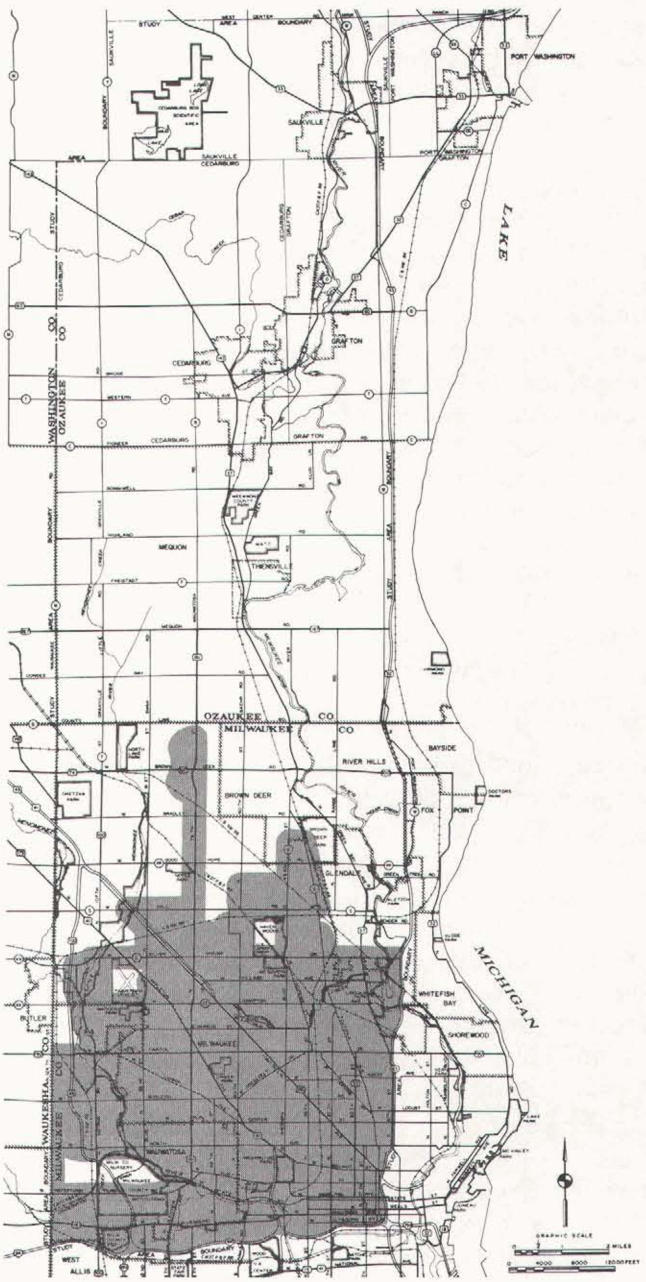
Local Transit Route Spacing: The ninth standard specifies the requirements for passenger stops along the remaining element of the public transit system, the tertiary or local service. Stops along local service routes are to be spaced no more than 660 to 1,250 feet apart. Furthermore, the standard specifies that the spacing of local service stops in commercial and residential parts of the study area should be no more frequent than 12 per mile—that is, at least 440 feet apart. This specified maximum frequency of passenger stops, and the earlier defined minimum of frequency of stops, is intended to ensure that local transit service is readily available to the greatest extent along the length of the route and yet is not inefficient in serving travel along the route because of the number of stops. Fourteen segments of local transit routes were determined to exceed this maximum passenger stop spacing of 1,250 feet: six segments on Route 76, three segments on Route 23, and one segment each on Routes 10, 60, 62, 63, and 71. However, there are good reasons for the spacing on nearly all these segments, and thus no violation of the standard occurs. Some of the segments constitute viaducts or roadway segments traversing grade-separated interchanges. Other segments are located next to largely undeveloped lands. Only one short segment north on Lisbon Avenue from its intersection with 92nd Street can truly be considered to be not meeting the standard.

Maximization of Residents Served by Public Transit: The tenth standard under the objective asserts that the number of residents of the study area served by public transit should be maximized. Whether the existing public transit system is currently serving the maximum number of residents in the study area cannot be determined without prior design and evaluation of alternative transit systems. In order to identify any problems the existing transportation system may have in meeting this standard, the way in which that system currently serves the residents of the study area will be examined. Those parts of northwestern Milwaukee County and southern Ozaukee County now served by public transit—specifically, within one-quarter-mile walking distance of a local service route, one-half-mile walking distance of a secondary service route, and one-half-mile walking distance of a primary transit stop, or one-half-mile walking or three-mile driving distance of a primary transit park-ride lot—are shown on Maps 74, 75, and 76. Residents of the study area are also considered to be served by primary transit if they are within 15 minutes overall travel time of a primary transit service stop by feeder bus.

Each element of the public transit system—local, secondary, and primary service—is intended to serve a different function, and, as a consequence, has different design and operational characteristics. Primary transit service is that component of the urban public transit system which is intended to

Map 74

AREAS WITHIN THE STUDY AREA SERVED BY LOCAL PUBLIC TRANSIT: 1978



Only the Milwaukee County portion of the northwest side study area, and specifically only the southern two-thirds of this portion, was served by local transit service in 1978. This area includes about 84 percent of the total population of the study area.

Source: SEWRPC.

Map 75

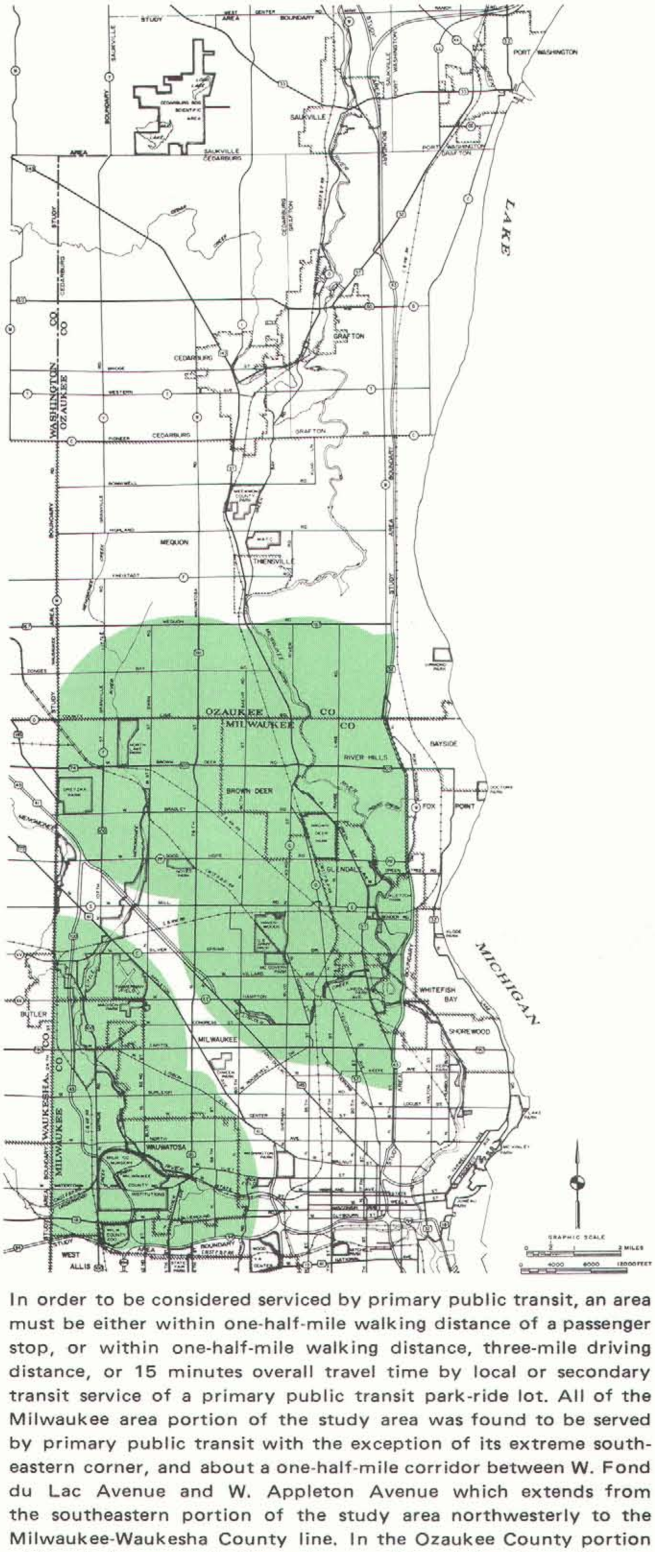
AREAS WITHIN THE STUDY AREA SERVED BY SECONDARY PUBLIC TRANSIT: 1978

Only one secondary public transit route is currently operated in the study area. This route is located in the southeastern corner of the Milwaukee County portion of the study area. Secondary public transit service is that component of the urban public transit system which is intended to provide express transit service over surface arterial streets and highways. Only a small proportion of the total population of the study area, 11 percent, was considered to be served by secondary, or express, public transit in 1978.

Source: SEWRPC.

Map 76

AREAS WITHIN THE STUDY AREA SERVED BY PRIMARY PUBLIC TRANSIT: 1978



In order to be considered serviced by primary public transit, an area must be either within one-half-mile walking distance of a passenger stop, or within one-half-mile walking distance, three-mile driving distance, or 15 minutes overall travel time by local or secondary transit service of a primary public transit park-ride lot. All of the Milwaukee area portion of the study area was found to be served by primary public transit with the exception of its extreme southeastern corner, and about a one-half-mile corridor between W. Fond du Lac Avenue and W. Appleton Avenue which extends from the southeastern portion of the study area northwesterly to the Milwaukee-Waukesha County line. In the Ozaukee County portion of the study area, only the eastern one-third of the City of Mequon was found to be served by primary public transit. In all, over 60 percent of the total population of the study area was found to be served by primary transit.

Source: SEWRPC.

provide rapid transit service on exclusive guideways or modified rapid transit service on freeways for trips in the most heavily traveled corridors of the transit system service area. The operating speeds of primary transit service are the highest of those of the public transit system, and the length of the trips served by primary transit are the longest. Stops on the primary transit system, however, are generally located one mile or more apart, making it the least accessible element of the public transit system.

Secondary transit service is that component of the urban public transit system which is intended to provide express transit service over arterial streets and highways. Stops are generally located only at intersecting transit routes and major traffic generators. The operating speeds provided, and the length of the trips served, are usually less than those characteristic of primary transit service. Primary and secondary transit service is generally provided to interconnect and serve major land use activities and centers, and thereby facilitate travel between major communities and land use centers in an urbanized area.

Tertiary public transit service is that component of the urban public transit system which is intended to provide either a local service for trips of short length, or a collection-circulation-distribution feeder service to the secondary and primary transit services. Operating speeds provided by tertiary service are low, but accessibility to the service is high as stops are generally located no more than a quarter-mile apart. The coverage of tertiary transit service in an urbanized area is much greater than that of primary and secondary transit service. Tertiary transit service routes are generally located throughout an urbanized area at spacings of one-half to one mile.

As shown on Map 74, only the Milwaukee County portion of the study area—specifically, the southern two-thirds of its area—is currently served by local transit service. Based upon population estimates for the study area for the year 1975, about 92 percent of the population of the Milwaukee County portion of the study area is currently served by local transit, or about 419,900 people. This population represents about 86 percent of the population of that portion of the study area which is considered to be urbanized.

The Ozaukee County portion of the study area is also not served by secondary or express public transit. Only a small proportion of the Milwaukee

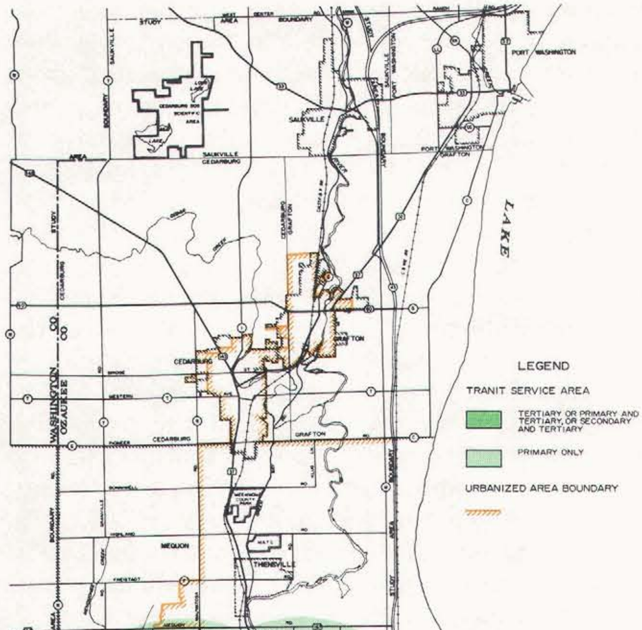
County study area population—12 percent, or 55,200 people—is considered to be served by secondary or express public transit. Less than 12 percent of the population in the urbanized portion of the study area is considered to be served by secondary transit. Only one express transit route is currently operated in the study area, and is located in its southeastern corner (see Map 75).

Parts of both the Milwaukee and Ozaukee County portions of the study area are considered to be served by primary public transit. Over 54 percent of the population of the Milwaukee County portion of the study area is considered to be served by primary transit. Over 13 percent of the population of the Ozaukee County portion of the study area which is urbanized is considered to be served by primary transit. And finally, over 61 percent of the total population in the urbanized portion of the study area is considered to be served by primary transit. Map 76 indicates those parts of the study area which meet any one or all of the appropriate criteria for primary transit service—specifically those parts which are within one-half-mile walking distance to stops, and within one-half-mile walking distance, three-mile driving distance, or 15 minutes overall travel time by local or secondary transit service to park-ride lots. All but the extreme southeastern corner of the Milwaukee County portion of the study area, and about a one-mile-wide corridor between W. Fond du Lac Avenue and Appleton Avenue which extends from the southeastern portion of the study area northwesterly to the Milwaukee-Waukesha County line, is considered to be served by primary transit. However, as shown on Map 77, local transit service is provided within nearly all of the Milwaukee County portion of the study area that is not served by primary transit, and both local and express transit service is provided in the southeastern corner of the Milwaukee County portion. In the Ozaukee County portion of the study area only the eastern one-third of the City of Mequon, a distance of about two miles from the Milwaukee-Ozaukee County line, is considered to be served by primary transit.

Considering the three elements of existing public transit service together, nearly 94 percent, or 458,200 people, of the total population of the urbanized portion of the study area is considered to be served by public transit. Over 99 percent, or 453,500 people, of the Milwaukee County portion of the study area is considered to be served by public transit; and about 13 percent, or 4,700 people, of the population of the Ozaukee

Map 77

TOTAL PUBLIC TRANSIT SERVICE AREA IN THE STUDY AREA: 1978



Considering the three elements of existing public transit service together—local, express, and primary service—nearly 92 percent of the total population of the study area was served by public transit in 1978. Over 99 percent of the population of the Milwaukee County portion of the study area was served by public transit, and about 11 percent of the population of the Ozaukee County portion of the study area was so served.

Source: SEWRPC.

County portion of the study area that is considered to be urbanized is considered to be served by public transit.

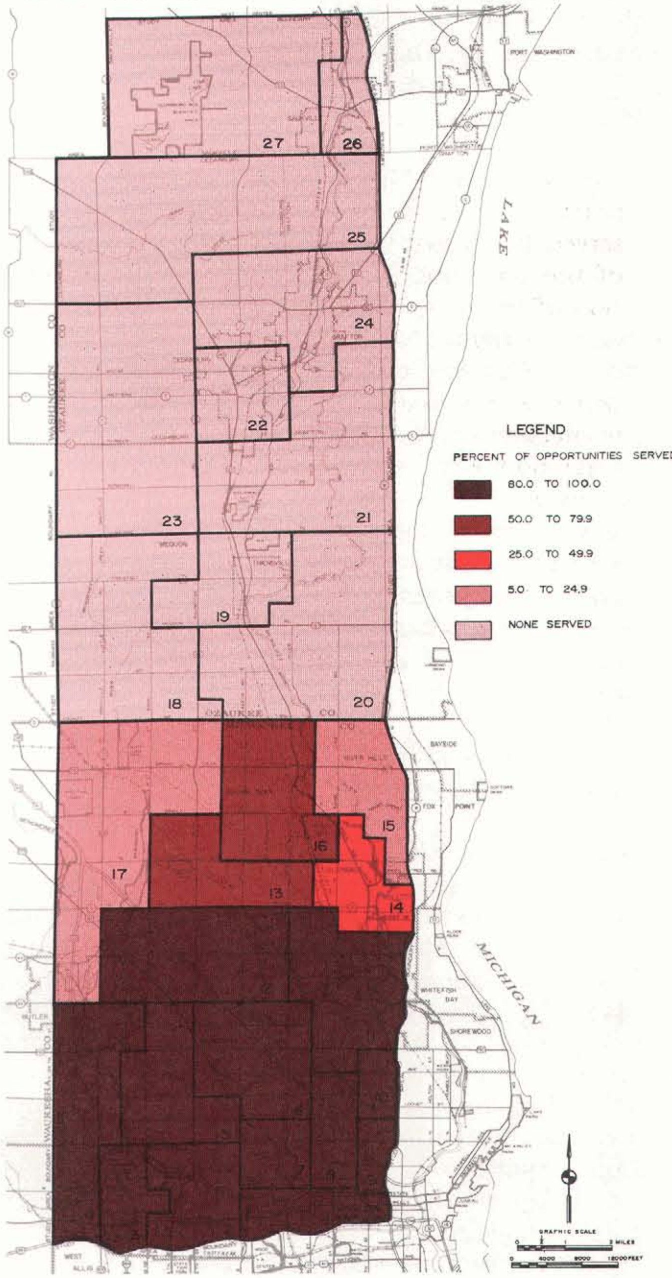
Maximization of Jobs Served by Public Transit: The eleventh standard under this objective specifies that the number of employment opportunities served by public transit in the study area should be maximized. Employment opportunities are considered to be served by public transit when they are within one-half-mile walking distance of stops provided by primary and secondary service routes and within one-quarter-mile walking distance of stops provided by local service routes. Over 92 percent of the employment in the urbanized portion of the study area, or 182,000 jobs of the total 197,500 jobs, is considered to be served by public transit. The percentage of employment served by existing public transit in the various subareas of the study area is shown on Map 78 and in Table 38. Employment opportunities in the southern half of the Milwaukee County portion of the study area are completely served by public transit, while no employment opportunities in the Ozaukee County portion of the study area are served. Maps 79, 80, and 81 and Table 38 summarize the extent to which the components of the public transit system—primary, express, and local service—currently serve employment opportunities in parts of the study area.

Provision of Adequate Park-Ride Lot Capacity: The twelfth standard under this objective requires that sufficient off-street parking be provided at primary transit service park-ride lots to accommodate the total parking demand generated by trips which change from automobile to public transit at those lots. The seven existing primary transit park-ride lots in the study area, and the percentage of parking spaces occupied at each lot in the year 1978 and during the first half of 1979, are shown on Map 82 and in Table 39.

Only one park-ride lot in the study area does not meet this standard, as it has had parking demand in excess of its capacity since April 1978. This park-ride lot, the Treasure Island-Brookfield park-ride lot, is a shopping center lot. Utilization of the lot generally increased during most of 1978 as well as during the first half of 1979. The parking supply problem at this lot is significant because it is the only park-ride lot in its portion of the study area. No other park-ride lot in the study area experienced a parking demand of 75 percent or more of its supply during 1978 or the first half of 1979. However, all park-ride stations showed significant increases in utilization in the second quarter of 1979 over both the first quarter of 1979 and the second quarter of 1978.

Map 78

EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY PUBLIC TRANSIT: 1978



Employment opportunities are considered to be served by public transit when they are within one-half-mile walking distance of stops provided by primary and secondary service routes and within one-quarter-mile walking distance of stops provided by local service routes. Over 89 percent of the total employment in the study area was served by public transit in 1978. All employment opportunities in the southern half of the Milwaukee County portion of the study area were found to be served by public transit, while no employment opportunities in the Ozaukee County portion of the study area were found to be served.

Source: SEWRPC.

Table 38

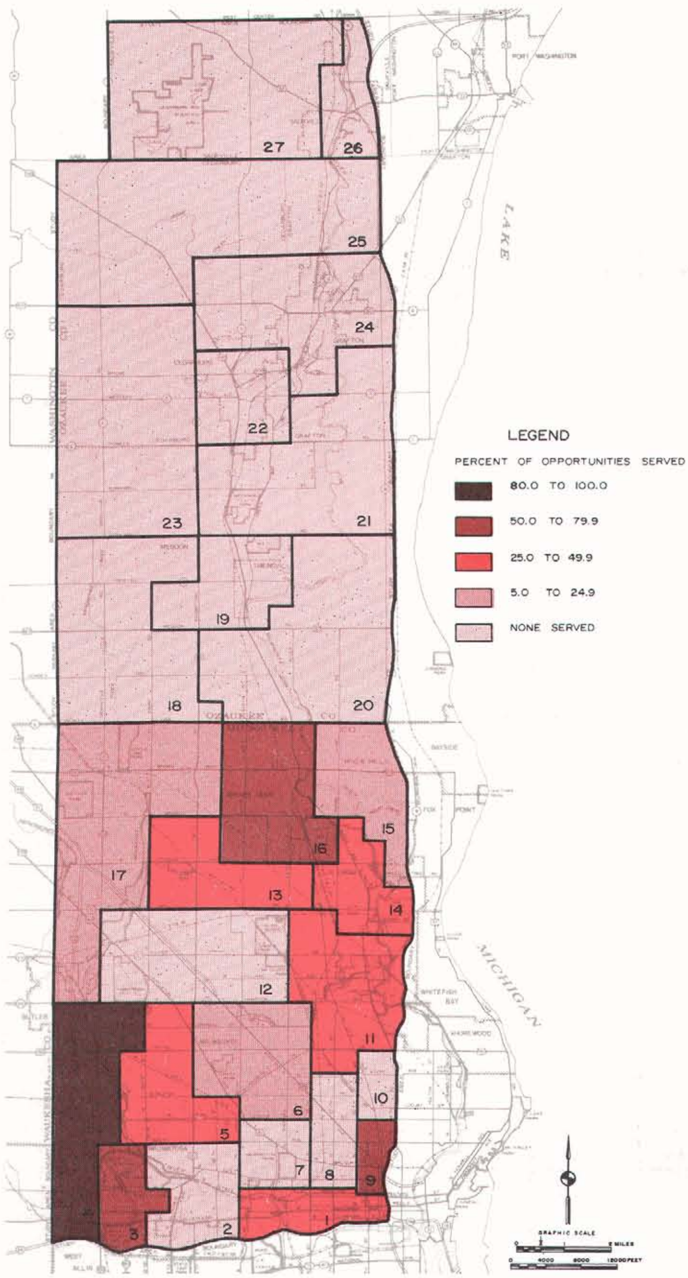
EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY PUBLIC TRANSIT BY TYPE OF SERVICE

Subarea	Total Employment 1972	Transit Service Type: Primary Employment	Primary Percent of Total	Secondary Employment	Secondary Percent of Total	Tertiary Employment	Tertiary Percent of Total	Total Transit Employment	Total Transit Percent of Total
Milwaukee County Portion									
1	21,502	5,621	26.0	13,679	63.6	21,502	100.0	21,502	100.0
2	18,130	- -	- -	- -	- -	18,130	100.0	18,130	100.0
3	8,594	6,229	72.5	- -	- -	8,594	100.0	8,594	100.0
4	21,186	17,140	80.9	- -	- -	19,520	92.1	21,186	100.0
5	8,530	3,146	36.9	- -	- -	8,530	100.0	8,530	100.0
6	16,355	1,552	9.5	- -	- -	16,355	100.0	16,355	100.0
7	8,223	- -	- -	3,299	40.1	8,223	100.0	8,223	100.0
8	14,356	- -	- -	2,245	15.6	14,356	100.0	14,356	100.0
9	8,818	6,747	76.5	4,867	55.1	8,818	100.0	8,818	100.0
10	2,997	- -	- -	- -	- -	2,997	100.0	2,997	100.0
11	34,813	14,900	42.8	- -	- -	34,813	100.0	34,813	100.0
12	9,696	- -	- -	- -	- -	9,040	93.2	9,040	93.2
13	4,769	1,496	31.4	- -	- -	3,736	78.3	3,736	78.3
14	3,449	1,336	38.7	- -	- -	1,336	38.7	1,336	38.7
15	815	121	14.8	- -	- -	- -	- -	121	14.8
16	5,876	3,555	60.5	- -	- -	984	16.7	3,990	67.9
17	2,935	240	8.2	- -	- -	240	8.2	240	8.2
Subtotal	191,044	62,083	32.5	24,090	12.6	177,174	92.7	181,967	95.2
Ozaukee County Portion									
18	832	- -	- -	- -	- -	- -	- -	- -	- -
19	1,371	- -	- -	- -	- -	- -	- -	- -	- -
20	1,611	- -	- -	- -	- -	- -	- -	- -	- -
21	811	- -	- -	- -	- -	- -	- -	- -	- -
22	2,877	- -	- -	- -	- -	- -	- -	- -	- -
23	306	- -	- -	- -	- -	- -	- -	- -	- -
24	4,520	- -	- -	- -	- -	- -	- -	- -	- -
25	105	- -	- -	- -	- -	- -	- -	- -	- -
26	425	- -	- -	- -	- -	- -	- -	- -	- -
27	93	- -	- -	- -	- -	- -	- -	- -	- -
Subtotal	12,951	- -	- -	- -	- -	- -	- -	- -	- -
Total Study Area	203,995	62,083	30.4	24,090	11.8	177,174	86.9	181,967	89.2

Source: SEWRPC.

Map 79

EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY PRIMARY PUBLIC TRANSIT: 1978

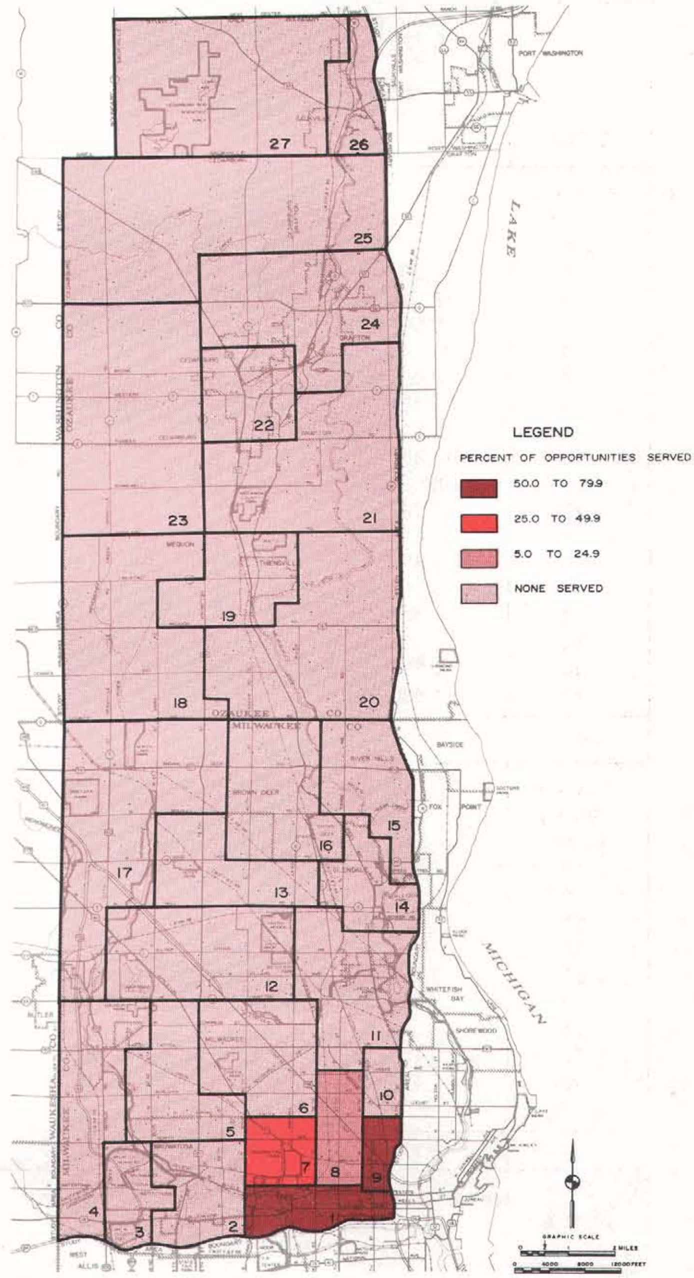


Employment opportunities are considered to be served by primary transit when they are within one-half-mile walking distance of stops provided by a primary transit service route. About 30 percent of the total employment of the study area was served by primary transit in 1978. All employment opportunities in the Milwaukee County portion of the study area, with the exception of those areas immediately surrounding the Milwaukee central business district and the central-most section of this portion of the study area, were served by primary transit, but no employment opportunities in the Ozaukee County portion of the study area were found to be served by primary public transit.

Source: SEWRPC.

Map 80

EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY SECONDARY PUBLIC TRANSIT: 1978

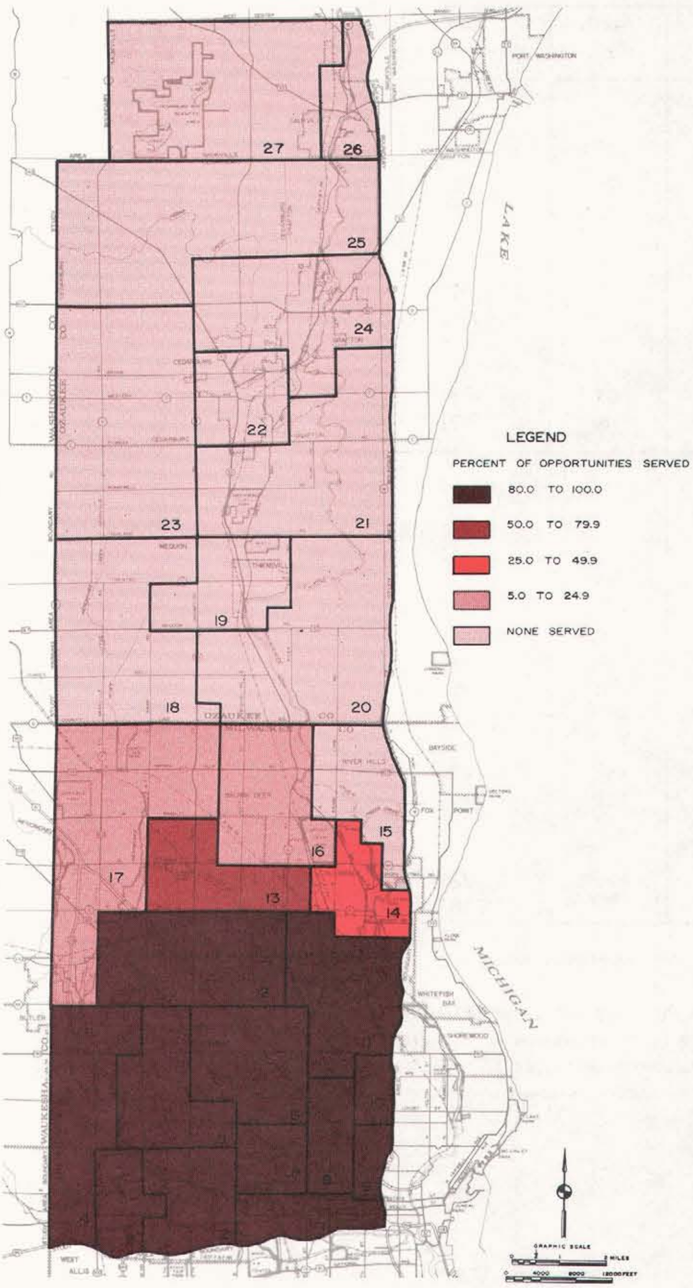


Employment opportunities are to be considered served by secondary transit when they are within one-half-mile walking distance of stops provided by a secondary, or express, transit service route. About 12 percent of the total employment of the study area was served by secondary transit in 1978.

Source: SEWRPC.

Map 81

EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY LOCAL PUBLIC TRANSIT: 1978

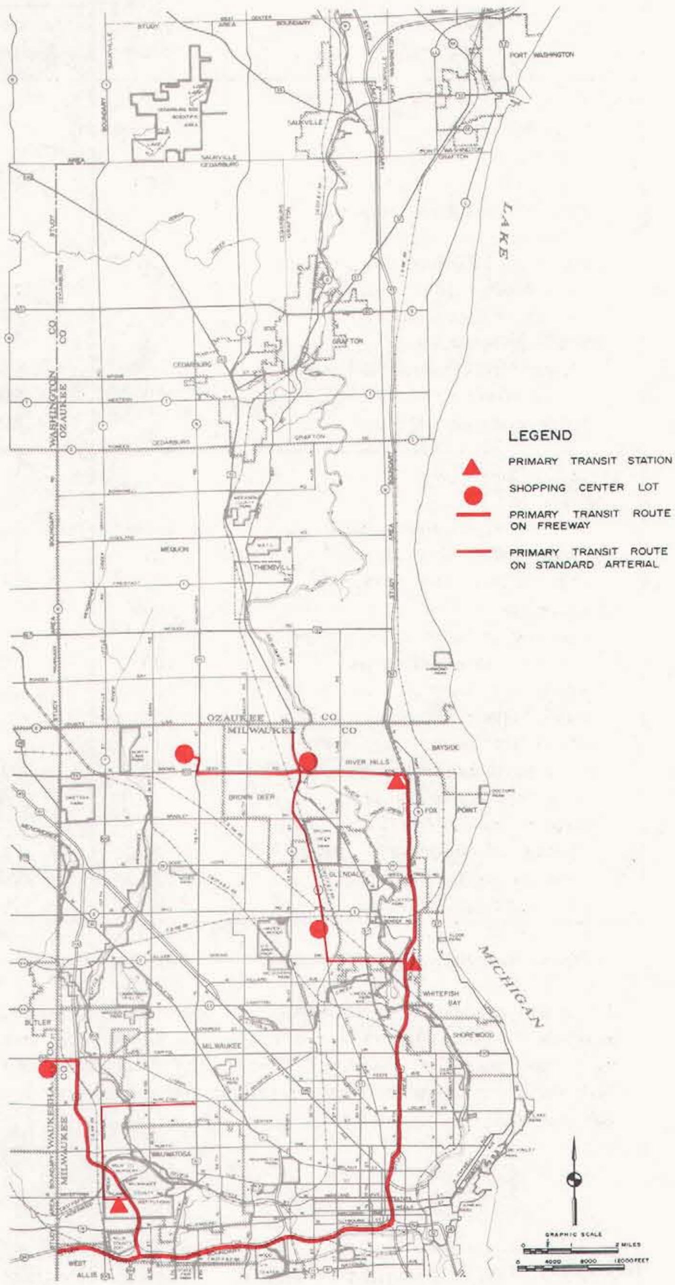


Employment opportunities are considered to be served by local (tertiary) public transit service when they are within one-quarter-mile walking distance of stops provided by local public transit service routes. About 89 percent of the total employment of the study area was served by local transit in 1978. Almost all of the employment opportunities in the Milwaukee County portion of the study area were found to be served by local public transit, while no employment opportunities in the Ozaukee County portion of the study area were found to be served by local public transit.

Source: SEWRPC.

Map 82

PRIMARY TRANSIT PARK-RIDE LOTS IN THE STUDY AREA: 1978



Sufficient off-street parking is necessary at primary transit service park-ride lots to accommodate the total parking demand generated by those who desire to change from the automobile to the public transit mode at these lots. The seven primary transit park-ride lots existing in the northwest side study area in 1978 are shown on this map. Only one park-ride lot in the study area was found to be utilized in excess of its capacity. This park-ride lot—the Treasure Island-Brookfield lot—is a shopping center lot, and its utilization increased significantly during most of 1978 as well as during the first half of 1979. No other park-ride lot in the study area was found to experience a parking demand in excess of 75 percent of its supply during 1978 or the first half of 1979.

Source: SEWRPC.

Table 39

PARKING SUPPLY AND USE AT FREEWAY FLYER PARK-RIDE LOTS IN THE STUDY AREA

Park-Ride Station	Total Parking Spaces Available	1978 January-March	1978 April-June[a]	1978 July-September	1978 October-December	1979 January-March	1979 April-June
Public Transit Stations							
Brown Deer-East							
Number of Automobiles Parked on an Average Weekday[b]	250	77	74	81	71	73	98
Percent of Space Utilized		31	30	32	28	29	39
North Shore							
Number of Automobiles Parked on an Average Weekday[b]	190	111	97	101	118	118	136
Percent of Space Utilized		58	51	53	62	62	72
Watertown Plank Road							
Number of Automobiles Parked on an Average Weekday[b]	200	99	91	104	121	111	125
Percent of Space Utilized		50	46	52	61	56	63
Shopping Center Lots							
Northland							
Number of Automobiles Parked on an Average Weekday[b]	100	12	12	13	14	17	25
Percent of Space Utilized		12	12	13	14	17	25
Northridge							
Number of Automobiles Parked on an Average Weekday[b]	100	34	34	38	54	51	57
Percent of Space Utilized		34	34	38	54	51	57
Treasure Island-Brookfield							
Number of Automobiles Parked on an Average Weekday[b]	140	131	167	162	183	150	204
Percent of Space Utilized		94	119	116	131	107	146
Treasure Island-Brown Deer							
Number of Automobiles Parked on an Average Weekday[b]	125	24	26	23	32	50	61
Percent of Space Utilized		19	21	18	26	40	49

[a] *The figures have been adjusted to account for the effect of a 39-day transit operators' strike.*

[b] *Parking use inventories conducted at three public transit stations in the study area since 1979 indicate even more substantial increases in the use of the Freeway Flyer park-ride lots. In the month of September 1979, an average of 155 automobiles were parked on an average weekday at the Brown Deer-East lot, 275 automobiles were parked at the North Shore lot, and 180 automobiles were parked at the Watertown Plank Road lot. These inventories indicate that the number of automobiles parked on an average weekday at these lots now approaches their capacity.*

Provision of Adequate Public Transit Seating Capacity: The thirteenth standard under this objective requires that public transit in the study area be operated so as to provide adequate vehicle capacity to meet travel demand. The provision of adequate vehicle capacity is determined by each route segment's average maximum load factor, which is the ratio of the number of passengers carried to the seating capacity provided. The ratio is measured at the maximum load point of a route, and is averaged for all transit vehicles operating during the travel time period, peak or off-peak, being considered. A load factor of 1.00 is considered the maximum desirable on primary, secondary, and tertiary public transit during off-peak periods. During peak periods, load factors of 1.00 in primary service, 1.25 in secondary service, and 1.33 in tertiary service are considered the maximum desirable. Load factor surveys conducted by the Milwaukee County Transit System during the summer and fall of 1978 and spring and summer of 1979 indicate that peak-period average load factor standards are being met by all local and secondary transit routes in the study area. Moreover, these surveys indicate that these standards are met not only when averaged over a two-hour morning or three-hour evening peak travel period, but also when averaged over one-half-hour time periods during the peak periods. Data have not yet been analyzed by the Milwaukee County Transit System to assess whether load factor standards are being met by primary transit service, or by all off-peak-period transit service, in the study area.

Summary and Conclusions: The third transportation system management and development objective formulated under the study specifies that the transportation system of the northwest side study area should be balanced, providing the appropriate types of transportatión service needed within the study area. Deficiencies in the study area transportation system in the attainment of this objective were found in terms of both the extent of transportation facilities and services currently provided in the study area and, to a lesser extent, the design and operation of public transit routes within the study area.

Standards for basic transportation facility and service provision are principally not met within the Milwaukee County portion of the study area. Arterial street spacing standards are not met in large, high-density-development areas in the central portion of this part of the study area. Primary and secondary transit route services are generally not provided to the southeast and -central portions of the study area, leaving significant areas of high-density development, a major retail and service center, three hospitals and a major medical center, and a large part of an industrial center not adequately served. It should be recognized that all service by primary transit in the study area is made during limited hours of the weekday and at a limited frequency, and that such service is provided to only a few stops concentrated in outlying suburban areas and the Milwaukee central business district. Suggested local transit route spacing is not met in nearly all parts of the study area. However, the number of residents and employment opportunities considered to be served by public transit within the urbanized portion of the study area is substantial—458,200 residents, or 94 percent of the urbanized area population, and 182,000 jobs, or 92 percent of the urbanized area employment.

The public transit facilities and services within the study area have no extensive deficiencies with respect to transit route alignment, transit route duplication, passenger stop spacing, park-ride lot parking supply, or transit vehicle capacity. The minimum one-half-mile stop spacing standard is violated on three primary transit routes which operate along arterial streets prior to reaching the freeway portion of their route. However, this arterial street service, although provided on a primary transit route, is more of a secondary or express service, and therefore its existing spacing would be appropriate. Only one of the seven primary transit park-ride lots in the study area has been utilized close to, or over, capacity during the past year, and it is located in a shopping center lot. Finally, the design of public transit routes in the part of the study area served by local transit would appear to be appropriate to provide one-seat service, as transfers are used for less than one of every two trips in a large part of the study area. For nearly all of the remainder of the study area, between one-half and one transfer is used per transit trip.

Deficiencies of the Existing Transportation System in Terms of Disruption of Community Development and the Natural Resource Base: The fourth transportation systems management and development objective formulated under the study specifies the need for a transportation system which minimizes the disruption of existing and future development in the study area, with such disruption including adverse impacts on the natural resource base. This objective is supported by seven standards. Only two of these seven are appropriate for use in identifying existing transportation system problems, one of which is concerned with air quality and the other of which is concerned with noise levels. The other five standards are not appropriate for defining existing transportation system problems as they measure the impacts of the construction of new or improved transportation facilities, with such impacts including the displacement of housing and business establishments, the acquisition of land, and the destruction of historic buildings or sites.

Noise From Arterial Street and Highway Use: The fifth standard under the objective requires that the transportation system of northwestern Milwaukee County and southern Ozaukee County be designed and located so as to minimize the exposure of the population to annoying, as well as possibly harmful, noise levels. Noise levels generated by transportation facilities must exceed 70 dBA at the exterior of buildings adjacent to the facility for at least 10 percent of an average weekday to be considered annoying. The characteristics of a transportation facility which influence the amount of noise generated by its use include its vertical alignment (at-grade, depressed, or elevated), gradient, and pavement type; the setback of development from the facility; the shielding of development from the facility; the traffic volume on the facility; and the peaking characteristics and level of congestion of the traffic, along with the mix of vehicles using the facility. Map 83 shows the potential of each arterial street and highway facility in the study area to generate annoying noise levels, based upon the amount and characteristics of its traffic. The shielding of development along some problem facilities or the setback of that development at more than standard distance (75 feet and 150 feet for freeways in urban and rural areas, respectively, and 50 feet and 100 feet for standard arterials in urban and rural areas, respectively) may result in lower noise levels. In addition, the type of land use development along the problem facility—that is, whether the land use is residential, commercial, industrial, transportation, governmental, agricultural, or recreational—is an important consideration in assessing the degree of severity of the noise problem. As shown on Map 83 and in Table 40, nearly 39 percent of the arterial streets in the study area have the potential to generate annoying noise levels, given their existing traffic volumes. Nearly 93 percent of these facilities are located in the Milwaukee County portion of the study area. Over 58 percent of the arterial facilities in the Milwaukee County portion of the study area have the potential to generate annoying noise levels. While a substantial proportion of arterial facilities in the study area, particularly in the Milwaukee County part, thus have the potential to generate at least annoying noise levels, a determination as to whether the noise levels generated by study area arterial streets are now being minimized cannot be made without prior design and evaluation of alternative transportation system plans.

Ambient Air Quality: The sixth standard under this objective specifies that the transportation system should be located, designed, and operated to minimize the amount of air pollutants generated. Existing ambient air quality for the year 1977 has been estimated for the study area and the Region for particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, and hydrocarbons and ozone as part of the Commission's air quality maintenance planning program.[5] Federal and state air quality standards have been promulgated for each of these six pollutants, as shown in Table 41. A primary standard has been promulgated for each pollutant which specifies the maximum concentration of the pollutant that should be permitted to occur in the ambient air in order to protect human health. A secondary standard has also been promulgated for each pollutant which specifies the maximum concentration of the pollutant that should be permitted to occur in the ambient air in order to protect animal and plant life and to prevent property damage. Attainment of the primary and secondary standards is deemed essential to the protection of the public health, safety, and welfare from the known or reasonably anticipated adverse effects of a particular air pollutant.

Particulate matter consists of very small particles of solid matter, such as soot, dust, and fly ash, which may be temporarily suspended in the atmosphere. Particulate matter may be corrosive, irritating, damaging to the respiratory system, toxic, or even carcinogenic.

As shown on Map 84, the primary annual geometric average ambient air quality standard for particulate matter of 75 micrograms per cubic meter ($\mu g/m^3$) is estimated to have been exceeded in 1977 in an approximately 0.2-square-mile area in the southeastern corner of the study area. In addition, the secondary annual geometric average standard of 60 $\mu g/m^3$ is estimated to have been exceeded in an approximately 5.1-square-mile area, all in the Milwaukee County portion of the study area, and principally in its southeastern half. The primary 24-hour arithmetic average ambient air quality standard for particulate matter of 260 $\mu g/m^3$ was determined through monitoring data to have been exceeded both in the study area and the Region during 1977. The secondary 24-hour arithmetic average standard of 150 $\mu g/m^3$ was also estimated through monitoring data to have been exceeded in the Region and the study area. Transportation is not a major source of particulate matter, contributing less than 15 percent of the total particulate emissions in the Region in 1977.

Oxides of sulfur, particularly sulfur dioxide and trioxide, may react in the atmosphere to form sulfate aerosol, including sulfuric acid, which attacks metals and masonry, and is a potent eye and respiratory tract irritant. Within the study area and the Region, none of the ambient air quality

[5] *See SEWRPC Planning Report No. 28, A Regional Air Quality Attainment and Maintenance Plan for Southeastern Wisconsin: 2000, June 1980.*

Map 83

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA HAVING THE POTENTIAL TO GENERATE ANNOYING NOISE LEVELS: 1978

LEGEND

FREEWAY

STANDARD ARTERIAL

GRAPHIC SCALE

0 1/2 1 2 MILES

0 4000 8000 12000 FEET

Noise levels generated by transportation facilities must exceed 70 dBA at the exterior of buildings adjacent to the facility during at least 10 percent of an average weekday to be considered annoying. Nearly 39 percent of the arterial street mileage in the study area currently has the potential, given the existing traffic volumes and traffic capacities, to generate annoying noise levels. Nearly 93 percent of this facility mileage is located in the Milwaukee County portion of the study area. Over 58 percent of the total arterial facility mileage in the Milwaukee County portion of the study area has the potential to generate annoying noise levels.

Source: SEWRPC.

Table 40

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA HAVING THE POTENTIAL TO GENERATE ANNOYING NOISE LEVELS: 1978

Portion of Study Area	Arterial Streets and Highways			Arterial Streets and Highways With the Potential to Generate An Annoying Noise Level[a]					
				Urban		Rural		Total	
	Urban (miles)	Rural (miles)	Total (miles)	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total
Milwaukee County . . .	273.9	- -	273.9	159.2	58.1	- -	- -	159.2	58.1
Ozaukee County	70.2	95.0	165.2	9.5	13.5	2.5	2.6	12.0	7.3
Total	344.1	95.0	439.1	168.7	49.0	2.5	2.6	171.2	39.0

[a]*Defined as exceeding 70 dBA.*

Source: SEWRPC.

Table 41

FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Period of Measurement or Calculation	Concentration (weight of pollutant per cubic meter of ambient air corrected to 25°C and 760 millimeters of mercury)	
		Primary Standard	Secondary Standard
Particulate Matter (PM)	Annual (geometric mean) 24 hour	75 micrograms 260 micrograms[b]	60 micrograms 150 micrograms[b]
Sulfur Oxides (SO_x) (measured as sulfur dioxide)	Annual (arithmetic mean) 24 hour 3 hour	80 micrograms (0.03 part per million) 365 micrograms (0.14 part per million)[b] - -	- - - - 1,300 micrograms (0.5 part per million)[b]
Carbon Monoxide (CO)	8 hour 1 hour	10 milligrams (9 parts per million)[b] 40 milligrams (35 parts per million)[b]	Same as Primary Same as Primary
Hydrocarbons (HC) (nonmethane measured as methane)	3 hour (6 a.m. to 9 a.m.)	160 micrograms (0.24 part per million)[b]	Same as Primary
Nitrogen Dioxide (NO_2)	Annual (arithmetic mean)	100 micrograms (0.05 part per million)	Same as Primary
Ozone[c] (O_x)	1 hour	235 micrograms (0.12 part per million)[d]	Same as Primary

[a]*Ambient air quality standards for a seventh pollutant, lead, were promulgated by the Administrator of the U. S. Environmental Protection Agency on October 5, 1978. More detailed ambient air quality monitoring will be needed to determine whether the standard for this pollutant species is being exceeded in the Region and whether, in fact, a plan need be prepared to ensure the attainment and maintenance of the lead ambient air quality standard.*

[b]*Concentration not to be exceeded more than once per year.*

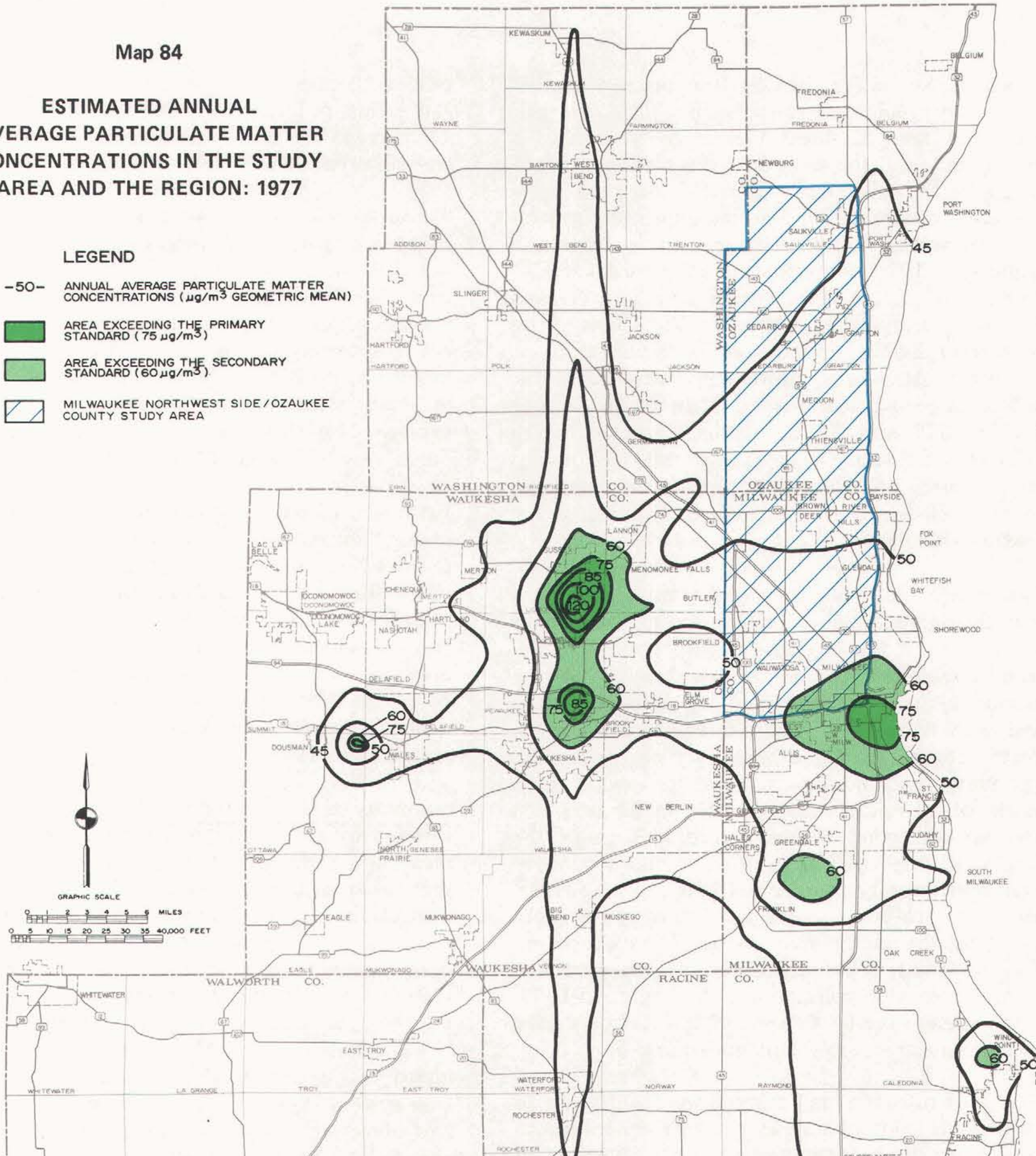
[c]*Formerly expressed as photochemical oxidants.*

[d]*Concentration not to be exceeded more than one hour averaged over any consecutive three-year period.*

Source: Code of Federal Regulations Title 40, Part 50, 1973.

Map 84

ESTIMATED ANNUAL AVERAGE PARTICULATE MATTER CONCENTRATIONS IN THE STUDY AREA AND THE REGION: 1977



Particulate matter is a term for very small particles of solid matter, such as soot, dust, and fly ash, which may be temporarily suspended in the atmosphere. Particulate matter may be corrosive, irritating, or damaging to the respiratory system, and may be toxic or even carcinogenic. The federally prescribed, primary annual geometric average standard for particulate matter of 75 micrograms per cubic meter ($\mu g/m^3$)—the level above which particulate matter may constitute a threat to human health—is estimated to have been exceeded in 1977 in the far southeastern corner of the northwest side study area. Less than 1 percent of the total population of the study area resides in the portion not meeting ambient air standards. Transportation, however, is not a major source of particulate matter pollution, contributing less than 15 percent of total particulate emissions in the Region in 1977.

Source: Air Quality Modeling Group, University of Wisconsin-Madison and SEWRPC.

standards for sulfur dioxide (the primary annual arithmetic average standard is 80 μg/m^3, the primary 24-hour arithmetic average standard is 365 μg/m^3, and the secondary three-hour standard is 1,300 μg/m^3) were estimated to have been exceeded during 1976. The maximum concentrations of sulfur dioxide estimated to occur in the Region in 1976, expressed as an annual average, 24-hour average, and three-hour average, were less than the corresponding standards. Violations of the short-term, 24-hour average, sulfur dioxide ambient air quality standards, however, were observed at two monitoring stations in Milwaukee County during 1977 and 1978, neither of which were located in the study area. Transportation is a very minor source of sulfur dioxide pollutant emissions, contributing less than 1 percent of the total sulfur dioxide emissions in the Region in 1976.

Carbon monoxide is a toxic pollutant; it combines with the hemoglobin of the blood in such a manner as to reduce the oxygen-carrying ability of the bloodstream. Exposure to excessive levels of carbon monoxide may aggravate coronary vascular disease and cause headaches, impaired reactions, and even death. The primary and secondary one-hour average ambient air quality standard for carbon monoxide of 40 milligrams per cubic meter (mg/m^3) was not exceeded within the study area or the Region during 1977. The primary and secondary eight-hour average standard of 10 mg/m^3, however, was found to be exceeded in parts of the Region, including the study area, in 1977, as shown on Map 85. Transportation was the principal source of carbon monoxide pollutants in the Region in 1977, contributing over 86 percent of the Region's total carbon monoxide pollutant emissions.

Oxides of nitrogen may react in the atmosphere to form nitric acid, which can cause or contribute to respiratory disorders and which is harmful to plant life. Oxides of nitrogen may also form soluble nitrates and contribute to surface water pollution. Absorption of ultraviolet light energy by nitrogen dioxide can also contribute to the formation of ozone. Map 86 shows the estimated average annual nitrogen oxide concentrations for the Region and study area in 1977; however, the extent to which nitrogen oxides are converted to nitrogen dioxide is not precisely known. Air quality monitoring data indicate that the annual average nitrogen dioxide standard of 100 μg/m^3 was not exceeded in the Region in 1977. The Milwaukee County portion of the study area is within that area of the Region having the highest concentrations of nitrogen oxides. Transportation is a major source of nitrogen oxide pollutant emissions, contributing over 41 percent of the total regional nitrogen oxide emissions in 1977.

Through photochemical reaction in the atmosphere, hydrocarbons promote the formation of photochemical oxidants and contribute to the formation of "smog," of which ozone is a component. Ozone is a lung and eye irritant and may act to suppress the capacity of the body to combat infection. Both the primary and secondary ozone pollutant standards are 235 μg/m^3 for a one-hour average. Monitoring data indicate that ozone standards were exceeded in the Region in 1977.

Estimates of hydrocarbon concentrations in 1977 under "worst case" meteorological conditions for a three-hour period, and in the assumed absence of photochemical reactions, indicate a maximum hydrocarbon concentration of 500 μg/m^3 in the Region, and of more than 400 μg/m^3 in the study area (see Map 87). Transportation is a major source of hydrocarbon pollutant emissions, contributing over 36 percent of total regional hydrocarbon emissions in 1977.

Summary and Conclusions: The degree to which this fourth adopted transportation system management and development objective is met—namely, that the transportation system should minimize the disruption of development and of the natural resource base—cannot be assessed without prior design and testing of alternative transportation system plans. However, information on the extent to which air quality and noise standards are now being violated within the study area is useful for identifying problems that the existing transportation system in the study area may have in meeting this objective. As set forth in this section of the chapter, the arterial facilities in the study area having the potential to generate noise levels that would be annoying to adjacent development, and those areas in the study area in which air quality standards for particulate matter and carbon monoxide have been found to be exceeded, are limited primarily to the southeastern and, to some extent, south-central parts of the Milwaukee County portion of the study area.

Deficiencies of the Existing Transportation System in Facilitating Quick and Convenient Travel

The fifth objective formulated under the study asserts the need for the provision of a transportation system which facilitates reasonably fast and

Map 85

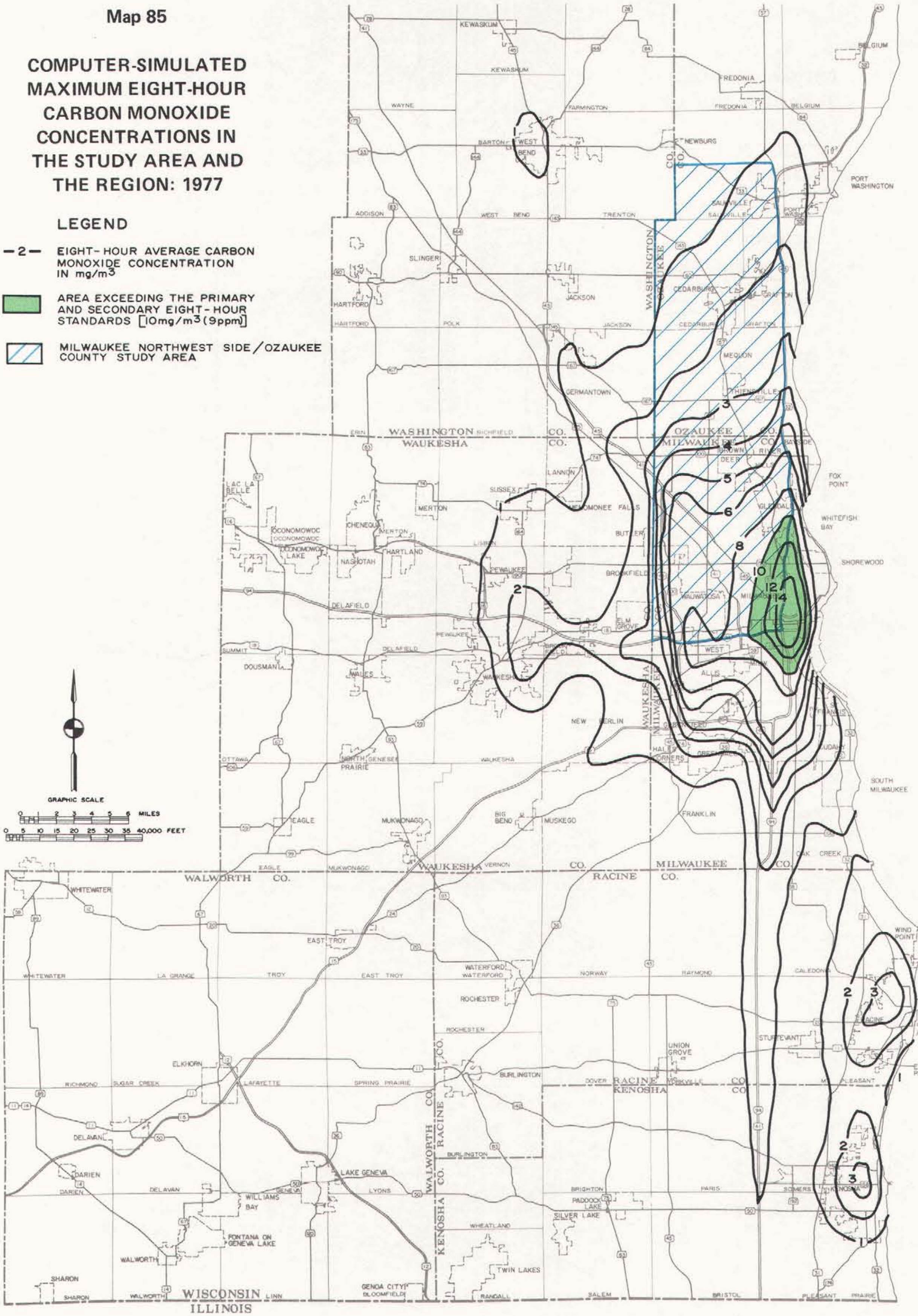
COMPUTER-SIMULATED MAXIMUM EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS IN THE STUDY AREA AND THE REGION: 1977

LEGEND

—2— EIGHT-HOUR AVERAGE CARBON MONOXIDE CONCENTRATION IN mg/m^3

AREA EXCEEDING THE PRIMARY AND SECONDARY EIGHT-HOUR STANDARDS [10mg/m^3 (9ppm)]

MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA

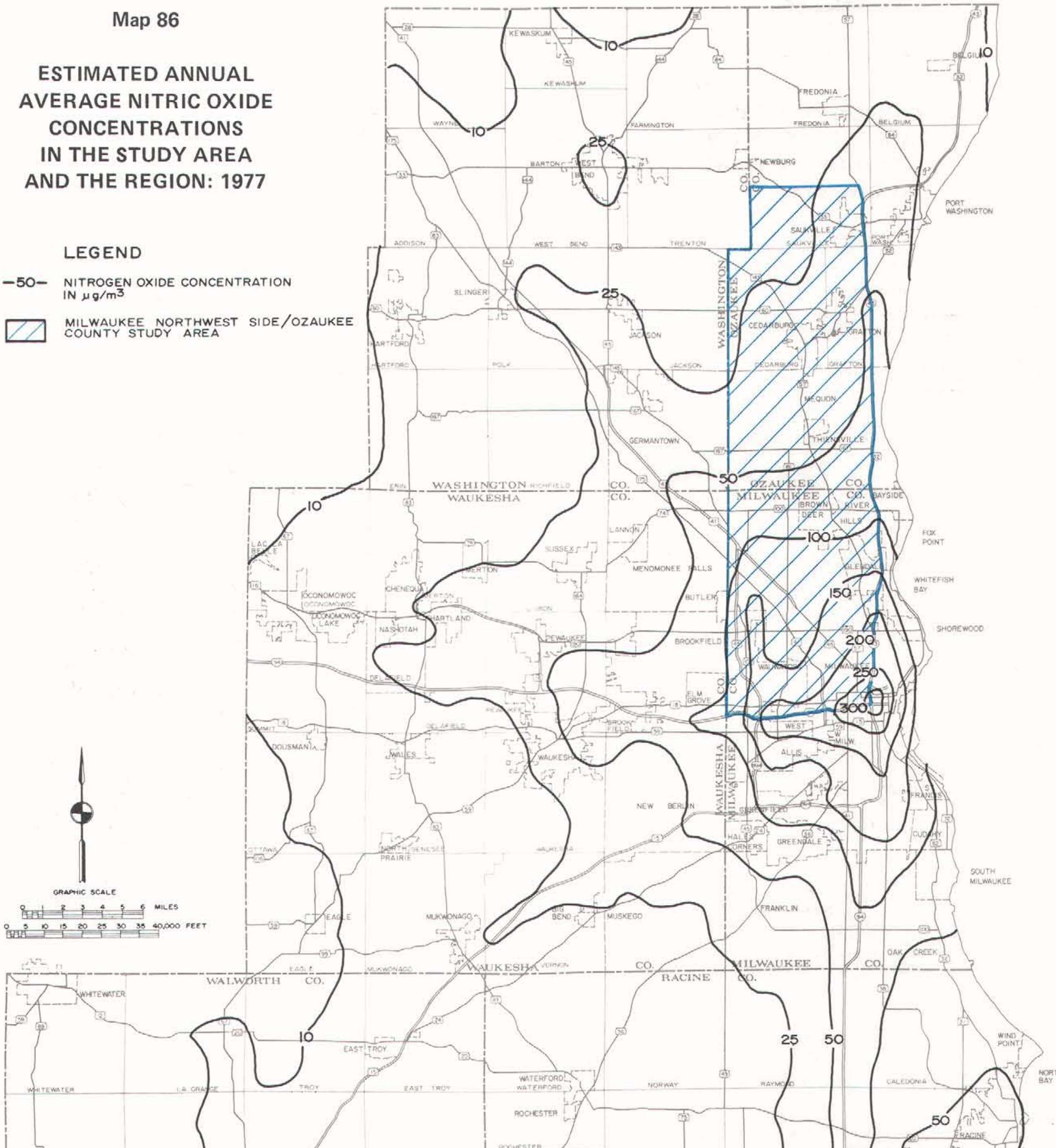


This map illustrates the composite impact of point, line, and area sources of emissions on eight-hour average carbon monoxide concentrations in the Region and in the northwest side study area during 1977. This simulation modeling effort was conducted under emission conditions representative of a period of heavy traffic flow, from 5:00 a.m. to 1:00 p.m. on a weekday, and under meteorological conditions least favorable to pollutant dispersion. Under these "worst case" conditions, the eight-hour average carbon monoxide ambient air quality standard of 10 milligrams per cubic meter (mg/m^3) is estimated to have been exceeded over a 21-square-mile area in Milwaukee County, and an 8.5-square-mile area in the study area during 1977. This area of the study area has an estimated resident population of 122,300.

Source: Air Quality Modeling Group, University of Wisconsin-Madison and SEWRPC.

Map 86

ESTIMATED ANNUAL AVERAGE NITRIC OXIDE CONCENTRATIONS IN THE STUDY AREA AND THE REGION: 1977

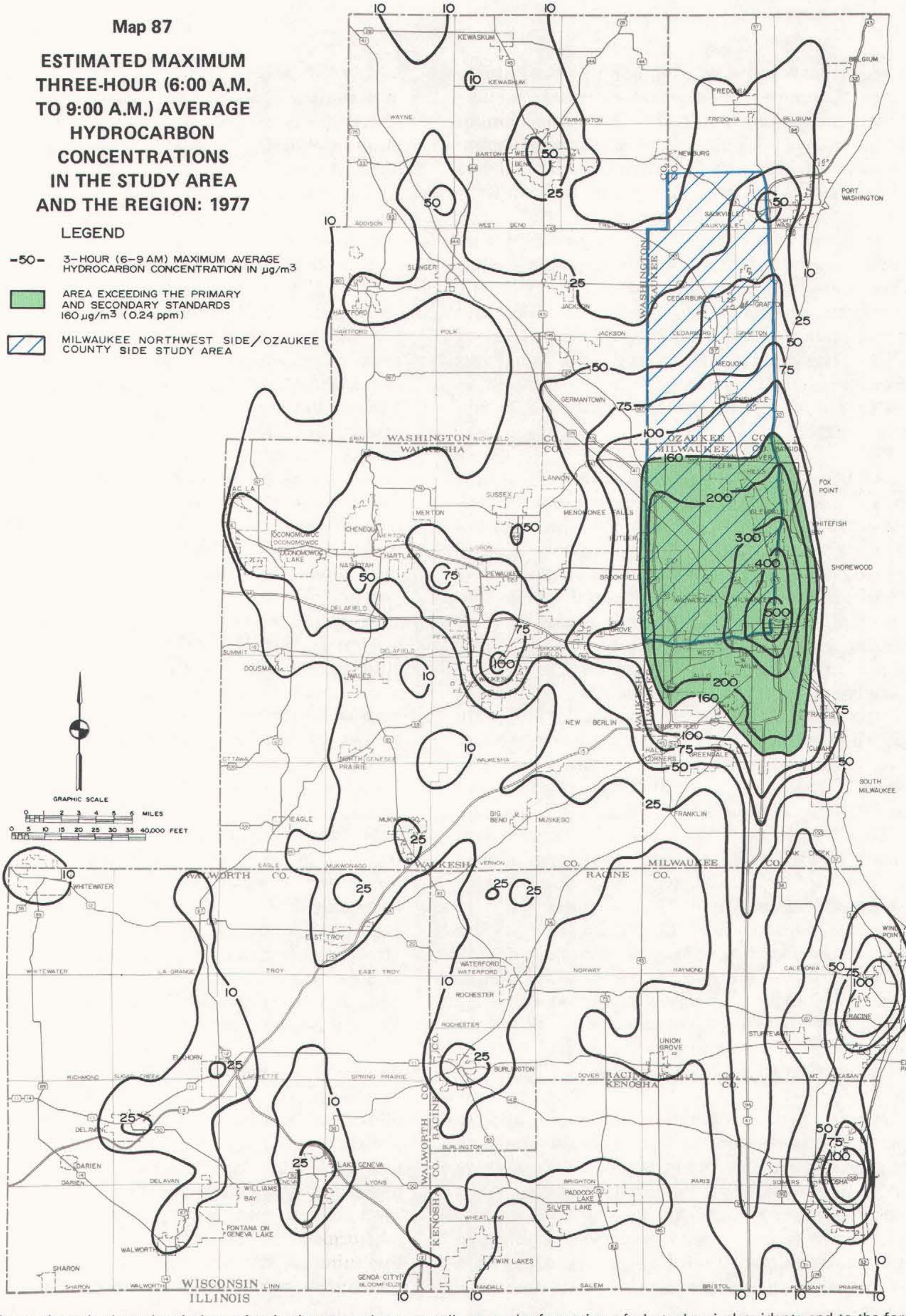


Oxides of nitrogen may react in the atmosphere to form nitric acid, which may cause or contribute to respiratory disorders and which is harmful to plant life. Oxides of nitrogen may also form soluble nitrates and contribute to surface water pollution. This map displays the average annual nitric oxide concentrations in the Region and study area during 1977. Air quality monitoring data indicate that the federally prescribed annual average nitrogen dioxide standard of 100 micrograms per cubic meter (µg/m^3) was not exceeded anywhere in the study area during 1977.

Source: Air Quality Modeling Group, University of Wisconsin-Madison and SEWRPC.

Map 87

ESTIMATED MAXIMUM THREE-HOUR (6:00 A.M. TO 9:00 A.M.) AVERAGE HYDROCARBON CONCENTRATIONS IN THE STUDY AREA AND THE REGION: 1977



Hydrocarbons, through photochemical reaction in the atmosphere, contribute to the formation of photochemical oxidants and to the formation of "smog," of which ozone is a component. Ozone is a lung and eye irritant and may act to suppress the capacity of the body to combat infection. Estimates of hydrocarbon concentrations in 1977 under "worst case" meteorological conditions for a three-hour period, and in the assumed absence of photochemical reactions, indicate a maximum hydrocarbon concentration of 500 micrograms per cubic meter (µg/m^3) in the Region and of over 400 µg/m^3 in the extreme southeastern portion of the study area, as shown on this map. Transportation is a major source of hydrocarbon pollutant emissions in the Region, contributing over 36 percent of total regional hydrocarbon emissions in 1977.

Source: SEWRPC.

convenient travel among component parts of northwestern Milwaukee County and southern Ozaukee County, and between this area and other component parts of the Southeastern Wisconsin Region. Ten standards support and quantify the achievement of this objective. Three of the standards specify measures of total area travel efficiency—total passenger hours, total vehicle hours, and total vehicle miles—which are useful for comparing alternative transportation plans but not for defining existing transportation system problems. The other seven standards, however, specify measures of facility congestion, travel speed and time, and transit use and frequency which can be used to identify specific transportation problems within the study area.

Arterial Street and Highway Congestion: The fourth standard under the objective requires that the proportion of the arterial street and highway system of the study area that is subject to congestion as measured by a peak-hour volume-to-design capacity ratio of greater than 1.1 be minimized. Congestion on arterial streets and highways increases the cost of transportation within the study area, including the cost of the journey to work, and can thereby adversely affect the relative market advantages of businesses and industries located in the study area. Those arterial facilities operating over design capacity within the study area for the peak travel hour of 7:00 a.m. to 8:00 a.m. are shown on Map 32 and summarized in Table 27 in Chapter III. Those facilities operating over design capacity in the study area during the evening peak travel hour of 4:00 p.m. to 5:00 p.m. are shown on Map 33 and in Table 27 of Chapter III. Also shown on Maps 32 and 33 and in Table 27 are those arterial facilities operating at design capacity during morning and evening peak travel hours, respectively. Arterial facilities operating at design capacity have peak-hour volume-to-design capacity ratios of 0.9 to 1.1, and also are subject to some effects of congestion.

An arterial facility operating at design capacity experiences some constraints on speed and lane changing and corresponding reductions in average speed and some delays behind turning vehicles at controlled intersections. An arterial facility operating over design capacity experiences unstable flow and breakdown conditions, with traffic delays of more than one signal cycle at intersections, frequent traffic stoppages, and substantially lowered speeds.

Nearly 57 miles of arterial streets and highways, representing nearly 13 percent of the arterial street and highway system of the study area, were operating over design capacity during the morning peak hour. A similar proportion of the study area arterial system—13 percent, or 58 miles—was operating over design capacity during the evening peak hour. Furthermore, an additional 8 percent of the study area arterial street system, or over 36 miles, was operating at design capacity during the morning and evening peak travel hours. The extent of arterial facilities operating both over and at design capacity during the morning and evening peak hours was greatest in the Milwaukee County portion of the study area. Nearly 98 percent of the arterial facilities in the study area operating over design capacity during both the morning and evening peak hours were located in the Milwaukee County portion. In addition over 95 percent of the arterial facilities in the study area operating at design capacity during the morning and evening peak hours were located in the Milwaukee County portion. During both the morning and evening peak travel hours, over 20 percent of the arterial system of the Milwaukee County portion of the study area and over 5 percent of its freeway system were operating over design capacity; and 13 percent of its arterial system and over 9 percent of its freeway system were operating at design capacity. In the Ozaukee County portion of the study area, less than 1 percent of the arterial street system, and no part of the freeway system, was operating over design capacity during the morning and evening peak hours, and about 1 percent of the arterial street system, and none of the freeway system, was operating at design capacity. As shown on Maps 32 and 33 in Chapter III, those congested arterial street and highway facilities operating both over and at design capacity were located largely in the southern two-thirds of the Milwaukee County portion of the study area.

Minimum Highway and Transit Overall Speeds: The fifth standard under this objective specifies minimum speeds for arterial streets and public transit by type and location of facility and service (see Table 42). Overall speed on the existing transportation system by specific facility and service is a direct measure of transportation system performance. Those arterial facilities not attaining the minimum overall average weekday speeds specified in this standard are shown on Map 88 and set forth in Table 43. About 16 percent of the arterial streets and highways in the study area, or about

70 miles, do not meet the minimum speed standards on an average weekday; all are standard arterial streets and highways and are located in urban parts of the study area. Over 90 percent of these facilities are located in the Milwaukee County portion of the study area, particularly in its southern and central parts.

Those public transit routes not attaining the minimum overall average weekday speeds specified in this standard are shown on Map 89. Those route segments identified as being in violation of this speed standard are all part of the tertiary or local transit system component, and are all located within the southeastern section of the Milwaukee County portion of the study area. Each of these route segments was identified to be in violation of this standard because its overall average weekday speed was less than 10 mph.

Table 42

MINIMUM OVERALL TRAVEL SPEEDS FOR THE STUDY AREA TRANSPORTATION SYSTEM BY TYPE OF FACILITY AND SERVICE

Transportation System Component	Overall Travel Speed by Area (mph)		
	Central Business District	Urban	Rural
Freeway	35	40	50
Expressway	25	30	50
Standard Arterial			
Divided	15	25	45
Undivided	15	20	40
Primary Transit	10	30	40
Secondary Transit	10	20	40
Tertiary Transit	5	10	40

Source: SEWRPC.

Arterial Street Surface Condition: The sixth standard under this objective specifies that the surface condition of the arterial street and highway system should be of adequate quality so as not to inhibit an otherwise safe and convenient travel speed. The surface condition of each segment of the arterial street and highway system of the study area was inventoried. For bituminous surface pavements, ride quality and the presence, extent, and degree of reflective transverse cracks, pavement edge widening cracks, block cracks, alligator cracks, and patching and rutting were determined. For portland cement concrete pavements, ride quality and the presence, extent, and degree of spalling, weathering, transverse cracks, corner cracks and faults, secondary cracks, and patching were determined. On Map 90, each element of the arterial street and highway system of the study area is classified into one of four categories: good to excellent condition, tolerable to good condition, barely tolerable to tolerable condition, and intolerable to barely tolerable condition. Only on surfaces in the last category is travel speed affected.

As shown on Map 90 and in Table 44, the surface condition of about 48 percent of the arterial street system of the study area, or 211 miles, is considered to be in good to excellent condition, and another 47 percent, or 207 miles, is considered to be in tolerable to good condition. Less than 5 percent of the arterial street system of the study area, or 21 miles, is considered to have a surface condition that is less than tolerable. Most of the arterial streets in the study area considered to have a less than tolerable surface condition are located in the developing parts of northwestern Milwaukee County. Only about six miles of arterial streets in the Milwaukee County portion of the study area were classified as having an intolerable to barely tolerable surface condition.

Table 43

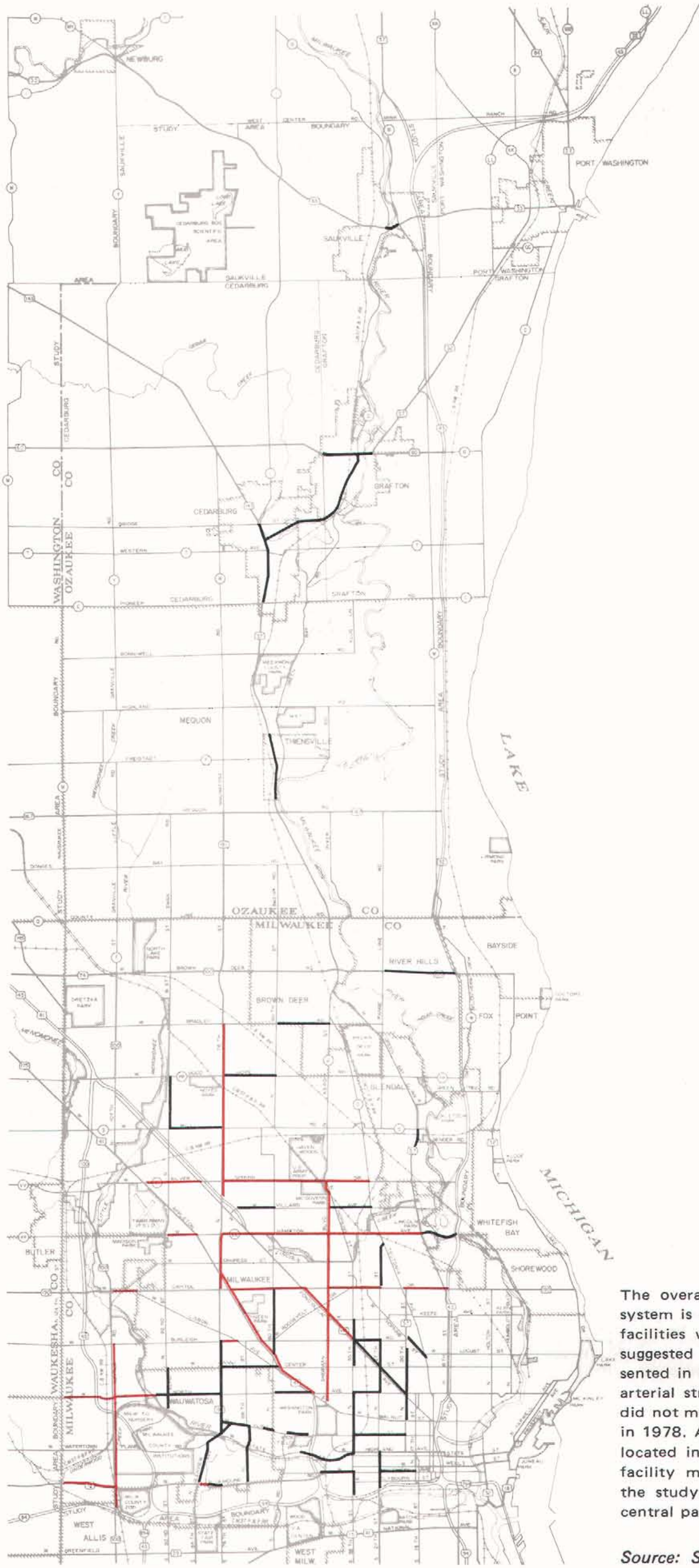
ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA OPERATING AT LESS THAN MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY: 1978

Portion of Study Area	Miles of Freeways Below Minimum Speeds			Miles of Standard Arterials Below Minimum Speeds			Miles of Total Arterials Below Minimum Speeds		
	Rural	Urban	Percent of Freeway System	Rural	Urban	Percent of Standard Arterial System	Rural	Urban	Percent of Total Arterial System
Milwaukee County	- -	- -	- -	- -	63.50	26.6	63.50	- -	23.2
Ozaukee County	- -	- -	- -	- -	7.00	4.6	7.00	- -	4.2
Total	- -	- -	- -	- -	70.50	18.1	70.50	- -	16.1

Source: SEWRPC.

Map 88

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA OPERATING BELOW MINIMUM SUGGESTED OVERALL SPEEDS ON AN AVERAGE WEEKDAY: 1978



LEGEND

URBAN DIVIDED STANDARD ARTERIAL WITH SUBSTANDARD OPERATING SPEEDS

URBAN UNDIVIDED STANDARD ARTERIAL WITH SUBSTANDARD OPERATING SPEEDS

NOTE: ALL OTHER TYPES OF ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA OPERATE AT OR ABOVE SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY

GRAPHIC SCALE

0 1 2 MILES

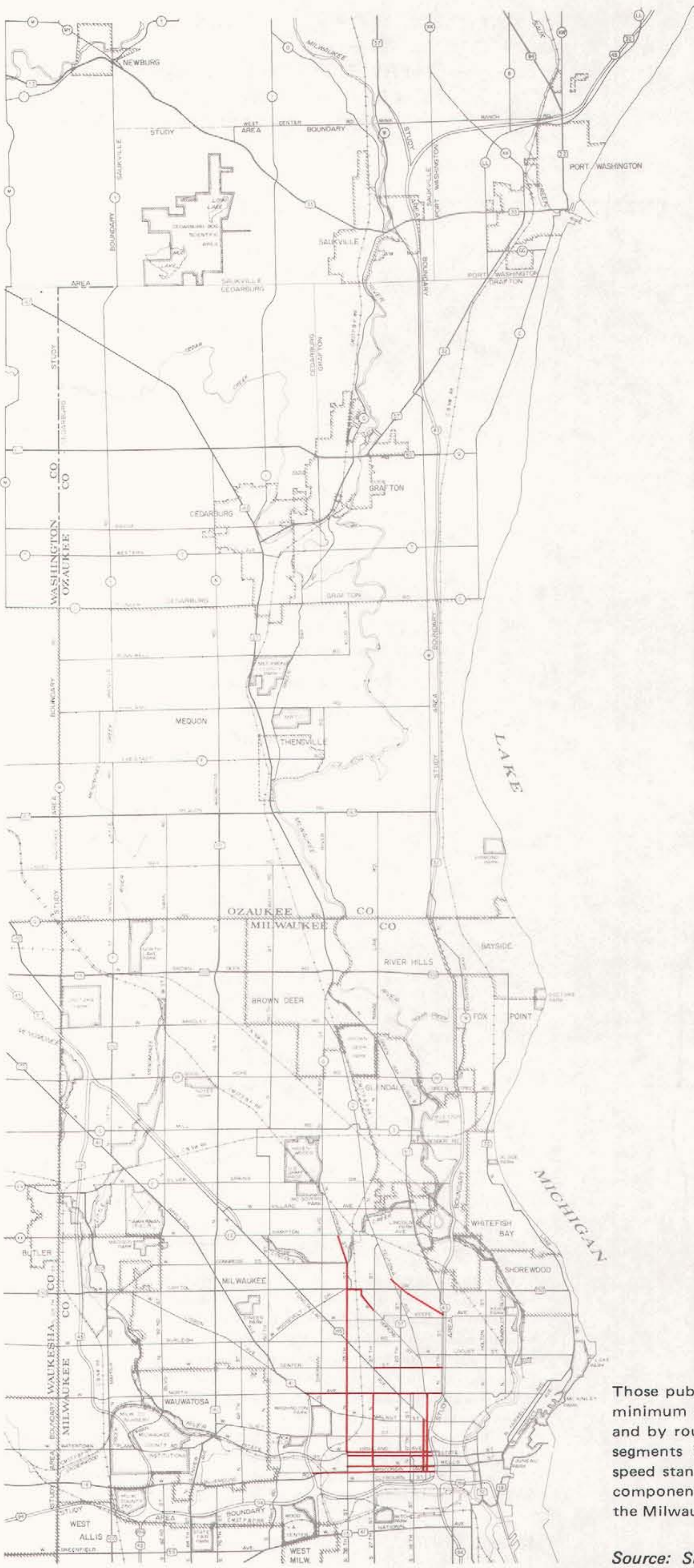
0 4000 8000 12000 FEET

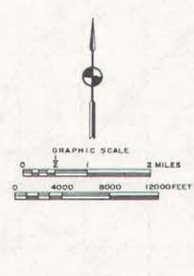
The overall speed on the elements of the existing transportation system is one measure of that system's performance. Those arterial facilities within the northwest side study area not attaining the suggested minimum overall average weekday speeds in 1978 presented in Table 8 are shown on this map. About 16 percent of the arterial streets and highways in the study area, or about 70 miles, did not meet such specified minimum speeds on an average weekday in 1978. All were surface arterial streets and highways and all were located in urban parts of the study area. Over 90 percent of such facility mileage was located in the Milwaukee County portion of the study area and was concentrated largely in its southern and central parts.

Source: SEWRPC.

Map 89

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT LESS THAN MINIMUM SUGGESTED OVERALL SPEEDS ON AN AVERAGE WEEKDAY: 1978



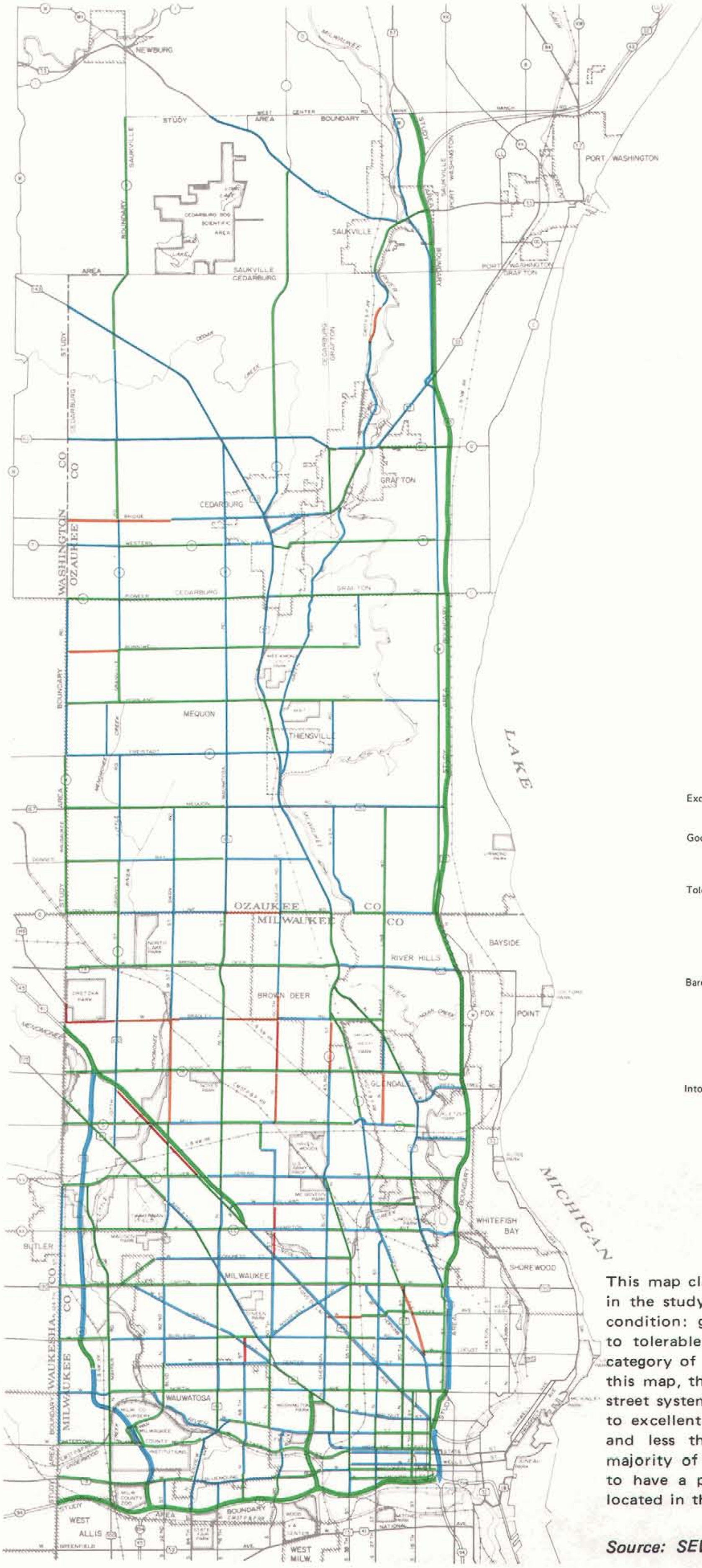


Those public transit routes in the study area found not to attain the minimum overall average weekday speeds suggested by service type and by route segment location are shown on this map. Those route segments identified as being in violation of the 10-mile-per-hour speed standard were all part of the tertiary, or local, transit system component, and were all located within the southeastern section of the Milwaukee County portion of the study area.

Source: SEWRPC.

Map 90

PAVEMENT SURFACE CONDITIONS OF ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA: 1979



LEGEND

SURFACE CONDITION

GOOD TO EXCELLENT

- FREEWAY
- STANDARD ARTERIAL

TOLERABLE TO GOOD

- FREEWAY
- STANDARD ARTERIAL

BARELY TOLERABLE TO TOLERABLE

- STANDARD ARTERIAL

INTOLERABLE TO BARELY TOLERABLE

- STANDARD ARTERIAL

	Bituminous	Portland Cement Concrete
Excellent	Few and hairline transverse cracks	Few and hairline transverse cracks
Good	Transverse cracks every 200 feet with observable pavement edge cracks and minor rutting	Slight spalling with transverse cracks every 40 feet, approaching one-fourth-inch in width
Tolerable	Upheaved transverse cracks every 10 feet with definite pavement edge cracks, minor patching, and one-half-inch-deep rutting	Well weathered, with one-quarter-inch transverse cracks every 15 feet, with some faults at corners, and some patching
Barely Tolerable	Upheaved and widening transverse cracks every 5 to 10 feet with pavement edge approaching disintegration; common block cracks, observable alligator cracks, patching, and noticeable rutting	Transverse cracks every 5 to 10 feet at least one-quarter-inch wide with noticeable to common faulting, secondary cracking, and common to frequent patching
Intolerable	Entire surface cracked and disintegrated	Extreme cracking with pavement chunks missing

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

This map classifies each segment of the arterial street and highway in the study area into one of four categories of pavement surface condition: good to excellent, tolerable to good, barely tolerable to tolerable, and intolerable to barely tolerable. Only in the last category of surface condition is travel speed affected. As shown on this map, the surface condition of about 48 percent of the arterial street system mileage in the study area is considered to be in good to excellent condition; 47 percent in tolerable to good condition; and less than 5 percent in less than tolerable condition. The majority of the arterial street mileage in the study area considered to have a pavement surface condition of less than tolerable was located in the developing parts of northwestern Milwaukee County.

Source: SEWRPC.

Table 44

PAVEMENT SURFACE CONDITION OF ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA: 1979

Surface Condition	Arterial Street (miles)	Percent of Study Area Portion Arterial Mileage	Percent of Total Study Area Arterial Mileage
Milwaukee County Portion			
Good to Excellent	141.0	51.5	32.1
Tolerable to Good	116.9	42.7	26.6
Barely Tolerable to Tolerable	9.7	3.5	2.2
Intolerable to Barely Tolerable	6.3	2.3	1.4
Total	273.9	100.0	62.4
Ozaukee County Portion			
Good to Excellent	69.8	42.3	15.9
Tolerable to Good	90.4	54.7	20.6
Barely Tolerable to Tolerable	5.0	3.0	1.1
Intolerable to Barely Tolerable	--	--	--
Total	165.2	100.0	37.6
Total Study Area			
Good to Excellent	210.8	--	48.0
Tolerable to Good	207.3	--	47.2
Barely Tolerable to Tolerable	14.7	--	3.3
Intolerable to Barely Tolerable	6.3	--	1.4
Total	439.1	--	100.0

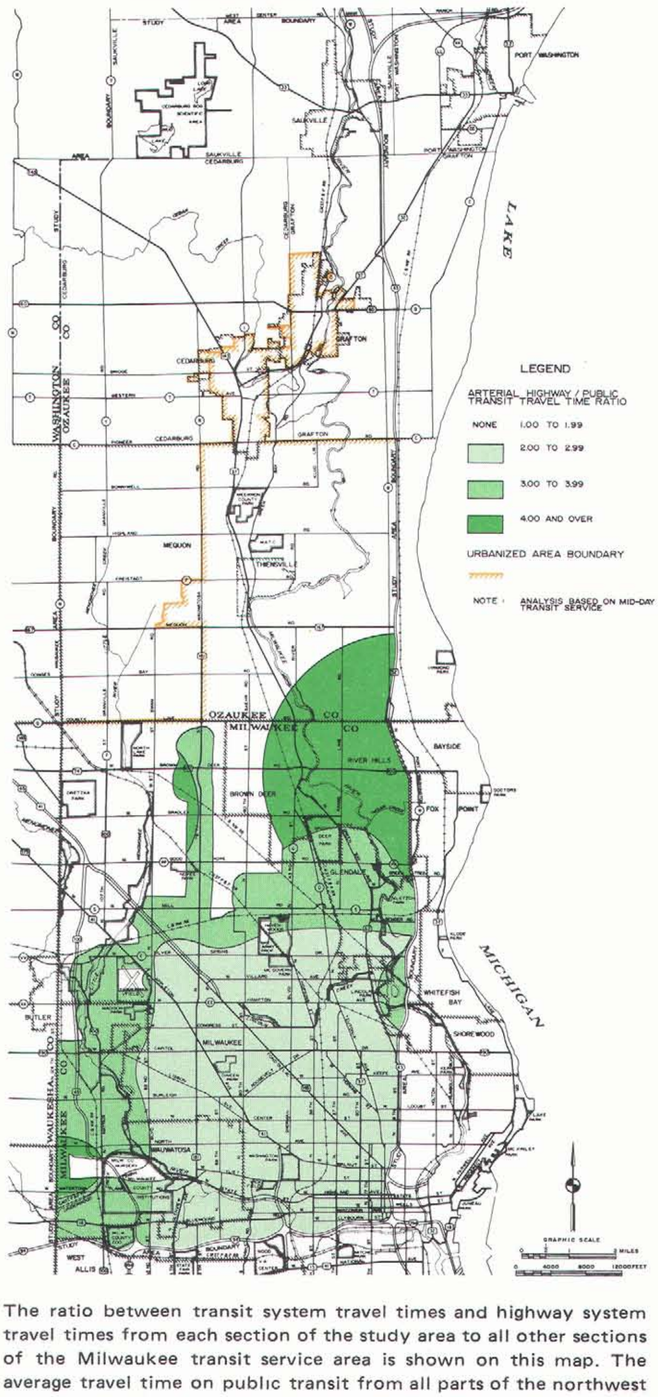
Source: SEWRPC.

Comparability of Highway and Transit Travel Times: The seventh standard under this objective requires that overall travel times on public transit be comparable to overall travel times on arterial streets between component parts of the study area and between parts of the area and the remainder of the Milwaukee transit service area. For each subarea of the study area served by public transit, the existing arterial street and public transit overall travel times were compared to those of all other subareas of the study area. The derived ratios between transit system travel times and highway system travel times from each subarea in the study area to all other subareas served by public transit in the Milwaukee transit service area are shown on Map 91. The average travel time on public transit from all parts of the northwest side study area served by local transit, except at the outer fringes of the transit service area, to all other parts of the Milwaukee transit service area is two to three times longer than the time required for equivalent travel by automobile. At the outer fringes of the transit service area, the average travel time to all other parts of the transit service area is three to four times longer by transit than by automobile. In the areas which are served only by primary transit, requiring trips to destinations within the transit service area but outside the Milwaukee central business district to be made first to the central business district, average travel times are more than four times greater by transit than by automobile.

Frequency of Public Transit Service: The eighth standard under this objective specifies that the frequency of public transit service should be sufficient to accommodate passenger volumes while not exceeding specified maximum load factors, but should not, in any case, be less than one transit vehicle every 30 minutes during peak travel periods, or one transit vehicle every 60 minutes during off-peak periods, including evening and weekend travel periods. All existing public transit route segments within the study area meet this frequency-of-transit service standard of at least two motor buses per hour during the peak travel period. During off-peak periods, however, segments of five routes in the study area—Routes 10, 13, 23, 27, and 60—do not meet the frequency-of-service standard of at least one bus per hour, as shown on Map 92. On four of the routes, the segments which do not meet the standard are located at the outlying ends of the routes. On Routes 10 and 60, the segments which

Map 91

COMPARISON OF AVERAGE TRAVEL TIMES ON ARTERIAL STREET AND HIGHWAY SYSTEM AND PUBLIC TRANSIT SYSTEM WITHIN THE STUDY AREA: 1978



The ratio between transit system travel times and highway system travel times from each section of the study area to all other sections of the Milwaukee transit service area is shown on this map. The average travel time on public transit from all parts of the northwest side study area served by local transit, except the outer fringes of the transit service area, to all other parts of the Milwaukee transit service area is two to three times longer than travel by automobile. At the outer fringes of the transit service area, the average transit travel time to all other parts of the transit service area is three to four times longer than by automobile.

Source: SEWRPC.

do not meet the standards branch toward the end of the routes, where service and its frequency are divided along two paths. On Routes 23 and 27, the segments which do not meet the standard turn back before the end of a route in order to provide better service to the more central part of the route. Those routes on which the frequency-of-service standard is violated during evening and weekend off-peak periods are Routes 12, 13, 23, 60, 62, and 82, as shown on Map 93.

Maximization of Public Transit Use: The ninth standard under this objective specifies that ridership on the public transit system should be maximized. However, whether public transit use in the study area is now being maximized can be determined only through alternative public transit system design and evaluation. In order to identify problems the existing transportation system may have in meeting this objective, existing transit use and its variations in the study area will be assessed under this standard. The percentage of all tripmaking by transit on an average weekday in 1972 in each subarea of the study area served by public transit is shown on Map 36 in Chapter III.[6]

The highest transit utilization occurs in the southeastern portion of the study area, north and west of the Milwaukee central business district. The percentage of tripmaking by transit in this two- to three-square-mile area generally ranges from 10 to 20 percent, with some areas exceeding 20 percent. Generally, the percentage of trip-

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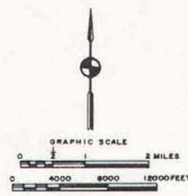
[6] *Total mass transit ridership in the Milwaukee urbanized area from 1972 through 1978 has varied as follows:*

Year	*Revenue Passengers*
1972	*52,886,000*
1973	*50,091,000*
1974	*50,300,000*
1975	*45,277,000*
1976	*46,622,000*
1977	*48,343,000*
1978	*45,754,000*[a]

[a] *1978 ridership was adjusted to eliminate the effects of a 39-day transit operator strike which suspended Milwaukee County Transit System services for portions of the months of May and June.*

Map 92

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA NOT MEETING SPECIFIED FREQUENCY-OF-SERVICE STANDARDS: 1978

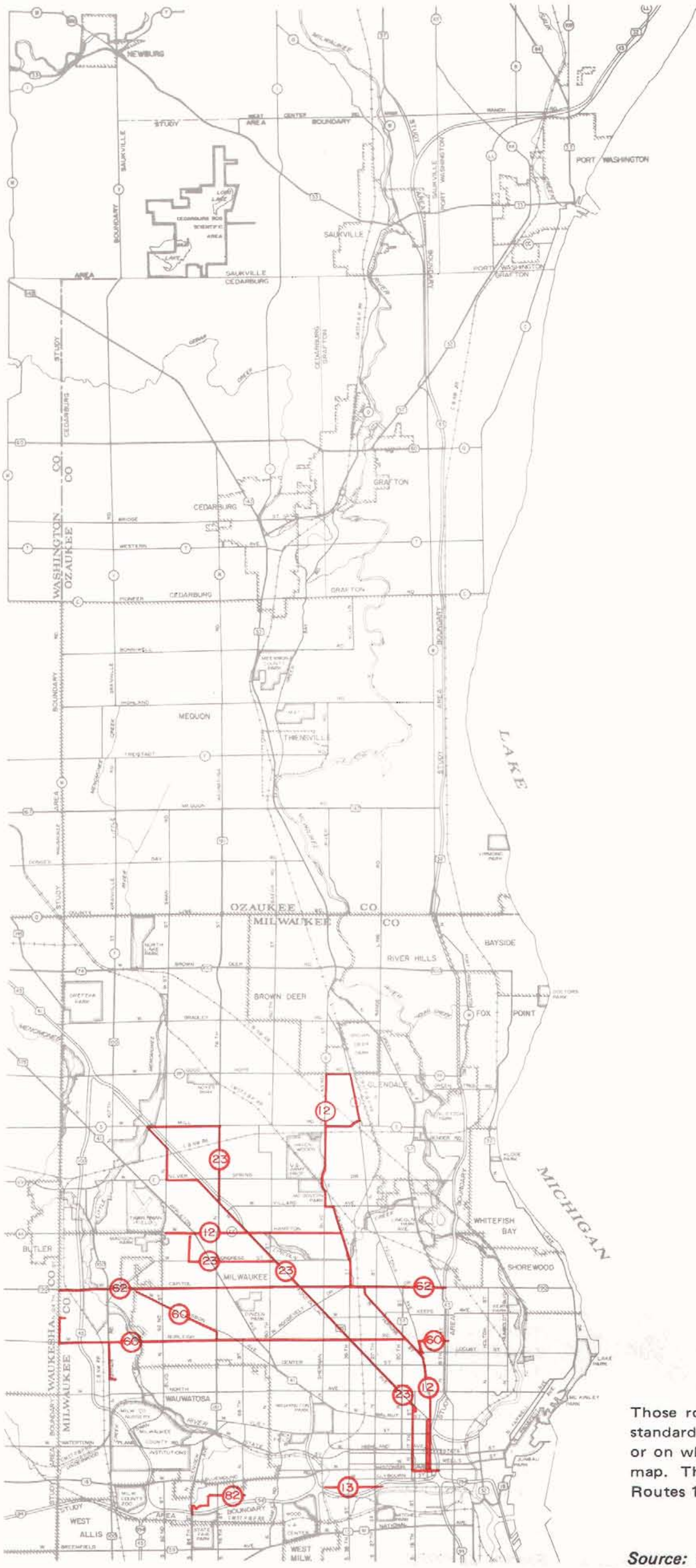


Public transit system routes in the study area not meeting specified frequency-of-service standards—one transit vehicle every 30 minutes during peak travel periods and one transit vehicle every 60 minutes during off-peak periods, including evening and weekend travel periods—are shown on this map. All existing public transit routes operating within the study area during the peak-hour travel period meet this frequency-of-service standard during the peak hour. During off-peak periods, however, segments of five routes in the study area—Routes 10, 13, 23, 27, and 60—do not meet the frequency-of-service standard of at least one bus per hour.

Source: SEWRPC.

Map 93

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA NOT MEETING SPECIFIED FREQUENCY-OF-SERVICE STANDARDS DURING WEEKEND OR EVENING PERIODS: 1978



Those routes in the study area on which the frequency-of-service standard is exceeded during evening and weekend off-peak periods, or on which service is less than one bus per hour, are shown on this map. The service standards are exceeded during this period by Routes 12, 13, 23, 60, 62, and 82.

Source: SEWRPC.

making by public transit decreases with distance from the Milwaukee central business district, although isolated areas, or corridors, of higher transit use can be seen, particularly along the eastern study area boundary. In the northern and western fringes of the transit service area within the Milwaukee County portion of the study area—which are about three to five miles from the southeastern corner of the study area—less than 4 percent of all tripmaking utilizes public transit.

Traveltime Standards for Industrial Centers: The tenth standard under this objective requires that the transportation system provide such service that the number of industrial centers in the study area within 30 minutes overall travel time of 50 percent of the study area's resident population, 30 minutes overall travel time by truck of the Milwaukee port facility, 15 minutes overall travel time by truck of a railroad team track, and 10 minutes overall travel time by truck of a freeway exit and entrance ramp is maximized.

Major regional industrial centers within the study area are located exclusively in the Milwaukee County portion, as shown on Map 21 in Chapter III. The major industrial centers include the entire Milwaukee North center, located along a Chicago, Milwaukee, St. Paul & Pacific (Milwaukee Road) corridor between N. 27th and N. 35th Streets; part of the Milwaukee Glendale center, generally aligned along W. Capitol Drive from N. 27th Street to the eastern study area boundary; part of the Milwaukee Menomonee Valley East center, located along W. St. Paul Avenue; the Milwaukee Menomonee Valley West center, located along W. State Street; part of the Wauwatosa/Butler center, situated along the Chicago & North Western Transportation Company's main line; and part of the West Allis West center, located at S. 100th Street and the East-West Freeway (IH 94).

Five community industrial centers are located within the study area. Three are in the Milwaukee County portion, and are situated in proximity to each other in the northeast part of the City of Milwaukee. The other two centers are located in Ozaukee County—one in the southern portion of the City of Cedarburg and the other along the Milwaukee Road in the Village of Grafton.

Two characteristics of the location of these regional and community industrial centers in the study area should be noted. First, all of the industrial areas are situated along one or more railroad lines. Second, all of the regional centers are in the extreme southern portion of the study area, while all of the community centers are located north of the regional centers.

This standard addresses four specific requirements, as mentioned earlier in this section, regarding service provided by the transportation system to industrial centers. The first requirement, that each of the industrial centers within the study area be within 30 minutes overall travel time by highway of 50 percent of the study area's resident population, is met by each regional and community industrial center in the study area.

The second requirement of the standard, that each of the industrial centers within the study area be within 30 minutes overall travel time by truck of the Port of Milwaukee, is met only by those industrial centers within the Milwaukee County portion of the study area. The two industrial centers within the City of Cedarburg and the Village of Grafton do not meet this part of the standard, principally because of the distance from these centers to Milwaukee's only port facilities located at Jones Island (approximately 25 to 30 miles).

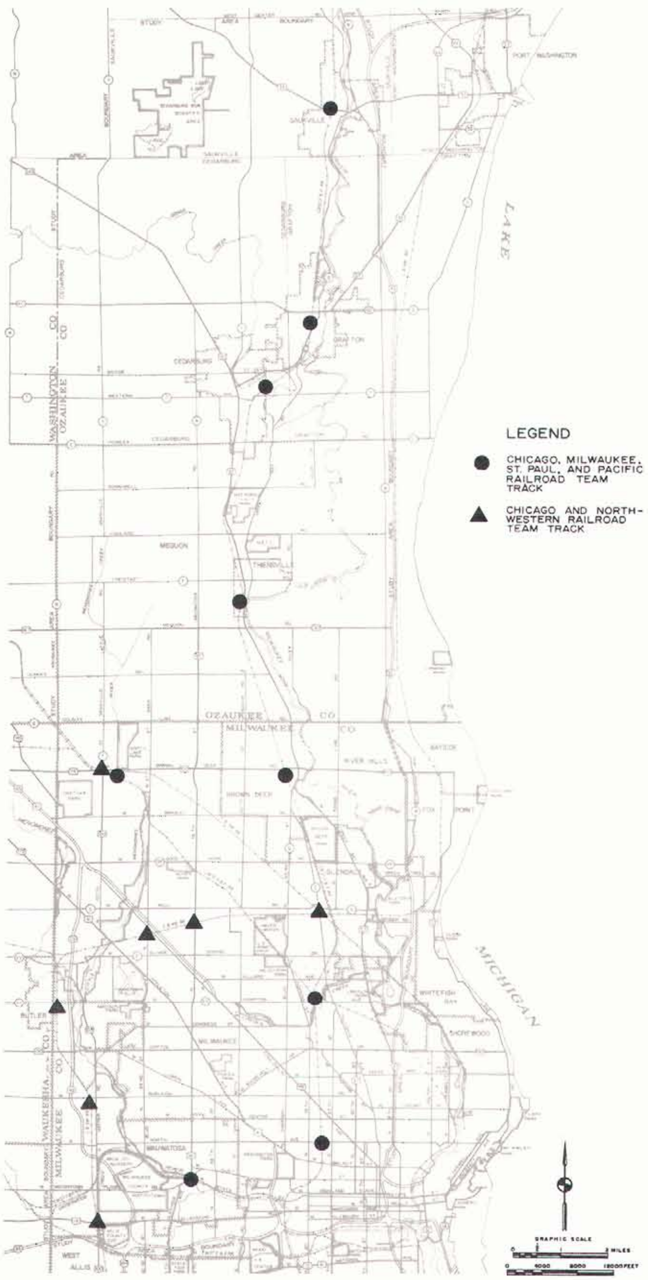
The third requirement of the standard, that each of the industrial centers within the study area be within 15 minutes overall travel time by truck of a designated railroad team track, is met by all the industrial centers in the study area. There are a total of 16 designated team tracks within the study area, 12 of which are located in Milwaukee County and four of which are located in Ozaukee County (see Map 94). Team tracks consist of a railroad siding and an adjacent space large enough to park a motor truck, and effect a transfer of cargo from the rail cars to the trucks. However, even though specific team-track locations have been designated for use by industries, railroads do attempt to transport cars consigned to shippers that don't have a private railroad siding to any available side track close to the origin or destination of shipment.

The fourth requirement of the standard, that the industrial centers within the study area be within 10 minutes overall travel time by truck of a freeway entrance and exit ramp, is met by all the regional and community centers in the study area.

Summary and Conclusions: The fifth objective sets forth the need for a transportation system in the study area that will facilitate quick and convenient

Map 94

DESIGNATED RAILROAD TEAM TRACKS WITHIN THE STUDY AREA: 1978



There are a total of 16 designated team tracks within the northwest side study area—12 in the Milwaukee County portion of the study area and 4 in the Ozaukee County portion of the study area. Team tracks consist of a railroad siding and an adjacent space large enough to park a motor truck alongside of railroad freight cars. They enable the ready transfer of cargo from the rail cars to trucks.

Source: SEWRPC.

travel. Arterial street and highway congestion has been identified as an existing obstacle to quick and convenient travel during morning and evening peak travel hours, particularly in the southern two-thirds of the Milwaukee County portion of the study area. About 13 percent of the study area's arterial street system was operating over design capacity during peak travel hours in 1978, with an additional 8 percent of the arterial system operating at design capacity. In the Milwaukee County portion of the study area, about 20 percent of the arterial system was operating over design capacity in 1978, with an additional 13 percent of the arterial system operating at design capacity. Substantial portions of arterial streets and transit routes in the most southeastern portion of this area have been determined to be operating below minimum travel speeds on an average weekday. Transit trips originating in the study area are substantially slower than automobile trips by arterial highway, requiring on the average at least twice the travel time as trips by private automobile.

Deficiencies of the Existing Transportation System in the Provision of Travel Safety

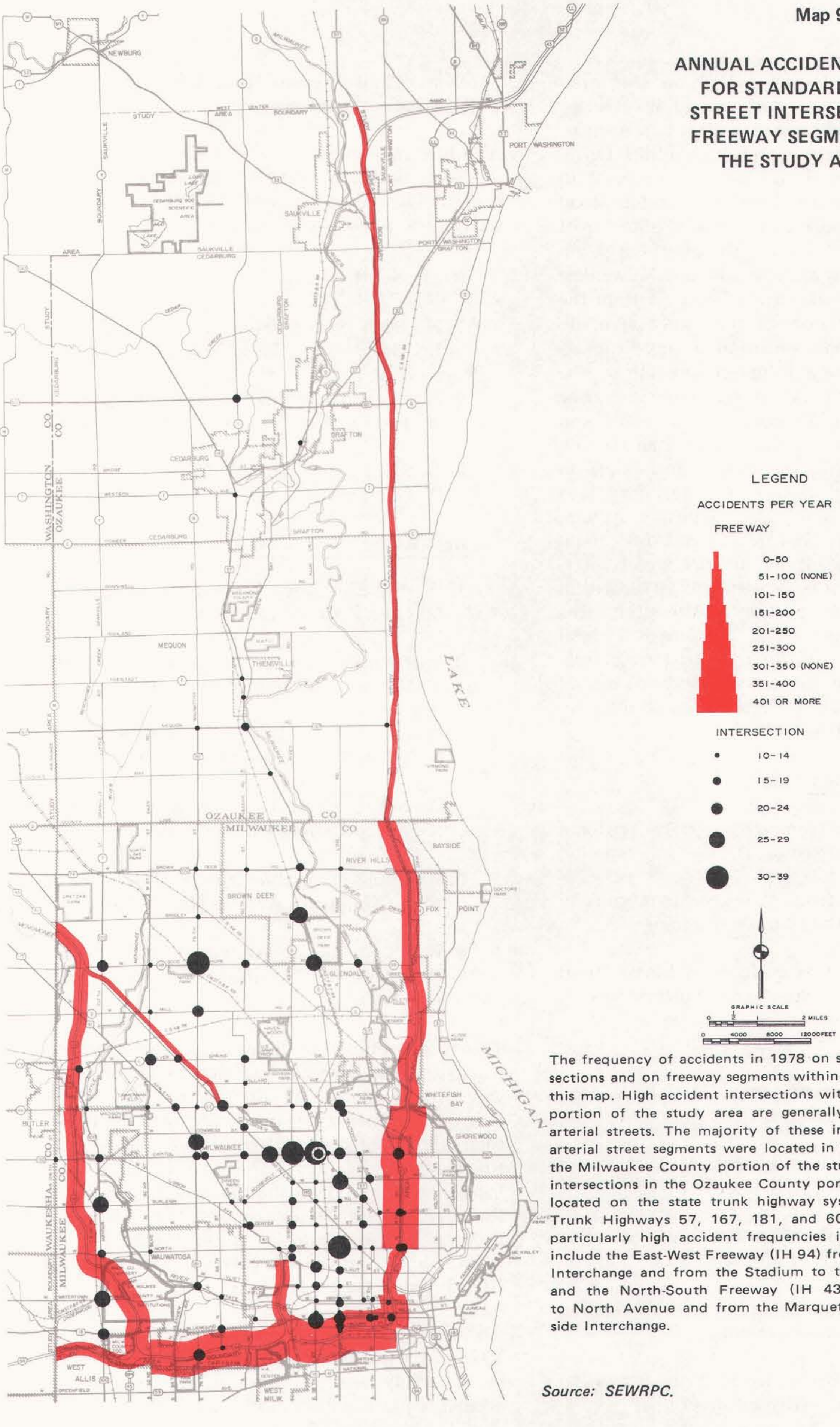
The sixth objective formulated under the study asserts the need to reduce accident exposure and provide increased travel safety within the study area. This objective is supported by three standards, two of which may be used to identify problems on the existing transportation system of the study area.

Traffic Accident Exposure: The first standard under this objective specifies that travel on facilities exhibiting the lowest accident exposure should be maximized so as to reduce the number of travel accidents in northwestern Milwaukee County and southern Ozaukee County. Accident exposure problems on the existing arterial street and highway system of the study area were defined for the year 1978. The total number, or frequency, of accidents in 1978 for each standard arterial street intersection and freeway segment within the study area is shown on Map 95.

The standard arterial street intersections within the study area have been stratified into six accident frequency categories, as shown on Map 95, the most serious of which is 30 to 39 accidents occurring per year at the intersection. At no standard arterial street intersection in the study area were there 40 or more accidents in 1978. At four intersections, between 30 and 39 accidents occurred in 1978: N. 76th Street and W. Good Hope Road, N. Sherman Boulevard and W. Capitol Drive, N. 35th Street and W. Capitol Drive, and N. 27th Street and W. North Avenue. Between 25 and

Map 95

ANNUAL ACCIDENT FREQUENCY FOR STANDARD ARTERIAL STREET INTERSECTIONS AND FREEWAY SEGMENTS WITHIN THE STUDY AREA: 1978



The frequency of accidents in 1978 on surface arterial street intersections and on freeway segments within the study area is shown on this map. High accident intersections within the Milwaukee County portion of the study area are generally located along congested arterial streets. The majority of these intersections and associated arterial street segments were located in the southeastern corner of the Milwaukee County portion of the study area. All high accident intersections in the Ozaukee County portion of the study area were located on the state trunk highway system, specifically on State Trunk Highways 57, 167, 181, and 60. Freeway segments with particularly high accident frequencies in the study area in 1978 include the East-West Freeway (IH 94) from the Zoo to the Stadium Interchange and from the Stadium to the Marquette Interchange, and the North-South Freeway (IH 43) from Hampton Avenue to North Avenue and from the Marquette Interchange to the Hillside Interchange.

Source: SEWRPC.

29 accidents occurred during 1978 at the intersections of: N. Teutonia Avenue and W. Bradley Road, N. 76th Street and W. Appleton Avenue, W. Fond du Lac Avenue and W. Capitol Drive, N. Mayfair Road and W. Burleigh Street, N. 27th Street and W. Townsend Street, N. Mayfair Road and W. Watertown Plank Road, and N. 35th Street and W. Wisconsin Avenue. All of these high-accident intersections were within the Milwaukee County portion of the study area. Within the Ozaukee County portion of the study area, no more than 19 accidents occurred at any intersection in 1978. At nine intersections, all in the urbanized portion of the study area, including the City of Mequon, Villages of Thiensville and Grafton, and City of Cedarburg, more than 10 accidents occurred in 1978. All these intersections in the Ozaukee County, portion of the study area were located on the state trunk highway system, specifically STH 57, 167, 181, and 60. High-accident intersections, those arterial street intersections with 10 or more accidents in 1978, within the Milwaukee County portion of the study area are generally located along particular arterial streets. The majority of these arterial street segments are located in the southeastern corner of the Milwaukee County portion of the study area. These street segments are:

North-South Streets

1. N. 27th Street from IH 94 to N. Teutonia Avenue (14 intersections).

2. N. 35th Street from W. Wisconsin Avenue to W. Capitol Drive (10 intersections).

3. N. Sherman Boulevard from W. Lloyd Street to W. Hampton Avenue (seven intersections).

East-West Streets (including diagonals)

1. W. Wisconsin Avenue from IH 43 to N. 35th Street (five intersections).

2. W. Highland Boulevard from N. 17th Street to W. Vliet Street (five intersections).

3. W. Lisbon Avenue from N. Walnut Street to N. 47th Street (four intersections).

4. W. North Avenue from IH 43 to W. Lisbon Avenue (seven intersections).

5. W. Burleigh Street from 27th Street to Appleton Avenue (five intersections).

6. W. Capitol Drive from IH 43 to N. 60th Street (nine intersections).

Another concentration of standard arterial street segments with a number of high-accident intersections is located in the west-central portion of the study area. These segments are:

North-South Streets

1. N. 60th Street from W. Center Street to W. Good Hope Road (eight intersections).

2. N. 76th Street from W. Lisbon Avenue to W. Brown Deer Road (eight intersections).

3. N. 92nd Street from W. Hampton Avenue to W. Good Hope Road (four intersections).

East-West Streets (including diagonals)

1. W. Capitol Drive from N. 60th Street to Mayfair Road (four intersections).

2. W. Hampton Avenue from N. 60th Street to N. Mayfair Road (three intersections).

3. W. Good Hope Road from N. 60th Street to N. 107th Street (four intersections).

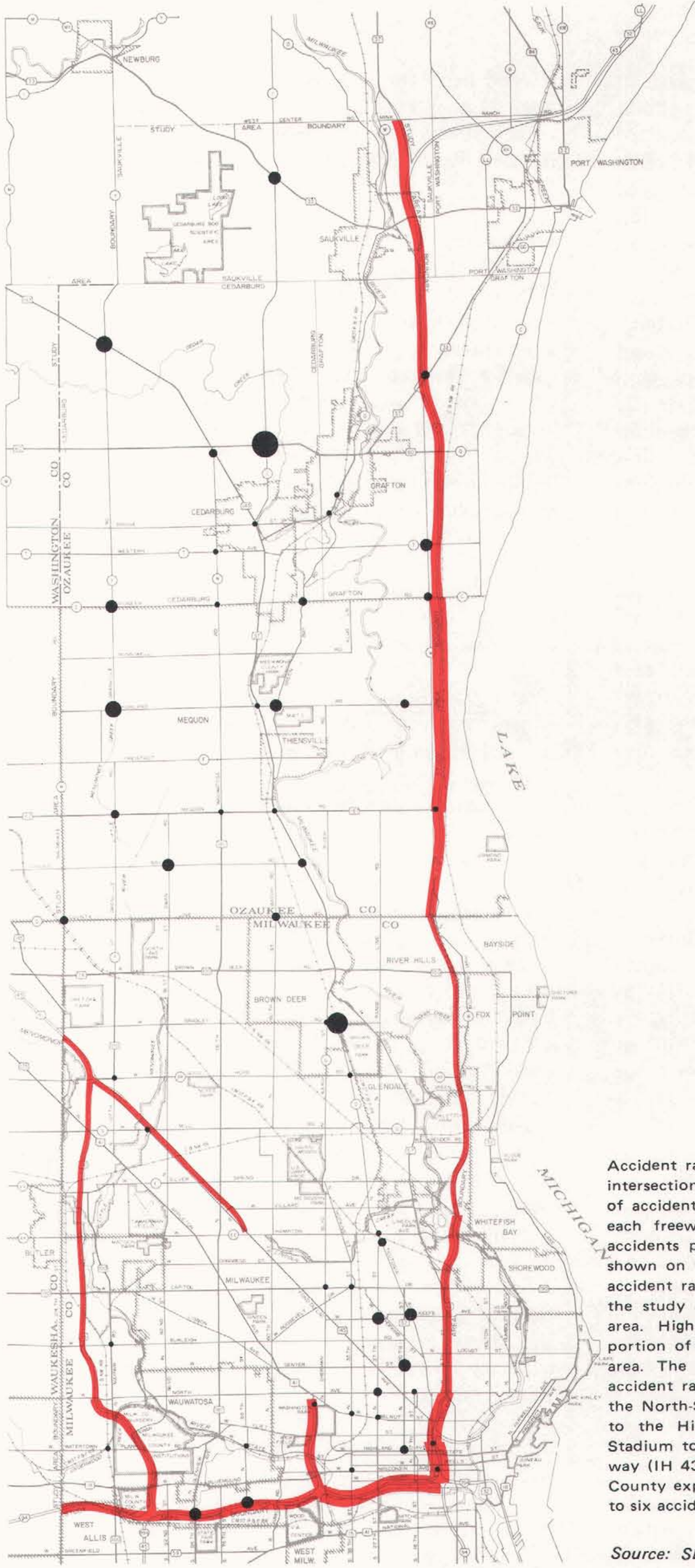
4. W. Silver Spring Drive from N. 60th Street to N. 92nd Street (three intersections).

5. W. Appleton Avenue from W. Lisbon Avenue to W. Hampton Avenue (five intersections).

6. W. Fond du Lac Avenue from N. Sherman Boulevard to N. 68th Street (three intersections).

The total number of freeway accidents per freeway segment, generally defined as between freeway interchanges, is also shown on Map 95. Freeway segments in the study area with more than 350 accidents in 1978 include the East-West Freeway (IH 94) from the Zoo to the Stadium Interchange and from the Stadium Interchange to the Marquette Interchange, and the North-South Freeway (IH 43) from Hampton Avenue to North Avenue and from the Marquette Interchange to the Hillside Interchange.

Accident rates are shown on Map 96 for the year 1978 for each standard arterial street intersection in the study area in terms of the frequency of accidents per hundred million vehicles entering the



Map 96

ANNUAL ACCIDENT RATE FOR STANDARD ARTERIAL STREET INTERSECTIONS AND FREEWAY SEGMENTS WITHIN THE STUDY AREA: 1978

LEGEND

ACCIDENTS PER MILLION VEHICLE MILES OF FREEWAY TRAVEL

0.0 TO 1.9
2.0 TO 2.9
3.0 TO 3.9
4.0 OR MORE

ACCIDENTS PER HUNDRED MILLION VEHICLES ENTERING INTERSECTION

200 TO 249
250 TO 299
300 TO 399
400 TO 499
500 TO 599
600 OR MORE

GRAPHIC SCALE
0 1 2 MILES
0 4000 8000 12000 FEET

Accident rates for the year 1978 for each standard arterial street intersection in the study area, expressed in terms of the frequency of accidents per million vehicles entering an intersection, and for each freeway segment, expressed in terms of the frequency of accidents per million vehicle miles of travel on that segment, are shown on this map. Surface arterial street intersections with high accident rates were as prevalent in the Ozaukee County portion of the study area as in the Milwaukee County portion of the study area. High accident rate intersections in the Ozaukee County portion of the study area were generally scattered throughout the area. The freeway segment in the study area with the highest accident rate, six or more accidents per million vehicle miles, was the North-South Freeway (IH 43) from the Marquette Interchange to the Hillside Interchange. The East-West Freeway from the Stadium to the Marquette Interchange, and the North-South Freeway (IH 43) from Mequon Road (STH 167) to CTH C in Ozaukee County experienced the next highest accident rate in 1978, or four to six accidents per million vehicle miles.

Source: SEWRPC.

intersection, and for each freeway segment in terms of the frequency of accidents per million vehicle miles of travel on the segment. Standard arterial street intersections with high accident rates are as prevalent in the Ozaukee County portion of the study area as in the Milwaukee County portion of the study area. The high-accident rate locations in the Ozaukee County study area portion are generally scattered, and, for the most part, have noticeably higher accident rates than such locations in Milwaukee County. Standard arterial street intersections within the Ozaukee County portion of the study area with 400 or more accidents per hundred million vehicles entering the intersection include: STH 60 and CTH I in the Town of Cedarburg; STH 43, CTH Y, and Pleasant Valley Road in the Town of Cedarburg; and Highland Road and Granville Road in the City of Mequon.

At only one intersection within the Milwaukee County portion of the study area were there more than 400 accidents per hundred million vehicles entering the intersection: N. Teutonia Avenue and Bradley Road. The major standard arterial street intersections with high accident rates in the Milwaukee County portion of the study area are also concentrated in its southeastern corner.

The freeway segment in the study area with the highest accident rate, six or more accidents per million vehicle miles, was the North-South Freeway (IH 43) from the Marquette Interchange to the Hillside Interchange. The East-West Freeway from the Stadium Interchange to the Marquette Interchange and the North-South Freeway (IH 43) from Mequon Road (STH 167) to CTH C in Ozaukee County experienced the next highest accident rate in 1978, four to six accidents per million vehicle miles.

Those standard arterial street intersections which exceeded both the average accident frequency and the average accident rate for all standard arterial street intersections in the study area are shown on Map 97. The average frequency of accidents in the year 1978 for standard arterial street intersections in the study area was eight, and the average accident rate for standard arterial street intersections in the study area was 126.5 accidents per 100 million vehicles entering the intersection. As shown on Map 97, those standard arterial street intersections with both an above average frequency and above average rate of accidents are concentrated in the southeastern part of the Milwaukee County portion of the study area. The intersections which exceed both the average frequency and the average rate of accidents in the Ozaukee County portion of the study area are largely located along STH 57 in the City of Mequon, Village of Thiensville, and City of Cedarburg.

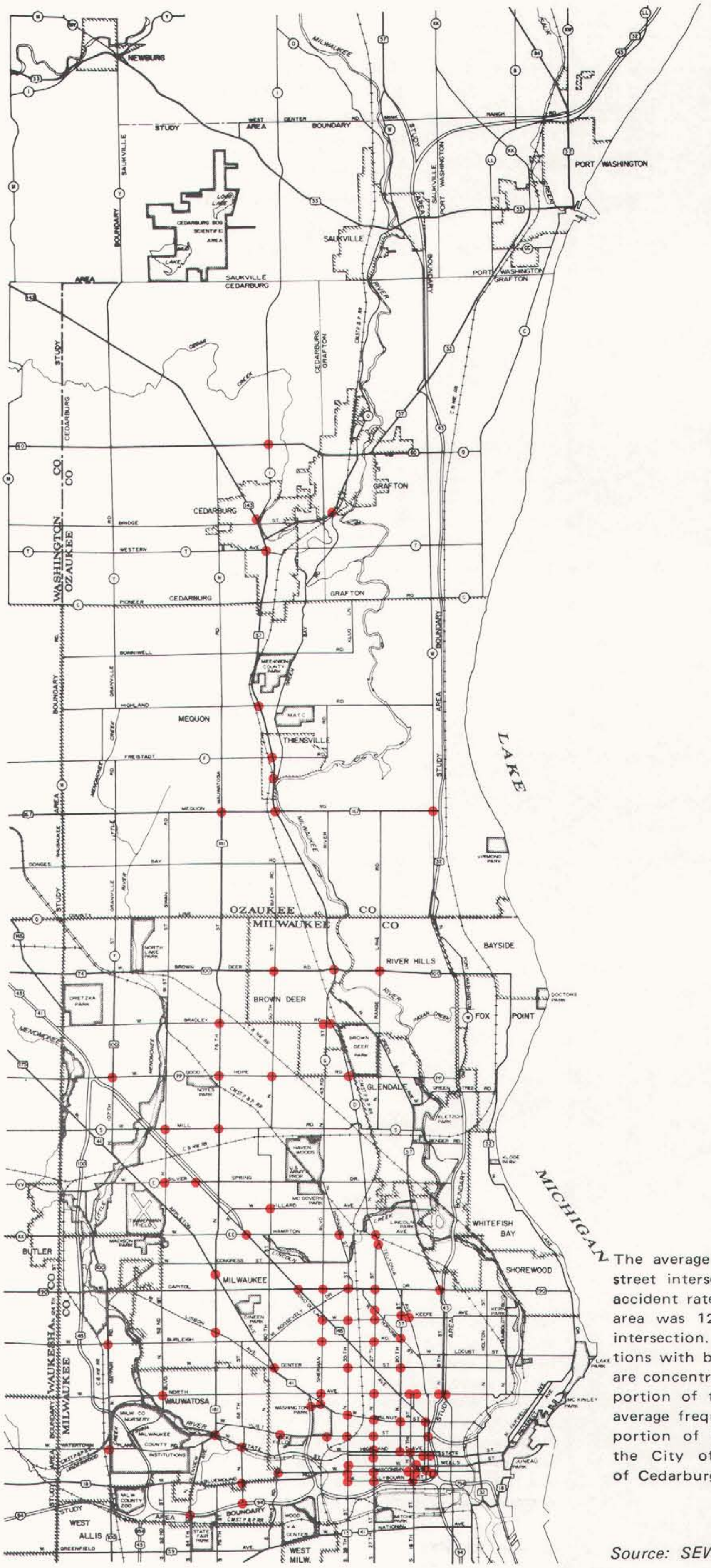
Shown on Map 98 are the segments of standard arterial streets between intersections within the City of Milwaukee portion of the study area that exceeded both the average accident frequency and the average accident rate in 1978. Standard arterial street segments in the City of Milwaukee portion of the study area experienced an average of eight accidents in 1978, and the accidents occurred at an average rate of 1,042 accidents per 100 million vehicle miles on the segment. As shown on Map 98, the arterial street segments which exceeded both the average accident frequency and the average accident rate within the City of Milwaukee portion of the study area in 1978 are concentrated in that portion of the City which occupies the extreme southeastern portion of the study area.

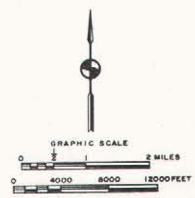
Traffic Conflicts: The second standard under this objective requires that the proportion of the total arterial street and highway system operating at or over design capacity during morning and evening peak travel hours be minimized in order to minimize traffic conflicts and congestion, thereby reducing the traffic accident potential. Maps 32 and 33 in Chapter III indicate those segments of the arterial street and highway system of the study area which operated at or over design capacity during the morning and the evening peak travel hour, respectively. As shown on Maps 32 and 33 and summarized in Table 27 in Chapter III, about 13 percent of the study area arterial street system, or 57 miles, was operating over design capacity during the peak travel hours and experiencing traffic conflicts and congestion. About 8 percent of the study area arterial system, or 36 miles, was operating at design capacity during each of the peak travel hours. Most of the arterial street mileage in the study area operating over design capacity in the peak travel hours, about 56 miles of a total 57 miles, was located within the Milwaukee County portion of the study area, as was most of the study area street mileage operating at design capacity during the peak travel hours, about 35 of a total 36 miles.

Summary and Conclusions: This sixth transportation system management and development objective for the northwest side study sets forth the need for a transportation system which reduces

Map 97

STANDARD ARTERIAL STREET INTERSECTIONS WITHIN THE STUDY AREA EXCEEDING BOTH THE AVERAGE ACCIDENT FREQUENCY AND THE AVERAGE ACCIDENT RATE: 1978



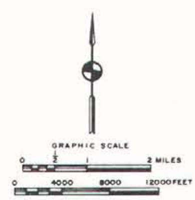


The average frequency of accidents in 1978 for standard arterial street intersections in the study area was eight, and the average accident rate for standard arterial street intersections in the study area was 126.5 accidents per 100 million vehicles entering the intersection. As shown on this map, those arterial street intersections with both above average frequency of and rate of accidents are concentrated in the southeastern part of the Milwaukee County portion of the study area. The intersections which exceed both average frequency of and rate of accidents in the Ozaukee County portion of the study area are largely located along STH 57 in the City of Mequon, the Village of Thiensville, and the City of Cedarburg.

Source: SEWRPC.

Map 98

STANDARD ARTERIAL STREET SEGMENTS WITHIN THE CITY OF MILWAUKEE PORTION OF THE STUDY AREA EXCEEDING BOTH THE AVERAGE ACCIDENT FREQUENCY AND THE AVERAGE ACCIDENT RATE: 1978



This map shows those segments of arterial streets within the City of Milwaukee portion of the study area which exceeded both the average accident frequency and average accident rate in 1978. Standard arterial street segments in the City of Milwaukee portion of the study area experienced an average of eight accidents, and the rate at which such accidents occurred was 1,042 accidents per 100 million vehicle miles on the arterial segment. Those arterial street segments within the City of Milwaukee portion of the study area which in 1978 exceeded both the average accident frequency and rate are concentrated in that portion of the City occupying the extreme southeastern portion of the study area.

Source: SEWRPC.

traffic accident exposure and provides for increased travel safety. Current traffic safety problems, measured in terms of accident frequency on standard arterial street intersections and freeway segments, were concentrated in the southern, and particularly southeastern, parts of the Milwaukee County portion of the study area in 1978. This is the same part of the study area wherein a high potential for increased traffic conflicts and accidents was identified.

Deficiencies in the Existing Transportation System in the Provision of Transportation Facilities With a High Aesthetic Quality

The seventh and last objective formulated under the study recognizes the need for beauty in the environment for the physical and mental health and well being of people in the study area. Transportation facilities are major and ubiquitous features of the land- and cityscape and therefore have a significant impact on the attractiveness of the environment. This objective and its supporting standards are principally directed toward consideration of new or improved transportation facilities, specifying that such facilities should be located so as to avoid the destruction of visually pleasing buildings, structures, natural features and vistas to natural features, and should be designed to complement the aesthetic quality of the area through which they pass. The principal intended use of this objective is to guide alternative plan design and evaluation, not problem identification, as well as to provide guidelines for use in the implementation of plan recommendations. In addition, it is very difficult to quantitatively identify aesthetic problems related to the existing transportation system. These problems must be identified through the involvement of the resident population of the study area.

PRELIMINARY CONCLUSIONS BASED UPON OBJECTIVE DEFINITION OF PROBLEMS

The seven transportation system management and development objectives adopted for the Milwaukee Northwest Side/Ozaukee County transportation improvement study represent a formal definition of the basic transportation needs of the northwestern Milwaukee County and southern Ozaukee County study area. These basic transportation needs include accessibility to land use; economic and energy efficiency; safety; quick and convenient travel; minimum disruption of community and natural resource base; an appropriate range of available services; and aesthetics.

The current transportation problems of the study area were identified by determining how well the quantitative standards supporting the objectives were being met by the existing transportation system in the study area. Land use accessibility problems in the study area have been determined to be limited principally to the transit system of the area. Only in limited parts of the existing transit service area within the study area is the suggested level of accessibility to retail and service centers, park and outdoor recreation areas, and a scheduled air transport facility met. No part of the study area meets the desirable level of accessibility to employment opportunities by transit. The only highway accessibility problem relates to the current relative levels of accessibility now provided by the transportation system and the relative intensity of land use development recommended within the study area. Although the southeastern portion of the study area is recommended for continued high-density development, it is provided a lower level of highway accessibility than other high- and medium-density development in the study area.

This extreme southeastern portion of the study area also has transportation problems, relative to the remainder of the study area, with respect to economic and energy efficiency and disruption of the community and the natural resource base. Operating costs per mile to the user of the arterial street system and public transit system in this portion of the study area are significantly higher. In addition, there are substantially greater concentrations of arterial facilities with operating speeds that result in inefficient fuel consumption, and with the potential to generate annoying noise levels. Ambient air quality concentrations of particulate matter and carbon monoxide emissions in this portion of the study area have been estimated to exceed primary and secondary standards promulgated for the protection of public health, safety, and welfare.

Problems have also been identified in the southeastern portion of the study area concerning the provision of quick and convenient travel. Public transit routes in this area do not operate even at minimum overall travel speeds during nonpeak travel hours. Congested highway facilities in the study area which preclude quick and efficient travel by private automobile during morning and evening peak travel hours are concentrated in the entire southern two-thirds of the Milwaukee

County portion of the study area, which includes this extreme southeastern portion of the study area. Traffic accidents and traffic conflicts similarly have been noted to be concentrated in the southeastern portion of the study area, as well as in the entire southern two-thirds of the Milwaukee County portion of the study area. And importantly, the basic provision of transportation facilities and services, including arterial streets and highways, primary and secondary transit, and local transit, has been found to be inadequate in the southern two-thirds of the Milwaukee County portion of the study area, based on suggested levels of arterial street and public transit route spacing and location.

The existing transportation system problems of the northwest side study area can be more specifically defined in terms of the arterial streets and highways within the study area which have a severe traffic problem. Fourteen arterial reaches have been identified as having traffic problems (see Table 45). These 14 arterial reaches exhibit at least one, and in some segments a combination, of the following traffic congestion symptoms: over-design-capacity operation during either the morning or evening peak hour or both; substandard operating speeds—that is, operating speeds below 25 mph on divided facilities and below 20 mph on undivided facilities; and the presence of high-accident locations—that is, intersections experiencing 10 or more accidents in 1978.

Within these 14 arterial reaches, five segments can be identified as having the most severe traffic problems, as shown on Map 99. These are that portion of N. 76th Street between W. Good Hope Road and W. Bradley Road, including the intersection with W. Good Hope Road; that portion of N. 76th Street between W. Appleton Avenue and W. Capitol Drive, including the intersection with W. Appleton Avenue; that portion of N. Mayfair Road between the East-West Freeway and Watertown Plank Road, including the intersection with Watertown Plank Road; that portion of W. Capitol Drive between Sherman Boulevard and N. 35th Street, including the intersections with Sherman Boulevard and N. 35th Street; and that portion of W. Sherman Boulevard between Congress Street and W. Capitol Drive, including the intersection with W. Capitol Drive. These five arterial segments operate over design capacity during both the morning and evening peak hours, exhibit substandard operating speeds, and include at least one intersection that experienced 25 or more accidents during 1978. Twelve of the 14 arterial reaches with traffic problems are located within the southeastern and south-central parts of the Milwaukee County portion of the study area. This is the same spatial concentration of arterial reaches within the study area which has streets exhibiting inefficient fuel utilization, higher user operating costs, and areas where suggested levels of arterial street spacing have not been provided. Four freeway segments with particularly severe transportation problems—that is, severe congestion during both the morning and evening peak hours and a high frequency of accidents (at least 200 in 1978)—can also be identified (see Map 99). These segments generally bound the southern portion of the study area and include: the Zoo Freeway (USH 45) from W. North Avenue to W. Wisconsin Avenue; the East-West Freeway (IH 94) from the Zoo Interchange to the Stadium Interchange; the East-West Freeway (IH 94) from N. 35th Street to the Marquette Interchange; and the North-South Freeway (IH 43) from W. North Avenue to W. Hampton Avenue.

The problems of the public transit system in the northwest side study area cannot be identified by specific existing routes because, unlike the study area arterial streets, the public transit routes as now designed and operated in the study area do not individually exhibit a combination of problems, such as substandard speeds, low frequency of service, and excessive load factors. The public transit problems in the study area can rather be attributed to a more basic lack of certain types of service in some parts of the study area. Within parts of the southeastern portion of the study area, as shown on Map 100, only local transit service, and no primary or secondary service, is operated. This is significant, because local service in this part of the study area currently operates at substandard speeds. In the outlying portion of the Milwaukee transit service area within the study area, there are inadequacies in the provision of all three types of transit service: primary, secondary, and local. Secondary or express transit service is provided only in the southeastern portion of the City of Milwaukee. Primary transit service is limited to peak travel periods of the weekday and to a small number of stops principally in the Milwaukee central business district and in outlying suburban shopping centers. These transit service problems in this part of the study area are reflected by high average overall travel time ratios between comparable public transit and arterial highway trips; a higher number of transfers required per transit trip than in the other portions of the study area served by transit; and generally low levels of public transit accessibility to major land use activities.

Table 45

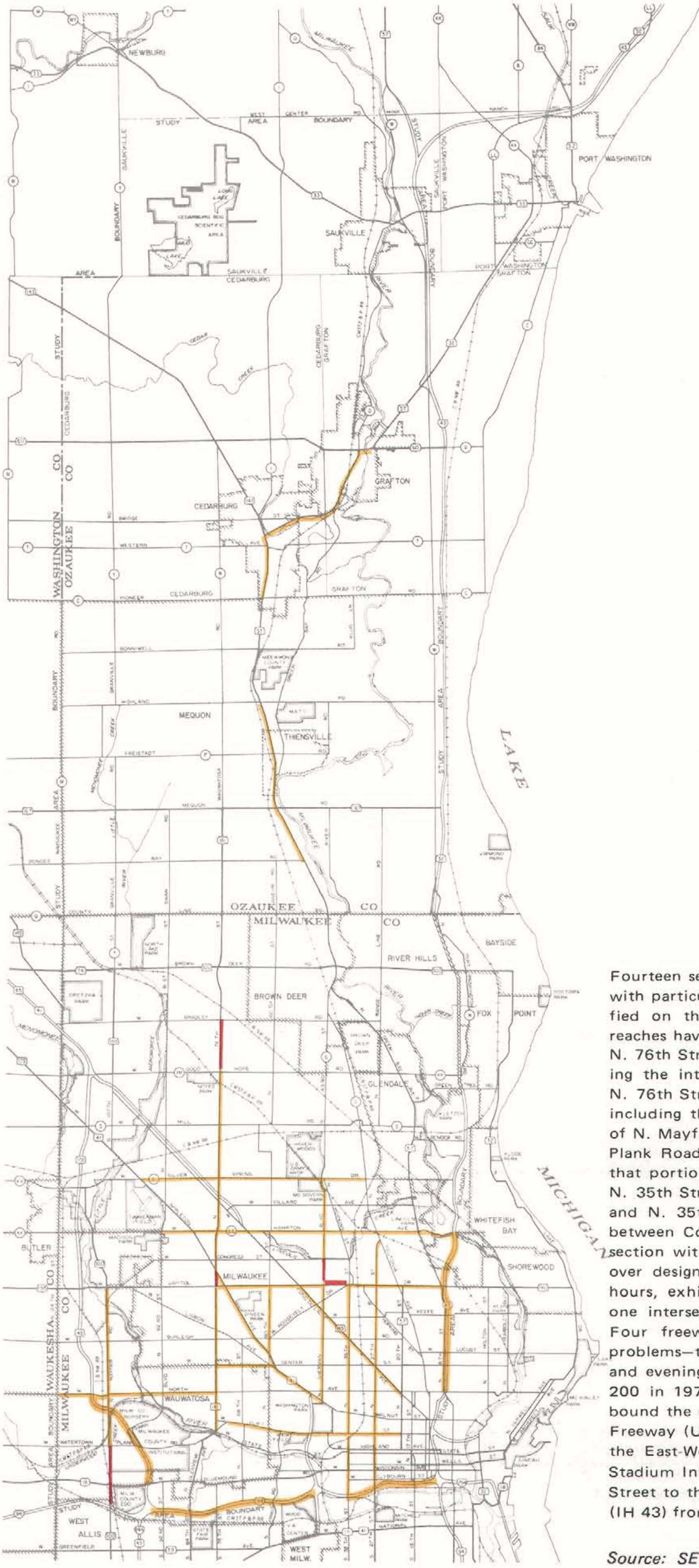
STANDARD ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA EXHIBITING SEVERE TRANSPORTATION PROBLEMS: 1978

Study Area Standard Arterial Streets and Highways	Length (miles)	Percent of Study Area Portion Arterial System	Percent of Total Study Area Arterial System
Milwaukee County Portion			
N. 76th Street from W. Harwood Avenue to W. Bradley Road	8.0	3.0	1.8
W. Capitol Drive from N. 76th Street to the North-South Freeway (IH 43)	4.4	1.6	1.0
N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive	4.3	1.6	1.0
N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive	4.4	1.6	1.0
W. Silver Spring Drive from W. Appleton Avenue to N. Teutonia Avenue	4.1	1.5	1.0
N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive	4.0	1.5	1.0
N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue	4.8	1.8	1.0
W. Vliet Street and Milwaukee Avenue from N. 20th Street to Harwood Avenue	3.4	1.2	0.8
Related street segments proceeding from the terminus of the Stadium Freeway-North "stub end" including W. Lisbon Avenue from N. Sherman Boulevard to its intersection with N. 60th Street, W. Center Street from its intersection with W. Lisbon Avenue to N. 76th Street, N. 60th Street from its intersection with W. Center Street to W. Capitol Drive, and W. Appleton Avenue from its intersection with W. Lisbon Avenue to N. 76th Street	5.9	2.2	1.4
W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43)	5.6	2.0	1.2
W. Fond du Lac Avenue from N. 20th Street to W. Capitol Drive	2.8	1.0	0.6
W. North Avenue from N. 124th Street to N. 76th Street	3.0	1.0	0.6
Subtotal	54.7	20.0	12.4
Ozaukee County Portion			
STH 57 from Donges Bay Road to Highland Road	3.2	2.0	0.8
STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57)	4.0	2.4	0.8
Subtotal	7.2	4.4	1.6
Total Arterial Streets	61.9	- -	14.0
Freeway Portions			
Zoo Freeway (USH 45) from W. North Avenue to W. Wisconsin Avenue	2.2	0.8	0.5
East-West Freeway (IH 94) from Zoo Interchange to the Stadium Interchange	3.2	1.2	0.7
East-West Freeway (IH 94) from N. 35th Street to the Marquette Interchange	1.8	0.7	0.4
North-South Freeway (IH 43) from W. North Avenue to W. Hampton Avenue	3.0	1.1	0.7
Total Freeways	10.2	3.8	2.3

Source: SEWRPC.

Map 99

STANDARD ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA EXHIBITING SEVERE TRANSPORTATION PROBLEMS: 1978



LEGEND

FREEWAY SYSTEM

PROBLEM REACH

STANDARD ARTERIAL STREET SYSTEM

SEVERE SEGMENT WITHIN PROBLEM REACH

PROBLEM REACH

GRAPHIC SCALE

0 1 2 MILES

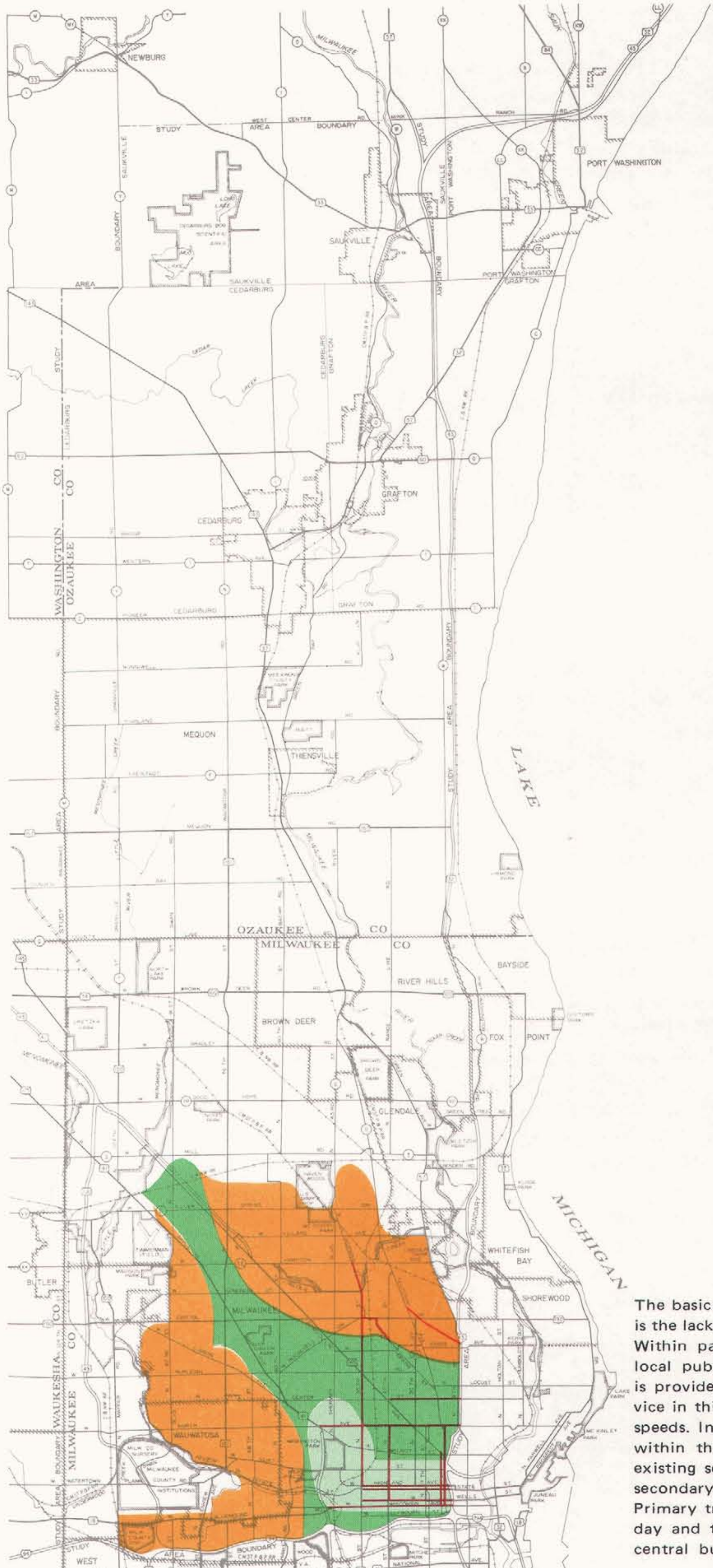
0 4000 8000 12000 FEET

Fourteen segments of arterial streets and highways in the study area with particularly severe transportation problems in 1978 are identified on this map. Those five segments within these 14 arterial reaches having the most severe traffic problems are that portion of N. 76th Street between W. Good Hope and W. Bradley Road including the intersection with W. Good Hope Road; that portion of N. 76th Street between W. Appleton Avenue and W. Capitol Drive including the intersection with W. Appleton Avenue; that portion of N. Mayfair Road between the East-West Freeway and Watertown Plank Road including the intersection with Watertown Plank Road; that portion of W. Capitol Drive between Sherman Boulevard and N. 35th Street including the intersections with Sherman Boulevard and N. 35th Street; and that portion of W. Sherman Boulevard between Congress Street and W. Capitol Drive including the intersection with W. Capitol Drive. These five arterial segments operate over design capacity during both the morning and evening peak hours, exhibit substandard operating speeds, and include at least one intersection experiencing 25 or more accidents during 1978. Four freeway segments with particularly severe transportation problems—that is, having severe congestion during both morning and evening peak hours and a high frequency of accidents, at least 200 in 1978—have also been identified. These segments generally bound the southern portion of the study area and include the Zoo Freeway (USH 45) from W. North Avenue to W. Wisconsin Avenue; the East-West Freeway (IH 94) from the Zoo Interchange to the Stadium Interchange; the East-West Freeway (IH 94) from N. 35th Street to the Marquette Interchange; and the North-South Freeway (IH 43) from W. North Avenue to W. Hampton Avenue.

Source: SEWRPC.

Map 100

PORTIONS OF THE STUDY AREA EXHIBITING PUBLIC TRANSIT PROBLEMS: 1978



LEGEND

- HIGH DENSITY URBAN AREA NOT SERVED BY PRIMARY TRANSIT
- HIGH DENSITY URBAN AREA NOT SERVED BY SECONDARY TRANSIT
- HIGH DENSITY URBAN AREA NOT SERVED BY EITHER PRIMARY OR SECONDARY TRANSIT
- TERTIARY PUBLIC TRANSIT ROUTE WITHIN THE STUDY AREA OPERATING BELOW MINIMUM SUGGESTED OVERALL SPEEDS ON AN AVERAGE WEEKDAY

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

The basic problem of public transit in the northwest side study area is the lack of certain types of service in some parts of the study area. Within parts of the southeastern portion of the study area, only local public transit service, and no primary or secondary service, is provided. This fact is significant because local public transit service in this part of the study area currently operates at substandard speeds. In the outlying portion of the Milwaukee transit service area within the study area, there are inadequacies in the provision of existing service with respect to all three types of service: primary, secondary, and local. No secondary or express service is provided. Primary transit service is limited to peak travel periods of the weekday and to a small number of stops, principally in the Milwaukee central business district and outlying suburban shopping centers.

Source: SEWRPC.

The City of Milwaukee Department of Public Works added to the list of problems identified under the study through a separate but concurrently conducted and coordinated study which focused on traffic accident frequencies and rates for arterial street segments and intersections within the City of Milwaukee. Eight additional problem segments were so identified by the City of Milwaukee Department of Public Works Study:

1. W. North Avenue from N. 27th Street to the North-South Freeway—IH 43—(1.2 miles);

2. W. Lisbon Avenue from N. Sherman Boulevard to W. Walnut Street (1.3 miles);

3. W. Wisconsin Avenue from N. 35th Street to N. 16th Street (1.2 miles);

4. W. Fond du Lac Avenue from W. Capitol Drive to N. 60th Street (0.8 mile);

5. N. 20th Street from W. Hopkins Street to W. North Avenue (1.0 mile);

6. N. 107th Street from W. Good Hope Road to W. Brown Deer Road (2.0 miles);

7. W. Brown Deer Road from N. 91st Street to N. 76th Street (1.0 mile); and

8. W. Good Hope Road from N. Sherman Boulevard to N. 76th Street (2.0 miles).

RESULTS OF PUBLIC REVIEW OF DEFINED STUDY AREA TRANSPORTATION PROBLEMS

The transportation problems of the study area as identified in a preliminary manner by evaluation of the performance of the existing transportation system in light of the agreed-upon system performance objectives and standards was the subject of three public informational meetings held by the Commission in the months of September and November of 1979. The schedule and location of the meetings are provided below:

Ozaukee County

September 19, 1979
7:00 p.m.
Webster Transitional School
Cedarburg, Wisconsin

Milwaukee County

November 13, 1979
7:00 p.m.
Martin Luther King Center
1531 W. Vliet Street
City of Milwaukee

November 15, 1979
7:00 p.m.
Custer Senior High School
5075 N. Sherman Boulevard
City of Milwaukee

Prior to the meeting, the Commission prepared and widely distributed a SEWRPC Newsletter (Volume 19, No. 4), which presented in summary form the existing study area transportation system problems, as identified in a preliminary manner. Importantly, community groups within the study area believed to be interested in transportation issues were contacted prior to the public informational meetings with a mailing which was distributed with the Newsletter. In the mailing, the Regional Planning Commission staff offered to make a presentation to the group of the information presented in the Newsletter prior to the public informational meetings. The following groups received this mailing:

Appleton Avenue N.W. Advancement Association
Bluemound Business Advancement Association
Calvary Housing Development Ltd.
Central City Churches
Church, Inc.
Citizen's Regional Environmental Coalition
Cooperation West Side Association
Council on Urban Life
Harambee Ombudsperson
Inner City Development Project
Interfaith Central City Churches
Metro Milwaukee Fair Housing Council
Midtown Neighborhood Association
Milwaukee Associates in Urban Development
Milwaukee Tenants Union
Milwaukee Urban League
Neighborhood House of Milwaukee
Next Door Foundation
Northcott Neighborhood House
North Side Community Design Center
Northwest Action Council
North/West Businessmen's Association
Organization of Organizations

Park West Redevelopment Task Force
Senior Action Coalition
Sherman Park Community Association
State Street Advancement Association
University of Wisconsin-Extension
Upper Center Street Business Association
West North Avenue Advancement Association
West Side Community Center
West Side Home Buyers Clinic

While public attendance and interest in the public informational meeting held in the Ozaukee County portion of the study area was high, the lack of public attendance and interest in the two meetings held in the Milwaukee County portion of the study area was disappointing, although expected. However, constructive comments were derived from both the Milwaukee County and Ozaukee County sessions. The following discussion summarizes the public reaction to the preliminary definition of existing study area transportation problems at the three informational meetings.

Ozaukee County Public Informational Meeting

At the public informational meeting held in Ozaukee County, general support was expressed for the preliminary definition of existing arterial street and highway problems in the area. At that meeting, a number of elected officials noted severe transportation problems on STH 57, particularly through the City of Cedarburg and Village of Grafton in Ozaukee County. The problems of STH 57 in Ozaukee County were also identified by a number of other elected officials at the meeting through their proposal of the use of STH 181 and CTH N, Wauwatosa Road, as an alternative routing to STH 57 if Wauwatosa Road were widened. County Board Supervisor William F. Kachel, supported by County Board Supervisor James L. Swan, urged immediate action toward additional right-of-way preservation for an improved Wauwatosa Road in Ozaukee County. Current traffic congestion and travel safety problems on STH 181, Wauwatosa Road, were also identified by citizens at the meeting. Also pointed out at the meeting were traffic problems on STH 60 in Ozaukee County. Two major street intersections on STH 60 were noted as being unsafe, consistent with the preliminary problem identification. These are the intersection of STH 60 with STH 143 and CTH N, and the intersection of STH 60 and CTH I. A number of citizens also indicated a potential need for public transit in the urbanized portion of Ozaukee County, which was noted as being inadequate in the problem definition.

Milwaukee County Public Informational Meetings

At the first public informational meeting in Milwaukee County, which was held in the extreme southern portion of the study area, citizens expressed a need to take advantage of a perceived underutilized potential of existing divided and widened standard surface arterials in the northwest side study area. Specific surface arterials identified were Highland Avenue from 27th Street to Vliet Street, 60th Street from Capitol Drive to Florist Avenue, Green Bay Road from Capitol Drive to Silver Spring, and Appleton Avenue from the Zoo Freeway (USH 45) to Burleigh Street. The substantial industrial refurbishment and redevelopment which had taken place along the Milwaukee Road railroad corridor at 30th Street between North Avenue and Burleigh Street was noted at the meeting, and the provision of more convenient public transit service to this area through a circulation/distribution public transit shuttle operation was suggested. Also suggested was the establishment of a "transportation center" at the intersection of North Avenue and Fond du Lac Avenue to facilitate intercity passenger transportation by motorcoach and railroad from the northwest side study area.

At the second public informational meeting in Milwaukee County, concern was expressed by public officials and citizens over the existing transportation problems of the northwestern part of the Milwaukee County portion of the study area. General support for the preliminary definition of arterial street problems in the area was expressed, particularly for those problems identified along 76th Street from Bradley Road to Silver Spring Drive. Also expressed was a belief that these problems were sufficiently severe to require the implementation of transportation systems management measures along 76th Street northerly beyond Bradley Road to County Line Road, the construction of a new north-south arterial street along 68th Street from Brown Deer Road to Florist Avenue, the widening of 91st Street from Mill Road to Brown Deer Road, the extension of County Line Road through the construction of a bridge across the Milwaukee River, the improvement of Brown Deer Road between Green Bay Road and the North-South Freeway

(IH 43), and the improvement of Bradley Road from 124th Street to the North-South Freeway (IH 43). Also expressed at that meeting was a need for transit service in scattered medium- and high-density residential development and in the developing City of Milwaukee industrial land bank in the northwestern part of the Milwaukee County portion of the study area.

SUMMARY AND CONCLUSIONS

The current problems and deficiencies of the transportation system of the Milwaukee Northwest Side/Ozaukee County transportation improvement study area have been identified in this chapter. This identification is an important step in the northwest side study because the short-range transportation system improvement plans to be prepared under the study will be directed toward alleviation of the most severe problems identified. This identification was conducted in two stages. The first stage consisted of the preliminary identification of these problems based upon a quantitative evaluation of the performance of the existing transportation system against the agreed-upon study transportation system management and development objectives. The second stage consisted of public review and comment on these problems, as identified in a preliminary manner through this technical work—a step that involved not only the advisory committee structure for the study, but three public informational meetings held within the study area.

Under the first stage of this problem identification process, the current transportation system problems of the study area were identified by determining how well the quantitative standards supporting the adopted study objectives were being met by the existing transportation system in the study area. The basic transportation needs or objectives considered in this preliminary analysis included the accessibility to land use provided by the transportation system; the economic and energy efficiency of the transportation system; the travel safety of the transportation system; the provision of quick and convenient travel by the transportation system; the disruption of community development and of the natural resource base by the transportation system; the range of services provided by the transportation system; and the aesthetics of the transportation system.

Land use accessibility problems in the study area were determined to be limited principally to the transit system of the area. Only in limited parts of the existing transit service area was the suggested level of public transit accessibility to retail and service centers, park and outdoor recreation areas, and a scheduled air transport facility found to be met. No part of the study area met the desirable level of accessibility to employment opportunities by transit. The only highway accessibility problem concerned the current relative levels of accessibility now provided by the transportation system and the relative intensity of land use development recommended within the study area. Although the southeastern portion of the study area is recommended for continued high-density development, it was determined that it is being provided a lower level of highway accessibility than other high- and medium-density urban development in the study area.

This extreme southeastern portion of the study area also was determined to have transportation problems, relative to the remainder of the study area, with respect to energy efficiency and disruption of the community and the natural resource base.

Problems were also identified in the southeastern portion of the study area concerning the provision of quick and convenient travel, both by public transit and by highway facilities. Traffic accidents and traffic conflicts were noted to be concentrated in the southeastern portion of the study area, as well as in the southern two-thirds of the Milwaukee County portion of the study area.

The existing transportation system problems of the northwest side study area were defined in the first phase of the analysis in terms of specific arterial streets and highways within the study area exhibiting particularly severe traffic problems. Arterial streets and highways with severe problems were, for the purposes of the study, defined as those arterial streets and highways that exhibit a combination of transportation problems, including not only a severe level of congestion—that is, operation over design capacity—during morning and evening peak travel hours and the provision of lower than suggested overall operating speeds, but also a number of significantly high-accident intersections, and a higher than average intersection accident rate.

Fourteen arterial reaches in the study area, representing nearly 62 miles of arterials, were identified as having traffic problems. These fourteen arterial reaches exhibited at least one, and in some segments a combination, of the above-mentioned severe traffic congestion symptoms and problems. Twelve of these 14 arterial reaches were located in the Milwaukee County portion of the study area; two were located in the Ozaukee County portion of the study area. Eight additional reaches, representing 10 miles of arterials, all within the City of Milwaukee portion of the study area were identified by the City of Milwaukee as being problem arterials based on consideration of accident rates and frequencies. Four freeway segments with particularly severe traffic problems—that is, severe congestion during both the morning and evening peak hours and a high frequency of accidents (at least 200 in 1978)—were also identified. These segments generally bounded the southern portion of the study area.

Under the technical analysis, the problems of the public transit system in the northwest side study area were attributed to a lack of certain types of public transit service in some parts of the study area. Within parts of the southeastern portion of the study area, it was determined that only local transit service was being operated, often at substandard speeds. In the outlying portion of the Milwaukee transit service area within the study area, inadequacies were determined to exist in the provision of all three types of transit service: primary, secondary, and tertiary. Primary transit service was found to be limited to peak travel periods of the weekday and to a small number of stops, principally in the Milwaukee central business district and in outlying suburban shopping centers. No express transit service was being provided. The above problems were reflected by the high average overall travel time ratios found between comparable public transit and arterial highway trips; the high number of transfers required per transit trip in some portions of the study area served by transit; and the generally low levels of public transit service being provided to major land use activities.

Under the second stage of the definition of existing transportation system problems in the northwest side study area, public review and comment, general support of the preliminary technical definition of arterial street and highway and transit problems was expressed at three public informational meetings. There was no testimony that the problems as preliminarily defined did not exist. In fact, a number of additional arterial street and highway and public transit system problems were identified. These additional problems are primarily concentrated in the northwestern part of the Milwaukee County portion of the study area, and include the need to consider transportation systems management in the short range along 76th Street northerly beyond Bradley Road to County Line Road, and to consider in the long range the improvement of STH 181 and CTH N—Wauwatosa Road in Ozaukee County—and of parallel north-south surface arterials to STH 181—76th Street, in northwestern Milwaukee County. Also expressed was a need to consider long-range improvements to east-west streets in the northwestern part of the Milwaukee County portion of the study area. Additional public transit problems were also noted in this part of the study area—namely, the lack of any type of local transit service in many pockets which have medium- to high-density development and in the developing City of Milwaukee industrial land bank.

The preparation of short-range transportation system improvement plans under the northwest side study is intended to alleviate the existing transportation problems of the area to the extent possible using transportation systems management measures on arterial streets and highways and transit service improvements on the public transit system of the area. Based upon the comments received at the public informational meetings, the short-range transportation systems management planning under the study will be directed toward alleviating the most severe transportation system problems existing in the study area as identified under the first stage of this study—namely, the problems on the 14 arterial street reaches listed in Table 45 plus the problems on the eight reaches identified as problem reaches by City of Milwaukee officials, and the lack of provision of certain types of transit service in the study area. In addition, the short-range planning will consider transportation systems management measures along 76th Street between Bradley Road and County Line Road in the northwestern part of the Milwaukee County portion of the study area, as well as the possible provision of public transit service to noncontiguous high- and medium-density development in this same area and to the City of Milwaukee industrial land bank and the redeveloping industrial corridor along the Milwaukee Road railroad line at 30th Street between North Avenue and Burleigh Street.

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Chapter V

ALTERNATIVE AND RECOMMENDED SHORT-RANGE TRANSPORTATION SYSTEM PLANS

INTRODUCTION

Existing transportation system problems in the northwest side study area were identified in Chapter IV of this report. Fourteen segments of arterial streets were determined to have severe traffic congestion, travel speed, and safety problems. These segments are:

1. W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43);
2. N. 76th Street (STH 181) from W. Harwood Avenue to W. Bradley Road;
3. N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive;
4. W. Vliet Street and W. Milwaukee Avenue from W. Harwood Avenue to N. 20th Street;
5. W. Fond du Lac Avenue (STH 145) from W. Capitol Drive (STH 190) to W. Walnut Street;
6. N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue;
7. W. Silver Spring Drive from W. Appleton Avenue (USH 41) to N. Teutonia Avenue;
8. Related street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end," including W. Lisbon Avenue from N. 60th Street to its intersection with N. Sherman Boulevard; W. Center Street from its intersection with N. 76th Street (STH 181) to W. Lisbon Avenue; N. 60th Street from its intersection with W. Center Street to W. Capitol Drive (STH 190); and W. Appleton Avenue (USH 41) from its intersection with N. 76th Street (STH 181) to W. Lisbon Avenue;
9. N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190);
10. W. North Avenue from N. 124th Street to N. 76th Street (STH 181);
11. N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190);
12. W. Capitol Drive (STH 190) from N. 76th Street (STH 181) to the North-South Freeway (IH 43);
13. STH 57 from Donges Bay Road to Highland Road; and
14. STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57).

The first 12 of these 14 segments are all in Milwaukee County, the last two in Ozaukee County. An additional eight segments of arterial streets were identified by the City of Milwaukee as problem segments, including:

1. W. Fond du Lac Avenue (STH 145) from N. 60th Street to W. Capitol Drive (STH 190);
2. W. Lisbon Avenue from N. Sherman Boulevard to W. Walnut Street;
3. W. Wisconsin Avenue from N. 35th Street to N. 16th Street;
4. N. 20th Street from W. North Avenue to W. Hopkins Street;
5. W. North Avenue from N. 35th Street to the North-South Freeway (IH 43);
6. N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road (STH 100);
7. W. Brown Deer Road (STH 100) from N. 91st Street to N. 76th Street (STH 181); and
8. W. Good Hope Road from N. 76th Street (STH 181) to N. Teutonia Avenue.

Two of these additional eight segments—the W. Fond du Lac Avenue (STH 145) and W. Lisbon Avenue problem segments—were incorporated as extensions of two of the original 14 problem segments. This resulted as a total of 20 problem arterial segments totaling approximately 76 miles, or about 17 percent of the total arterial street mileage within the northwest side study area, as shown on Map 101.

A traffic engineering analysis was performed on each of these identified problem street segments. Alternative transportation system management actions were developed and evaluated for each congested intersection along the problem arterial segments, and recommended actions were selected from among the alternatives considered. Care was taken in the conduct of all of the traffic engineering analyses of the 20 arterial street segments that the transportation systems management actions proposed for each intersection, and for each segment of an arterial street, were compatible with other actions proposed along the reach of each arterial street, and for the entire arterial street system of the study area. However, no specific analyses were conducted of safety problems along the problem arterial segments as a part of the traffic engineering analysis, and specific actions to increase operating speeds and to reduce accident rates and frequencies are not included in the short-range transportation system plans. It is accordingly recommended that accident rate analyses and safety improvement considerations for intersections along each arterial segment be coordinated with the implementation of recommended congestion abatement actions at each intersection. In this respect, it should be noted that actions to reduce congestion, while not specifically designed to do so, should generally contribute to freer traffic flow and therefore reduced accident frequency, particularly at those locations at which an accident problem involves left-turning vehicles and when the recommended congestion abatement action involves separate left-turn signal phasing or left-turn lane construction actions.

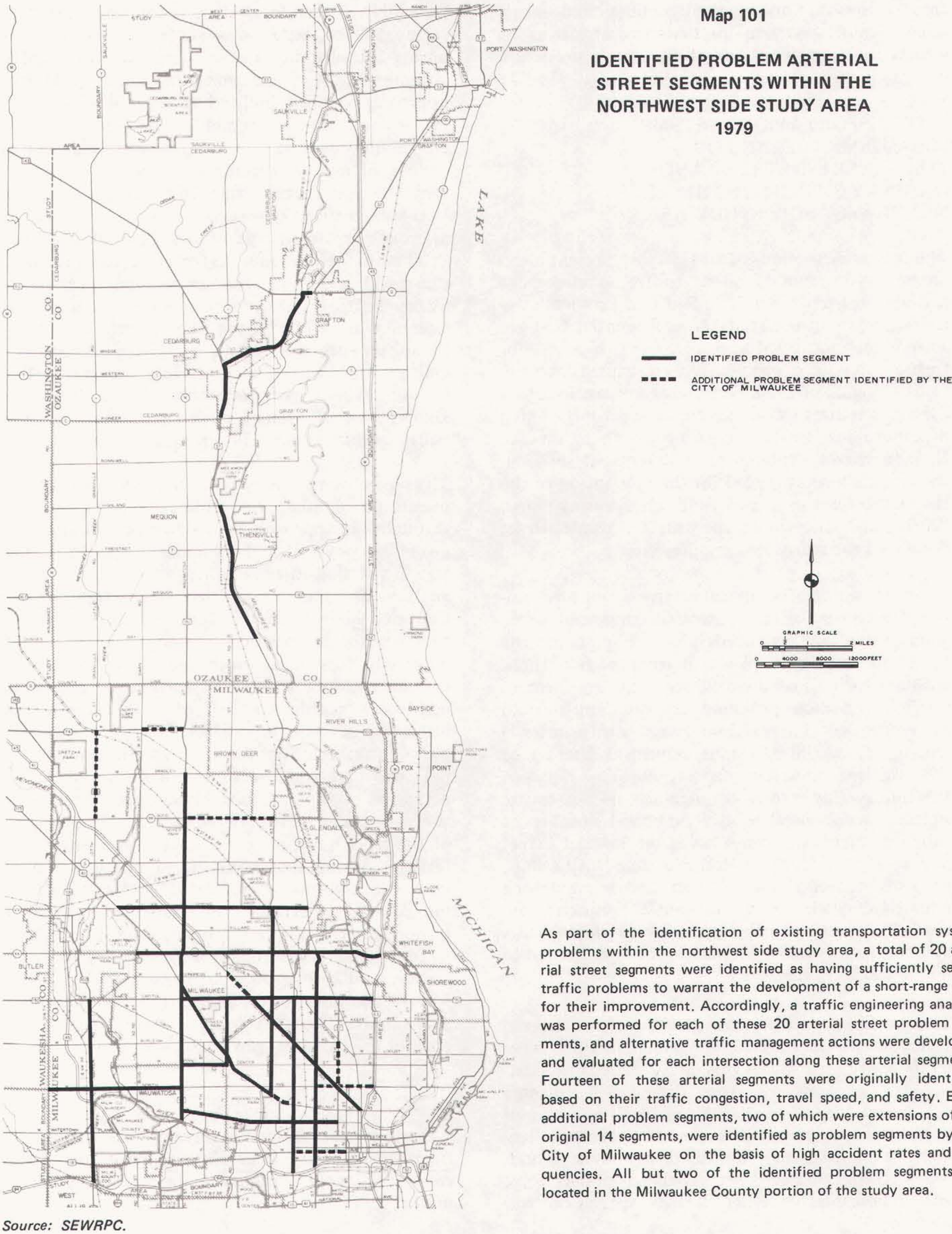
Also, an analysis was made of the midblock problems attendant to median and driveway openings on one of the 20 problem arterial stretches—N. 76th Street (STH 181)—which was identified at public informational meetings on existing study area transportation problems as requiring such an analysis. The analysis of midblock problems and recommendation of actions to abate those problems were prepared by the Wisconsin Department of Transportation, District 2.

Another element of the short-range transportation system plan for the northwest side study area is the integration of the "stub ends" of the no longer-proposed Park Freeway-West and Park Freeway spur at the uncompleted Hillside Interchange on the North-South Freeway (IH 43), and the "stub-ends" of the Stadium Freeway-North at W. Lloyd Street, into the existing surface arterial street system. A presentation of the alternative and recommended actions considered for incorporation of these freeway "stub ends" into the surface arterial street system is included in this chapter.

Also identified in Chapter IV of this report were the most severe problems of the existing public transit system of the northwest side study area—specifically, the lack of primary and secondary transit service in some of the most intensively developed parts of the study area. In order to alleviate these transit service problems, alternative short-range transit system improvement plans were developed, tested, and evaluated for the public transit system of the study area as part of the concurrent Milwaukee County Transit System service improvement study of the entire transit system of Milwaukee County. That study considered four alternative short-range transit service improvement plans for Milwaukee County: 1) a "status quo" plan, which consisted of continued operation of the existing transit routes and frequency of service and which served as a basis for the evaluation of the other alternatives; 2) an "augmented" transit service plan, which consisted only of increased frequency of transit service over the existing routes of the Milwaukee County Transit System; 3) a "timed-transfer" plan, under which selected existing and new transit routes in Milwaukee County would meet at a common point, or transit center, with common arrival times in order to facilitate transfers, and under which express service would be expanded; and 4) an "extended grid" plan, under which transit service would be extended to areas not presently served, and express service would be expanded. Following the testing and evaluation of these plans, a recommended plan for all of Milwaukee County was developed which combined the best features of both the "timed-transfer" and "extended grid" plans. Under this recommended plan, local service would be extended to portions of the study area; existing local service would be rerouted to improve directness and connectivity and the frequency of local service would be increased; a timed-transfer center would be provided at the Bay Shore Shopping Center at the eastern boundary of the study area; and two new express routes and two new

Map 101

IDENTIFIED PROBLEM ARTERIAL STREET SEGMENTS WITHIN THE NORTHWEST SIDE STUDY AREA 1979



Source: SEWRPC.

As part of the identification of existing transportation system problems within the northwest side study area, a total of 20 arterial street segments were identified as having sufficiently severe traffic problems to warrant the development of a short-range plan for their improvement. Accordingly, a traffic engineering analysis was performed for each of these 20 arterial street problem segments, and alternative traffic management actions were developed and evaluated for each intersection along these arterial segments. Fourteen of these arterial segments were originally identified based on their traffic congestion, travel speed, and safety. Eight additional problem segments, two of which were extensions of the original 14 segments, were identified as problem segments by the City of Milwaukee on the basis of high accident rates and frequencies. All but two of the identified problem segments are located in the Milwaukee County portion of the study area.

park-ride lots would be provided in the study area. A description of the recommended short-range transit system improvement plan as it affects the northwest side study area is presented in this chapter.

A TRANSPORTATION SYSTEMS MANAGEMENT PLAN FOR THE ARTERIAL STREET AND HIGHWAY SYSTEM OF THE NORTHWEST SIDE STUDY AREA

The following sections of this chapter present alternative and recommended traffic management actions for each of the 20 identified problem arterial segments in the study area. Presented first are actions recommended to resolve existing peak-hour traffic congestion problems at controlled intersections along all of the 20 arterial segments, followed by those actions recommended to resolve the existing midblock median crossing conflicts on the N. 76th Street problem arterial segment. Finally, the actions recommended for the integration of the Hillside Interchange and Stadium Freeway-North "stub ends" into the existing surface arterial street system of the study area are presented.

Most of the traffic management actions recommended to resolve existing traffic congestion problems pertain to signalized intersections along the 20 arterial segments. In urban areas, such as those within which all of these 20 segments are located, traffic congestion problems are generally located at controlled intersections with other arterial streets. These intersections require a sharing of the available vehicular roadway capacity between the intersecting streets through the use of traffic signals, which regulate the flow and number of vehicles that can travel over an arterial street during a given time period. In some situations, roadway capacity can be controlled by midblock conditions—such as a substantial reduction in roadway width, or substantial turning movements at nonarterial street intersections or at entrances to major traffic generators.

The specific locations along the 20 problem arterial segments where traffic management actions were to be considered under this study to resolve existing traffic problems were determined through a detailed inventory of the existing physical and peak-hour operating characteristics of each segment. This inventory identified any unusual midblock restrictions between signalized intersections, and established whether traffic congestion was present on the roadway approaches to the signalized intersections located along the reaches of each segment. The latter was accomplished by comparing the morning and evening peak-hour traffic volumes to the maximum hourly capacity of each approach to the signalized intersections along the 20 problem arterial segments. The peak-hour traffic volumes used in the analyses were obtained by counts of manual turning movements, and represent the four consecutive 15-minute intervals of heaviest traffic on each separate intersection approach between the hours of 6:30 a.m. and 9:00 a.m. for the morning peak hour, and 3:00 p.m. and 6:00 p.m. for the evening peak hour. These traffic counts, which were taken by the Commission staff during the months of March through September 1980, were supplemented by and verified with traffic counts taken in 1977 through 1980 by the staffs of the Wisconsin Department of Transportation and of the municipality within which the arterials are located.

The maximum hourly capacity, defined as the maximum number of vehicles which can pass through an approach to a signalized intersection given the physical and vehicular operating characteristics at that intersection, was calculated for the analyses using the method set forth in the Highway Capacity Manual.[1] Under this method, seven factors control intersection capacity: 1) intersection approach pavement width and the presence of channelization for exclusive turn lanes; 2) parking conditions within 250 feet of both sides of the intersection; 3) the type of traffic control measures at the intersection (at those intersections where signal phases are traffic-actuated, it was assumed that actuation of those phases would occur throughout the peak travel hour under analysis or for a portion of the peak hour based on the traffic flow characteristics during that hour) 4) community population size and the character of land development immediately adjacent to the roadway; 5) the distribution of right and left turns at each intersection; 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 of these factors constitute the existing physical conditions affecting

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

roadway capacity, and the last three factors constitute the existing operating characteristics of the vehicular traffic which affect roadway capacity.

One physical roadway characteristic which is not addressed in the procedures set forth in the Highway Capacity Manual pertains to the impact of divided roadway intersections on the capacity of left-turning traffic movements. Based upon the experience and current traffic engineering practices of the City of Milwaukee and the Wisconsin Department of Transportation, and upon field observations by Commission staff of the peak-hour operation of various signalized intersections in the northwest side study area, the procedures for determining the maximum capacity of exclusive left-turn movements in the Highway Capacity Manual have been modified to more accurately reflect the existing operation of left-turning traffic movements in the Milwaukee area at divided intersections. Specifically, these modifications in left-turn capacity levels occur at, and are a result of, the improved operating conditions afforded by the increased vehicular storage capacity, longer signal clearance intervals, and separation of conflicting traffic movements at the intersection of divided arterial roadway cross-sections. This modification in left-turn-movement capacity levels is included in the analysis and identification of existing traffic congestion problems and recommended transportation system management actions designed to abate those problems in the northwest side study area.

In the analyses, traffic congestion was assumed to exist when the volume-to-capacity ratio equaled or exceeded that attendant to a level-of-service of D or E as defined in the Highway Capacity Manual. Under level-of-service D operation, traffic volumes approach unstable conditions characterized by restrictions in operating speeds and vehicle flow. Drivers have little freedom to manuever and experience extensive delays at signalized intersections—turning movements may require waiting through more than one red phase to travel through the intersection. Under level-of-service D conditions, from 30 to 70 percent of the green phases of the traffic signal cycle are fully utilized by vehicular traffic—that is, traffic is constantly moving through the intersection during the green phase, or is waiting to use the green phase but is delayed, for example, by pedestrian or opposing vehicular traffic. The volume-to-capacity ratio attendant to a level-of-service D ranges from 0.81 to 0.90. Under level-of-service E operation, traffic volumes approach maximum capacity, characterized by unstable flow with stop-and-go conditions resulting in long queues of vehicles waiting upstream of the intersection. In addition, under level-of-service E conditions drivers experience excessive delays, with nearly all vehicles being delayed through one or more traffic signal cycles. Under level-of-service conditions, from 70 to 100 percent of the green phases of the traffic signal cycle are fully utilized by vehicular traffic. The volume-to-capacity ratio at level-of-service E ranges from 0.91 to 1.00. Both levels-of-service D and E represent conditions under which traffic volumes exceed the design capacity of standard arterial facilities.[2]

The differences between facilities operating at design capacity, or at level-of-service C, and over design capacity, or at levels-of-service D or E, include increased delays at intersections, a 20 to 25 percent reduction in travel speed, and similar proportionate increases in motor fuel consumption and air pollutant emissions. Using these assumptions, the number of congested traffic movements was calculated for each intersection

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[2]*Design capacity is defined as the upper limit of level-of-service C, or the maximum vehicular traffic which can be accommodated on an arterial facility and still provide level-of-service C operating conditions. Those arterial facilities experiencing traffic congestion are defined as those arterials with traffic volumes which exceed design capacity, and operate at levels-of-service D or E. The design capacity of an arterial facility is generally 70 to 80 percent of its maximum capacity. (Maximum capacity is sometimes simply referred to as capacity.)*

Because long-range transportation system planning must be conducted with at least 20-year forecasts of arterial traffic volumes, in which forecasts are dependent upon forecasts of regional population and economic activity levels and planned allocations of such levels to subareas of the Region, and because forecasts of arterial traffic volumes necessarily assume full implementation of the planned transportation system, design capacity is conservatively expressed as a range in such planning. Thus, for long-range planning purposes an arterial facility, in order to be considered to operate over design capacity, must have forecast traffic volumes which exceed its design capacity by more than 10 percent. When existing traffic volumes must be estimated or updated, this same conservative assumption regarding design capacity is generally applied as well, as in Chapter IV of this planning report.

roadway approach. In accordance with the Highway Capacity Manual, left turns were always analyzed as a separate movement when provided with a separate signal phase or exclusive turn lane, and right-turn and through movements together were analyzed as a separate movement, except where a separate signal phase or right-turn channelization existed, in which case right turns were analyzed as a separate movement. In those cases where no separate turn phases or channelization was provided, the entire intersection approach—left-turn, through-, and right-turn movements—was analyzed in total.

Traffic management measures for the 20 problem arterial street segments were designed to achieve a level-of-service C—that is, at design capacity—during the peak-traffic-volume periods of an average weekday. These measures were so designed because the traffic management planning was being done for relatively long stretches of arterial streets which were identified in a systemwide analysis as requiring the abatement of congestion. Consideration of design levels-of-service D or E for long stretches of the identified problem arterials would implicitly mean permitting all of the problem arterials, representing nearly 20 percent of the study area arterial street system, to operate under congested conditions. This would not represent good practice, particularly when considering that the street system of the study area is being planned for average weekday conditions. Daily and seasonal variations in travel demand, the occurrence of special events, severe weather, and street maintenance and reconstruction operations can all cause either significant increases in traffic or significant restrictions in the street width available to accommodate traffic flow and thereby result in operating conditions which exceed design capacity levels, resulting in excessive traffic congestion problems on major portions of the arterial street system.

Four basic types of traffic management actions have the potential to abate traffic congestion at signalized intersections on arterial streets: 1) retiming the existing traffic signal phasing plan so as to increase the green time allotted to a problem intersection approach and thereby the resultant capacity, thus reducing congestion; 2) adding signals or separate signal phases, such as exclusive turn arrows, to provide for increased and segregated traffic movement and capacity on a problem approach; 3) prohibiting on-street parking within 250 feet of the intersection to provide for increased traffic movement; and 4) constructing new or additional through or exclusive turn lanes to add capacity to the problem intersection approaches. The first action listed above, the revision of signal timing, involves the least capital cost and disruption. The second action listed would involve a somewhat higher capital cost but no disruption. The third action would involve little capital cost, but may entail some disruption of urban activities and therefore be liable to strong local opposition. The fourth action, the construction of new or additional turn lanes, would involve substantially greater capital costs than the other actions and may also involve some disruption. Therefore, in the development of traffic management action recommendations for problem intersections, the revision of signal timing was the first alternative considered, and the other actions were considered—in the order listed above—only if the analyses indicated the first action could not solve the congestion problem. Under each alternative action recommended to solve a traffic congestion problem, an analysis was made to ensure that sufficient pedestrian crossing time, based on a pedestrian walking rate of four feet per second and a walk start time of seven seconds, was maintained on all approaches to the problem intersection.

The retiming of the existing traffic signal phasing plan at a problem intersection, as noted above, can increase the green time allotted to the problem approach. The resultant increase in the capacity of the identified problem approach or approaches to the intersection may be sufficient to alleviate the congestion problem at that intersection. If the retiming can be accomplished without increasing the total cycle length of the traffic signal, it can be implemented at minimal cost. If the total cycle length needs to be increased—for example, from 60 seconds to 90 seconds—the attendant capital cost will approximate $200. The drawback to traffic signal retiming is that in order to increase the green time and capacity on the problem approaches to an intersection, green time and capacity have to be decreased for the cross approaches to the intersection. At some intersections, increasing green time to the extent required to eliminate the congestion problems will only result in shifting the congestion problem to the cross arterial approaches. In all cases where retiming was recommended under this study, the analyses indicated that the existing traffic congestion could be eliminated, and not merely shifted to the cross arterial approaches. In certain cases, when implementing the recommended signal retimings, the implementing agency may also desire to modify the signal timing plans of the adjacent signal subsystems in order to assure efficient traffic progression between signals. Such modifications could be quite extensive, and no estimate has been made of the costs associated with such additional signal timing alterations.

The second traffic management action considered involves adding to the existing traffic signal phasing plan a leading or lagging green arrow as a separate right- and/or left-turn phase at the problem intersection approaches. The separate turn phase would, as dictated by the existing traffic movements, operate concurrently with, or exclusive of, the through green phase controlling the problem approach in order to increase the green time and capacity associated with the turn movements at that approach. The capital cost of adding separate turn phasing to the traffic signalization at an intersection approximates $2,000 for each approach to receive such phasing, unless a new traffic controller is required at the intersection. The new controller would add an estimated $12,000 to the capital cost of adding a new turn phase. The disadvantage of this action is similar to that of traffic signal retiming. In order to increase the green time and capacity associated with turn movements at a problem approach to an intersection through separate turn phasing, green time and capacity must be reduced for the opposite approach, or cross approaches, to the intersection. In all cases where separate turn phasing is recommended under this study, the analyses indicated that the levels of service for all approaches to the problem intersection remained adequate, and the congestion problems were not merely shifted to an opposing or a crossing approach. Separate turn phasing, consequently, was the second action considered in the resolution of intersection traffic congestion problems. At those intersections where minimum pedestrian crossing time could not be advanced, pedestrian-activated signal phasing was recommended. All existing pedestrian-activated phasing was retained. At each intersection at which pedestrian-activated phasing was recommended, new traffic controllers were also recommended.

The third traffic management action considered involves the prohibition of on-street parking within 250 feet of both sides of the intersection. Prohibition of parking at an intersection can eliminate congestion in some cases by increasing the usable intersection approach width and attendant capacity, particularly for high-volume right-turn movements. This action has a low capital cost, as it requires only regulatory signing changes for implementation, approximately $200 to $300 per intersection approach. The disadvantage of this action is the local disruption that it may entail. The prohibition of on-street parking can reduce convenient, direct access to adjacent land use activities. As a result, it can generate substantial public opposition, particularly if it is to be implemented during the evening peak hour in commercial and other nonresidential land use areas where adequate nearby off-street parking may not be available. The prohibition of parking was therefore not recommended as a traffic management alternative under such conditions unless it was the only remaining alternative traffic management action available to abate a congestion problem at a specific intersection.

The fourth traffic management action considered for the resolution of congestion problems at intersections involves the widening of the intersection to increase capacity at problem approaches. The widening, depending upon the specific intersection approach, could consist of the construction of a new right-turn lane or left-turn lane within an existing median, the construction of an additional lane to create a double left- or double right-turn lane, or the widening of the intersection to provide an additional lane for through traffic. Some of these actions could require the taking of adjacent right-of-way. The minimum capital cost for intersection widening would be $15,000 to $20,000 per approach, this being for the addition of a turn lane constructed within an existing roadway median so as not to require any additional right-of-way. Pavement markings at a capital cost of $200 may be recommended with a turn lane to enable its more efficient use.

Another traffic management action which can be considered as an alternative solution for a congestion problem at an intersection is the prohibition of right and/or left turns at the intersection. The prohibition of turn movements increases the capacity of an intersection by removing conflicts between turning movements and through movements. This action has a low capital cost, as it essentially requires only regulatory signing for implementation, approximating $200 to $300 per intersection approach. The disadvantage of this action is the increased traffic that it may entail for the surrounding land access, collector, and arterial streets. The prohibited turns may be expected to be diverted to nearby land access and collector streets, resulting in the penetration of residential neighborhoods by through traffic, or causing new or exacerbating existing congestion problems at other nearby arterial intersections. This action may also result in a circuitous routing of traffic, with additional vehicle trip length, trip time, and turning movements; increased fuel consumption and air pollutant emissions; and little or no net systemwide reduction in traffic congestion and its associated undesirable impacts. Consequently, turn prohibition was considered but not recommended as a solution for any problem intersection under this study.

In addition to the signalized problem intersections in the study area, certain other intersections along the 20 arterial street segments which were controlled by stop signs were also found to exhibit traffic congestion, and required the development of alternative traffic management actions to abate this congestion. The action considered in such cases involved the installation of new traffic signals at a capital cost of approximately $40,000 per intersection.

In any consideration of the recommended traffic management actions presented in the following sections, it must be recognized that these actions will require, prior to implementation, final engineering and design studies by the implementing agencies. Such studies may result in the identification of alternatives in addition to the recommended actions, or in the identification of desirable modifications to those actions. The final engineering and design studies may also determine that some recommended actions are not feasible, owing to constraints or limitations which can be identified only in the more detailed studies. These constraints could include restrictions on the recommended traffic signal timing modifications to avoid adverse effects on existing traffic signal progression systems, and negative impacts of recommended new or lengthened turn bays on some pedestrian movements and driveway and median openings.

It should also be noted that the capital costs of the traffic management actions recommended in this study are presented in 1980 dollars. These costs represent the estimated expenditures required to implement each recommendation, but do not include the additional costs associated with the preliminary design engineering or construction engineering, or the cost of timing modifications which might be required to the signal subsystems adjacent to each problem arterial segment evaluated in the study. The additional costs associated with the preliminary design engineering or construction engineering for each recommendation could range from zero percent for actions such as signal retiming or parking prohibition, to 10 percent for actions such as the construction of exclusive turn lanes. The additional costs associated with the retiming modifications which might be required to the signal subsystems adjacent to each problem arterial segment evaluated in this study may be expected to be minimal, due to the fact that the signal retiming actions recommended at each congested problem intersection approach include consideration of any effects of that action on adjacent signal subsystems, particularly when the signal subsystems which might require modifications are located immediately adjacent to the problem intersection being considered.

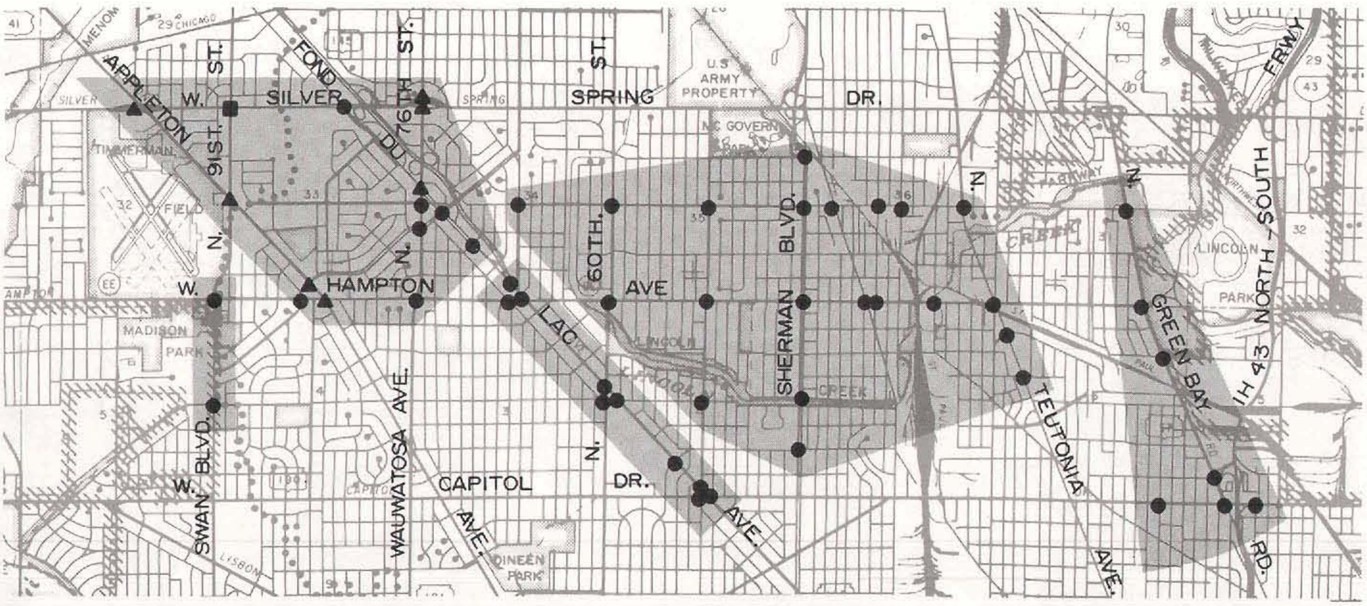
W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43)

One of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 102, W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43), a distance of 5.6 miles. The existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Hampton Avenue is shown on Map 103. Residential land use comprises the majority of all development in the corridor, as well as of all development located immediately adjacent to W. Hampton Avenue. Retail sales and service land uses abut W. Hampton Avenue at its intersections with W. Appleton Avenue (USH 41), N. 76th Street (STH 181), W. Fond du Lac Avenue (STH 145), W. Hopkins Street, and N. Teutonia Avenue, and otherwise occur in a scattered fashion along the corridor. The only major industrial development in the corridor is concentrated between N. 35th and N. 20th Streets. Recreational land use occurs at the western and eastern termini of this problem segment at Madison Park and Lincoln Park, respectively, and near W. Hampton Avenue and N. 60th Street at the Lincoln Creek Parkway. Governmental and institutional land uses are dispersed throughout the corridor.

Physical Characteristics: There are no physical roadway restrictions along this segment of W. Hampton Avenue. The roadway is divided by a median ranging in width from 8 to 22 feet between N. 92nd Street and N. Green Bay Avenue (STH 57), and the curb-to-curb pavement widths of the dual roadways range from 28 to 35 feet, adequate to provide two lanes in each direction for moving traffic with parking permitted. The existing cross-section between N. Green Bay Avenue and the North-South Free-

Map 102

DETAIL OF THE PROBLEM SEGMENT OF W. HAMPTON AVENUE TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



LEGEND

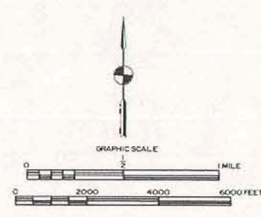
SIGNAL JURISDICTION

▲ WISCONSIN DEPARTMENT OF TRANSPORTATION

■ MILWAUKEE COUNTY

● CITY OF MILWAUKEE

SIGNAL SUBSYSTEMS ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON W. HAMPTON AVENUE INCLUDED AS A PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR

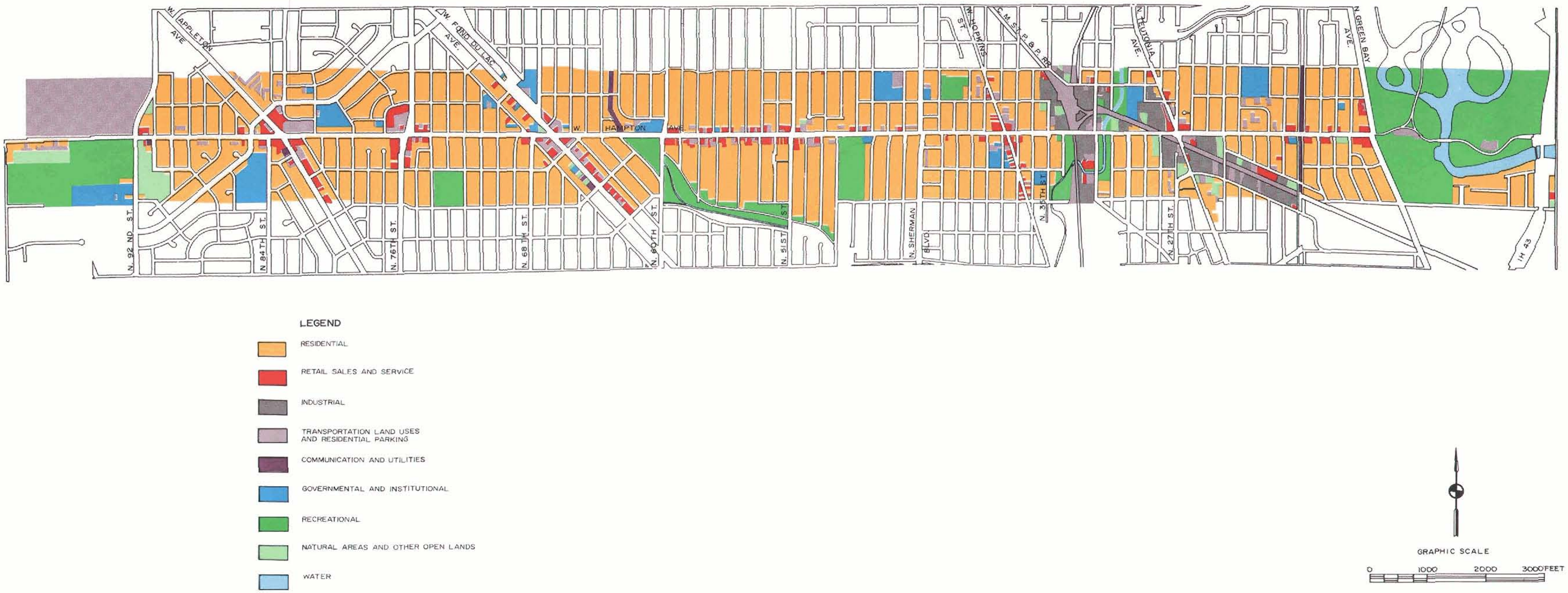


Shown on this map is one of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43), a distance of 5.6 miles. This map also shows the location and jurisdiction of each of the 14 traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Hampton Avenue and are directly affected by the timing plans of the traffic signals on W. Hampton Avenue.

Source: SEWRPC.

Map 103

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. HAMPTON AVENUE



This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of W. Hampton Avenue. Residential land use comprises the majority of all development in this corridor, as well as of all development located immediately adjacent to W. Hampton Avenue. Retail sales and service land uses abut W. Hampton Avenue at its intersections with W. Appleton Avenue (USH 41), N. 76th Street (STH 181), W. Fond du Lac Avenue (STH 145), W. Hopkins Street, and N. Teutonia Avenue, and otherwise occur in a scattered fashion throughout the corridor. The only major industrial development in the corridor is concentrated between N. 35th and N. 20th Streets. Recreational land use occurs at the western and eastern termini of this problem segment at Madison Park and Lincoln Park, respectively, and near W. Hampton Avenue and N. 60th Street at the Lincoln Creek Parkway.

Source: SEWRPC.

way (IH 43) ranges in curb-to-curb width from 48 to 52 feet, adequate to provide two lanes in each direction for moving traffic with parking prohibited. Parking is currently permitted along this problem segment of W. Hampton Avenue from N. 92nd Street to W. Green Bay Avenue, and is prohibited from W. Green Bay Avenue to the North-South Freeway (IH 43).

As indicated in Table 46, the problem segment of W. Hampton Avenue has 14 traffic signal-controlled intersections. Eight of the eastbound and nine of the westbound approaches to these 14 intersections provide exclusive lanes for left-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. Hampton Avenue are also indicated in Table 46.

Traffic Control Measures: The timing plan for each of the 14 traffic signals along W. Hampton Avenue between N. 92nd Street and the North-South Freeway (IH 43) is indicated in Table 47. Map 102 shows the location and jurisdiction of all traffic signals on this segment of W. Hampton Avenue, and the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Hampton Avenue and are directly affected by the timing plans of the traffic signals on W. Hampton Avenue. Nine of the traffic signals are located at intersections of W. Hampton Avenue with other arterial streets, while five of the traffic signals are located at intersections of W. Hampton Avenue with nonarterial streets—specifically, W. Grantosa Drive, N. 68th Street, N. 51st Street, N. 37th Street, and N. 32nd Street. Stop signs are located on the approaches to all other collector and local streets crossing this segment of W. Hampton Avenue. Flashing railroad crossing signals are located to control traffic at the Milwaukee Road at-grade crossing of W. Hampton Avenue at N. 28th

Table 46

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound or Northwest-bound		Southbound or Southeast-bound	
W. Hampton Avenue and N. 92nd Street	32 ML	P	32 ML	P	28 ML	NS	32 M	NP
W. Hampton Avenue and W. Grantosa Drive	32 ML	P	32 ML	P	34 ML	P	34 ML	P
W. Hampton Avenue and W. Appleton Avenue (USH 41)	32 ML	P	32 ML	P	36 ML	P	36 ML	P
W. Hampton Avenue and N. 76th Street (STH 181)	32 ML	P	32 ML	P	36 ML	P	36 ML	NP
W. Hampton Avenue and N. 68th Street	44 M	P	32 ML	NP	32 M	FS	32 M	P
W. Hampton Avenue and W. Fond du Lac Avenue (STH 145)	32 M	P	32 M	P	36 ML	FS	36 ML	NP
W. Hampton Avenue and N. 60th Street	32 ML	P	32 ML	P	32 M	P	32 M	P
W. Hampton Avenue and N. 51st Street	32 ML	P	32 ML	P	30 M	P	32 M	P
W. Hampton Avenue and N. Sherman Boulevard	32 ML	P	32 ML	P	32 ML	P	32 ML	P
W. Hampton Avenue and W. Hopkins Street	32 M	NS	32 M	NPPM	24	P	24	P
W. Hampton Avenue and N. 37th Street	32 M	P	32 M	NPPM	18	FSPM	18	FS
W. Hampton Avenue and N. 32nd Street	34 M	FS	34 M	NS	20	NSPM	20	P
W. Hampton Avenue and N. Teutonia Avenue	32 M	NP	32 ML	P	44 M	NP	24 ML	NPAM
W. Hampton Avenue and N. Green Bay Avenue (STH 57)	32 ML	FS	26	NP	34 ML	P	34 ML	P

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

Source: SEWRPC.

Table 47

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE

<table>
<tr><th rowspan="2">Phase</th><th colspan="6">Intersection (time in seconds)</th></tr>
<tr><th colspan="2">W. Hampton Avenue</th><th colspan="4">N. 92nd Street</th></tr>
<tr><td>Green</td><td colspan="2">28.2</td><td colspan="4">22.2</td></tr>
<tr><td>Yellow</td><td colspan="2">3.6</td><td colspan="4">3.6</td></tr>
<tr><td>Red</td><td colspan="2">28.2</td><td colspan="4">34.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="4">60.0</td></tr>
<tr><td></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">W. Grantosa Drive</th></tr>
<tr><td>Green</td><td colspan="2">48.6</td><td colspan="4">30.6</td></tr>
<tr><td>Yellow</td><td colspan="2">3.6</td><td colspan="4">3.6</td></tr>
<tr><td>Red</td><td colspan="2">37.8</td><td colspan="4">55.8</td></tr>
<tr><td>Total Cycle</td><td colspan="2">90.0</td><td colspan="4">90.0</td></tr>
<tr><td></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">W. Appleton Avenue (USH 41)</th></tr>
<tr><td>Green</td><td colspan="2">34.2</td><td colspan="4">31.5</td></tr>
<tr><td>Yellow</td><td colspan="2">4.5</td><td colspan="4">4.5</td></tr>
<tr><td>Red</td><td colspan="2">51.3</td><td colspan="4">54.0</td></tr>
<tr><td>Green Arrow</td><td colspan="2">--</td><td colspan="4">9.0[a]</td></tr>
<tr><td>Yellow Arrow</td><td colspan="2">--</td><td colspan="4">4.5</td></tr>
<tr><td>Total Cycle</td><td colspan="2">90.0</td><td colspan="4">90.0</td></tr>
<tr><td></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">N. 76th Street (STH 181)</th></tr>
<tr><td>Green</td><td colspan="2">44.1</td><td colspan="4">35.1</td></tr>
<tr><td>Yellow</td><td colspan="2">3.6</td><td colspan="4">3.6</td></tr>
<tr><td>Red</td><td colspan="2">42.3</td><td colspan="4">51.3</td></tr>
<tr><td>Total Cycle</td><td colspan="2">90.0</td><td colspan="4">90.0</td></tr>
<tr><td></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">N. 68th Street</th></tr>
<tr><td>Green</td><td colspan="2">53.1</td><td colspan="4">26.1</td></tr>
<tr><td>Yellow</td><td colspan="2">3.6</td><td colspan="4">3.6</td></tr>
<tr><td>Red</td><td colspan="2">33.3</td><td colspan="4">60.3</td></tr>
<tr><td>Total Cycle</td><td colspan="2">90.0</td><td colspan="4">90.0</td></tr>
<tr><td rowspan="3"></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">W. Fond du Lac Avenue (STH 145)</th></tr>
<tr><th rowspan="2">Morning</th><th rowspan="2">Evening</th><th colspan="2">Morning</th><th colspan="2">Evening</th></tr>
<tr><th>Northbound</th><th>Southbound</th><th>Northbound</th><th>Southbound</th></tr>
<tr><td>Green</td><td>32.4</td><td>33.3</td><td>45.0</td><td>35.1</td><td>44.1</td><td>30.6</td></tr>
<tr><td>Yellow</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td></tr>
<tr><td>Red</td><td>53.1</td><td>52.2</td><td>40.5</td><td>50.4</td><td>41.4</td><td>54.9</td></tr>
<tr><td>Green Arrow</td><td>--</td><td>--</td><td>7.2[b]</td><td>--</td><td>10.8[b]</td><td>--</td></tr>
<tr><td>Yellow Arrow</td><td>--</td><td>--</td><td>2.7</td><td>--</td><td>2.7</td><td>--</td></tr>
<tr><td>Total Cycle</td><td>90.0</td><td>90.0</td><td>90.0</td><td>90.0</td><td>90.0</td><td>90.0</td></tr>
<tr><td></td><th colspan="2">W. Hampton Avenue</th><th colspan="4">N. 60th Street</th></tr>
<tr><td>Green</td><td colspan="2">25.2</td><td colspan="4">25.2</td></tr>
<tr><td>Yellow</td><td colspan="2">3.6</td><td colspan="4">3.6</td></tr>
<tr><td>Red</td><td colspan="2">31.2</td><td colspan="4">31.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="4">60.0</td></tr>
</table>

Table 47 (continued)

Phase	Intersection (time in seconds)			
	W. Hampton Avenue		N. 51th Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. Sherman Boulevard	
Green	25.2		25.2	
Yellow	3.6		3.6	
Red	31.2		31.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		W. Hopkins Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. 37th Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. 32nd Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. Teutonia Avenue	
	Westbound	Eastbound	Northbound	Southbound
Green	25.2	15.0	15.0	25.2
Yellow	3.6	3.6	3.6	3.6
Red	31.2	41.4	41.4	31.2
Green Arrow	7.2[b]	--	--	7.2[b]
Yellow Arrow	3.0	--	--	3.0
Total Cycle[c]	60.0	60.0	60.0	60.0
	W. Hampton Avenue		N. Green Bay Road (STH 57)	
Green	34.2		36.0	
Yellow	3.6		3.6	
Red	52.2		50.4	
Green Arrow	--		7.2[a]	
Yellow Arrow	--		3.6	
Total Cycle	90.0		90.0	

[a] *Actuated lagging left-turn arrow.*

[b] *Leading left-turn arrow.*

[c] *The signal timing sequence on one or more appoaches to this intersection is subject to change by pedestrian-actuated control.*

Source: Wisconsin Department of Transportation, Milwaukee County, City of Milwaukee, and SEWRPC.

Street. This problem segment of W. Hampton Avenue is posted for a 35-mile-per-hour (mph) speed limit from N. 92nd Street to W. Appleton Avenue (USH 41), a 30-mph speed limit from W. Appleton Avenue to N. Green Bay Avenue (STH 57), and a 25-mph speed limit from N. Green Bay Avenue to the North-South Freeway (IH 43).

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 14 signalized intersections along the problem segment of W. Hampton Avenue in Figures 7 and 8. The locations along W. Hampton Avenue from N. 92nd Street to the North-South Freeway (IH 43) where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 14 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Hampton Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 48.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Hampton Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is operating at level-of-service D or E—were identified and are shown in Figures 1 and 2. One congested traffic movement was found to occur along this segment of W. Hampton Avenue during the morning peak hour, and eight congested traffic movements were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The one morning and eight evening peak-hour traffic congestion problems identified along W. Hampton Avenue occur at its intersections with the five streets: N. 92nd Street, W. Appleton Avenue (USH 41), W. Fond du Lac Avenue (STH 145), N. Teutonia Avenue, and N. Green Bay Avenue (STH 57). Table 49 provides a summary of the specific congestion problems at each intersection, and of the traffic management actions recommended to abate those problems. Table 50 summarizes all of the changes in traffic signal timing recommended for the problem intersections along this segment of W. Hampton Avenue. A total of 16 actions are recommended at the five intersections, with a capital cost of approximately $101,400 expressed in 1980 dollars.[3] Table 49 also summarizes the changes in traffic signal timing recommended for the five problem intersections.

As shown in Table 49, only the retiming of the existing traffic signal plan was necessary to solve the congestion problem at one of the five problem intersections, the intersection of W. Hampton Avenue and W. Appleton Avenue (USH 41). Minimal cost would be entailed in this action.

The remaining four intersections would all require turn-lane construction to abate their existing congestion. One of the intersections, W. Hampton Avenue and N. 92nd Street, would require the lengthening of an existing left-turn lane in an existing median so that adequate storage capacity for left-turning vehicles is provided for the east- to northbound turning movement during the evening peak hour. In addition, an increase in traffic signal cycle length and the addition of a special turn phase, as well as the addition of a new traffic controller, is required at this intersection, at an estimated total capital cost of $14,200. The total cost of improvements at this intersection is estimated at $29,200, the lengthenning of the existing turn lane accounting for $15,000 of this total.

Another of the four intersections, W. Hampton Avenue and N. Teutonia Avenue, requires the retiming of its existing traffic signal plan at minimal cost, and the reconstruction of an existing tapered turn lane to full width for its entire length at an estimated cost of $15,000.

To resolve the existing traffic congestion problem at the intersection of W. Hampton Avenue and N. Green Bay Avenue (STH 57), the northwest-to-westbound left-turn lane at the intersection must be reconstructed from one to two lanes within the existing median. Also, the existing traffic signal plan at the intersection must be retimed at minimal cost, and a restricted red turn phase should be added during the morning and evening peak hours at an estimated capital cost of $800. The total cost of these improvements is estimated at $20,800.

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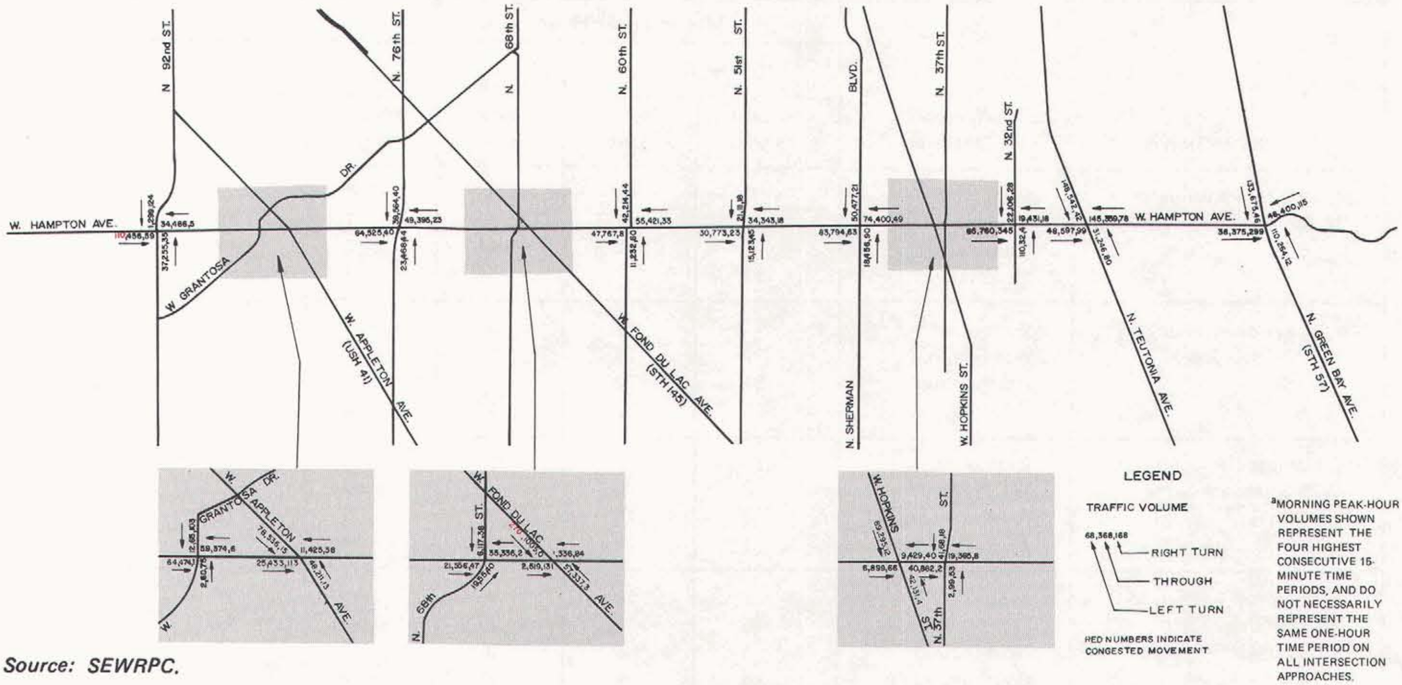
[3] *The addition of one or several new signal phases at certain intersections will require the installation of new traffic controllers at each of those intersections. The estimated capital cost of a new traffic controller is $12,000. The capital cost shown in the text and tables of this chapter includes the cost of the provision of new controllers at each location at which they are required, as identified by the City of Milwaukee.*

Figure 7

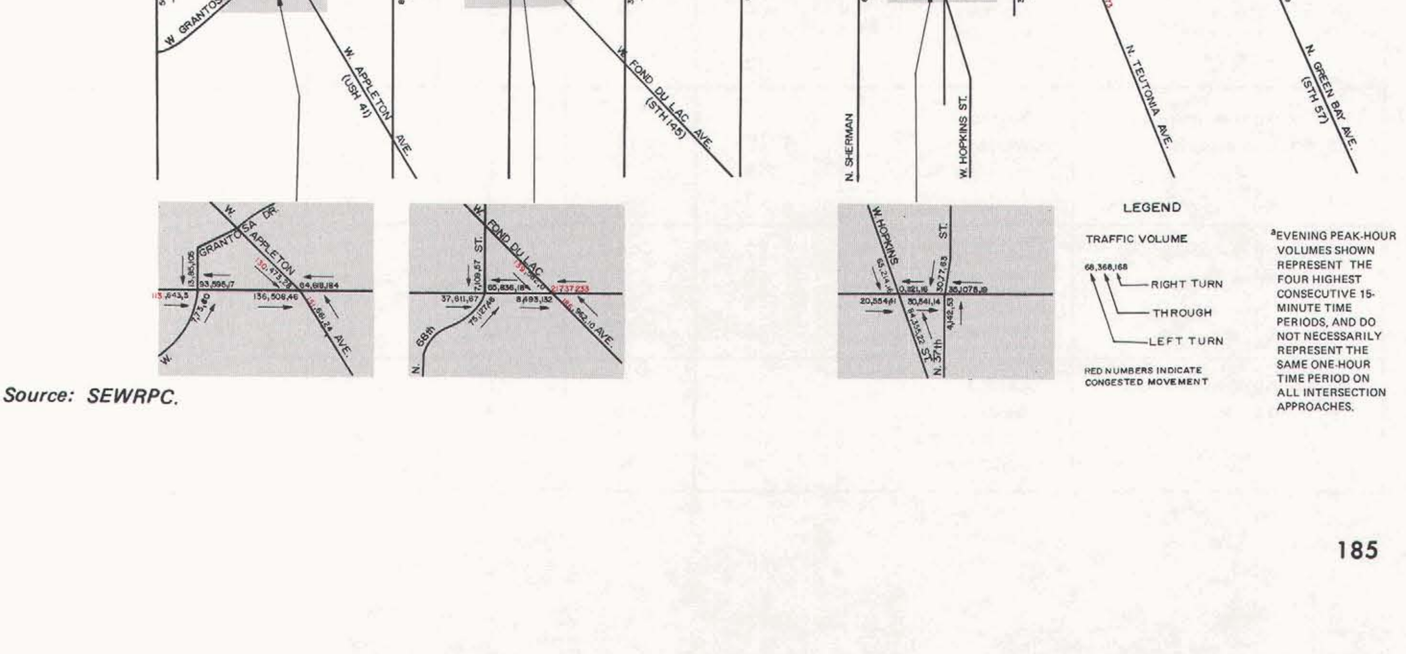
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 8

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 48

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Hampton Avenue and N. 92nd Street	Eastbound	9	18	5	7	22	1
	Westbound	1	7	3	2	5	1
	Northbound	11	11	4	12	12	1
	Southbound	29	- -	3	31	1	1
W. Hampton Avenue and W. Grantosa Drive	Eastbound	- -	12	3	1	15	2
	Westbound	2	13	3	3	13	2
	Northbound	54	2	1	50	4	1
	Southbound	57	7	1	52	6	1
W. Hampton Avenue and W. Appleton Avenue (USH 41)	Eastbound	19	4	6	19	7	2
	Westbound	8	2	4	22	7	3
	Northwest-bound	4	18	3	3	18	1
	Southeast-bound	3	12	3	4	21	1
W. Hampton Avenue and N. 76th Street (STH 181)	Eastbound	7	10	4	11	11	2
	Westbound	5	10	6	10	12	2
	Northbound	6	4	3	7	9	2
	Southbound	6	6	3	9	6	1
W. Hampton Avenue and N. 68th Street	Eastbound	8	3	3	9	7	2
	Westbound	1	9	4	2	7	2
	Northbound	35	17	- -	19	30	1
	Southbound	23	4	3	33	4	3
W. Hampton Avenue and W. Fond du Lac Avenue (STH 145)	Eastbound	20	1	5	21	1	3
	Westbound	21	- -	4	24	2	2
	Northwest-bound	1	11	7	1	16	3
	Southeast-bound	- -	21	4	- -	19	2
W. Hampton Avenue and N. 60th Street	Eastbound	1	6	3	2	10	3
	Westbound	6	11	5	6	9	2
	Northbound	20	3	3	19	6	1
	Southbound	15	14	3	15	10	1
W. Hampton Avenue and N. 51st Street	Eastbound	3	4	2	3	7	3
	Westbound	4	9	5	4	6	1
	Northbound	24	8	1	21	23	- -
	Southbound	12	14	2	23	15	2
W. Hampton Avenue and N. Sherman Boulevard	Eastbound	7	9	3	8	12	2
	Westbound	9	14	5	4	9	1
	Northbound	16	3	3	10	8	2
	Southbound	4	9	6	9	5	2
W. Hampton Avenue and W. Hopkins Street	Eastbound	7	1	3	7	3	3
	Westbound	8	2	5	9	- -	2
	Northwest-bound	2	24	11	5	18	6
	Southeast-bound	3	22	8	5	22	10
W. Hampton Avenue and N. 37th Street	Eastbound	- -	4	1	3	5	4
	Westbound	2	5	4	1	3	1
	Northbound	35	1	3	27	2	2
	Southbound	14	32	1	37	18	1

Table 48 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Hampton Avenue and N. 32nd Street	Eastbound	30	6	2	15	6	2
	Westbound	4	4	3	5	- -	2
	Northbound	3	75	18	3	72	1
	Southbound	15	12	9	45	23	3
W. Hampton Avenue and N. Teutonia Avenue	Eastbound	14	6	5	16	12	3
	Westbound	13	25	7	14	14	3
	Northwest-bound	22	9	10	20	11	6
	Southeast-bound	6	20	7	10	29	7
W. Hampton Avenue and N. Green Bay Avenue (STH 57)	Eastbound	42	5	2	24	7	2
	Westbound	21	8	1	24	5	1
	Northwest-bound	3	26	5	3	31	3
	Southeast-bound	5	16	3	11	26	4

Source: SEWRPC.

Turn-lane construction is also required to resolve the problems at the intersection of W. Hampton Avenue and N. Fond du Lac Avenue (STH 145). This intersection is the most congested on W. Hamton Avenue, with one congested approach in the morning peak hour and three in the evening peak hour. Elimination of the morning and evening peak congestion at this intersection would require the addition of separate turn phasing during the morning and evening peak hour, as well as the addition of a new traffic controller, at an estimated capital cost of $16,000; the prohibition of on-street parking and substitution of a far-side for a near-side bus stop during the evening peak hour on the westbound W. Hampton Avenue approach at an estimated capital cost of $200; the designation by pavement marking of the right-hand lane on the westbound approach for right-turns only at an estimated capital cost of $200; and the reconstruction to two lanes of an existing single left-turn lane at an estimated capital cost of $20,000. The total cost of improving this intersection is thus estimated at $36,400.

In addition, the existing offsets between the traffic signal timing plans of the 14 signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Hampton Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

N. 76th Street (STH 181) from
W. Harwood Avenue to W. Bradley Road

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 104, N. 76th Street (STH 181) from W. Harwood Avenue to W. Bradley Road, a distance of 8.0 miles. Map 105 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 76th Street. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 76th Street. Retail sales and service uses abut N. 76th Street at its intersections with W. Harwood Avenue, W. Capitol Drive (STH 190), W. Appleton Avenue (USH 41), W. Hampton Avenue, W. Fond du Lac Avenue (STH 145), W. Mill Road, and W. Good Hope Road, and otherwise occur in a scattered fashion along the corridor. Industrial land use is evident along the northern one-third of this segment of N. 76th Street. Governmental and institutional land uses occur along N. 76th Street at W. Harwood Avenue at the Milwaukee County Institutions; at W. North Avenue at Longfellow Junior High School, Wauwatosa Cemetery, and the Wauwatosa Civic Center; and between W. Lisbon Avenue and W. Nash Avenue at Holy Cross Cemetery. Recreational land uses are dispersed throughout the corridor.

Table 49

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. HAMPTON AVENUE

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Hampton Avenue and N. 92nd Street	Congested east-to-northbound left turn during the evening peak hour (206 vehicles per hour at level-of-service E)	Recommended Actions Retime signal cycle length to 90 seconds, making necessary signal phasing changes at other approaches	$ 200	
	Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour	Add an actuated 10.8-second east-to-northbound leading green arrow to operate concurrently with eastbound through green phase during the morning and evening peak hours	$14,000	
		Increase storage length of east-to-northbound left-turn lane from 134 to 200 feet	$15,000	$29,200
		Alternative Action Retime 60-second cycle or initiate 90-second cycle so that east-to-northbound left turn can be adequately negotiated on through green phase (Not recommended because neither a 60- nor a 90-second cycle length would provide a sufficient percentage of through green time on W. Hampton Avenue to accommodate the existing left turns during the evening peak hour)		
W. Hampton Avenue W. Appleton Avenue (USH 41)	Congested northwest-to-westbound left turn during the evening peak hour (151 vehicles per hour at level-of-service E) and congested southeast-to-eastbound left turn during the evening peak hour (130 vehicles per hour at level-of-service E)	Recommended Action Retime 90-second cycle, and increase existing lagging left-turn arrows controlling both northwest-bound and southeast-bound approaches from 9.0 to 12.6 seconds to operate independently of the through green phase, making necessary signal phasing changes at other approaches	- -	- -
W. Hampton Avenue and N. Fond du Lac Avenue (STH 145)	Congested southeast-to-eastbound left turn during the morning peak hour (270 vehicles per hour at level-of-service E); congested southeast-to-eastbound left turn during the evening peak hour (139 vehicles per hour at level-of-service E); congested northwest-to-westbound left turn during the evening peak hour (186 vehicles per hour at level-of-service E); and congested left-turn, right-turn, and through movements from westbound approach during the evening peak hour (991 vehicles per hour entering approach at level-of-service D)	Recommended Actions Add 12.6-second southeast-to-eastbound actuated leading green arrow to operate concurrently with through southeast-bound green phase terminated with a restricted circular red-turn indication for the remaining portion of the southeast-bound green phase for pedestrian crossing protection, and eliminate 7.2-second northwest-to-west actuated leading green arrow during the morning peak hour. Also, add 11.7-second southeast-to-eastbound actuated leading green left-turn arrow terminated with a restricted circular red-turn indication for the remaining portion of the southeast-bound green phase for pedestiran crossing protection, and 11.7-second west-to-northwest actuated leading green right-turn arrow to operate independently of through north- and southbound green phase; northwest-to-westbound leading left-turn arrow to 11.7 seconds during the evening peak hour, making necessary signal phasing changes on all other approaches	$16,000	- -

Table 49 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Hampton Avenue and N. Fond du Lac Avenue (STH 145) (continued)		(It should be noted that under this recommendation, it is intended that the westbound right-turn arrow would be actuated only when the southeast-bound and northwest-bound left-turn arrows are actuated to provide additional green time for the current right-turn-on-red operation to facilitate the heavy westbound right turn)		
		Prohibit on-street parking on westbound approach during the evening peak hour and relocate bus stop on westbound approach	$ 200	
		Reconstruct exclusive left-turn lane to 150-foot-long double lane for south-east-to-eastbound movement	$20,000	
		Designate right-hand lane on westbound approach for right turns only	$ 200	$36,400
		<u>Alternative Actions</u> Retime 90-second cycle so that all vehicular traffic movements operate at or over design levels		
		(Not recommended because the 90-second cycle length would not provide a sufficient percentage of green time to adequately accommodate the magnitude of traffic volumes occurring at this intersection)		
		Increase northwest-to-westbound actuated leading left-turn arrow from 10.8 seconds to 11.7 seconds, and add 11.7-second actuated leading south-east-to-eastbound left turn and west-to-northwest-bound right-turn arrows during the evening peak hour. Add 22.5-second southeast-to-eastbound actuated left-turn arrow and eliminate 7.2-second leading green arrow from northwest-bound approach during the morning peak hour		
		Prohibit parking on westbound approach during the evening peak hour		
		Lengthen turn lane on northwest-bound approach from 140 to 190 feet		
		(Not recommended because, owing to space restrictions, existing exclusive southeast-to-eastbound left-turn lane cannot be lengthened adequately to provide storage capacity necessary for present turn volume. Consequently, double left-turn lane is recommended)		

Table 49 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Hampton Avenue and N. Teutonia Avenue	Congested left-turn, right-turn, and through movements from northwest-bound approach during the evening peak hour (871 vehicles per hour entering approach at level-of-service E)	Recommended Actions Retime 60-second cycle to increase northwest-bound green time from 15.0 to 16.8 seconds, making necessary signal phasing changes at other approaches	- -	
		Reconstruct right-turn lane curbline on northbound approach to remove irregular alignment	$15,000	$15,000
W. Hampton Avenue and N. Green Bay Avenue (STH 57)	Congested northwest-to-westbound left turn during the evening peak hour (284 vehicles per hour at level-of-service E)	Recommended Actions Retime signal phasing such that actuated lagging green arrow controlling this lane is increased from 7.2 to 12.6 seconds to operate independently of through green phase during the morning and evening peak hours, making necessary signal timing changes at all other approaches	- -	
		Add restricted circular red-turn phase while the northwest-bound through green phase is operating to precede the northwest-to-westbound lagging turn arrows during the morning and evening peak hours for pedestrian crossing protection	$ 800	
		Reconstruct exclusive northwest-to-westbound left-turn lane to double lane	$20,000	$20,800
		Alternative Action Retime 90-second signal cycle so that northwest-to-westbound actuated green arrow is increased from 7.2 to 18 seconds, making necessary signal phase changes at all other approaches		
		(Not recommended because this retiming does not provide sufficient green time to adequately improve the level-of-service of the left-turn movement on the northwest-bound approach to the intersection. Also, further increases in green time of the exclusive turn arrow would adversely affect the level of service on the other approaches)		
Total Capital Cost				$101,400

Source: SEWRPC.

Table 50

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. HAMPTON AVENUE

Phase	Intersection (time in seconds)		
	W. Hampton Avenue		N. 92nd Street
	Eastbound	Westbound	
Green	48.0	33.6	31.2
Yellow	3.6	3.6	3.6
Red	38.4	52.8	55.2
Green Arrow	10.8[a]	--	--
Yellow Arrow	3.6	--	--
Total Cycle	90.0	90.0	90.0

Phase	W. Hampton Avenue	W. Grantosa Drive
Green	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Hampton Avenue	W. Appleton Avenue (USH 41)
Green	34.2	27.9
Yellow	4.5	4.5
Red	51.3	57.6
Green Arrow	--	12.6[b]
Yellow Arrow	--	4.5
Total Cycle	90.0	90.0

Phase	W. Hampton Avenue	N. 76th Street (STH 181)
Green	41.1	37.8
Yellow	3.6	3.6
Red	42.3	48.5
Green Arrow	--	--
Yellow Arrow	--	--
Total Cycle	90.0	90.0

Phase	W. Hampton Avenue	N. 68th Street
Green	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	W. Hampton Avenue			W. Fond du Lac Avenue (STH 145)			
	Morning	Evening		Morning		Evening	
		Eastbound	Westbound	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound
Green	34.2	29.7	29.7	26.1	43.2	31.5	31.5
Yellow	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Red	51.3	55.8	55.8	59.4	42.3	54.0	54.0
Green Arrow	--	--	11.7[c]	--	12.6[a]	11.7[a]	11.7
Yellow Arrow	--	--	4.5	--	4.5	4.5	4.5
Red-Turn Indication	--	--	--	--	72.9	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	77.9

Phase	W. Hampton Avenue	N. 60th Street
Green	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Table 50 (continued)

Phase	Intersection (time in seconds)			
	W. Hampton Avenue		N. 51st Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. Sherman Boulevard	
Green	25.2		25.2	
Yellow	3.6		3.6	
Red	31.2		31.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		W. Hopkins Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. 37th Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. 32nd Street	
Green	28.2		22.2	
Yellow	3.6		3.6	
Red	28.2		34.2	
Total Cycle	60.0		60.0	
	W. Hampton Avenue		N. Teutonia Avenue	
	Eastbound	Westbound	Northwest-bound	Southeast-bound
Green	16.8	23.4	16.8	23.4
Yellow	3.6	3.6	3.6	3.6
Red	39.6	33.0	39.6	33.0
Green Arrow	- -	7.2[c]	- -	7.2[c]
Yellow Arrow	- -	3.0	- -	3.0
Total Cycle[d]	60.0	60.0	60.0	60.0
	W. Hampton Avenue		N. Green Bay Road (STH 57)	
			Northwest-bound	Southeast-bound
Green	32.4		30.6	30.6
Yellow	3.6		3.6	3.6
Red	54.0		55.8	55.8
Green Arrow	- -		12.6[b]	12.6[b]
Yellow Arrow	- -		3.6	3.6
Red-Turn Indication	- -		- -	73.8
Total Cycle	90.0		90.0	90.0

[a] *Actuated leading left-turn arrow.*

[b] *Actuated lagging left-turn arrow.*

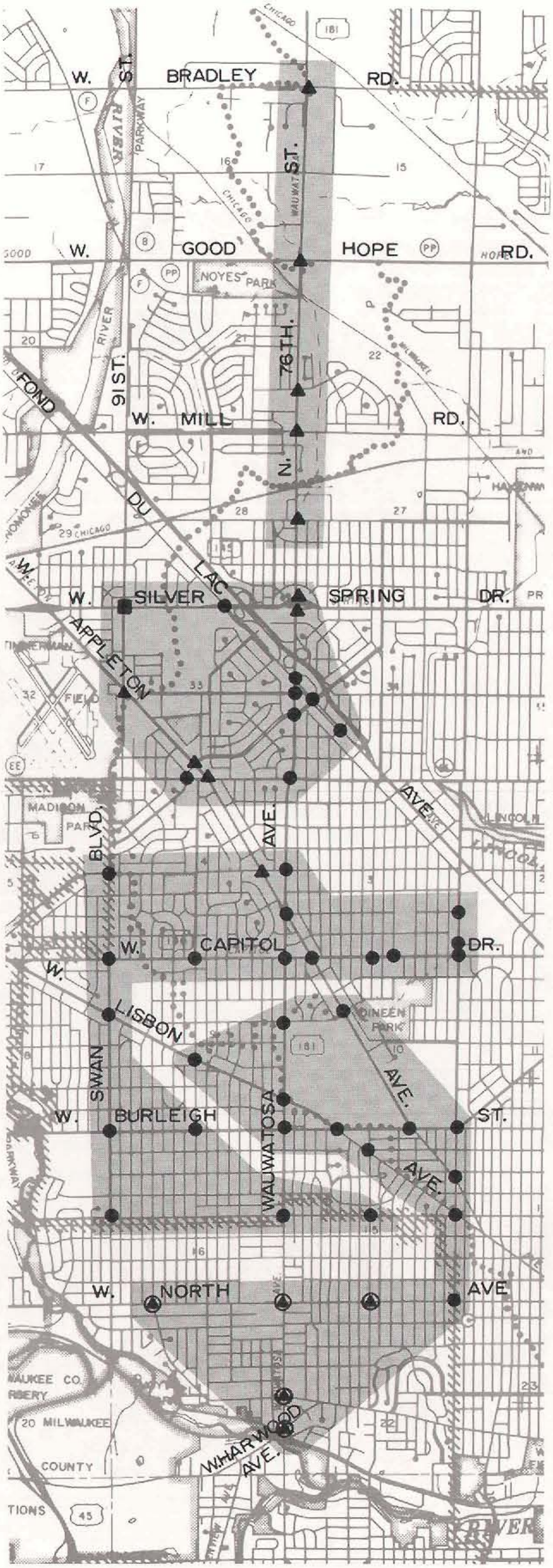
[c] *Leading left-turn arrow.*

[d] *The signal timing sequence on one approach to this intersection is subject to change by pedestrian-actuated control.*

Source: SEWRPC.

Map 104

DETAIL OF THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



LEGEND

SIGNAL JURISDICTION

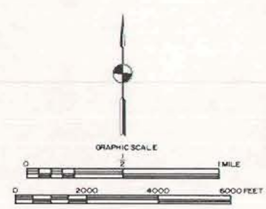
▲ WISCONSIN DEPARTMENT OF TRANSPORTATION

■ MILWAUKEE COUNTY

● CITY OF MILWAUKEE

◬ CITY OF WAUWATOSA

SIGNAL SUBSYSTEMS ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON N. 76 TH STREET INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR

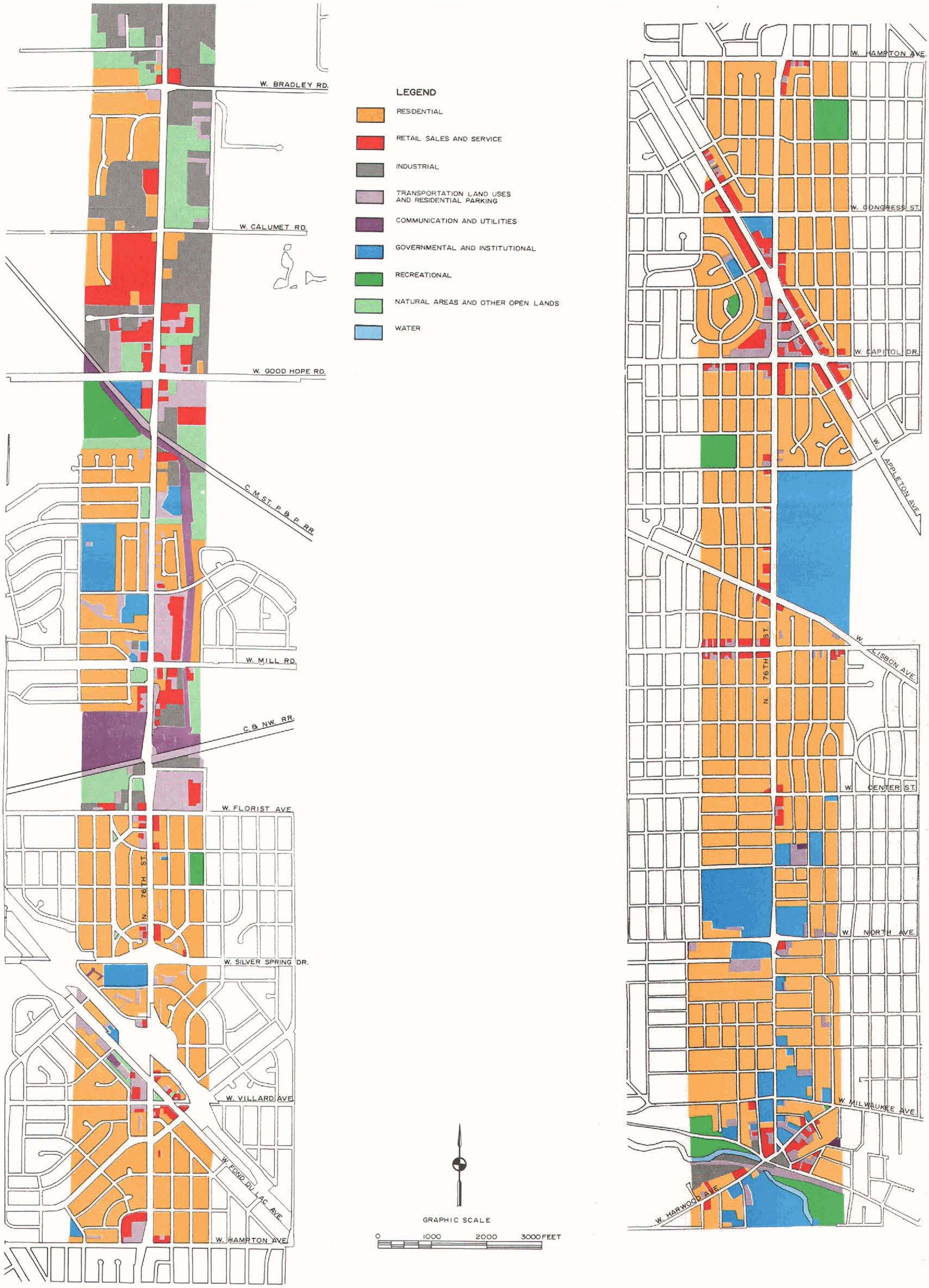


Shown on this map is another of the 20 arterial street segments within the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—76th Street (STH 181) from W. Harwood Avenue to W. Bradley Road, a distance of 8.0 miles. This map also shows the location and jurisdiction of each of the 21 traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 76th Street and are directly affected by the timing plans of the traffic signals on N. 76th Street.

Source: Wisconsin Department of Transportation, Milwaukee County, City of Milwaukee, and SEWRPC.

Map 105

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)



This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of N. 76th Street (STH 181). Residential land use comprises the majority of the existing urban development in this corridor, as well as of the existing urban development immediately adjacent to N. 76th Street. Retail sales and service uses, however, abut N. 76th Street at its intersections with W. Harwood Avenue, W. Capitol Drive (STH 190), W. Appleton Avenue (USH 41), W. Hampton Avenue, W. Fond du Lac Avenue (STH 145), W. Mill Road, and W. Good Hope Road, and otherwise occur in a scattered fashion throughout the corridor. Industrial land use is evident along the northern one-third of this segment of N. 76th Street. Governmental and institutional land uses occur along N. 76th Street at W. Harwood Avenue at the Milwaukee County Institutions; at W. North Avenue at Longfellow Junior High School, Wauwatosa Cemetery, and the Wauwatosa Civic Center; and between W. Lisbon Avenue and W. Nash Avenue at Holy Cross Cemetery. Recreational land uses are dispersed throughout the corridor.

Source: SEWRPC.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 76th Street. Between W. Harwood Avenue and W. North Avenue, the roadway is not median-divided and has a curb-to-curb width of 36 feet, adequate to provide one lane for moving traffic in each direction. Parking is currently prohibited on this segment of N. 76th Street. Between W. North Avenue and W. Center Street, with the exception of its intersection with W. North Avenue, which is channelized, N. 76th Street is not median-divided and has a curb-to-curb width of 51 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted between W. North Avenue and W. Center Street. Between W. Center Street and W. Bradley Road, the roadway is divided by a median ranging in width from 9 to 24 feet, and the curb-to-curb widths of the dual roadways range from 34 to 36 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted on this stretch of the N. 76th Street problem segment except between W. Mill Road and W. Acacia Street, on the overpasses of the Fond du Lac Freeway (STH 145) and W. Silver Spring Drive, and between W. Capitol Drive (STH 190) and W. Congress Street, where parking is currently prohibited.

As indicated in Table 51, the problem segment of N. 76th Street in the study area has 21 signalized intersections, at which the N. 76th Street approaches range in width from 17 to 36 feet. Eighteen of the northbound and 16 of the southbound approaches to these 21 intersections provide separate lanes for the exclusive use of left-turning vehicles. Only one approach along this segment—the southbound approach at the intersection of W. Harwood Avenue—provides a separate lane for the exclusive use of right-turning vehicles, and this lane is identified through regulatory pavement markings rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along N. 76th Street are also indicated in Table 51.

Traffic Control Measures: The timing plan for each of the 21 traffic signals along N. 76th Street (STH 181) between W. Harwood Avenue and W. Bradley Road is indicated in Table 52. Map 104 shows the location and jurisdiction of each of these signals and the relationship of these signals to the other interconnected progessive signal subsystems which are located within approximately one-half mile of N. 76th Street and are directly affected by the timing plans of the traffic signals on N. 76th Street. Sixteen of the traffic signals are located at intersections of N. 76th Street with other arterial streets, and five of the traffic signals are located at intersections of N. 76th Street with nonarterial streets—specifically, W. Nash Street, W. Grantosa Drive, W. Villard Street, W. Florist Avenue, and W. Acacia Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. 76th Street. The stop sign control on W. Watson Avenue at the intersection of W. Watson Avenue and N. 76th Street is supplemented by a flashing signal beacon which displays red on the W. Watson Avenue approaches and amber on the N. 76th Street approaches. This segment of N. 76th Street is posted for a 30-mile-per-hour (mph) speed limit from W. Harwood Avenue to W. Hadley Street, a 35-mph speed limit from W. Hadley Street to W. Florist Avenue, a 40-mph speed limit from W. Florist Avenue to W. Good Hope Road, and a 45-mph speed limit from W. Good Hope Road to W. Bradley Road.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 21 signalized intersections along the problem segment of N. 76th Street in Figures 9 and 10. The locations along N. 76th Street from W. Harwood Avenue to W. Bradley Road where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 21 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. 76th Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 53.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 76th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 9 and 10. Eight congested traffic movements were found to occur along this segment of N. 76th Street during the morning peak hour, and 17 were found to occur during the evening peak hour.

Table 51

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)

Intersection	Roadway Approach Width (feet)							
	Northbound		Southbound		Eastbound or Southeast-bound		Westbound or Northwest-bound	
N. 76th Street and W. Harwood Avenue	17	NP	24 R[a]	NP	24 L[a]	P	24	NPFS
N. 76th Street and W. Milwaukee Avenue	18	NP	18	NP	20	NPAM	18	NP
N. 76th Street and W. North Avenue	32 ML	NP	32 ML	NP	34 ML	NP	34 ML	NP
N. 76th Street and W. Center Street	32 ML	P	34 ML	FS	25	P	25	P
N. 76th Street and W. Burleigh Street	34 ML	P	34 ML	P	34 ML	P	34 ML	P
N. 76th Street and W. Lisbon Avenue	34 ML	P	36 ML	P	34 ML	P	34 ML	P
N. 76th Street and W. Nash Street	36 ML	P	36 ML	P	17	P	20	P
N. 76th Street and W. Capitol Drive (STH 190)	36 ML	FS	36 ML	P	36 ML	NPAM	36 ML	NPPM
N. 76th Street and W. Appleton Avenue (USH 41)	36 ML	P	36 ML	FS	36 MR	P	36 MR	P
N. 76th Street and W. Congress Street	36 ML	P	36 ML	FS	22	NS	22	P
N. 76th Street and W. Hampton Avenue	36 ML	P	36 ML	NS	32 ML	P	32 ML	P
N. 76th Street and W. Grantosa Drive	36 ML	P	36 M	P	34 ML	P	34 ML	P
N. 76th Street and W. Villard Avenue	36 ML	P	36 M	P	31 ML	P	31 M	P
N. 76th Street and W. Fond du Lac Avenue (STH 145)	36 ML	P	36 ML	NS	36 M	NS	36 M	FS
N. 76th Street and W. Silver Spring Drive (south)[b]	36 M	NP	36 ML	NP	24	NP	--	--
N. 76th Street and W. Silver Spring Drive (north)[c]	36 ML	NP	36 M	NP	--	--	24	NP
N. 76th Street and W. Florist Avenue	36 ML	P	36 ML	P	32 M	P	32 M	P
N. 76th Street and W. Mill Road	36 ML	FS	36 ML	NS	33 ML	P	33 ML	P
N. 76th Street and W. Acacia Street	36 ML	NS	36 ML	P	17	FS	17	NS
N. 76th Street and W. Good Hope Road	36 ML	P	36 ML	P	40 ML	NS	40 MLR[a]	NS
N. 76th Street and W. Bradley Road	36 ML	P	36 ML	P	32 ML	P	32 ML	P

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a]Exclusive turn-lane width included as a part of roadway approach width.

[b]One-way roadway eastbound.

[c]One-way roadway westbound.

Source: SEWRPC.

Table 52

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)

Phase	Intersection (time in seconds)							
	N. 76th Street				W. Harwood Avenue			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	22.5	22.5	18.9	18.9	56.7	27.9	60.3	18.9
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	63.9	63.9	67.5	67.5	29.7	58.5	26.1	67.5
Green Arrow. . .	- -	23.4[a]	- -	36.0[a]	23.4[b]	- -	36.0[b]	- -
Yellow Arrow . .	- -	3.6	- -	3.6	3.6	- -	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	N. 76th Street				W. Milwaukee Avenue			
Green.	31.2				19.2			
Yellow	3.0				3.0			
Red.	25.8				37.8			
Total Cycle	60.0				60.0			
	N. 76th Street				W. North Avenue			
Green.	26.1				26.1			
Yellow	3.6				3.6			
Red.	60.3				60.3			
Green Arrow. . .	9.9[b]				9.9[b]			
Yellow Arrow . .	3.6				3.6			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Center Street			
Green.	25.2				25.2			
Yellow	3.6				3.6			
Red.	31.2				31.2			
Total Cycle	60.0				60.0			
	N. 76th Street				W. Burleigh Street			
Green.	39.6				39.6			
Yellow	3.6				3.6			
Red.	46.8				46.8			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Lisbon Avenue			
Green.	39.6				39.6			
Yellow	3.6				3.6			
Red.	46.8				46.8			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Nash Street			
Green.	57.6				21.6			
Yellow	3.6				3.6			
Red.	28.8				64.8			
Total Cycle[c]	90.0				90.0			

Table 52 (continued)

Phase	Intersection (time in seconds)	
	N. 76th Street	W. Capitol Drive (STH 190)
Green.	20.7	44.1
Yellow	4.5	4.5
Red	64.8	41.4
Green Arrow. . .	--	9.0[b]
Yellow Arrow . .	--	3.6
Total Cycle[c]	90.0	90.0
	N. 76th Street	W. Appleton Avenue (USH 41)
Green.	34.2	32.4
Yellow	4.5	4.5
Red	51.3	53.1
Green Arrow. . .	7.2[c]	--
Yellow Arrow . .	3.6	--
Total Cycle[c]	90.0	90.0
	N. 76th Street	W. Congress Street
Green.	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle[c]	90.0	90.0
	N. 76th Street	W. Hampton Avenue
Green.	35.1	44.1
Yellow	3.6	3.6
Red	51.3	42.3
Total Cycle	90.0	90.0
	N. 76th Street	W. Grantosa Drive
Green.	44.1	35.1
Yellow	3.6	3.6
Red	42.3	51.3
Total Cycle	90.0	90.0
	N. 76th Street	W. Villard Avenue
Green.	47.7	29.7
Yellow	4.5	4.5
Red	37.8	55.8
Total Cycle	90.0	90.0
	N. 76th Street	W. Fond du Lac Avenue (STH 145)
Green.	43.2	34.2
Yellow	4.5	4.5
Red	42.3	51.3
Total Cycle	90.0	90.0

Table 52 (continued)

Phase	Intersection (time in seconds)		
	N. 76th Street		W. Silver Spring Drive (south)
	Northbound	Southbound	
Green.	43.2	56.7	20.7
Yellow	4.5	4.5	4.5
Red	42.3	28.8	64.8
Green Arrow. . .	--	7.2[d]	--
Yellow Arrow . .	--	4.5	--
Total Cycle	90.0	90.0	90.0
	N. 76th Street		W. Silver Spring Drive (north)
	Northbound	Southbound	
Green.	56.7	43.2	20.7
Yellow	4.5	4.5	4.5
Red	28.8	42.3	64.8
Green Arrow. . .	7.2[d]	--	--
Yellow Arrow . .	4.5	--	--
Total Cycle	90.0	90.0	90.0
	N. 76th Street		W. Florist Avenue
Green.	52.2		25.2
Yellow	4.5		4.5
Red	33.3		60.3
Total Cycle	90.0		90.0
	N. 76th Street		W. Mill Road
Green.	47.7		29.7
Yellow	4.5		4.5
Red	37.8		55.8
Total Cycle	90.0		90.0
	N. 76th Street		W. Acacia Street
	Northbound	Southbound	
Green.	36.0	47.7	29.7
Yellow	4.5	4.5	4.5
Red	49.5	37.8	55.8
Green Arrow. . .	--	9.0[e]	--
Yellow Arrow . .	--	2.7	--
Total Cycle	90.0	90.0	90.0
	N. 76th Street		W. Good Hope Road
	Northbound	Southbound	
Green.	40.0	58.0	37.0
Yellow	4.5	4.5	4.5
Red	80.5	57.5	83.0
Green Arrow. . .	--	15.0[b]	16.0[b]
Yellow Arrow . .	--	3.0	3.0
Total Cycle	125.0	125.0	125.0

Table 52 (continued)

Phase	Intersection (time in seconds)	
	N. 76th Street	W. Bradley Road
Green.	35.0	24.0
Yellow	5.0	5.0
Red.	30.0	41.0
Green Arrow. . .	--	--
Yellow Arrow . .	--	--
Total Cycle	70.0	70.0

[a] *Leading right-turn arrow.*

[b] *Leading left-turn arrow.*

[c] *The signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d] *Actuated lagging left-turn arrow.*

[e] *Actuated leading left-turn arrow.*

Source: Wisconsin Department of Transportation, City of Milwaukee, City of Wauwatosa, and SEWRPC.

Alternative and Recommended Transportation Systems Management Actions: The eight morning and 17 evening peak-hour traffic congestion problems identified along N. 76th Street are associated with the following eight signalized intersections: W. Capitol Drive (STH 190), W. Appleton Avenue (USH 41), W. Fond du Lac Avenue (STH 145), W. Silver Spring Drive, W. Mill Road, W. Acacia Street, W. Good Hope Road, and W. Bradley Road.

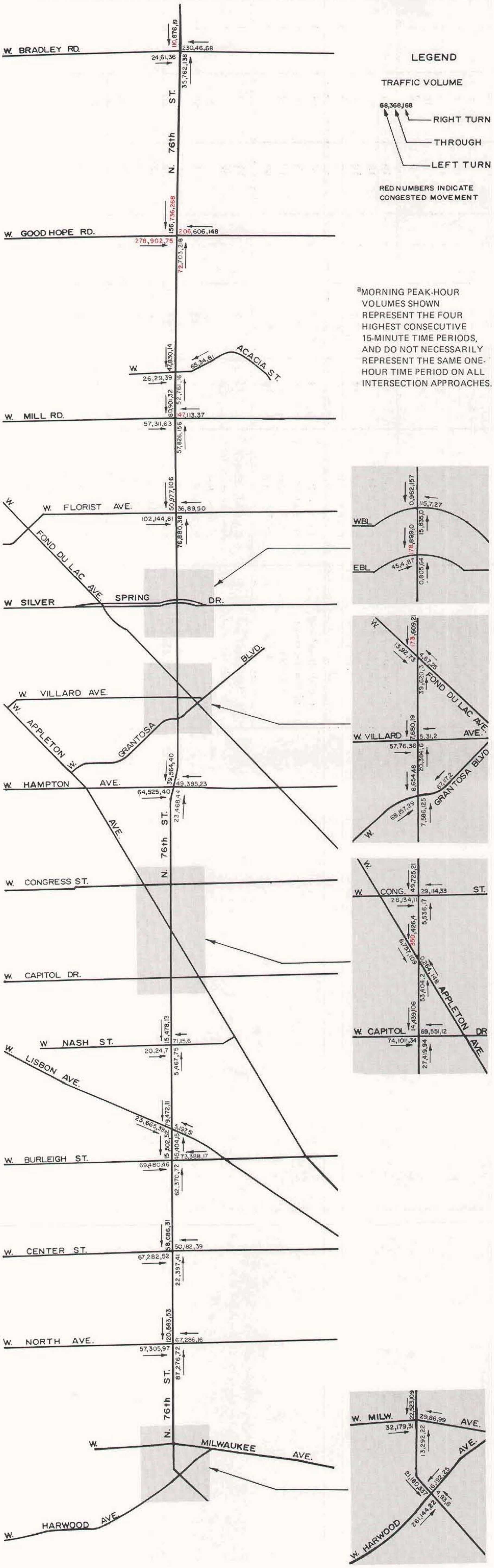
Two intersections along N. 76th Street—W. Harwood Avenue, and W. North Avenue—while not displaying congestion problems, were found to lack adequate vehicle storage capacity within an existing exclusive turn lane, and two other intersections—N. 76th Street and W. Center Street and N. 76th Street and W. Grantosa Drive—while also not displaying congestion problems, were found to have signals that could be retimed to more efficiently serve existing traffic volumes. Transportation systems management actions were accordingly also considered for these intersections.

Table 54 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 55 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of N. 76th Street. A total of 19 actions are recommended to be implemented at the eight problem intersections at a capital cost of approximately $206,400, expressed in 1980 dollars, not including right-of-way and relocation costs. Right-of-way and relocation costs would be associated only with improvements recommended at the intersection of N. 76th Street and W. Good Hope Road, and would represent an additional $35,000 to $150,000, as shown in Table 54. An additional three actions are recommended to be implemented at three of the four intersections not displaying congestion problems, at a total capital cost of $31,000.

As indicated in Table 54, the addition of separate signal phasing is the only action considered necessary to eliminate the congestion problems at two of the eight problem intersections: the intersections of N. 76th Street with W. Fond du Lac Avenue (STH 145) and with W. Mill Road. The capital costs of providing the necessary additional signal phasing at these intersections are both estimated at approximately $2,000. At the intersection of N. 76th Street and W. Silver Spring Drive, it was recommended that one additional signal phase and separate morning and evening timing plans be added at an estimated capital cost of $2,000, and that program visibility signal heads be installed at an estimated capital cost of $10,000. The total cost of improvements at this intersection is estimated at

Figure 9

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181) DURING THE MORNING PEAK HOUR[a]

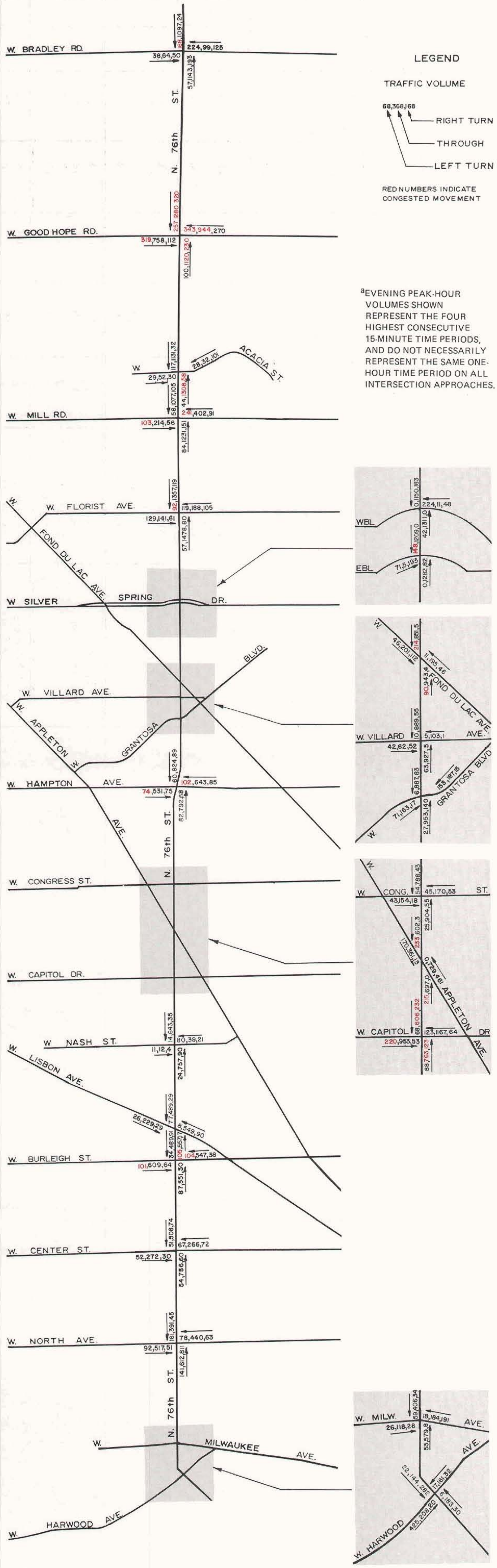


[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 10

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181) DURING THE EVENING PEAK HOUR[a]



[a]EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 53

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)

Intersection	Approach Direction	Morning Peak Hour: Turns Percent Right	Morning Peak Hour: Turns Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns Percent Right	Evening Peak Hour: Turns Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 76th Street and W. Harwood Avenue	Eastbound	5	61	6	3	65	1
	Westbound	11	7	2	15	8	3
	Northbound	6	4	9	14	3	1
	Southbound	63	4	3	63	5	4
N. 76th Street and W. Milwaukee Avenue	Eastbound	13	13	1	16	15	2
	Westbound	46	14	--	49	4	1
	Northbound	7	4	7	1	8	1
	Southbound	3	18	3	6	11	3
N. 76th Street and W. North Avenue	Eastbound	21	12	3	8	14	1
	Westbound	4	18	2	11	13	1
	Northbound	17	20	5	14	16	1
	Southbound	7	16	1	8	27	1
N. 76th Street and W. Center Street	Eastbound	13	17	3	8	15	3
	Westbound	14	19	3	18	16	3
	Northbound	9	5	3	7	6	3
	Southbound	4	7	3	12	8	3
N. 76th Street and W. Burleigh Street	Eastbound	8	11	3	8	13	4
	Westbound	4	15	3	6	15	2
	Northbound	14	12	3	7	13	1
	Southbound	9	3	3	15	5	2
N. 76th Street and W. Lisbon Avenue	Southeast-bound	5	3	1	10	9	1
	Northwest-bound	20	2	1	14	1	2
	Northbound	3	10	1	3	15	1
	Southbound	2	14	1	5	13	1
N. 76th Street and W. Nash Street	Southeast-bound	14	39	2	15	41	--
	Northwest-bound	7	77	1	15	57	3
	Northbound	14	1	4	10	3	1
	Southbound	3	3	5	5	2	2
N. 76th Street and W. Capitol Drive (STH 190)	Eastbound	3	7	4	4	18	2
	Westbound	2	11	6	5	9	2
	Northbound	17	5	4	13	9	1
	Southbound	19	2	3	26	7	3
N. 76th Street and W. Appleton Avenue (USH 41)	Southeast-bound	12	1	2	31	3	1
	Northwest-bound	36	--	4	39	--	1
	Northbound	1	11	4	--	24	1
	Southbound	1	45	2	1	27	1
N. 76th Street and W. Congress Street	Eastbound	6	16	8	8	20	9
	Westbound	19	16	6	19	18	2
	Northbound	3	1	4	6	2	--
	Southbound	3	6	2	5	6	2
N. 76th Street and W. Hampton Avenue	Eastbound	7	10	4	11	11	2
	Westbound	5	10	6	10	12	2
	Northbound	6	4	3	7	9	2
	Southbound	6	6	3	9	6	1

Table 53 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 76th Street and W. Grantosa Boulevard	Eastbound	11	27	2	7	28	1
	Westbound	1	36	3	4	43	1
	Northbound	17	1	5	13	2	2
	Southbound	7	1	4	8	1	1
N. 76th Street and W. Villard Avenue	Eastbound	21	34	4	33	27	3
	Westbound	5	13	18	1	5	6
	Northbound	1	3	4	1	6	1
	Southbound	3	1	4	6	1	2
N. 76th Street and W. Fond du Lac Avenue (STH 145)	Southeast-bound	41	7	5	31	13	1
	Northwest-bound	26	4	17	18	4	3
	Northbound	1	6	3	1	8	2
	Southbound	3	21	4	1	20	2
N. 76th Street and W. Silver Spring Drive (south)	Eastbound	64	33	12	72	26	3
	Westbound	--	--	--	--	--	--
	Northbound	7	--	3	6	--	1
	Southbound	--	17	4	--	11	2
N. 76th Street and W. Silver Spring Drive (north)	Eastbound	--	--	--	--	--	--
	Westbound	18	77	7	14	79	4
	Northbound	--	2	4	--	3	1
	Southbound	14	--	4	14	--	3
N. 76th Street and W. Florist Avenue	Eastbound	25	31	12	18	39	3
	Westbound	29	20	5	25	29	5
	Northbound	4	8	4	5	4	2
	Southbound	9	5	4	8	6	3
N. 76th Street and W. Mill Road	Eastbound	15	13	3	15	28	2
	Westbound	12	50	8	12	33	4
	Northbound	15	5	4	10	6	2
	Southbound	3	6	5	8	5	3
N. 76th Street and W. Acacia Street	Eastbound	41	28	5	27	26	3
	Westbound	45	36	2	63	17	1
	Northbound	2	6	3	4	3	3
	Southbound	2	5	4	3	9	2
N. 76th Street and W. Good Hope Road	Eastbound	6	22	5	9	27	5
	Westbound	15	22	6	17	22	3
	Northbound	22	7	5	16	7	3
	Southbound	23	14	3	17	14	3
N. 76th Street and W. Bradley Road	Eastbound	30	20	7	33	25	4
	Westbound	20	67	5	28	50	6
	Northbound	15	4	5	14	4	3
	Southbound	2	11	4	2	13	4

Source: SEWRPC.

Table 54

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 76th Street and W. Capitol Drive (STH 190)	Congested east-to-northbound left-turn movement during the evening peak hour (220 vehicles per hour at level-of-service E) and congested right-turn and through movements from northbound and southbound approaches during the evening peak hour (886 and 838 vehicles entering approaches per hour, respectively, both at level-of-service E)	Recommended Actions Retime east-to-northbound and west-to-northbound traffic-actuated 9.0-second leading green arrows to 14.4-second leading green arrows operating simultaneously and independently of the through green phase during the evening peak hour, making necessary signal changes at other approaches	--	
	Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour. (This storage capacity problem cannot be corrected owing to inadequate space for construction due to the location of N. 77th Street)	Prohibit on-street parking on northbound and southbound approaches to intertion during the evening peak hour	$ 300	$ 300
N. 76th Street and W. Appleton Avenue (USH 41)	Congested north-to-northwest-bound left-turn movement during the evening peak hour (215 vehicles per hour at level-of-service E); congested south-to-southeast-bound left-turn movement during the morning peak hour (350 vehicles per hour at level-of-service E) and during the evening peak hour (233 vehicles per hour at level-of-service E)	Recommended Actions Retime traffic signals to increase south-to-southeast-bound and north-to-northwest-bound 7.2-second lagging left-turn arrows to 9.9-second lagging arrows operating independently of through green phase during the morning and evening peak hours	--	
	Insufficient north-to-northwest-bound left-turn-lane storage capacity during the evening peak hour and south-to-southeast-bound left-turn-lane storage capacity during both peak hours	Add circular red indication to operate concurrently with the southbound through green phase and precede the south-to-southeast-bound lagging turn arrows during the morning and evening peak hours for pedestrian crossing protection	$ 12,800	
		Reconstruct exclusive south-to-southeast-bound left-turn lane to double lane with 200 feet of storage	$ 15,000	
		Lengthen north-to-northwest-bound left-turn lane from 110 to 220 feet for increased storage capacity	$ 15,000	$ 42,800
		Alternative Action Retime 90-second cycle, taking green time from north- and southbound through movements and allotting it to signal phases controlling the north- and southbound approaches of N. 76th Street (Not recommended, as such signal phasing alterations cannot provide adequate hourly green time to the problem turning movements to alleviate congestion)		
N. 76th Street and W. Fond du Lac Avenue (STH 145)	Congested south-to-southeast-bound left turn during the morning and evening peak hours (173 and 214 vehicles per hour, respectively, at level-of-service E)	Recommended Action Add 12.6-second traffic-actuated south-to-southeast-bound leading green left-turn arrows during the evening peak hour operating simultaneously and independently of through green phase; and 9.9-second south-to-southeast-bound leading green left-turn arrow during the morning peak hour operating concurrently with the southbound through green phase. Make all other necessary signal timing revisions at other approaches	$ 2,000	$ 2,000

Table 54 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 76th Street and W. Fond du Lac Avenue (STH 145) (continued)		Alternative Action Retime existing 90-second cycle, taking green time from W. Fond du Lac Avenue and allotting it to N. 76th Street in order to alleviate congested movements (Not recommended, as adequate through green time cannot be allotted to alleviate north-to-northwest-bound and south-to-southeast-bound left-turn congestion)		
N. 76th Street and W. Silver Spring Drive	Congested south-to-eastbound left-turn movement during both the morning and evening peak hours (178 vehicles per hour at level-of-service E during the morning peak hour, and 148 vehicles per hour at level-of-service E during the evening peak hour)	Recommended Actions Add a traffic-actuated south-to-eastbound lagging green left-turn arrow of 12.6 and 16.2 seconds during the morning and evening peak hours, respectively, operating concurrently with the southbound through green phase, making necessary signal timing revisions on all other approaches	$ 2,000	
	Insufficient south-to-eastbound left-turn-lane storage capacity during the morning and evening peak hours. (This storage capacity problem cannot be corrected owing to inadequate space for construction)	Add separate morning and evening timing plans to existing 90-second traffic signal sequence, and modify signals for program visibility heads	$ 10,000	$ 12,000
		Alternative Action Retime existing 90-second traffic signal sequence without adding any separate phasing, allotting more green time to south-to-eastbound left-turn phase (Not recommended, as such signal timing revisions cannot provide adequate green time to alleviate congestion from southbound left-turn movement)		
N. 76th Street and W. Mill Road	Congested west-to-southbound left-turn movement during the morning and evening peak hours (147 vehicles per hour during the morning peak at level-of-service E and 241 vehicles per hour during the evening peak at level-of-service E)	Recommended Actions Add west-to-southbound 9.0- and 14.4-second leading left-turn arrows during the morning and evening peak hours, respectively, to existing signalization to operate concurrently with the througn green phase, making necessary signal timing changes at other approaches	$ 2,000	
	Insufficient west-to-southbound left-turn-lane storage capacity during the evening peak hour	Monitor traffic volumes to update signal timing in accordance with the scheduled opening of N. 60th Street. (If such volumes are considerably higher, parking restrictions on N. 76th Street and/or construction of a double left-turn bay for west-to-southbound movement may be required)		$ 2,000
		Alternative Action Retime existing 90-second cycle such that all problem turning movements can be negotiated at an acceptable level of service on the through green phase (Not recommended, as high opposing volumes preclude such action and require the installation of separate left-turn phasing)		

Table 54 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 76th Street and W. Acacia Street	Congested through and right-turn movements from northbound approach during the evening peak hour (1,308 through vehicles and 58 right-turning vehicles at level-of-service D)	Recommended Actions Change existing pretimed signal operation to semi-actuated operation controlled by pedestrian pushbutton	$ 600	
		Reconstruct and channelize existing median opening so that through and left-turn movements from W. Acacia Street approaches cannot be made	$ 10,000	$ 10,600
N. 76th Street and W. Good Hope Road	Congested west-to-southbound left-turn movement (206 vehicles per hour at level-of-service E); congested eastbound through and right-turn movements (902 and 75 vehicles per hour at level-of-service D); and congested east-to-northbound left-turn movement (278 vehicles per hour at level-of-service E) during the morning peak hour. Congested westbound through movement (944 vehicles per hour at level-of-service D); congested west-to-southbound left-turn movement (343 vehicles per hour at level-of-service E); congested east-to-northbound left-turn movement (319 vehicles per hour at level-of-service E); congested northbound through and right-turn movements (1,120 and 230 vehicles per hour at level-of-service E); congested southbound right-turn and through movements (320 and 1,280 vehicles per hour at level-of-service E); and congested south-to-eastbound left-turn movements (257 vehicles per hour at level-of-service E) during the evening peak hour	Recommended Actions Change traffic signal sequence from 125.0-second cycle to 90.0-second cycle, adding separate morning and evening signal timing plans, reducing the maximum morning east-to-northbound and west-to-southbound left-turn arrows to 9.0 seconds, and the south-to-eastbound left-turn arrow to 6.3 seconds, and reducing the maximum evening east-to-northbound and west-to-southbound left-turn arrows to 12.6 seconds and the south-to-eastbound left-turn arrow to 7.2 seconds. The southbound, eastbound, and westbound green left-turn arrows should be followed by a restricted red arrow during the through green phases on each respective approach	$ 200	
		Add 43.0-second west-to-northbound and 39.6-second north-to-eastbound and south-to-westbound right-turn arrows operating concurrently with the through green phases during the morning peak hour. During the evening peak hour, add 36.0-second west-to-northbound and 54.9-second north-to-eastbound and south-to-westbound right-turn arrows operating concurrently with the through green phase. Add also a circular red indication to follow the south-, east-, and westbound left-turn arrows to restrict timing movements during the through green phase on each of these approaches make all necessary signal timing revisions at other approaches	$ 16,500	
		Restrict on-street parking on all approaches during the evening peak hour and on southbound approach during the morning peak hour	$ 800	
	Insufficient east-to-northbound left-turn-lane storage capacity during the morning and evening peak hours	Construct exclusive 200-foot northbound and 250-foot southbound right-turn lanes; reconstruct westbound right-turn lane for 250-foot exclusive approach; and construct double left-turn lanes on the southbound, eastbound, and westbound approaches	$105,000 (Right-of-way and possible relocation costs associated with southbound right-turn lane will add between $35,000 and $150,000 to these construction costs, depending upon whether the entire existing retail gasoline station is purchased or whether a strip of right-of-way is purchased from this property)	$157,500 - $272,500 (Including right-of-way and possible relocation costs associated with southbound right-turn lane)

Table 54 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
		Alternative Action Retime existing 125.0-second cycle so that all problem movements can be negotiated at an acceptable level of service using existing phasing structure (Not recommended, as congested movements at this intersection are too extensive and only significant increases in intersection capacity are seen as solutions)		
N. 76th Street and W. Bradley Road	Congested south-to-eastbound left-turn during the morning and evening peak hours (110 vehicles per hour at level-of-service E during morning peak-hour and 168 vehicles per hour during evening peak hour at level-of-service E) Insufficient west-to-southbound left-turn lane storage capacity during the morning and evening peak hours	Recommended Actions Retime existing 70.0-second signal cycle to 90.0-second cycle, making necessary signal timing changes at all other approaches	$ 200	
		Add a 7.2-second leading green left-turn phase for south-to-eastbound movement during the morning peak hour and 9.9-second leading green left-turn phase for south-to-eastbound movement during the evening peak hour, both operating concurrently with southbound through green phase	$ 14,000	
		Include west-to-southbound exclusive left-turn lane of 230 feet in reconstruction plans for W. Bradley Road scheduled for letting in 1982	- -	$ 14,200
		Alternative Action Retime existing signals such that all problem movements can be negotiated at an adequate level-of-service using existing phasing structure (Not recommended, as sufficient through green time cannot be allotted southbound approach during either the morning or evening peak hour to alleviate problem turning congestion)		
Subtotal			$241,400 - $356,400 (Including right-of-way and possible relocation costs associated with southbound right-turn lane at intersection of N. 76th Street and W. Good Hope Road)	
N. Wauwatosa Avenue and W. Harwood Avenue	Insufficient east-to-northbound left-turn-lane storage capacity during the morning and evening peak hours	Recommended Action No action is recommended due to 1) the proximity of the intersection of W. Harwood Avenue to N. 76th Street and W. State Street which limits the storage length of the eastbound-to-northbound left-turn lane, and 2) the scheduled construction of the W. Harwood Avenue bridge which will serve to alleviate this problem	- -	- -

Table 54 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 76th Street and W. North Avenue	Insufficient north-to-westbound left-turn-lane storage capacity during the evening peak hour and south-to-east-bound left-turn-lane storage capacity during the morning and evening peak hours	Recommended Action Increase storage length of north-to-westbound left-turn lane from 100 to 140 feet and south-to-eastbound left-turn lane from 90 to 160 feet	$ 31,000	$ 31,000
N. 76th Street and W. Center Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime traffic signal sequence from 60.0-second cycle to 90.0-second cycle	--	--
N. 76th Street and W. Grantosa Drive	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime existing 90-second cycle to provide balanced distribution of signal time between N. 76th Street and W. Grantosa Drive	--	--
Subtotal				$ 31,000
Total				$272,400 - $387,400 (Including right-of-way and possible relocation costs associated with southbound right-turn lane at intersection of N. 76th Street and W. Good Hope Road)

Source: SEWRPC.

$12,000. However, these actions will not alleviate the problem of inefficient storage capacity at the south-to-east-bound left-turn lane at this intersection, the lengthening of which cannot be accomplished owing to inadequate space for construction because of the signalized ramp located on the north side of the intersection.

At the intersection of N. 76th Street and W. Bradley Road, it is recommended that the total signal cycle length be changed from 70 to 90 seconds at an estimated cost of $200, that one additional signal phase be added at an estimated capital cost of $2,000, and that a new traffic controller be added at an estimated cost of $12,000, bringing the total estimated cost of all recommended improvements at this intersection to $14,200.

To abate existing congestion at the intersection of N. 76th Street and W. Capitol Drive (STH 190), the prohibition of on-street parking on the north- and southbound approaches during the evening peak hour at an estimated capital cost of $300, in addition to the retiming of the existing signal timing plan at minimal cost, is required. At this intersection, however, the inefficient storage capacity of the east- to northbound left-turn lane cannot be corrected owing to inadequate space for construction because of the location of the intersection of N. 77th Street.

The remaining two intersections which exhibited congestion problems require some turn-lane construction. At one of the intersections, N. 76th Street and W. Appleton Avenue (USH 41), a left-turn lane on the southbound intersection approach should be enlarged from one to two lanes within the existing median at an approximate cost of $15,000, and an existing left-turn lane on the northbound approach should be lengthened from 110 to 220 feet at a capital cost of approximately $15,000. Also at this intersection, a separate red indication for pedestrian crossing protection, in addition to a new traffic controller, should be added at an estimated capital cost of $12,800, and the existing signal timing plan should be retimed at minimal cost. The estimated total cost of the recommended improvements at this intersection is $42,800.

To resolve the existing congestion at the intersection of N. 76th Street and W. Acacia Street, it would be necessary only to retime the existing signal timing plan. However, efficient traffic signal

Table 55

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 76TH STREET (STH 181)

Phase	Intersection (time in seconds)							
	N. 76th Street				W. Harwood Avenue			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	22.5	22.5	18.9	18.9	56.7	27.9	60.3	18.9
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	63.9	63.9	67.5	67.5	29.7	58.5	26.1	67.5
Green Arrow. . .	- -	23.4[a]	- -	36.0[a]	23.4[b]	- -	36.0[b]	- -
Yellow Arrow . .	- -	3.6	- -	3.6	3.6	- -	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	N. 76th Street				W. Milwaukee Avenue			
Green.	31.2				19.2			
Yellow	3.0				3.0			
Red.	25.8				37.8			
Total Cycle	60.0				60.0			
	N. 76th Street				W. North Avenue			
Green.	26.1				26.1			
Yellow	3.6				3.6			
Red.	60.3				60.3			
Green Arrow. . .	9.9[b]				9.9[b]			
Yellow Arrow . .	3.6				3.6			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Center Street			
Green.	42.3				36.9			
Yellow	3.6				3.6			
Red.	44.1				49.5			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Burleigh Street			
Green.	39.6				39.6			
Yellow	3.6				3.6			
Red.	46.8				46.8			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Lisbon Avenue			
Green.	39.6				39.6			
Yellow	3.6				3.6			
Red.	46.8				46.8			
Total Cycle	90.0				90.0			
	N. 76th Street				W. Nash Street			
Green.	57.6				21.6			
Yellow	3.6				3.6			
Red.	28.8				64.8			
Total Cycle[c]	90.0				90.0			

Table 55 (continued)

Phase	Intersection (time in seconds)			
	N. 76th Street		W. Capitol Drive (STH 190)	
			Morning	Evening
Green.	20.7		44.1	38.7
Yellow	4.5		4.5	4.5
Red	64.8		41.4	46.8
Green Arrow. . .	--		9.0[b]	14.4[b]
Yellow Arrow . .	--		3.6	3.6
Total Cycle[c]	90.0		90.0	90.0
	N. 76th Street		W. Appleton Avenue (USH 41)	
	Northbound	Southbound		
Green.	31.5	31.5	31.5	
Yellow	4.5	4.5	4.5	
Red	54.0	54.0	54.0	
Green Arrow. . .	9.9[d]	9.9[d]	--	
Yellow Arrow . .	4.5	4.5	--	
Red-Turn Indication . . .	--	75.6	--	
Total Cycle[c]	90.0	90.0	90.0	
	N. 76th Street		W. Congress Street	
Green.	57.6		21.6	
Yellow	3.6		3.6	
Red	28.8		64.8	
Total Cycle[c]	90.0		90.0	
	N. 76th Street		W. Hampton Avenue	
Green.	35.1		44.1	
Yellow	3.6		3.6	
Red	51.3		42.3	
Total Cycle	90.0		90.0	
	N. 76th Street		W. Grantosa Drive	
Green.	48.6		30.6	
Yellow	3.6		3.6	
Red	37.8		55.8	
Total Cycle	90.0		90.0	
	N. 76th Street		W. Villard Avenue	
Green.	47.7		29.7	
Yellow	4.5		4.5	
Red	37.8		55.8	
Total Cycle	90.0		90.0	

Table 55 (continued)

Phase	Intersection (time in seconds)				
	N. 76th Street				W. Fond du Lac Avenue (STH 145)
	Morning		Evening		
	Northbound	Southbound	Northbound	Southbound	
Green.	37.8	51.3	35.1	51.3	26.1
Yellow	4.5	4.5	4.5	4.5	4.5
Red.	47.7	34.2	50.4	34.2	59.4
Green Arrow. . .	- -	9.9[e]	- -	12.6	- -
Yellow Arrow . .	- -	3.6	- -	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

	N. 76th Street				W. Silver Spring Drive (south)
	Northbound		Southbound		
	Morning	Evening	Morning	Evening	
Green.	37.8	34.2	56.7	56.7	20.7
Yellow	4.5	4.5	4.5	4.5	4.5
Red.	47.7	51.3	28.8	28.8	64.8
Green Arrow. . .	- -	- -	12.6[f]	16.2[f]	- -
Yellow Arrow . .	- -	- -	4.5	4.5	- -
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0

	N. 76th Street	W. Silver Spring Drive (north)
Green.	56.7	20.7
Yellow	4.5	4.5
Red.	28.8	64.8
Total Cycle[c]	90.0	90.0

	N. 76th Street	W. Florist Avenue
Green.	52.2	25.2
Yellow	4.5	4.5
Red.	33.3	60.3
Total Cycle	90.0	90.0

	N. 76th Street	W. Mill Road			
	Evening	Morning		Evening	
		Eastbound	Westbound	Eastbound	Westbound
Green.	41.4	23.4	36.0	18.0	36.9
Yellow	4.5	4.5	4.5	4.5	4.5
Red.	44.1	62.1	49.5	62.5	49.5
Green Arrow. . .	- -	- -	9.0[b]	- -	14.4[b]
Yellow Arrow . .	- -	- -	3.6	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0

Table 55 (continued)

Phase	Intersection (time in seconds)							
	N. 76th Street				W. Acacia Street			
Green.	48.2				32.8			
Yellow	3.6				3.6			
Red	38.2				53.6			
Green Arrow. . .	- -				- -			
Yellow Arrow . .	- -				- -			
Total Cycle[h]	90.0				90.0			
	N. 76th Street				W. Good Hope Road			
	Morning		Evening		Eastbound		Westbound	
	Northbound	Southbound	Northbound	Southbound	Morning	Evening	Morning	Evening
Green.	27.0	37.8	30.6	44.4	30.6	23.4	30.6	23.4
Yellow	3.6	3.6	4.5	4.5	3.6	4.5	3.6	4.5
Red	59.4	48.6	34.9	44.1	55.8	62.1	55.8	62.1
Green Right-Turn Arrow . .	39.6[g]	39.6[g]	46.8[g]	46.8[g]	- -	- -	43.2[g]	36.0[g]
Yellow Right-Turn Arrow . .	3.6	3.6	3.6	3.6	- -	- -	3.6	3.6
Green Left-Turn Arrow . .	- -	7.2[e]	- -	7.2[e]	7.2[e]	10.8[e]	7.2[e]	10.8[e]
Yellow Left-Turn Arrow . .	- -	3.6	- -	3.6	3.6	3.6	3.6	3.6
Red Left-Turn Indication . . .	- -	79.2	- -	79.2	79.2	75.6	79.2	75.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	N. 76th Street				W. Bradley Road			
	Morning		Evening					
	Northbound	Southbound	Northbound	Southbound				
Green.	40.5	51.3	37.8	51.3	26.1			
Yellow	4.5	4.5	4.5	4.5	4.5			
Red	45.0	34.2	47.7	34.2	59.4			
Green Arrow. . .	- -	7.2[b]	- -	9.9[b]	- -			
Yellow Arrow . .	- -	3.6	- -	3.6	- -			
Total Cycle	90.0	90.0	90.0	90.0	90.0			

[a] *Leading right-turn arrow.*

[b] *Leading left-turn arrow.*

[c] *The signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d] *Lagging left-turn arrow.*

[e] *Actuated leading-left turn arrow.*

[f] *Actuated lagging left-turn arrow.*

[g] *Right-turn arrow initially concurrent with through green phase and then lagging arrow.*

[h] *Signal operates as flashing yellow indication on N. 76th Street approaches unless activated by pedestrian-actuated control.*

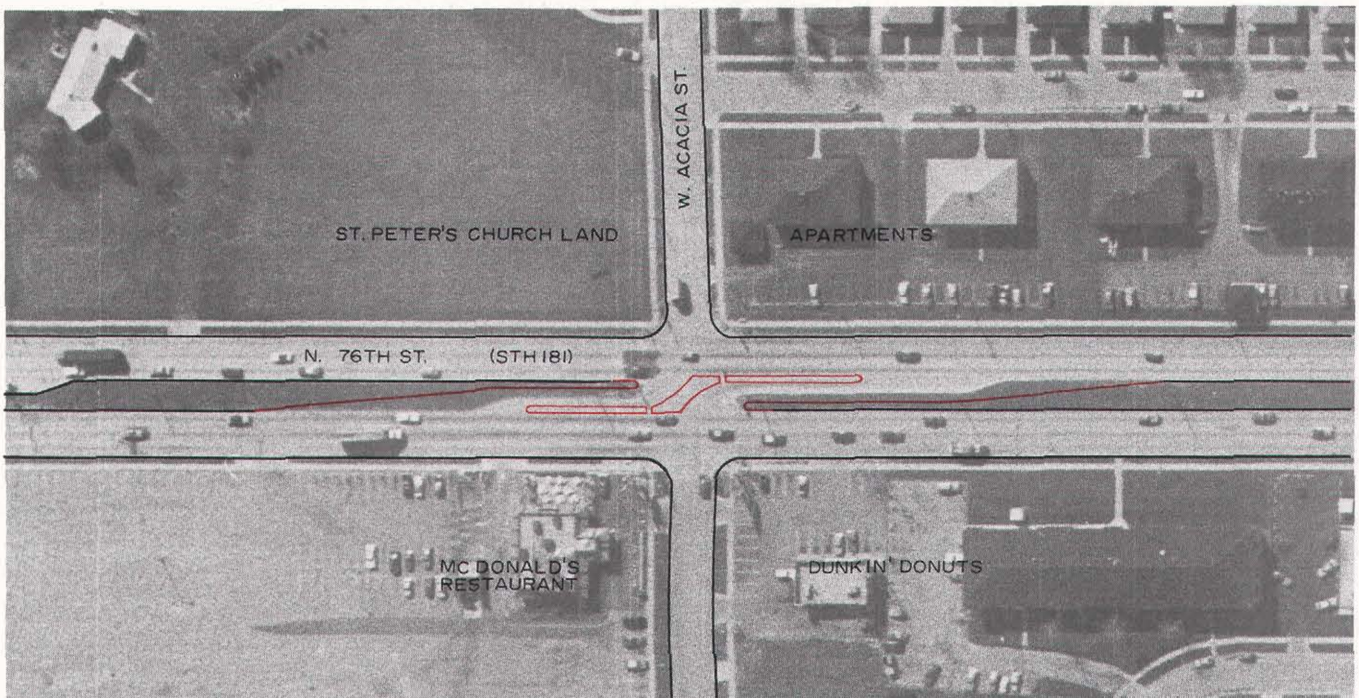
Source: SEWRPC.

progression along the N. 76th Street problem segment cannot be provided, given the location of the existing traffic signal at the intersection of N. 76th Street and W. Acacia Street—a collector street—as it is only one-quarter mile north of the signalized intersection of N. 76th Street and W. Mill Road. Travel time and delay studies conducted by the Wisconsin Department of Transportation indicate that the number of test vehicle stops and average test vehicle delays at the W. Acacia Street intersection with N. 76th Street is between 4 and 12 times greater than that at any other controlled intersection under State of Wisconsin jurisdiction on the N. 76th Street problem segment.

It is therefore recommended that this traffic signal be changed from its existing pretimed operation to a semi-actuated operation controlled only by a pedestrian pushbutton. That is, N. 76th Street at this intersection would be under a flashing yellow signal and W. Acacia would be under a flashing red traffic signal, except when actuated by a pedestrian wishing to cross N. 76th Street. Then, N. 76th Street would be under a red traffic signal. The estimated capital cost of this action is $600. It is also recommended at this intersection that the existing median opening be reconstructed and channelized so that through and left-turn movements from the W. Acacia Street approaches cannot be made, as shown in Figure 11, at an estimated capital cost of $10,000. The greatest disadvantage of this recommendation is the indirection of traffic movement from, to, and between the two neighborhoods north of W. Mill Road and east and west of N. 76th Street. As a result of this indirection, some increased access travel will be required in the neighborhoods, with additional travel on some local streets in the neighborhood, and there may be some increase in U-turn movements at median openings on N. 76th Street north and south of W. Acacia Street. It should be noted, however, that the increased travel on selected local streets and U-turns on N. 76th Street will be only from neighborhood traffic, and that any resultant additional travel time and accident potential can be expected to be very small compared to the reduced travel delays and accident potential at the intersection of N. 76th Street and W. Acacia Street. To reduce the possible additional neighborhood access travel time in the northern parts of the neighborhood

Figure 11

RECOMMENDED TRAFFIC MANAGEMENT ACTIONS AT THE INTERSECTION OF N. 76TH STREET (STH 181) AND W. ACACIA STREET



Source: Wisconsin Department of Transportation and SEWRPC.

north of Mill Road and east of N. 76th Street, it may be appropriate to extend N. 74th Street approximately 200 feet from W. Casper Street to W. Green Tree Road. W. Green Tree Road is recommended to be signalized at its intersection with N. 76th Street upon the completion of these recommended actions at W. Acacia Street, as such signalization would provide the one-half-mile spacing of traffic signals necessary to promote efficient traffic signal progression along N. 76th Street.

The other problem intersection on N. 76th Street requiring turn-lane construction is that of N. 76th Street and W. Good Hope Road. This intersection is the most congested on N. 76th Street, with three separate congested traffic movements during the morning peak hour and six separate congested traffic movements during the evening peak hour. The elimination of morning and evening peak-hour congestion at this intersection would require the retiming of the existing traffic signal and changing of the total cycle length at an estimated capital cost of $200; the addition of six separate right- and left-turn phases during the morning and evening peak hour, as well as the addition of a separate red indicator on three approaches, at an approximate cost of $16,500; the restriction of onsite street parking on all four approaches to the intersection during the evening peak hour and on the southbound approach during the morning peak hour at an approximate cost of $800; and the construction of new exclusive right-turn lanes on the north- and southbound approaches, the reconstruction of the existing right lane on the westbound approach to an exclusive right-turn lane, and the enlargement of the existing left-turn lanes on the south-, east-, and westbound approaches from one to two lanes within the existing medians, all at an approximate capital cost of $105,000. The estimated cost of the recommended improvements at this intersection is thus $122,500.

All turn-lane construction recommended for this intersection is possible within the existing right-of-way with the exception of the construction of the southbound-to-westbound right-turn lane. A minimum of 10 feet of additional right-of-way would have to be acquired for the length of this turn lane from a retail gasoline station now located on the northwest corner of the intersection. Construction of an exclusive right-turn lane of sufficient length to provide the required storage for right-turning vehicles during the morning and evening peak hours at this intersection approach is likely to require a strip of land 10 feet wide, which would entail relocation of station gasoline pumps, possibly resulting in the dislocation of the gasoline station. The cost of obtaining an additional 10-foot-wide strip of right-of-way from this retail gasoline service station is estimated at $35,000, while the cost of obtaining the station in its entirety is estimated at $150,000. Construction of a somewhat shorter turn lane would not require relocation of gasoline pumps, but would nevertheless require some additional right-of-way. Furthermore, right-turn and through movements on this intersection approach may operate below level-of-service C during the morning and evening peak hours as a result of this construction. The total cost of implementing all recommended improvements at this intersection, including right-of-way costs, is thus $157,500 to $272,500, depending upon the extent of right-of-way required.

As indicated in Table 54 and as already noted, four other intersections, although not exhibiting specific congestion problems, were found to warrant traffic management actions to improve operations. These are the intersections of N. 76th Street with W. Harwood Avenue, W. North Avenue, W. Center Street, and W. Grantosa Drive. The intersections of N. 76th and W. Harwood Avenue and N. 76th Street and W. North Avenue were both found to have insufficient left-turn lane storage capacity during both peak hours; while the intersections of N. 76th Street and W. Center Street and N. 76th Street and W. Grantosa Drive were found to have timing plans which could be revised to more efficiently balance traffic operating conditions. No action is recommended at the intersection of N. 76th Street and W. Harwood Avenue, owing to the lack of adequate distance between the intersection of N. 76th Street with W. Harwood Avenue and its intersection with W. State Street to lengthen the existing eastbound left-turn lane, and to the fact that the current construction of a new N. 76th Street to W. Harwood Avenue bridge over the Menomonee River should serve to alleviate the turn lane storage capacity problem.[4] At the intersection of N. 76th Street

[4] *The construction of the new Harwood Avenue bridge between N. 76th Street and W. Harwood Avenue, completed in August 1981, resulted in the diversion of some traffic from the intersection of N. 76th Street and W. Harwood Avenue, and thereby served to abate the turn-lane storage capacity problem at this intersection. Traffic flow problems which may be associated with the new W. Harmonee Avenue route are currently being monitored and studied by the City of Wauwatosa. The timing of this monitoring effort, however, is such that a specific analysis of the traffic flow problems associated with the new route cannot be addressed within the time frame of the northwest side study.*

and W. North Avenue, however, the lengthening of the existing westbound exclusive left-turn lane from 100 to 140 feet, with appropriate signing and pavement marking, and the lengthening of the southbound exclusive left-turn lane from 90 to 160 feet should alleviate storage capacity problems during the morning and evening peak hours at an approximate capital cost of $31,000. Only the retiming of the existing signal timing plans is required to improve operations at the intersections of N. 76th Street and W. Center Street and N. 76th Street and W. Grantosa Drive, at minimal cost.

In addition, the existing offsets between the traffic signal timing plans of the 21 signalized intersections along this segment of N. 76th Street should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation systems management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and to reduce vehicular delays at the signalized intersections along this segment of N. 76th Street by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive

Another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements os. as shown on Map 106, N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive, a distance of 4.4 miles. Map 107 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. Sherman Boulevard. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. Sherman Boulevard. Retail sales and service uses, however, abut N. Sherman Boulevard at its intersections with W. Lisbon Avenue, W. North Avenue, W. Burleigh Street, W. Keefe Avenue, W. Fond du Lac Avenue (STH 145), W. Capitol Drive (STH 190), and W. Silver Spring Drive. Industrial land use occurs along N. Sherman Boulevard adjacent to its intersection with W. Hopkins Street. Governmental and institutional land uses occur at the intersection of N. Sherman Boulevard with W. Center Street at Washington Senior High School and between W. Hampton Avenue and W. Villard Avenue at Custer Senior High School. Recreational land uses occur along the corridor at W. Lisbon Avenue at Washington Park, at W. Burleigh Street at Sherman Park, at W. Hampton Avenue at Lincoln Creek Parkway, and at W. Silver Spring Drive at McGovern Park.

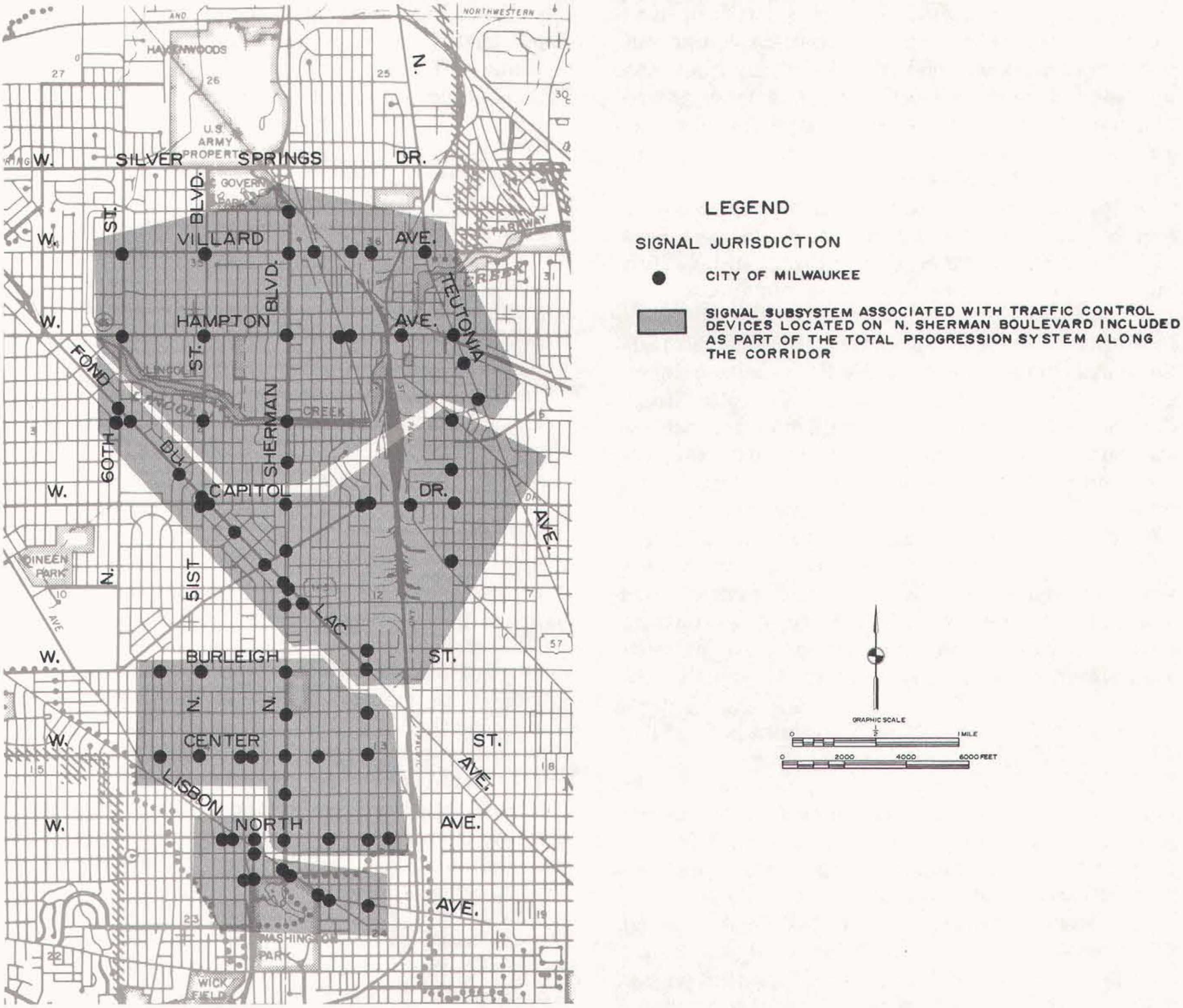
Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. Sherman Boulevard. For the entire length of this segment, N. Sherman Boulevard is divided by a median ranging in width from 24 to 30 feet, and the curb-to-curb pavement widths of the dual roadways range from 26 to 36 feet. Except for the bridge over Lincoln Creek north of W. Congress Street, which restricts the width of the dual roadways to 26 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited, N. Sherman Boulevard between W. Lisbon Avenue and W. Custer Avenue has dual roadways which have curb-to-curb pavement widths which range from 30 to 33 feet, adequate to provide two lanes for traffic in each direction with parking permitted. Between W. Custer Street and W. Silver Spring Drive, the curb-to-curb pavement widths of the dual roadways are 36 feet wide, adequate to provide two lanes for moving traffic in each direction with parking permitted. Except on the bridge over Lincoln Creek where parking is currently prohibited, parking is currently permitted between W. Lisbon Avenue and W. Custer Avenue. Parking is currently prohibited on that segment of N. Sherman Boulevard between W. Custer Avenue and W. Silver Spring Drive.

As indicated in Table 56, the problem segment of N. Sherman Boulevard in the study area has 15 signalized intersections, at which the N. Sherman Boulevard approaches range in width from 26 to 36 feet. Ten of the northbound and 13 of the southbound approaches to these 15 intersections provide separate lanes for the exclusive use of left-turning vehicles. Only two approaches along this segment—the south- and northbound approaches at the intersection of W. Roosevelt Drive—provide a separate lane for the exclusive use of right-turning vehicles. These right-turn lanes are identified by regulatory pavement marking rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along N. Sherman Boulevard are also indicated in Table 56.

Traffic Control Measures: The timing plan for each of the 15 traffic signals along N. Sherman Boulevard between W. Lisbon Avenue and W. Silver

Map 106

DETAIL OF THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive, a distance of 4.4 miles. The map also shows the location and jurisdiction of each of the 15 traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. Sherman Boulevard and are directly affected by the timing plans of the traffic signals on the N. Sherman Boulevard.

Source: SEWRPC.

Spring Drive is shown in Table 57. Map 106 shows the location and jurisdiction of each of these signals and the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. Sherman Boulevard and are directly affected by the timing plans of the traffic signals on the Boulevard. Eleven of the traffic signals are located at the intersections of N. Sherman Boulevard with other arterial streets, and four are located at intersections of N. Sherman Boulevard with nonarterial streets—specifically, W. Wright Street, W. Locust Street, W. Hope Avenue, and W. Custer Avenue. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. Sherman Boulevard. This segment of N. Sherman Boulevard is posted for a 30-mile-per-hour (mph) speed limit from W. Lisbon Avenue to W. Villard Avenue, and a 35-mph speed limit from W. Villard Avenue to W. Silver Spring Drive.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 15 signalized intersections along the problem segment of N. Sherman

Map 107

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of N. Sherman Boulevard. Residential land use comprises the majority of the existing urban development in this corridor, as well as of the existing urban development immediately adjacent to N. Sherman Boulevard. Retail sales and service uses, however, abut N. Sherman Boulevard at its intersections with W. Lisbon Avenue, W. North Avenue, W. Burleigh Street, W. Keefe Avenue, W. Fond du Lac Avenue (STH 145), W. Capitol Drive (STH 190), and W. Silver Spring Drive. Industrial land use occurs along N. Sherman Boulevard adjacent to its intersection with W. Hopkins Street. Governmental and institutional land uses occur at the intersection of N. Sherman Boulevard with W. Center Street at Washington Senior High School, and between W. Hampton Avenue and W. Villard Avenue at Custer Senior High School. Recreational land uses occur along the corridor at W. Lisbon Avenue at Washington Park, at W. Burleigh Street at Sherman Park, at W. Hampton Avenue at Lincoln Creek Parkway, and at W. Silver Spring Drive at McGovern Park.

Source: SEWRPC.

Table 56

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

Intersection	Roadway Approach Width (feet)							
	Eastbound, Southeast-bound, or Northeast-bound		Westbound, Northwest-bound, or Southwest-bound		Northbound		Southbound	
N. Sherman Boulevard and W. Lisbon Avenue. . .	25	NPAM	34 MR[a]	NS	34 M	NPPM	28 ML	NPAM
N. Sherman Boulevard and W. North Avenue . . .	25	P	25	P	33 ML	NPPM	33 ML	NPAM
N. Sherman Boulevard and W. Wright Street. . . .	12	P	15	FS	33 ML	NPPM	33 ML	NPAM
N. Sherman Boulevard and W. Center Street. . . .	25	P	25	P	33 ML	NPPM	33 ML	P
N. Sherman Boulevard and W. Locust Street . . .	13	NS	15	FS	33 ML	NPPM	33 ML	P
N. Sherman Boulevard and W. Burleigh Street. . .	26	FSAM	22 L	NS	33 ML	NPPM	30 ML	NSAM
N. Sherman Boulevard and W. Townsend Street .	15	FS	22 R[a]	NS	30 M	NPPM	30 ML	P
N. Sherman Boulevard and W. Fond du Lac Avenue (STH 145).	34 M	NSAM	34 M	NSPM	33 ML	NPPM	30 ML	FS
N. Sherman Boulevard and W. Roosevelt Drive . .	28 ML	P	28 ML	P	30 MLR[a]	NSPM	30 MLR[a]	P
N. Sherman Boulevard and W. Capitol Drive (STH 190)	34 ML	NPAM	34 ML	NPPM	30 ML	P	30 ML	P
N. Sherman Boulevard and W. Hope Avenue . . .	18	P	15	P	30 M	P	30 M	P
N. Sherman Boulevard and W. Congress Street (south)	14	P	14	NP	30 M	P	26 M	P
N. Sherman Boulevard and W. Hampton Avenue .	32 ML	P	32 ML	P	32 ML	P	32 ML	P
N. Sherman Boulevard and W. Villard Avenue. . .	30 M	P	24	NSPM	30 ML	P	30 ML	P
N. Sherman Boulevard and W. Custer Avenue . . .	20	FS	20	NS	30 M	P	36 ML	NS

NOTE: M = median provided
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a]*Exclusive turn-lane width included as a part of roadway approach width.*

Source: SEWRPC.

Boulevard in Figures 12 and 13. The locations along N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 15 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. Sherman Boulevard, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 58.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. Sherman Boulevard, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 12 and 13. Two congested traffic

Table 57

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

Phase	Intersection (time in seconds)							
	N. Sherman Boulevard				W. Lisbon Avenue			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Westbound	Eastbound	Westbound	Eastbound
Green.	18.9	47.7	28.8	47.7	31.5	31.5	31.5	31.5
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	67.5	38.7	57.6	38.7	54.9	54.9	54.9	54.9
Green Arrow. . .	- -	25.2[a]	- -	15.3[a]	23.4[b]	- -	13.5[b]	- -
Yellow Arrow . .	- -	3.6	- -	3.6	3.6	- -	3.6	- -
Total Cycle[a]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	N. Sherman Boulevard				W. North Avenue			
Green.	24.6				24.0			
Yellow	4.2				4.2			
Red.	31.2				31.8			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Wright Street			
Green.	25.2				24.0			
Yellow	3.6				4.2			
Red.	31.2				31.8			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Center Street			
Green.	25.2				24.0			
Yellow	3.6				4.2			
Red.	31.2				31.8			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Locust Street			
Green.	25.2				24.6			
Yellow	3.6				4.2			
Red.	31.2				31.2			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Burleigh Street			
Green.	25.2				25.2			
Yellow	3.6				3.6			
Red.	31.2				31.2			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Townsend Street			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound			Westbound	Eastbound		
Green.	47.7	58.5	58.5		21.6	21.6	21.6	
Yellow	4.5	4.5	4.5		3.6	3.6	3.6	
Red.	37.8	27.0	27.0		64.8	64.8	64.8	
Green Arrow. . .	- -	7.2[d]	- -		12.6[e]	- -	- -	
Yellow Arrow . .	- -	3.6	- -		3.6	- -	- -	
Total Cycle[c]	90.0	90.0	90.0		90.0	90.0	90.0	

Table 57 (continued)

Phase	Intersection (time in seconds)				
	N. Sherman Boulevard				W. Fond du Lac Avenue (STH 145)
	Morning		Evening		
	Northbound	Southbound	Northbound	Southbound	
Green.	28.8	43.2	43.2	28.8	34.2
Yellow	4.5	4.5	4.5	4.5	3.6
Red	56.7	42.3	42.3	56.7	52.2
Green Arrow. . .	- -	10.8[f]	10.8[f]	- -	- -
Yellow Arrow . .	- -	3.6	3.6	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	N. Sherman Boulevard	W. Roosevelt Drive
Green.	38.7	27.9
Yellow	4.5	4.5
Red	46.8	57.6
Green Arrow. . .	13.5[e]	7.2[d]
Yellow Arrow . .	3.6	3.6
Total Cycle	90.0	90.0

Phase	N. Sherman Boulevard	W. Capitol Drive (STH 190)
Green.	34.2	43.2
Yellow	4.5	4.5
Red	51.3	42.3
Total Cycle	90.0	90.0

Phase	N. Sherman Boulevard	W. Hope Avenue
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle[c]	60.0	60.0

Phase	N. Sherman Boulevard	W. Congress Street (south)
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle[e]	60.0	60.0

Phase	N. Sherman Boulevard	W. Hampton Avenue
Green.	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Phase	N. Sherman Boulevard	W. Villard Avenue	
		Westbound	Eastbound
Green.	17.4	33.0	24.0
Yellow	3.6	3.6	3.6
Red	39.0	23.4	32.4
Green Arrow. . .	- -	7.2[f]	- -
Yellow Arrow . .	- -	- -	- -
Total Cycle	60.0	60.0	60.0

Table 57 (continued)

Phase	Intersection (time in seconds)		
	N. Sherman Boulevard		W. Custer Avenue
	Northbound	Southbound	
Green.	22.2	34.2	16.2
Yellow	3.6	3.6	3.6
Red.	34.2	22.2	40.2
Green Arrow. . .	- -	9.0[f]	- -
Yellow Arrow . .	- -	3.0	- -
Total Cycle[c]	60.0	60.0	60.0

[a]*Lagging left-turn arrow concurrent with through green phase.*

[b]*Leading right-turn arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Leading left-turn arrow.*

[e]*Lagging right-turn arrow.*

[f]*Leading left-turn arrow concurrent with through green phase.*

Source: City of Milwaukee and SEWRPC.

movements were found to occur along this segment of N. Sherman Boulevard during the morning peak hour, and four were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The two morning and four evening peak-hour traffic congestion problems identified along N. Sherman Boulevard are associated with the following five signalized intersections: W. North Avenue, W. Fond du Lac Avenue (STH 145), W. Capitol Drive (STH 190), W. Villard Avenue, and W. Custer Avenue.

Two intersections along N. Sherman Boulevard—W. Lisbon Avenue and W. Roosevelt Drive—while not evidencing congestion problems, were found to lack adequate vehicle storage capacity within an existing exclusive turn lane. Transportation systems management actions were accordingly also considered for these intersections.

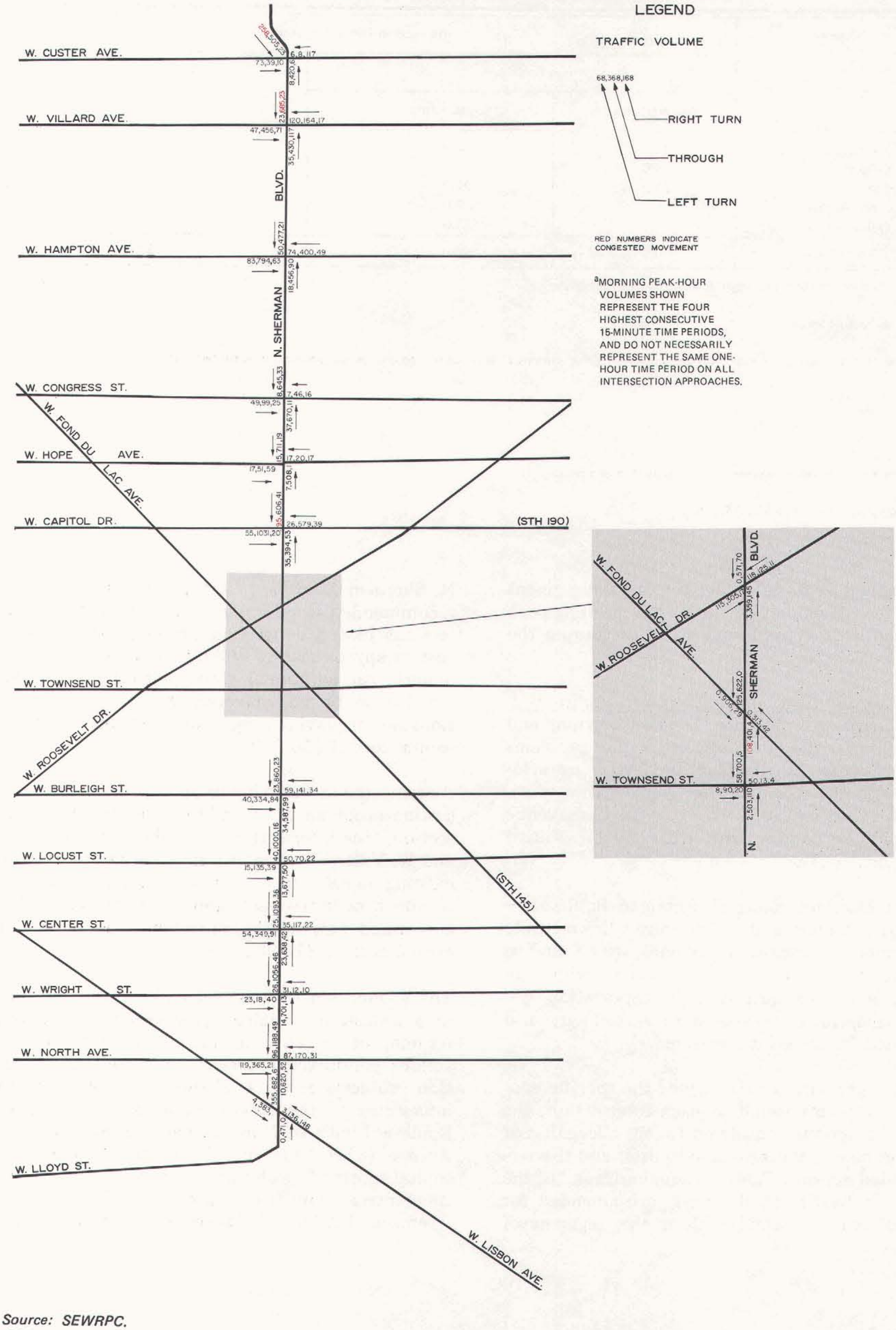
Table 59 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 60 summarizes all of the changes in traffic signal timing recommended for the problem intersections along this segment of N. Sherman Boulevard. A total of 13 actions are recommended to be implemented at the five intersections having congestion problems at a capital cost of approximately $63,000, expressed in 1980 dollars. An additional three actions are recommended to be implemented at the two intersections not displaying congestion problems, at a total capital cost of $50,000.

As indicated in Table 59, in order to abate the congestion problems at one of the five problem intersections, the intersection of N. Sherman Boulevard and W. Villard Avenue, it is necessary to retime the existing signal timing plan at minimal cost, and to add a pedestrian-actuated signal sequence plus a required new traffic controller at an estimated capital cost of $12,000.

The prohibition of on-street parking, the addition of a pedestrian-actuated signal sequence, and the retiming of the existing traffic signal plan are the actions considered necessary to abate the congestion problems at three of the other five problem intersections: the intersections of N. Sherman Boulevard with W. North Avenue, W. Fond du Lac Avenue (STH 145), and W. Custer Avenue. The capital cost of prohibiting on-street parking at these intersections is estimated at $400 at W. North Avenue and $200 at W. Custer Avenue and W. Fond

Figure 12

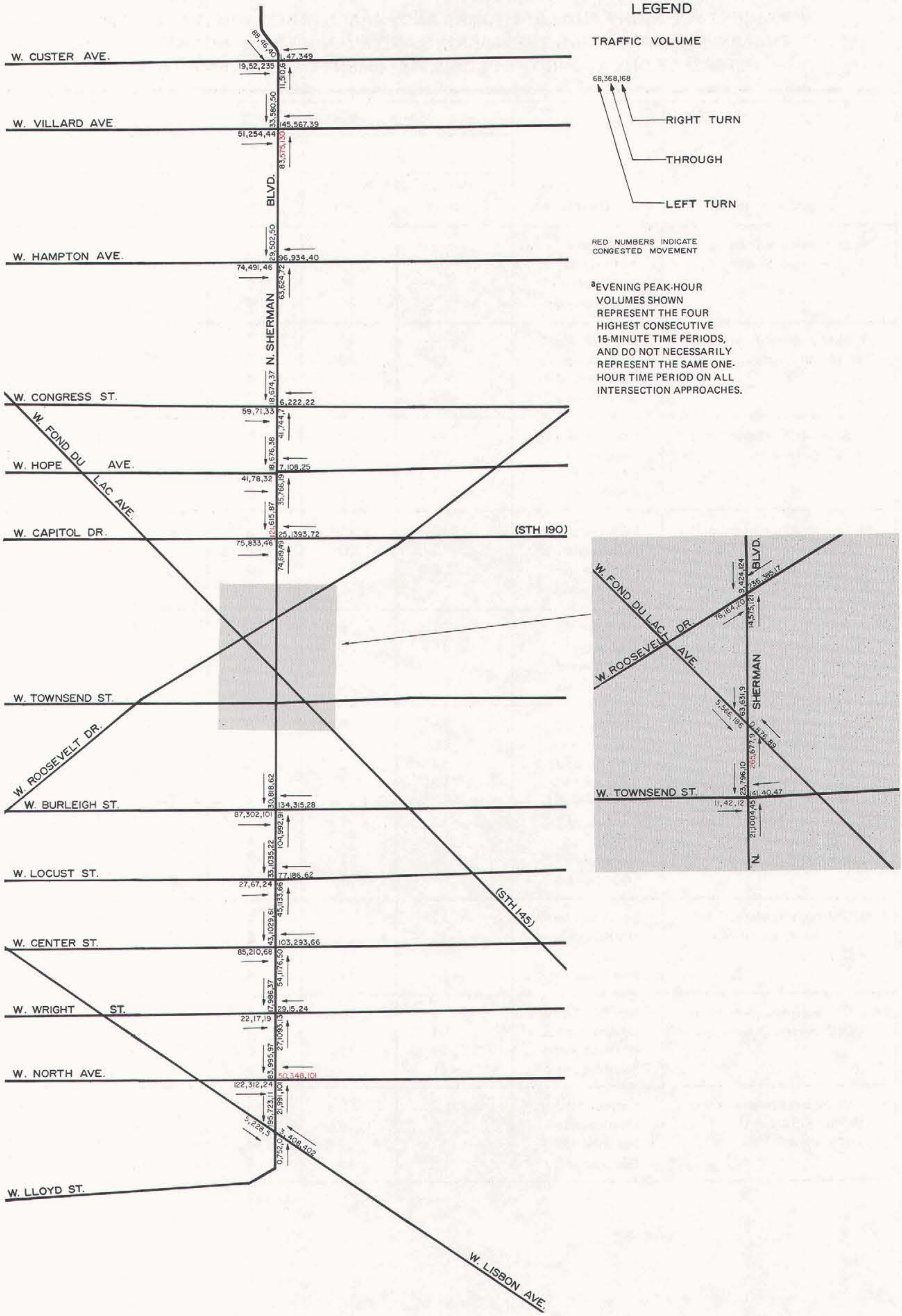
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 13

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 58

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. Sherman Boulevard and W. Lisbon Avenue	Eastbound	- -	1	6	2	2	6
	Westbound	52	1	13	49	1	3
	Northbound	- -	- -	4	- -	- -	1
	Southbound	1	34	4	1	21	4
N. Sherman Boulevard and W. North Avenue	Eastbound	4	24	7	5	27	3
	Westbound	11	30	7	17	25	4
	Northbound	7	2	4	9	2	2
	Southbound	4	7	3	8	7	3
N. Sherman Boulevard and W. Wright Street	Eastbound	49	29	5	33	38	7
	Westbound	19	58	8	35	43	7
	Northbound	2	2	5	1	2	2
	Southbound	4	2	3	3	2	4
N. Sherman Boulevard and W. Center Street	Eastbound	18	11	5	19	23	9
	Westbound	13	20	13	14	22	4
	Northbound	6	3	6	4	4	2
	Southbound	3	2	3	5	4	3
N. Sherman Boulevard and W. Locust Street	Eastbound	21	8	2	20	23	3
	Westbound	16	35	4	19	24	2
	Northbound	7	2	5	5	4	2
	Southbound	1	4	4	2	3	4
N. Sherman Boulevard and W. Burleigh Street	Eastbound	18	9	7	20	18	4
	Westbound	15	25	10	6	28	5
	Northbound	14	5	5	8	9	2
	Southbound	2	3	4	7	3	5
N. Sherman Boulevard and W. Townsend Street	Eastbound	17	7	2	3	17	3
	Westbound	6	75	4	1	62	1
	Northbound	18	1	3	2	2	2
	Southbound	1	7	3	2	3	2
N. Sherman Boulevard and W. Fond du Lac Avenue (STH 145)	Southeast-bound	12	- -	4	24	1	7
	Northwest-bound	12	- -	9	9	- -	3
	Northbound	1	21	5	1	28	3
	Southbound	- -	17	4	1	9	4
N. Sherman Boulevard and W. Roosevelt Drive	Northeast-bound	4	26	1	1	29	1
	Southwest-bound	4	47	3	1	37	1
	Northbound	28	1	5	2	12	2
	Southbound	11	- -	3	3	2	3
N. Sherman Boulevard and W. Capitol Drive (STH 190)	Eastbound	2	5	4	5	8	5
	Westbound	6	4	11	5	2	3
	Northbound	11	7	4	7	10	4
	Southbound	5	13	4	11	15	4

Table 58 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. Sherman Boulevard and W. Hope Avenue	Eastbound	47	13	4	- -	27	- -
	Westbound	31	32	13	1	5	1
	Northbound	1	1	4	3	4	3
	Southbound	3	2	4	6	3	6
N. Sherman Boulevard and W. Congress Street (south)	Eastbound	15	28	2	20	36	7
	Westbound	23	10	- -	9	2	1
	Northbound	2	5	1	1	5	2
	Southbound	5	1	3	5	3	5
N. Sherman Boulevard and W. Hampton Avenue	Eastbound	7	9	3	8	12	2
	Westbound	9	14	5	4	9	1
	Northbound	16	3	3	10	8	2
	Southbound	4	9	6	9	5	2
N. Sherman Boulevard and W. Villard Avenue	Eastbound	12	8	3	12	15	3
	Westbound	6	40	3	5	20	3
	Northbound	20	6	3	16	11	3
	Southbound	3	3	3	8	5	3
N. Sherman Boulevard and W. Custer Avenue	Eastbound	8	60	3	77	6	3
	Westbound	89	5	3	88	1	3
	Northbound	1	2	3	2	4	3
	Southbound	3	3	3	8	17	3

Source: SEWRPC.

du Lac Avenue. The capital cost of adding a pedestrian-actuated signal sequence in addition to a new traffic controller at each of these intersections is estimated at $12,000. The retiming of the existing signal timing plan at each of these intersections would require minimal cost.

The addition of separate signal phasing in addition to the prohibition of on-street parking were the only actions considered necessary to abate the congestion problems at the intersection of N. Sherman Boulevard and W. Capitol Drive (STH 190). The capital cost of prohibiting parking at this intersection is estimated at $200, while the estimated capital cost of adding separate signal phasing is $14,000, owing to the required addition of a new traffic controller.

As indicated in Table 59 and as already noted, two other intersections, although not exhibiting specific congestion problems, were found to warrant traffic management actions to improve operations. The intersections of N. Sherman Boulevard with W. Lisbon Avenue and with W. Roosevelt Drive were both found to have insufficient left-turn-lane storage capacity during the morning and/or evening peak hours. At the intersection of N. Sherman Boulevard and W. Lisbon Avenue, the lengthening of the existing southbound exclusive left-turn lane from 125 to 180 feet with appropriate signing and pavement marking, at a cost of $20,000, would be necessary to eliminate storage capacity problems during the morning peak hour. At the intersection of N. Sherman Boulevard and W. Roosevelt Drive, the lengthening of the existing westbound exclu-

Table 59

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. Sherman Boulevard and W. North Avenue	Congested westbound approach during the evening peak hour (599 vehicles per hour at level-of-service D)	Recommended Actions Retime 60-second cycle so that all vehicular traffic movements operate at or over design levels	- -	
		Prohibit on-street parking on west-bound and southbound approaches during the evening peak hour	$ 400	
		Add pedestrian-actuated sequence to provide adequate pedestrian crossing time on N. Sherman Boulevard	$12,000	$ 12,400
N. Sherman Boulevard and W. Fond du Lac Avenue (STH 145)	Congested north-to-northwest-bound left-turn during the evening peak hour (265 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle and increase existing leading northwest-bound green arrow from 10.8 to 16.2 seconds during the evening peak hour, making necessary signal changes at other approaches	- -	
		Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on W. Fond du Lac Avenue and N. Sherman Boulevard	$12,000	
		Prohibit on-street parking on southbound approach during the evening peak hour	$ 200	$ 12,200
		Alternative Action Retime 90-second cycle so that all vehicles can negotiate north-to-northwest-bound left turn on through green phase (Not recommended because the existing 90-second cycle could not provide sufficient green time to accommodate all traffic movements during the morning peak hour)		
N. Sherman Boulevard and and W. Capitol Drive (STH 190)	Congested south-to-eastbound left-turn during the evening peak hour (121 vehicles per hour at level-of-service E)	Recommended Actions Add actuated 7.2-second south-to-east-bound leading green arrow operating concurrently with the through green phase during the evening peak hour	$14,000	
		Prohibit on-street parking on northbound approach during the evening peak hour	$ 200	$ 14,200
N. Sherman Boulevard and W. Villard Avenue	Congested southbound combined right-turn and through traffic movement during the morning peak hour (708 vehicles per hour at level-of-service D), and northbound combined right-turn and through traffic movement during the evening peak hour (705 vehicles per hour at level-of-service D)	Recommended Actions Retime 60-second cycle so that all vehicular traffic movements operate at or over design levels	- -	
		Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on N. Sherman Boulevard	$12,000	$ 12,000
N. Sherman Boulevard and W. Custer Avenue	Congested south-to-eastbound left turn during the morning peak hour (258 vehicles per hour at level-of-service E)	Recommended Actions Retime 60-second cycle and increase existing leading southbound green arrow from 9.0 to 10.8 seconds, making necessary signal changes at other approaches	- -	
		Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on N. Sherman Boulevard	$12,000	
		Prohibit on-street parking on north-bound approach during the evening peak hour	$ 200	$ 12,200
Subtotal				$ 63,000

Table 59 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. Sherman Boulevard and W. Lisbon Avenue	Insufficient south-to-eastbound left-turn-lane storage capacity during the morning peak hour	Recommended Action Increase storage length of south-to-westbound double-left-turn lane from 125 to 180 feet	$20,000	$ 20,000
N. Sherman Boulevard and W. Roosevelt Drive	Insufficient west-to-southbound and east-to-northbound left-turn-lane storage capacity during the evening and morning peak hours, respectively	Recommended Action Increase storage length of west-to-southbound left-turn lane from 135 to 235 feet and east-to-northbound left-turn lane from 95 to 115 feet	$30,000	$ 30,000
Subtotal				$ 50,000
Total				$113,000

Source: SEWRPC.

sive left-turn lane from 135 to 235 feet, and the eastbound exclusive left-turn lane from 95 to 115 feet, at a total capital cost of $30,000, would be required to alleviate storage capacity problems during the morning and evening peak hours.

In addition, the existing offsets between the traffic signal timing plans of the 15 signalized intersections along this segment of N. Sherman Boulevard should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation system management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of N. Sherman Boulevard by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

W. Vliet Street and W. Milwaukee Avenue from W. Harwood Avenue to N. 20th Street

Another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 108, W. Vliet Street and W. Milwaukee Avenue from W. Harwood Avenue to N. 20th Street, a distance of about 3.4 miles. Map 109 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Vliet Street and W. Milwaukee Avenue. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to W. Vliet Street and W. Milwaukee Avenue. Retail sales and service uses abut W. Vliet Street and W. Milwaukee Avenue at its intersections with N. 60th Street, N. Hawley Road, N. 51st Street, N. 35th Street, and N. 27th Street, and otherwise occur in a scattered fashion along the corridor. Recreational land uses occur along W. Vliet Street and W. Milwaukee Avenue at its intersection with N. Sherman Boulevard at Washington Park, at its intersection with N. 50th Street at Wick Playfield, and at its intersection with N. 17th Street at Martin Luther King Park.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Milwaukee Avenue and W. Vliet Street. Between W. Harwood Avenue and N. 47th Street, the roadway is not median divided. From W. Harwood Avenue to N. 50th Street, the roadway has a curb-to-curb width of 40 to 46 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited, and a curb-to-curb width of 58 feet from N. 50th Street to N. 47th Street, adequate to provide two lanes for moving traffic in each direction with parking permitted. Between N. 47th Street and N. 40th Street, W. Vliet Street is divided by a median ranging in width from 2 to 10 feet, and the curb-to-curb pavement widths of the dual roadways range from 28 to 40 feet, also adequate to provide two lanes for moving traffic in each direction with parking permitted. That segment of W. Vliet Street between N. 40th Street and N. 20th Street is not median divided and has a curb-to-curb width of 50 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along this problem segment of W. Vliet Street and W. Milwaukee Avenue.

Table 60

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. SHERMAN BOULEVARD

Phase	Intersection (time in seconds)							
	N. Sherman Boulevard				W. Lisbon Avenue			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Westbound	Eastbound	Westbound	Eastbound
Green.	18.9	47.7	28.8	47.7	31.5	31.5	31.5	31.5
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	67.5	38.7	57.6	38.7	54.9	54.9	54.9	54.9
Green Arrow. . .	--	25.2[a]	--	15.3[a]	23.4[b]	--	13.5[b]	--
Yellow Arrow . .	--	3.6	--	3.6	3.6	--	3.6	--
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	N. Sherman Boulevard				W. North Avenue			
Green.	25.8				22.8			
Yellow	4.2				4.2			
Red.	29.4				33.4			
Total Cycle[c]	60.0				60.0			
	N. Sherman Boulevard				W. Wright Street			
Green.	25.2				24.0			
Yellow	3.6				4.2			
Red.	31.2				31.8			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Center Street			
Green.	25.2				24.0			
Yellow	3.6				4.2			
Red.	31.2				31.8			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Locust Street			
Green.	25.2				24.6			
Yellow	3.6				4.2			
Red.	31.2				31.2			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Burleigh Street			
Green.	25.2				25.2			
Yellow	3.6				3.6			
Red.	31.2				31.2			
Total Cycle	60.0				60.0			
	N. Sherman Boulevard				W. Townsend Street			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound			Westbound	Eastbound		
Green.	47.7	58.5	58.5		21.6	21.6	21.6	
Yellow	4.5	4.5	4.5		3.6	3.6	3.6	
Red.	37.8	27.0	27.0		64.8	64.8	64.8	
Green Arrow. . .	--	7.2[d]	--		12.6[e]	--	--	
Yellow Arrow . .	--	3.6	--		3.6	--	--	
Total Cycle[c]	90.0	90.0	90.0		90.0	90.0	90.0	

Table 60 (continued)

Intersection (time in seconds)

Phase	N. Sherman Boulevard Morning Northbound	N. Sherman Boulevard Morning Southbound	N. Sherman Boulevard Evening Northbound	N. Sherman Boulevard Evening Southbound	W. Fond du Lac Avenue (STH 145) Morning	W. Fond du Lac Avenue (STH 145) Evening
Green.	30.6	41.4	45.9	26.1	36.0	31.5
Yellow	4.5	4.5	4.5	4.5	3.6	3.6
Red.	54.9	44.1	39.6	59.4	50.4	54.9
Green Arrow. . .	--	7.2[f]	16.2[f]	--	--	--
Yellow Arrow . .	--	3.6	3.6	--	--	--
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. Sherman Boulevard	W. Roosevelt Drive
Green.	38.7	27.9
Yellow	4.5	4.5
Red.	46.8	57.6
Green Arrow. . .	13.5[e]	7.2[d]
Yellow Arrow . .	3.6	3.6
Total Cycle	90.0	90.0

Phase	N. Sherman Boulevard Morning	N. Sherman Boulevard Evening Northbound	N. Sherman Boulevard Evening Southbound	W. Capitol Drive (STH 190)
Green.	34.2	23.4	34.2	43.2
Yellow	4.5	4.5	4.5	4.5
Red.	51.3	62.1	51.3	42.3
Green Arrow. . .	--	--	7.2[f]	--
Yellow Arrow . .	--	--	3.6	--
Total Cycle	90.0	90.0	90.0	90.0

Phase	N. Sherman Boulevard	W. Hope Avenue
Green.	34.2	16.2
Yellow	3.6	3.6
Red.	22.2	40.2
Total Cycle[c]	60.0	60.0

Phase	N. Sherman Boulevard	W. Congress Street (south)
Green.	34.2	16.2
Yellow	3.6	3.6
Red.	22.2	40.2
Total Cycle[e]	60.0	60.0

Phase	N. Sherman Boulevard	W. Hampton Avenue
Green.	25.2	25.2
Yellow	3.6	3.6
Red.	31.2	31.2
Total Cycle	60.0	60.0

Table 60 (continued)

Phase	Intersection (time in seconds)		
	N. Sherman Boulevard	W. Villard Avenue	
		Westbound	Eastbound
Green.	18.0	31.2	21.6
Yellow	3.6	3.6	3.6
Red	38.4	25.2	34.8
Green Arrow. . .	--	7.2[f]	--
Yellow Arrow . .	--	2.4	--
Total Cycle[c]	60.0	60.0	60.0
	N. Sherman Boulevard		W. Custer Avenue
	Northbound	Southbound	
Green.	18.6	33.0	19.2
Yellow	3.6	3.6	3.6
Red	37.8	23.4	37.2
Green Arrow. . .	--	10.8[f]	--
Yellow Arrow . .	--	3.0	--
Total Cycle[c]	60.0	60.0	90.0

[a]*Lagging left-turn arrow concurrent with through green phase.*

[b]*Leading right-turn arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Leading left-turn arrow.*

[e]*Lagging right-turn arrow.*

[f]*Leading left-turn arrow concurrent with through green phase.*

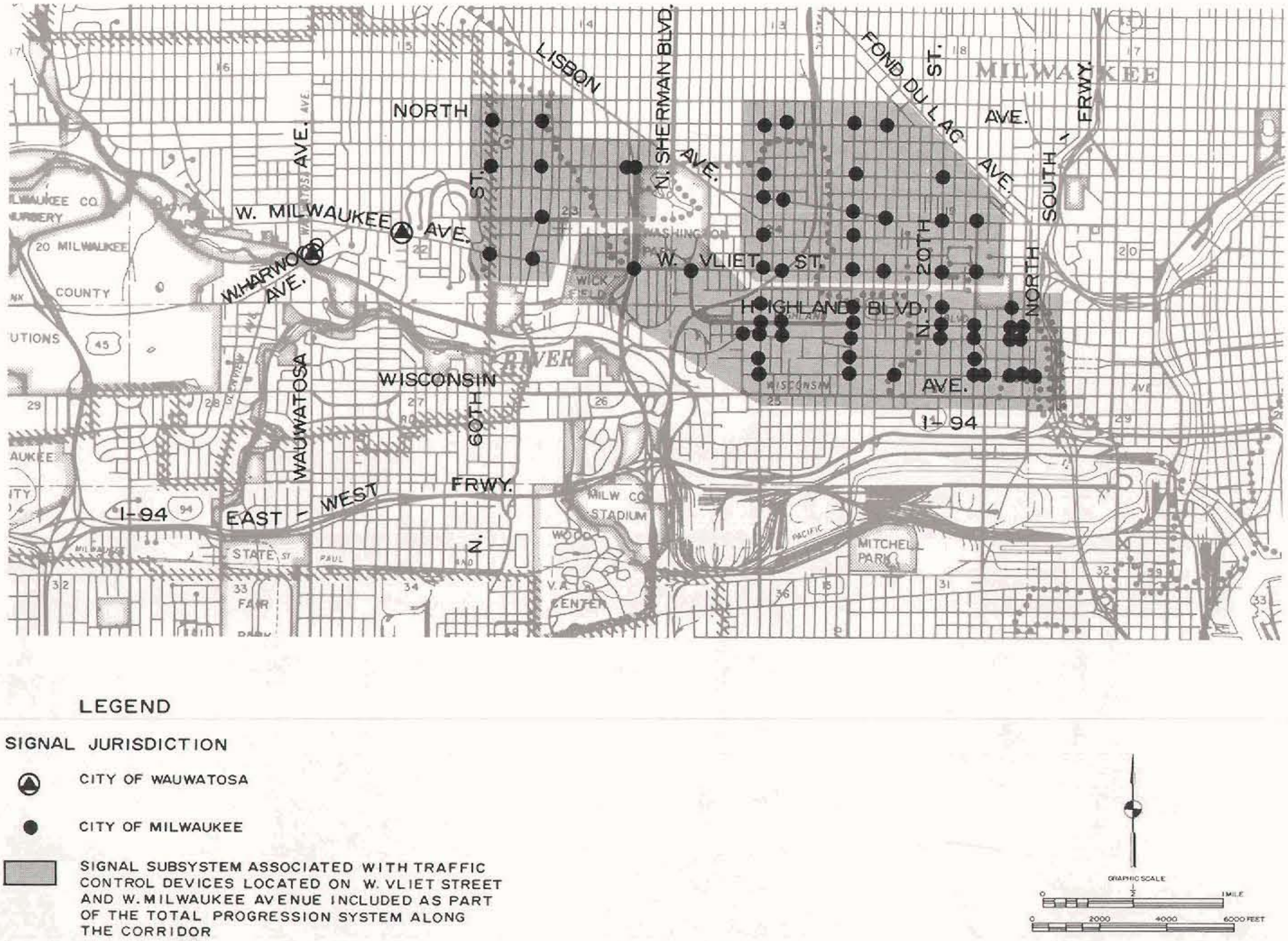
Source: SEWRPC.

As indicated in Table 61, the problem segment of W. Vliet Street and W. Milwaukee Avenue has 11 controlled intersections, at which the W. Vliet Street and W. Milwaukee Avenue approaches range in width from 20 to 36 feet. Of these 11 intersections, two intersections are controlled with four-way stop signs—the intersections of W. Milwaukee Avenue with N. 68th Street and with W. Harwood Avenue. Of the other nine signalized intersections, only the east- and westbound approaches of W. Vliet Street and W. Highland Boulevard provide separate lanes for the exclusive use of left-turning vehicles. Only one approach along this segment—the westbound approach at the intersection of W. Vliet Street and N. 47th Street—provides a separate lane for the exclusive use of right-turning vehicles, and this lane is identified by regulatory pavement markings rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along W. Vliet Street and W. Milwaukee Avenue are also indicated in Table 61.

Traffic Control Measures: The timing plan for each of the nine traffic signals along W. Vliet Street and W. Milwaukee Avenue between W. Harwood

Map 108

DETAIL OF THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Vliet Street and W. Milwaukee Avenue from W. Harwood Avenue to N. 20th Street, a distance of about 3.4 miles. This map also shows the location and jurisdiction of each of the 10 traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Vliet Street and W. Milwaukee Avenue and are directly affected by the timing plans of the traffic signals on W. Vliet Street and W. Milwaukee Avenue.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

Avenue and N. 20th Street is indicated in Table 62. Map 108 shows the location and jurisdiction of each of these signals and the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Vliet Street and W. Milwaukee Avenue, and are directly affected by the timing plans of the traffic signals on W. Vliet Street and W. Milwaukee Avenue. Six of the traffic signals are located at intersections of W. Vliet Street and W. Milwaukee Avenue with other arterial streets, and three are located at intersections of W. Vliet Street and W. Milwaukee Avenue with nonarterial streets—specifically, N. 47th Street, N. 33rd Street, and N. 24th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Vliet Street and W. Milwaukee Avenue, as well as at the arterial street crossing of N. 40th Street with W. Vliet Street. Four-way stop signs are located at the arterial intersections of W. Milwaukee Avenue and W. Harwood Avenue and W. Milwaukee Avenue

Map 109

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE

This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of W. Vliet Street and W. Milwaukee Avenue. Residential land use comprises the majority of the existing urban development in this corridor, as well as of the existing urban development immediately adjacent to W. Vliet Street and W. Milwaukee Avenue. Retail sales and service uses, however, abut W. Vliet Street and W. Milwaukee Avenue at its intersections with N. 60th Street, N. Hawley Road, N. 51st Street, N. 35th Street, and N. 27th Street, and otherwise occur in a scattered fashion throughout the corridor. Recreational land uses occur along W. Vliet Street and W. Milwaukee Avenue at its intersection with N. Sherman Boulevard at Washington Park, at its intersection with N. 50th Street at Wick Playfield, and at its intersection with N. 17th Street at Martin Luther King Park.

Source: SEWRPC.

Table 61

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE[a]

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
W. Milwaukee Avenue and W. Harwood Avenue . .	18	NPAM	20	FS	21	NP	18	P
W. Milwaukee Avenue and N. 68th Street	20	NS	20	NP	21	NPPM	15	P
W. Vliet Street and N. 60th Street	20	FSAM	22	P	24	FSPM	28	NS
W. Vliet Street and N. Hawley Road	23	NPAM	23	P	20	NPPM	20	NPAM
W. Vliet Street and N. 47th Street	28	NP	36 MR[b]	NS	18	FS	18	FS
W. Vliet Street and W. Highland Boulevard	32ML	P	36 ML	NP	34 ML	P	26	P
W. Vliet Street and N. 35th Street	25	P	25	P	20 L	NPPM	24	NPAM
W. Vliet Street and N. 33rd Street	25	P	25	P	18	NSAM	18	P
W. Vliet Street and N. 27th Street	25	P	25	P	36 ML	P	36 ML	P
W. Vliet Street and N. 24th Street	25	P	25	P	18	P	18	P
W. Vliet Street and N. 20th Street	25	P	25	P	19	P	19	P

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a] *Intersections of W. Milwaukee Avenue with W. Harwood Avenue and W. Milwaukee Avenue with N. 68th Street are stop sign-controlled.*

[b] *Exclusive turn-lane width included as a part of roadway approach width.*

Source: SEWRPC.

and N. 68th Street. This segment of W. Vliet Street and W. Milwaukee Avenue is posted for a 30-mile-per-hour speed limit for its entire length.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 11 controlled intersections along the problem segment of W. Vliet Street and W. Milwaukee Avenue in Figures 14 and 15. The locations along W. Vliet Street and W. Milwaukee Avenue from W. Harwood Avenue to N. 20th Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 11 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Vliet Street and W. Milwaukee Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 63.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Vliet Street and W. Milwaukee Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were

Table 62

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE

Phase	Intersection (time in seconds)							
	W. Vliet Street				N. 60th Street			
	Westbound		Eastbound		Northbound		Southbound	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
Green.	28.2	24.6	28.2	34.2	22.2	16.2	22.2	16.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	28.2	31.8	28.2	22.2	34.2	40.2	34.2	40.2
Green Arrow. . .	--	--	--	7.2[a]	--	--	--	--
Yellow Arrow . .	--	--	--	2.4	--	--	--	--
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Phase	W. Vliet Street	N. Hawley Road
Green.	25.2	25.2
Yellow	3.6	3.6
Red.	31.2	31.2
Total Cycle	60.0	60.0

Phase	W. Vliet Street	N. 47th Street
Green.	33.6	16.8
Yellow	3.6	3.6
Red.	22.8	39.6
Total Cycle	60.0	60.0

Phase	W. Vliet Street		W. Highland Boulevard	
	Westbound	Eastbound	Northbound	Southbound
Green.	28.2	18.0	22.2	22.2
Yellow	3.6	3.6	3.6	3.6
Red.	28.2	38.4	34.2	34.2
Green Right-Turn Arrow . .	--	--	8.4[b]	--
Yellow Right-Turn Arrow . .	--	--	3.0	--
Green Left-Turn Arrow . .	7.2[a]	--	--	--
Yellow Left-Turn Arrow . .	3.0	--	--	--
Total Cycle[c]	60.0	60.0	60.0	60.0

Phase	W. Vliet Street				N. 35th Street			
	Westbound		Eastbound		Northbound		Southbound	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
Green.	15.0	24.6	24.6	15.0	16.2	25.8	25.8	16.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	41.1	31.8	31.8	41.4	40.2	30.6	30.6	40.2
Green Arrow. . .	--	7.2[a]	7.2[a]	--	--	7.2[a]	7.2[a]	--
Yellow Arrow . .	--	--	--	--	--	--	--	--
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Table 62 (continued)

Phase	Intersection (time in seconds)	
	W. Vliet Street	N. 33rd Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle	60.0	60.0
	W. Vliet Street	N. 27th Street
Green.	22.2	28.2
Yellow	3.6	3.6
Red	34.2	28.2
Total Cycle[c]	60.0	60.0
	W. Vliet Street	N. 24th Street
Green.	36.6	13.2
Yellow	4.2	3.6
Red	19.2	43.2
Total Cycle[c]	60.0	60.0
	W. Vliet Street	N. 20th Street
Green.	22.2	28.2
Yellow	3.6	3.6
Red	34.2	28.2
Total Cycle	60.0	60.0

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Lagging right-turn arrow.*

[c] *Signal timing sequence on all four approaches to this intersection is subject to pedestrian-actuated control.*

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

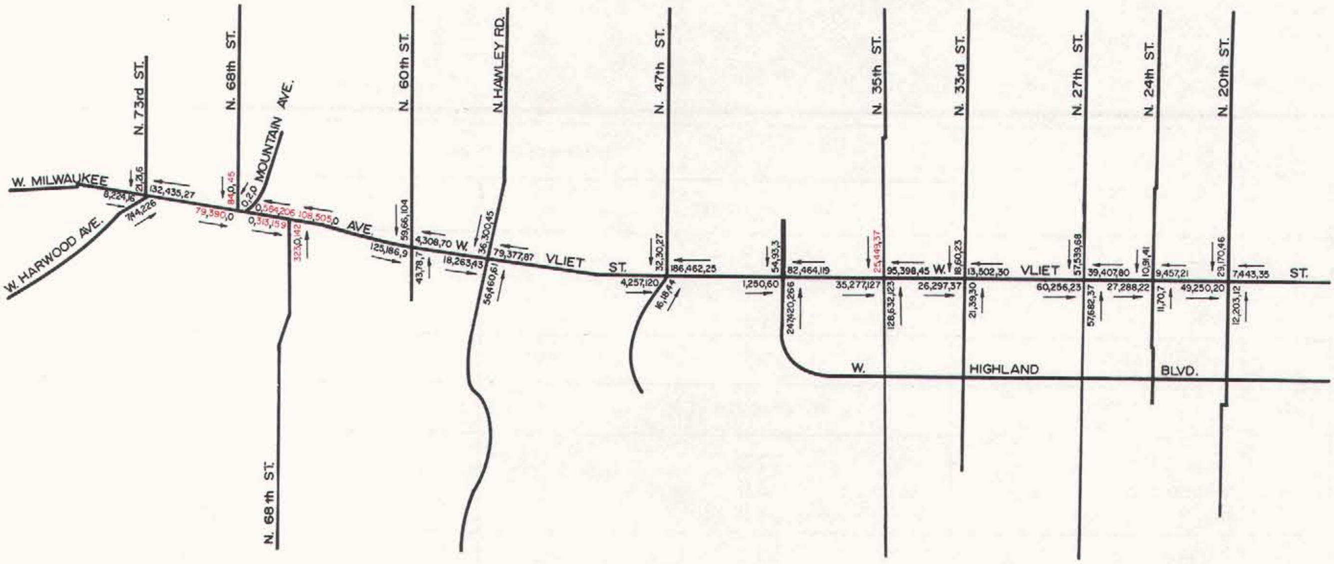
identified and are shown in Figures 14 and 15. One congested traffic movement was found to occur along this segment of W. Vliet and W. Milwaukee Avenue during the morning peak hour, and seven were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The one morning and seven evening peak-hour traffic congestion problems identified along W. Vliet Street and W. Milwaukee Avenue are associated with three controlled intersections: the signalized intersections of W. Vliet Street with W. Highland Boulevard and with N. 35th Street, and the stop sign-controlled intersection of W. Milwaukee Avenue with N. 68th Street.

One intersection along W. Vliet Street and W. Milwaukee Avenue—W. Vliet Street with N. 20th Street—while not having a congestion problem, was found to have signals that could be retimed to more efficiently serve existing traffic volumes. Transportation systems management actions were accordingly also considered for this intersection.

Figure 14

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE DURING THE MORNING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

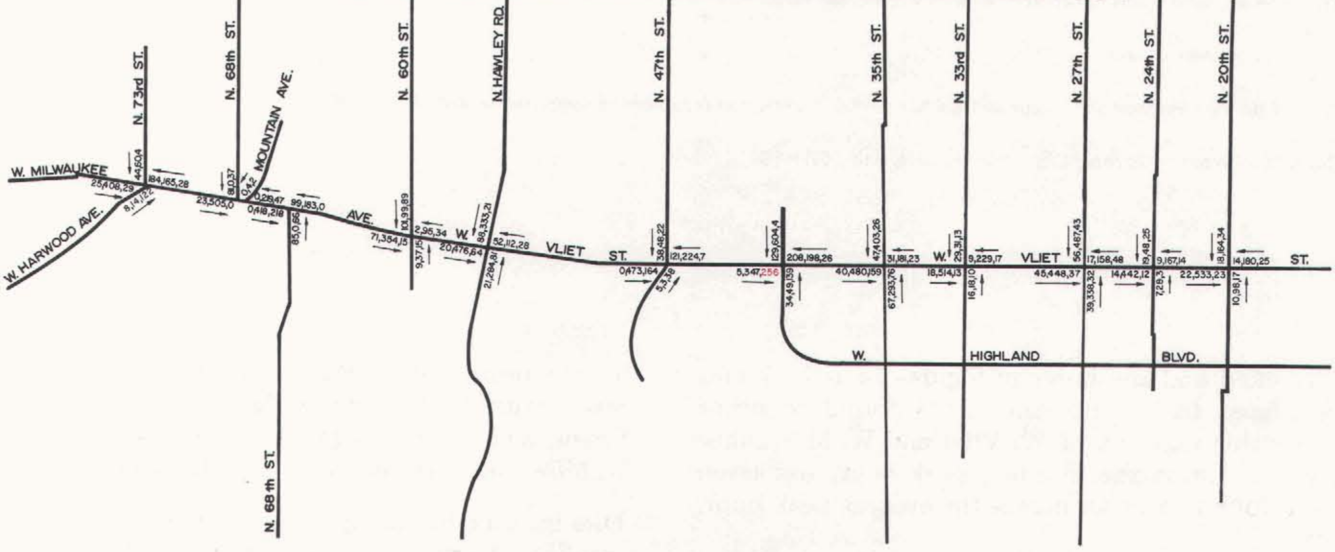
RED NUMBERS INDICATE CONGESTED MOVEMENT

[a]EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 15

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE DURING THE EVENING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

RED NUMBERS INDICATE CONGESTED MOVEMENT

[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 63

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Milwaukee Avenue and W. Harwood Avenue	Eastbound	7	5	1	7	3	1
	Westbound	7	49	2	4	24	2
	Northbound	84	6	5	82	2	2
	Southbound	4	40	- -	12	44	- -
W. Milwaukee Avenue and N. 68th Street (west intersection)	Eastbound	- -	4	2	- -	17	2
	Westbound	18	- -	4	31	- -	1
	Southbound	31	69	1	35	65	1
W. Milwaukee Avenue and N. 68th Street (east intersection)	Eastbound	34	- -	1	33	- -	1
	Westbound	- -	35	6	- -	18	3
	Northbound	44	56	7	30	70	1
W. Vliet Street and N. 60th Street	Eastbound	3	16	4	3	39	3
	Westbound	26	2	4	18	1	1
	Northbound	24	15	11	5	34	3
	Southbound	31	35	4	45	26	4
W. Vliet Street and N. Hawley Road	Eastbound	11	4	2	13	6	1
	Westbound	15	27	9	16	15	1
	Northbound	21	5	6	10	10	1
	Southbound	5	20	2	12	9	1
W. Vliet Street and N. 47th Street	Eastbound	26	- -	3	32	1	2
	Westbound	2	34	7	4	27	2
	Northbound	83	11	22	56	21	3
	Southbound	20	35	4	30	36	11
W. Vliet Street and W. Highland Boulevard	Eastbound	42	1	5	19	1	5
	Westbound	6	48	10	18	12	3
	Northbound	63	15	6	29	26	2
	Southbound	1	17	1	2	36	1
W. Vliet Street and N. 35th Street	Eastbound	23	6	4	29	8	4
	Westbound	10	13	13	8	18	2
	Northbound	18	15	17	14	14	5
	Southbound	5	10	10	7	5	6
W. Vliet Street and N. 33rd Street	Eastbound	3	3	5	10	7	2
	Westbound	7	3	12	6	2	3
	Northbound	23	36	9	33	23	8
	Southbound	18	40	4	23	18	6
W. Vliet Street and N. 27th Street	Easthbound	7	8	5	7	18	5
	Westbound	21	8	15	15	8	3
	Northbound	8	9	11	5	7	4
	Southbound	7	10	7	10	9	6
W. Vliet Street and N. 24th Street	Eastbound	3	3	6	7	8	4
	Westbound	7	5	15	4	2	2
	Northbound	8	18	5	8	12	3
	Southbound	27	21	11	29	7	3
W. Vliet Street and N. 20th Street	Eastbound	4	4	3	6	15	5
	Westbound	12	6	10	7	2	2
	Northbound	14	8	9	5	5	3
	Southbound	16	8	7	19	12	3

Source: SEWRPC.

Table 64 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 65 summarizes all of the changes in traffic signal timing recommended for the problem intersections along this segment of W. Vliet Street and W. Milwaukee Avenue. A total of 10 actions are recommended to be implemented at the three intersections having congestion problems at a capital cost of approximately $286,400, expressed in 1980 dollars. One additional action is recommended to be implemented at the intersection not displaying congestion problems at minimal cost.

As indicated in Table 64, both of the signalized intersections which exhibited congestion problems require the addition of some turn-lane storage capacity. One of the intersections, W. Vliet Street and W. Highland Boulevard, requires the lengthening of an existing left-turn lane on the northbound approach from 137 to 245 feet at a capital cost of approximately $15,000. Required also at this intersection is the addition of a separate signal turn phase and the installation of a new traffic controller at an approximate cost of $14,000, the installation of special pavement markings to delineate turning movements at an approximate cost of $400, and the prohibition of on-street parking on the near and far side of the eastbound intersection approach at an approximate cost of $200. The total capital cost of improvements at this intersection is thus estimated at $29,600.

To resolve the existing storage capacity problem associated with the north-to-westbound left-turn lane during the evening peak hour at the intersection of W. Vliet Street and N. 35th Street, a left-turn lane on the northbound approach, presently delineated by special pavement marking, would be lengthened from 90 to 130 feet. The cost of additional pavement marking to lengthen this turn lane would be approximately $600. Required to abate the existing congestion at this intersection is the installation of a new traffic controller and the retiming of two separate turn phases by adding yellow clearance arrows at an estimated cost of $16,000, and the prohibition of on-street parking on the southbound approach during the evening peak hour at an estimated cost of $2.00. The total capital cost of improvements at this intersection is thus estimated at $16,800.

Congestion problems were also identified on all approaches to both the east and west intersections of W. Milwaukee Avenue with N. 68th Street during the evening peak hour. To resolve this congestion, it is recommended that all approaches to both the east and west intersections be widened to provide for double left- and single right-turn lanes on the north- and southbound N. 68th Street approaches; that additional left-turn lanes be provided on the east- and westbound W. Milwaukee Avenue approaches; and that median channelization be provided on the northbound N. 68th Street approach and both W. Milwaukee Avenue approaches. It is also recommended that the western terminus of Mountain Avenue be relocated to intersect with W. Milwaukee Avenue between the east and west intersections with N. 68th Street, and that this intersection be stop sign-controlled. Finally, it is recommended that all approaches of W. Milwaukee Avenue with N. 68th Street be signalized. The capital cost of this action is estimated at $205,000. In addition, costs associated with new right-of-way to be acquired under this alternative are estimated at $35,000, bringing the total estimated capital cost of this recommended action to $240,000.

As indicated in Table 64 and as already noted, one other intersection, although not exhibiting congestion problems, was found to warrant traffic management actions to improve operations. This is the intersection of N. 20th Street with W. Vliet Street. This intersection was found to have a timing plan which could be revised to more efficiently balance traffic operating conditions. Only the retiming of the existing signal timing plan is required to improve operations at this intersection, at no capital cost.

In addition, the existing offsets between the traffic signal timing plans of the 11 signalized intersections along this segment of W. Vliet Street and W. Milwaukee Avenue should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation systems management actions, and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and to reduce vehicular delays at the signalized intersections along this segment of W. Vliet Street and W. Milwaukee Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

Table 64

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. VLIET STREET

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Milwaukee Avenue and N. 68th Street	Congested operation of all approaches to both the east and west stop sign-controlled intersections of N. 68th Street and W. Milwaukee Avenue (1,676 vehicles per hour at level-of-service E)	<u>Recommended Actions</u> Widen all approaches to the east and west intersections to provide for double left- and single right-turn lanes on the north- and southbound N. 68th Street approaches; to provide for additional left-turn lanes on east- and westbound W. Milwaukee Avenue approaches; and to provide for median channelization on northbound N. 68th Street approach and both W. Milwaukee Avenue approaches Relocate western terminus of Mountain Avenue to intersect with W. Milwaukee Avenue between the east and west intersections with N. 68th Street. Relocated Mountain Avenue to be stop sign-controlled Install traffic signals at all approaches to intersection	$240,000	$24,000 (Including additional right-of-way required on all approaches)
W. Vliet Street and W. Highland Boulevard	Congested east-to-southbound right turn during the morning peak hour (256 vehicles per hour at level-of-service E) Insufficient west-to-southbound left-turn-lane storage capacity during the morning peak hour and north-to-westbound left-turn-lane storage capacity during the evening peak hour	<u>Recommended Actions</u> Add traffic-actuated 8.4-second east-to-southbound leading right-turn arrow to operate concurrently with the existing north-to-eastbound right-turn and west-to-southbound left-turn arrows during the morning peak hour	$14,000	
		Install pavement marking to delineate east-to-southbound and west-to-southbound turn movements	$ 400	
		Prohibit on-street parking on eastbound near-side and southbound far-side intersection approaches during the morning peak hour, designating the eastbound right-hand lane for right turns only	$ 200	
		Increase storage length of north-to-westbound left-turn lane from 137 to 245 feet	$15,000	$29,600
		<u>Alternative Actions</u> Retime 90-second cycle so that all vehicles can negotiate east-to-southbound right turn on through green phase (Not recommended because the 90-second cycle could not provide a sufficient percentage of green time on W. Vliet Street to adequately accommodate the existing movements on all approaches to the intersection) Lengthen turn lane on westbound approach from 82 to 200 feet (Not recommended because, owing to space restrictions, existing exclusive west-to-northbound left-turn lane cannot be lengthened adequately to provide storage capacity necessary for present turn phase)		

Table 64 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Vliet Street and N. 35th Street	Congested right-turn, left-turn, and through movements from southbound approach during the evening peak hour (511 vehicles per hour at level-of-service D) Insufficient north-to-westbound left-turn-lane storage capacity during the evening peak hour	Recommended Actions Add 3.0-second yellow clearance arrows to existing south-to-eastbound and east-to-northbound leading green arrows during the morning peak hour, and to the existing north-to-westbound and west-to-southbound leading green arrows during the evening peak hour	$16,000	
		Prohibit on-street parking on near side of southbound approach during the evening peak hour	$ 200	
		Increase storage length of north-to-westbound left-turn lane from 90 to 130 feet	$ 600	
		Alternative Action Increase 60-second cycle to 90-second cycle (Not recommended owing to detrimental effect a 90-second cycle would have on traffic progression in existing 60-second cycle system)		
Subtotal				$286,400
W. Vliet Street and N. 20th Street	Inefficient signal timing plan; update to reflect current traffic conditions	Recommended Action Retime 60-second cycle to increase east- and westbound green time from 22.2 to 25.2 seconds, making necessary signal changes at other approaches to improve operating efficiency of intersection and provide a wider progression band on W. Vliet Street	- -	- -
Total				$286,400

Source: SEWRPC.

W. Fond du Lac Avenue (STH 145) from N. 60th Street to W. Walnut Street

Another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 110, W. Fond du Lac Avenue (STH 145) from N. 60th Street to W. Walnut Street, a distance of 4.2 miles. Map 111 shows the existing land use pattern within a one-half-mile wide corridor along this problem segment of W. Fond du Lac Avenue. Residential land use comprises the majority of the existing urban development in the corridor. Retail sales and service uses, however, comprise the majority of the existing land use immediately adjacent to W. Fond du Lac Avenue, and are nearly continuous between N. 60th Street and W. Capitol Drive (STH 190), between W. Roosevelt Drive and W. Burleigh Street, and between W. Locust Street and W. North Avenue. Industrial land use is evident along this corridor adjacent to the intersection of W. Fond du Lac Avenue and W. Locust Street. Governmental and institutional land uses are scattered throughout the corridor. Vacant land of the cleared Park Freeway-West corridor is evident in the southern portion of this corridor between W. Lloyd Street and W. North Avenue.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Fond du Lac Avenue (STH 145). Between N. 60th Street and N. 35th Street, the roadway is divided by a median which ranges from 10 to 30 feet in width from N. 60th Street to W. Capitol Drive (STH 190), is 20 feet in width from W. Capitol Drive to N. 36th Street, and ranges from five to nine feet in width

Table 65

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. VLIET STREET AND W. MILWAUKEE AVENUE

Phase	Intersection (time in seconds)							
	W. Milwaukee Avenue				N. 68th Street			
	(signal timing plan currently being planned by City of Wauwatosa)							
	W. Vliet Street				N. 60th Street			
	Westbound		Eastbound		Northbound		Southbound	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
Green.	28.2	24.6	28.2	34.2	22.2	16.2	22.2	16.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	28.2	31.8	28.2	22.2	34.2	40.2	34.2	40.2
Green Arrow. . .	- -	- -	- -	7.2[a]	- -	- -	- -	- -
Yellow Arrow . .	- -	- -	- -	2.4	- -	- -	- -	- -
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
	W. Vliet Street				N. Hawley Road			
Green.	25.2				25.2			
Yellow	3.6				3.6			
Red	31.2				31.2			
Total Cycle	60.0				60.0			
	W. Vliet Street				N. 47th Street			
Green.	33.6				16.8			
Yellow	3.6				3.6			
Red	22.8				39.6			
Total Cycle	60.0				60.0			
	W. Vliet Street				W. Highland Boulevard			
	Westbound		Eastbound		Northbound		Southbound	
Green.	28.2		18.9		22.2		22.2	
Yellow	3.6		3.6		3.6		3.6	
Red	28.2		38.4		34.2		34.2	
Green Right-Turn Arrow . .	- -		8.4[b]		8.4[c]		- -	
Yellow Right-Turn Arrow . .	- -		3.0		3.0		- -	
Green Left-Turn Arrow . .	7.2[a]		- -		- -		- -	
Yellow Left-Turn Arrow . .	3.0		- -		- -		- -	
Total Cycle[d]	60.0		60.0		60.0		60.0	
	W. Vliet Street				N. 35th Street			
	Westbound		Eastbound		Northbound		Southbound	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
Green.	15.0	24.6	24.6	15.0	18.6	25.8	23.4	16.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	41.1	31.8	31.8	41.4	37.8	30.6	33.0	40.2
Green Arrow. . .	- -	6.6[a]	6.6[a]	- -	- -	6.6[a]	6.6[a]	- -
Yellow Arrow . .	- -	3.0	3.0	- -	- -	3.0	3.0	- -
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Table 65 (continued)

Phase	Intersection (time in seconds)	
	W. Vliet Street	N. 33rd Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red.	22.2	40.2
Total Cycle	60.0	60.0
	W. Vliet Street	N. 27th Street
Green.	25.2	25.2
Yellow	3.6	3.6
Red.	31.2	31.2
Total Cycle[d]	60.0	60.0
	W. Vliet Street	N. 24th Street
Green.	36.6	13.2
Yellow	4.2	3.6
Red.	19.2	43.2
Total Cycle[d]	60.0	60.0
	W. Vliet Street	N. 20th Street
Green.	25.2	25.2
Yellow	3.6	3.6
Red.	31.2	31.2
Total Cycle	60.0	60.0

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Leading right-turn arrow.*

[c] *Lagging right-turn arrow.*

[d] *Signal timing sequence on all four approaches to these intersections is subject to pedestrian-actuated control.*

Source: City of Milwaukee and SEWRPC.

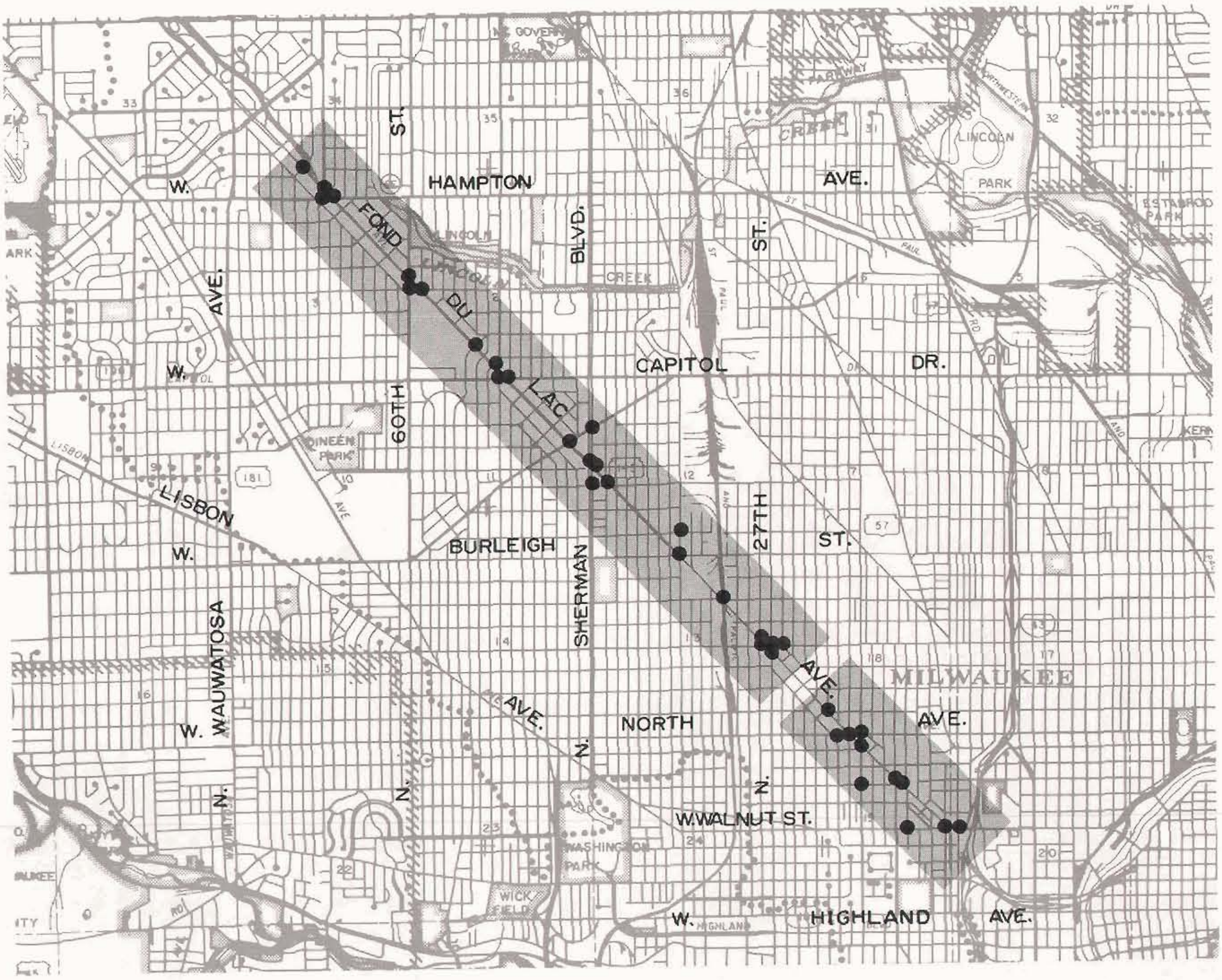
between N. 36th Street and N. 35th Street. The curb-to-curb pavement widths of the dual roadways from N. 60th Street to N. 35th Street are 34 feet, adequate to provide two lanes for moving traffic with parking permitted. From N. 35th Street to W. Walnut Street, W. Fond du Lac Avenue is not median divided, and has a curb-to-curb pavement width of 50 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along much of W. Fond du Lac Avenue from N. 60th Street to N. 13th Street, with parking being prohibited only along segments of the southeast-bound roadway from N. 60th Street to W. Capitol Drive (STH 190) adjacent to the Capitol Court Shopping Center. and between N. 13th Street and W. Walnut Street.

As indicated in Table 66, the problem segment of W. Fond du Lac Avenue (STH 145) within the study area has 19 signalized intersections, at which the W. Fond du Lac Avenue approaches range in width from 20 to 36 feet. Five of the southeast-bound and five of the northwest-bound approaches to these 19 intersections provide separate lanes for the exclusive use of left-turning vehicles. In addition, one of the southeast-bound approaches—the southeast-bound approach at the intersection of N. 51st Street—provides a separate lane for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersections along W. Fond du Lac Avenue are also shown in Table 66.

Traffic Control Measures: The timing plan for each of the 19 traffic signals along W. Fond du Lac Avenue (STH 145) between N. 60th Street and W. Walnut Street is indicated in Table 67. Map 110 shows the location and jurisdiction of each of these signals and the interconnected progressive signal subsystems which are located within approxi-

Map 110

DETAIL OF THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

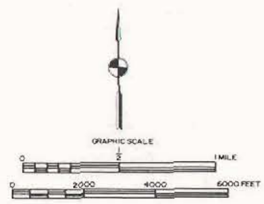


LEGEND

SIGNAL JURISDICTION

● CITY OF MILWAUKEE

▭ SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON W. FOND DU LAC AVENUE INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR



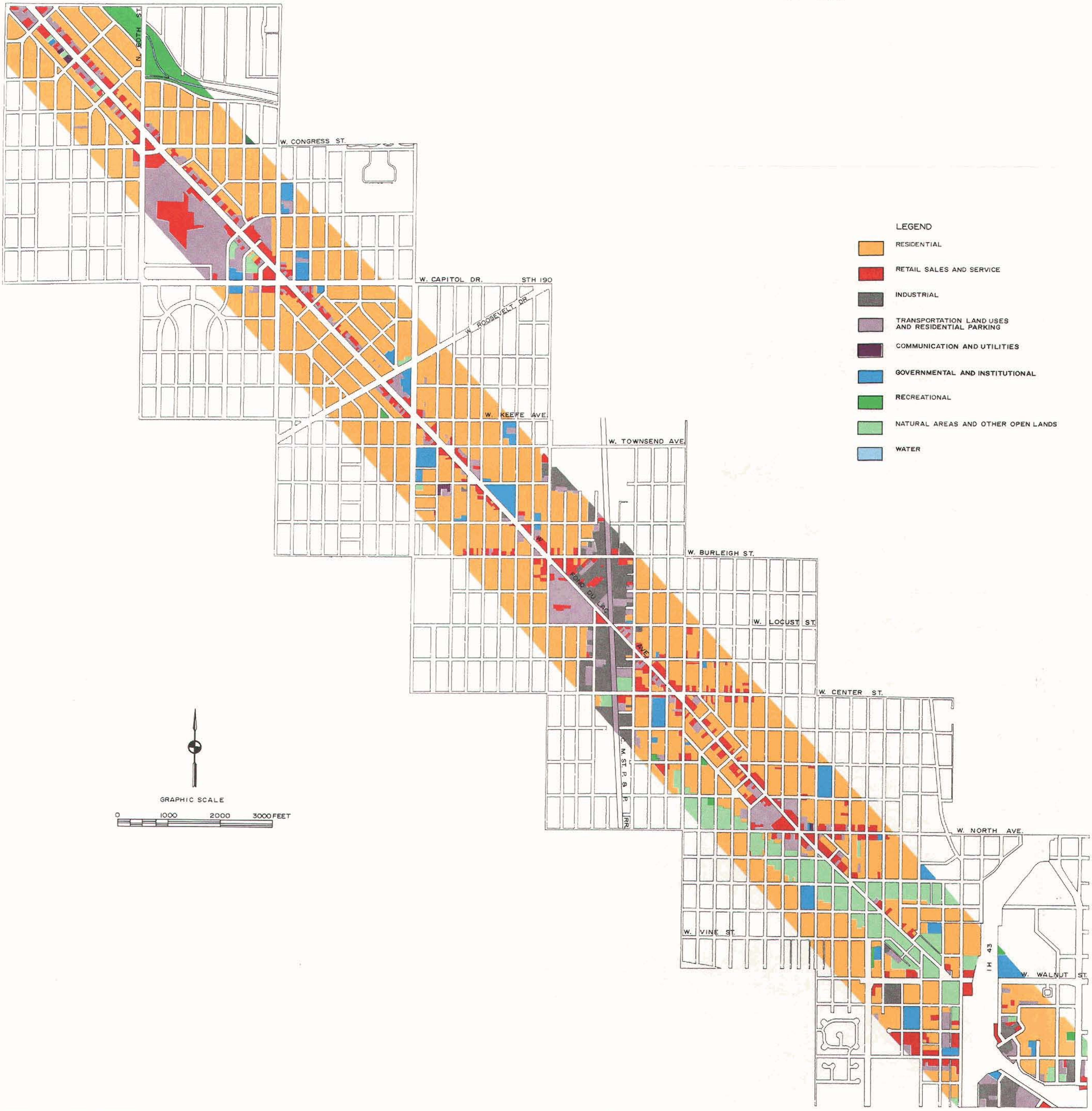
Shown on this map is another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Fond du Lac Avenue (STH 145) from N. 60th Street to W. Walnut Street, a distance of 4.2 miles. This map also shows the location and jurisdiction of each of the 19 traffic signals along this arterial segment, including the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Fond du Lac Avenue and are directly affected by the traffic signals on W. Fond du Lac Avenue.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

mately one-half mile of W. Fond du Lac Avenue and are directly affected by the traffic signals on W. Fond du Lac Avenue. Fourteen of the traffic signals are located at intersections of W. Fond du Lac Avenue with other arterial streets, and five are located at intersections of W. Fond du Lac Avenue with nonarterial streets—specifically, N. 51st Street, W. Maxwell Street, W. Locust Street, N. 28th Street, and N. 23rd Street and W. Oak Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Fond du Lac Avenue. The Milwaukee Road crosses over W. Fond du Lac Avenue at W. Locust Street on a grade separation structure. This segment of W. Fond du Lac Avenue is posted for a 30-mile-per-hour speed limit for its entire length.

Map 111

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)



This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of W. Fond du Lac Avenue (STH 145). Residential land use comprises the majority of the existing urban development in this corridor. Retail sales and service uses, however, comprise the majority of the existing land use immediately adjacent to W. Fond du Lac Avenue, and are nearly continuous between N. 60th Street and W. Capitol Drive (STH 190), between W. Roosevelt Drive and W. Burleigh Street, and between W. Locust Street and W. North Avenue. Industrial land use is evident along this corridor adjacent to the intersection of W. Fond du Lac Avenue and W. Locust Street. Governmental and institutional land uses are scattered throughout the corridor. Vacant land of the cleared Park Freeway-West corridor is evident in the southern portion of this corridor between W. Lloyd Street and W. North Avenue.

Source: SEWRPC.

Table 66

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)

Intersection	Roadway Approach Width (feet)					
	Southeast-bound		Northwest-bound		Northbound	
W. Fond du Lac Avenue and N. 60th Street	36 M	P	34 M	P	32 ML	P
W. Fond du Lac Avenue and W. Congress Street	34 ML	P	34 ML	P	--	--
W. Fond du Lac Avenue and W. Maxwell Street	34 ML	NS	34 ML	NS	--	--
W. Fond du Lac Avenue and N. 51st Street	22 MR	NP	34 M	NP	24	NS
W. Fond du Lac Avenue and W. Capitol Drive	34 ML	NPAM	34 ML	NPPM	--	--
W. Fond du Lac Avenue and W. Roosevelt Drive	34 M	FSAM	34 M	P	--	--
W. Fond du Lac Avenue and N. Sherman Boulevard	34 M	NSAM	34 M	NSPM	33 ML	NPPM
W. Fond du Lac Avenue and W. Townsend Street	34 ML	NP	34 ML	NP	--	--
W. Fond du Lac Avenue, N. 35th Street, and W. Burleigh Street	34 M	NPAM	31 M	NS	22	NPAM
W. Fond du Lac Avenue and W. Locust Street	21 L	NP	20 L	NP	--	--
W. Fond du Lac Avenue and N. 28th Street	25	FS	25	P	15	NS
W. Fond du Lac Avenue and W. Center Street	25	NPAM	25	NSPM	--	--
W. Fond du Lac Avenue and N. 27th Street	25	NPAM	25	FSPM	25	NP
W. Fond du Lac Avenue, N. 23rd Street,[a] and W. Oak Street	25	NPAM	25	NS	--	--
W. Fond du Lac Avenue, N. 21st Street,[a] and W. North Avenue	25	NPAM	25	P	--	--
W. Fond du Lac Avenue and N. 20th Street	25	NPAM	25	P	19	NS
W. Fond du Lac Avenue and N. 17th Street[b]	25	P	25	P	--	--
W. Fond du Lac Avenue, N. 16th Street,[b] and W. Brown Street[a]	25	P	25	P	34	NP[d]
N. 13th Street[b] and W. Walnut Street	--	--	--	--	--	--

Intersection	Roadway Approach Width (feet)					
	Southbound		Eastbound		Westbound	
W. Fond du Lac Avenue and N. 60th Street	31	P	--	--	--	--
W. Fond du Lac Avenue and W. Congress Street	--	--	28	NS	22	FS
W. Fond du Lac Avenue and W. Maxwell Street	--	--	21 L	NP	22 L	NP
W. Fond du Lac Avenue and N. 51st Street	22 L	NP	--	--	--	--
W. Fond du Lac Avenue and W. Capitol Drive	--	--	34 ML	NS	34 ML	NP
W. Fond du Lac Avenue and W. Roosevelt Drive	--	--	28 M	P	28 M	P
W. Fond du Lac Avenue and N. Sherman Boulevard	30 ML	FS	--	--	--	--
W. Fond du Lac Avenue and W. Townsend Street	--	--	18	NP	18	P
W. Fond du Lac Avenue, N. 35th Street, and W. Burleigh Street	22	NS	22	NSAM	22	NP
W. Fond du Lac Avenue and W. Locust Street	--	--	18	P	19	NP
W. Fond du Lac Avenue and N. 28th Street	15	FS	--	--	--	--
W. Fond du Lac Avenue and W. Center Street	--	--	21	NP	25	FS
W. Fond du Lac Avenue and N. 27th Street	25	NS	--	--	--	--
W. Fond du Lac Avenue, N. 23rd Street,[a] and W. Oak Street	--	--	15	NS	--	--
W. Fond du Lac Avenue, N. 21st Street,[a], and W. North Avenue	--	--	25	NP	25	NPPM
W. Fond du Lac Avenue and N. 20th Street	19	FS	--	--	--	--
W. Fond du Lac Avenue and N. 17th Street[b]	36	NP[d]	--	--	--	--
W. Fond du Lac Avenue, N. 16th Street,[c] and W. Brown Street[a]	--	--	--	--	--	--
N. 13th Street[b] and W. Walnut Street	36 L	NP	22	NP	29	NS

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a]One-way street away from intersection.

[b]One-way street southbound.

[c]One-way street away from intersection.

[d]One-way street with parking prohibited on one side.

Source: SEWRPC.

Table 67

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)

Phase	Intersection (time in seconds)		
	W. Fond du Lac Avenue	N. 60th Street	
		Northbound	Southbound
Green.	39.6	39.6	29.7
Yellow	3.6	3.6	3.6
Red	46.8	48.8	56.7
Green Arrow. . .	- -	7.2	- -
Yellow Arrow . .	- -	2.7	- -
Total Cycle[a,b]	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue			N. Congress Street
	Morning	Northwest-bound	Southeast-bound	
Green.	57.6	57.6	47.7	21.6
Yellow	3.6	3.6	3.6	3.6
Red	28.8	28.8	38.7	64.8
Green Arrow. . .	- -	7.2	- -	- -
Yellow Arrow . .	- -	2.7	- -	- -
Total Cycle[a,b]	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue		W. Maxwell Street	
	Morning	Evening	Morning	Evening
Green.	61.2	56.7	17.1	21.6
Yellow	4.5	4.5	3.6	3.6
Red	24.3	28.8	69.3	64.8
Green Arrow. . .	- -	- -	- -	- -
Yellow Arrow . .	- -	- -	- -	- -
Total Cycle[a]	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				N. 51st Street			
	Morning		Evening		Morning		Evening	
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound	Northbound	Southbound	Northbound	Southbound
Green.	51.3	23.4	54.0	27.9	17.1	27.9	14.4	25.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	35.1	63.0	32.4	58.5	69.3	58.5	72.0	61.2
Green Right-Turn Arrow . .	- -	27.9[c]	- -	26.1[c]	- -	- -	- -	- -
Yellow Right-Turn Arrow . .	- -	3.6	- -	3.6	- -	- -	- -	- -
Green Left-Turn Arrow . .	- -	- -	- -	- -	- -	7.2[d]	- -	7.2[d]
Yellow Left-Turn Arrow . .	- -	- -	- -	- -	- -	3.6	- -	3.6
Total Cycle[a]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				W. Capitol Drive (STH 190)	
	Morning		Evening		Morning	Evening
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound		
Green.	27.9	47.7	30.6	44.1	29.7	33.3
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	57.6	37.8	54.9	41.4	55.8	52.2
Green Arrow. . .	- -	16.2[d]	- -	9.9[d]	- -	- -
Yellow Arrow . .	- -	3.6	- -	3.6	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 67 (continued)

Phase	Intersection (time in seconds)	
	W. Fond du Lac Avenue	W. Roosevelt Drive
Green.	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Fond du Lac Avenue	N. Sherman Boulevard			
		Morning		Evening	
		Northbound	Southbound	Northbound	Southbound
Green.	34.2	28.8	43.2	43.2	28.8
Yellow	3.6	4.5	4.5	4.5	4.5
Red	52.2	56.7	42.3	42.3	56.7
Green Arrow. . .	- -	- -	10.8[d]	10.8[d]	- -
Yellow Arrow . .	- -	- -	3.6	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				W. Townsend Street
	Morning		Evening		
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound	
Green.	47.7	58.5	58.5	47.7	19.8
Yellow	4.5	4.5	4.5	4.5	3.6
Red	37.8	27.0	27.0	37.8	66.6
Green Arrow. . .	- -	7.2[d]	7.2[d]	- -	- -
Yellow Arrow . .	- -	3.6	3.6	- -	- -
Total Cycle[a]	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue	W. Burleigh Street	N. 35th Street
Green.	27.9	24.3	19.8
Yellow	3.6	3.6	3.6
Red	58.5	62.1	66.6
Total Cycle	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				W. Locust Street
	Morning		Evening		
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound	
Green.	35.1	48.6	48.6	35.1	30.6
Yellow	3.6	3.6	3.6	3.6	3.6
Red	51.3	37.8	37.8	51.3	55.8
Green Arrow. . .	- -	10.8[d]	10.8[d]	- -	- -
Yellow Arrow . .	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Table 67 (continued)

Phase	Intersection (time in seconds)		
	W. Fond du Lac Avenue		N. 28th Street
	Northwest-bound	Southeast-bound	
Green.	41.4	31.5	37.8
Yellow	3.6	3.6	3.6
Red	45.0	54.9	48.6
Total Cycle	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue		W. Center Street	
	Northwest-bound	Southeast-bound	Westbound	Eastbound
Green.	44.1	30.6	35.1	28.8
Yellow	3.6	3.6	3.6	3.6
Red	42.3	55.8	51.3	57.6
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue		N. 27th Street	
	Northwest-bound	Southeast-bound	Northbound	Southbound
Green.	32.4	52.2	21.6	27.0
Yellow	3.6	3.6	3.6	3.6
Red	54.0	34.2	64.8	59.4
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue		W. Oak Street		N. 23rd Street[e]
	Morning	Evening	Morning	Evening	
Green.	33.0	53.1	16.2	26.1	--
Yellow	3.6	3.6	3.6	3.6	--
Red	23.4	33.3	40.2	60.3	--
Total Cycle	60.0	90.0	60.0	90.0	--

Phase	W. Fond du Lac Avenue				W. North Avenue	N. 21st Street[e]
	Morning		Evening			
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound		
Green.	28.8	39.6	39.6	28.8	39.6	--
Yellow	3.6	3.6	3.6	3.6	3.6	--
Red	57.6	46.8	46.8	57.6	46.8	--
Green Arrow. . .	--	8.1[d]	8.1[d]	--	--	--
Yellow Arrow . .	--	2.7	2.7	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	--

Table 67 (continued)

Phase	Intersection (time in seconds)				
	W. Fond du Lac Avenue		N. 20th Street		
	Morning	Evening	Morning	Evening	
				Northbound	Southbound
Green.	48.6	44.1	30.6	35.1	25.2
Yellow	3.6	3.6	3.6	3.6	3.6
Red	37.8	42.3	55.8	51.3	61.2
Green Arrow. . .	- -	- -	- -	7.2[d]	- -
Yellow Arrow . .	- -	- -	- -	2.7	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue	N. 17th Street[f]
Green.	30.6	18.6
Yellow	3.6	3.6
Red	25.8	37.8
Total Cycle	60.0	60.0

Phase	W. Fond du Lac Avenue	N. 16th Street[g]	W. Brown Street[e]
Green.	29.4	18.6	- -
Yellow	4.2	3.6	- -
Red	26.4	37.8	- -
Total Cycle	60.0	60.0	- -

Phase	W. Walnut Street		N. 13th Street[f]	
	Morning	Evening	Morning	Evening
Green.	19.2	28.8	31.2	21.6
Yellow	3.6	3.6	3.6	3.6
Red	37.2	27.6	25.2	34.8
Total Cycle	60.0	60.0	60.0	60.0

[a]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[b]*Signal is traffic-actuated.*

[c]*Lagging right-turn arrow.*

[d]*Leading left-turn arrow concurrent with through green phase.*

[e]*One-way street proceeding away from intersection.*

[f]*One-way street southbound.*

[g]*One-way street northbound.*

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 19 signalized intersections along the problem segment of W. Fond du Lac Avenue (STH 145) in Figures 16 and 17. The locations along W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 19 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Fond du Lac Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 68.

Based on the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Fond du Lac Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 16 and 17. Four congested movements were found to occur along this segment of W. Fond du Lac Avenue during the morning peak hour, and six were found to occur during the evening peak hour. The portion of this problem segment of W. Fond du Lac Avenue between W. Capitol Drive and N. 60th Street was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve traffic safety problem which may exist on this segment.

Alternative and Recommended Transportation Systems Management Actions: The four morning and six evening peak-hour traffic congestion problems identified along W. Fond du Lac Avenue (STH 145) are associated with the following nine signalized intersections: N. 60th Street, N. 51st Street, W. Capitol Drive (STH 190), N. Sherman Boulevard, W. Burleigh Street and N. 35th Street, W. Locust Street, N. 28th Street, N. 27th Street, and N. 17th Street.

The intersections of W. Fond du Lac Avenue with W. Maxwell Street, W. Congress Street, W. North Avenue, and N. 16th Street, while not displaying congestion problems, were found to have either traffic signals that could be retimed, a signal phase which could be changed, or an exclusive turn lane which could be lengthened to more efficiently serve existing traffic volumes. Transportation systems management actions were accordingly also considered for these intersections.

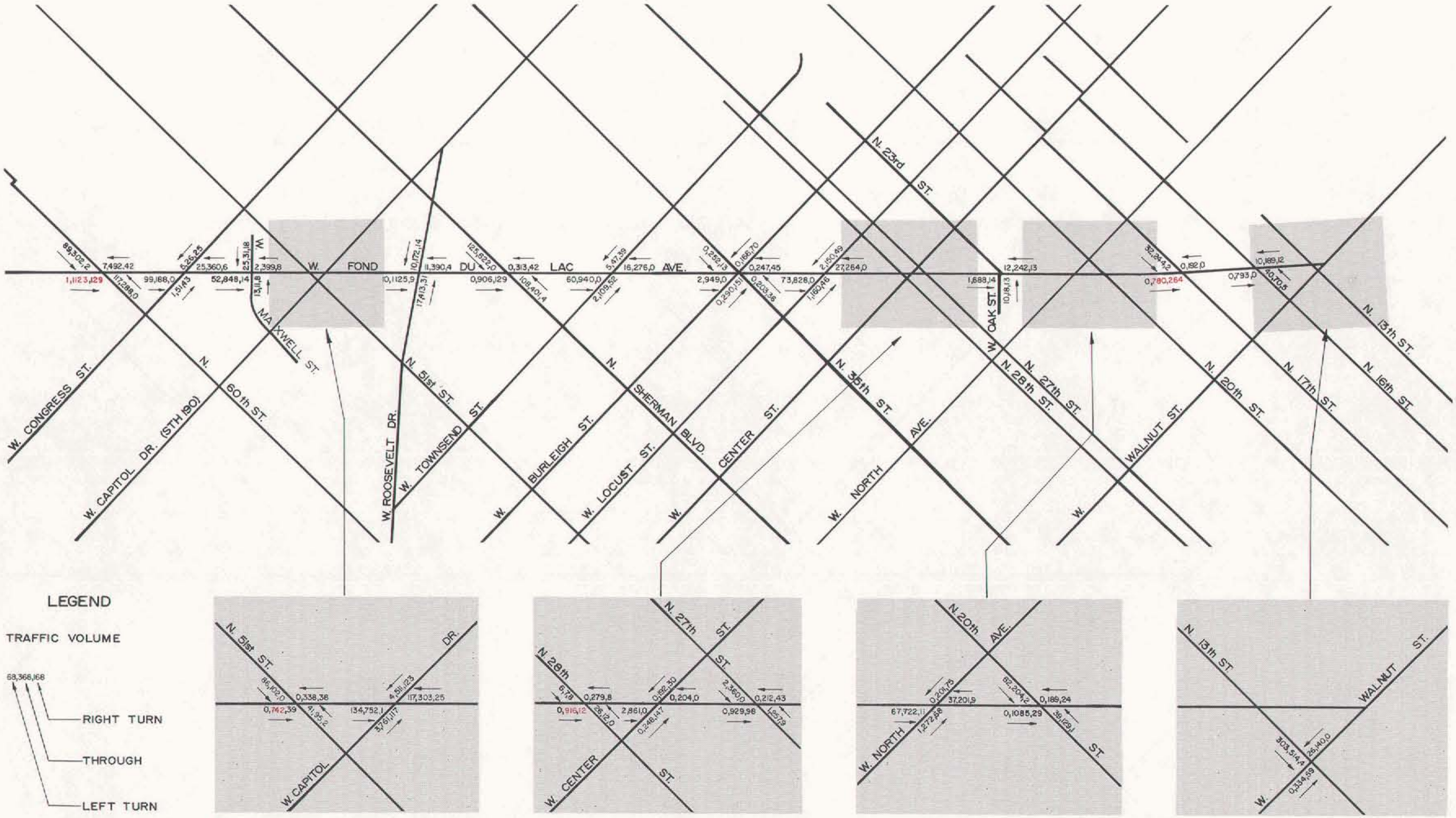
The connection of the Hillside Interchange "stub end" directly to the intersection of W. Fond du Lac Avenue (STH 145) and W. Walnut Street, as proposed by the Wisconsin Department of Transportation and adopted as part of this study's short-range plan by the northwest side study advisory committee on January 30, 1980, may increase traffic volumes on W. Fond du Lac Avenue northwest of the intersection of W. Fond du Lac Avenue and W. Walnut Street. The traffic management actions recommended in this chapter for W. Fond du Lac Avenue, however, all provide for increased traffic flow on W. Fond du Lac Avenue, and their implementation, therefore, should be consistent with the potential Hillside Interchange completion and likely attendant increase in traffic volumes on W. Fond du Lac Avenue. It may be necessary, however, to consider additional traffic management actions for W. Fond du Lac Avenue when the Hillside Interchange is completed. The completion of the Hillside Interchange may particularly affect the actions proposed for the intersection of W. Fond du Lac Avenue and N. 16th Street, as that intersection would be reconstructed and W. Fond du Lac Avenue would be widened through the intersection as part of the completion plans for the Hillside Interchange.

Table 69 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 70 summarizes all of the changes in traffic signal timing recommended for the problem intersections along this segment of W. Fond du Lac Avenue (STH 145).

It should be noted that the Federal Highway Administration has recently approved a demonstration grant for the City of Milwaukee to evaluate traffic signal timing and interconnection along a number of major arterial streets in the City, including W. Fond du Lac Avenue (STH 145), to begin in the summer of 1981. All signal timing recommendations of the northwest side study set forth in this planning report, and all information gathered for use in this analysis for W. Fond du Lac Avenue, will be transmitted to the City of Mil-

Figure 16

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145) DURING THE MORNING PEAK HOUR[a]

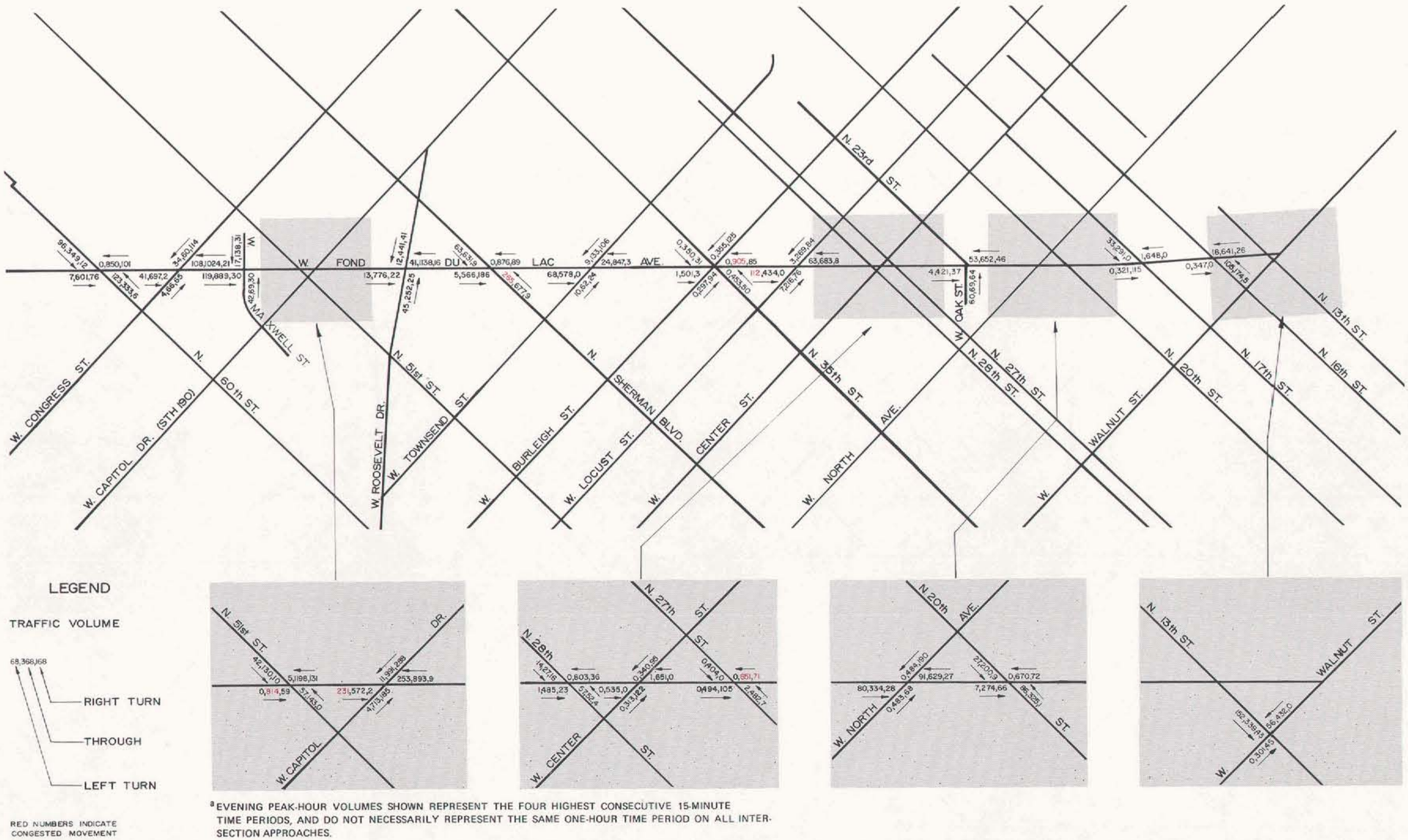


[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 17

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145) DURING THE EVENING PEAK HOUR[a]



[a] EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 68

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Fond du Lac Avenue and N. 60th Street	Southeast-bound	10	1	5	11	1	5
	Northwest-bound	8	1	5	11	- -	5
	Northbound	- -	29	5	1	27	5
	Southbound	1	22	5	3	21	5
W. Fond du Lac Avenue and W. Congress Street	Eastbound	45	1	5	48	3	3
	Northbound	45	9	4	55	16	1
	Northwest-bound	2	6	9	2	9	2
	Southeast-bound	- -	10	3	1	5	4
W. Fond du Lac Avenue and W. Maxwell Street	Eastbound	25	41	3	21	30	- -
	Westbound	24	34	1	45	20	1
	Northwest-bound	2	1	8	2	1	2
	Southeast-bound	1	6	8	3	11	2
W. Fond du Lac Avenue and N. 51st Street	Southeast-bound	5	- -	3	7	- -	4
	Northwest-bound	10	- -	8	10	- -	2
	Northbound	1	30	- -	- -	29	- -
	Southbound	- -	46	1	6	23	- -
W. Fond du Lac Avenue and W. Capitol Drive	Eastbound	12	- -	4	21	- -	4
	Westbound	19	1	8	22	1	3
	Northwest-bound	6	26	8	1	22	3
	Southeast-bound	1	15	6	1	28	8
W. Fond du Lac Avenue and W. Roosevelt Drive	Eastbound	6	4	1	8	14	2
	Westbound	7	5	2	9	2	1
	Northwest-bound	1	3	7	1	3	2
	Southeast-bound	1	1	4	2	2	6
W. Fond du Lac Avenue and N. Sherman Boulevard	Northbound	1	21	5	1	28	3
	Southbound	- -	17	4	1	9	4
	Northwest-bound	12	- -	9	9	- -	3
	Southeast-bound	12	- -	4	24	1	7
W. Fond du Lac Avenue and W. Townsend Street	Eastbound	32	1	4	25	10	3
	Westbound	43	5	5	43	4	3
	Northwest-bound	- -	5	10	1	2	4
	Southeast-bound	- -	6	4	- -	11	7
W. Fond du Lac Avenue, W. Burleigh Street, and N. 35th Street	Eastbound	34	- -	6	24	- -	5
	Westbound	30	- -	10	26	- -	3
	Northwest-bound	15	- -	9	9	- -	3
	Southeast-bound	- -	- -	3	1	- -	2
	Northbound	15	- -	5	10	- -	5
	Southbound	5	- -	5	8	- -	5
W. Fond du Lac Avenue and W. Locust Street	Southeast-bound	22	1	2	26	2	4
	Northwest-bound	24	1	3	24	1	2
	Northbound	- -	9	11	1	8	2
	Southbound	- -	8	3	- -	21	4
W. Fond du Lac Avenue and N. 28th Street	Southeast-bound	1	- -	3	5	- -	8
	Northwest-bound	3	- -	9	4	- -	3
	Northbound	- -	68	5	4	50	5
	Southbound	38	29	5	28	25	- -

Table 68 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Fond du Lac Avenue and W. Center Street	Southeast-bound	37	- -	7	28	- -	6
	Northwest-bound	14	- -	14	22	- -	5
	Northbound	- -	- -	13	- -	- -	3
	Southbound	- -	- -	3	- -	- -	5
W. Fond du Lac Avenue and N. 27th Street	Southeast-bound	10	- -	3	18	- -	7
	Northwest-bound	17	- -	13	10	- -	4
	Northbound	3	- -	12	1	- -	4
	Southbound	- -	- -	10	- -	- -	5
W. Fond du Lac Avenue, N. 23rd Street,[a] and W. Oak Street	Southeast-bound	32	24	7	33	31	1
	Northwest-bound	- -	- -	- -	- -	- -	- -
	Northbound	5	4	10	6	7	2
	Southbound	2	1	3	8	1	4
W. Fond du Lac Avenue, N. 21st Street,[a] and W. North Avenue	Eastbound	20	- -	20	12	- -	3
	Westbound	27	- -	27	28	- -	2
	Northwest-bound	4	15	4	4	12	2
	Southeast-bound	1	9	1	6	18	7
W. Fond du Lac Avenue and N. 20th Street	Southeast-bound	3	- -	- -	19	2	- -
	Northwest-bound	11	- -	- -	10	- -	- -
	Northbound	1	23	- -	1	20	- -
	Southbound	1	23	- -	4	11	- -
W. Fond du Lac Avenue and N. 17th Street[b]	Southeast-bound	25	- -	8	26	- -	8
	Northwest-bound	- -	- -	8	- -	1	8
	Northbound	- -	- -	- -	- -	- -	- -
	Southbound	1	11	5	- -	10	5
W. Fond du Lac Avenue, N. 16th Street,[c] and W. Brown Street[a]	Southeast-bound	- -	- -	8	- -	- -	8
	Westbound	6	5	8	4	3	8
	Northbound	4	35	5	2	37	5
	Southbound	- -	- -	- -	- -	- -	- -
N. 13th Street[b] and W. Walnut Street	Eastbound	15	- -	8	13	- -	8
	Westbound	- -	16	8	- -	11	8
	Northbound	- -	- -	- -	- -	- -	- -
	Southbound	1	37	8	8	28	8

[a] *One-way street proceeding away from intersection.*

[b] *One-way street southbound.*

[c] *One-way street northbound.*

Source: SEWRPC.

Table 69

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Fond du Lac Avenue and N. 51st Street	Congested through traffic movement from southeast-bound approach during the morning and evening hours (742 and 814 vehicles per hour, respectively, at level-of-service D)	Recommended Action Retime existing 90-second cycle for the morning and evening peak hours, increasing green time on W. Fond du Lac Avenue from 23.4 to 27.0 seconds during the morning peak hour and from 27.9 to 29.7 seconds during the evening peak hour, reducing the green time allotted to the southeast-to-southbound laggging right-turn arrow on W. Fond du Lac Avenue	- -	- -
W. Fond du Lac Avenue and W. Capitol Drive	Congested southeast-bound-to-east-bound left-turn movement during the evening peak hour (231 vehicles per hour at level-of-service E) Insufficient northwest-bound-to-west-bound left-turn-lane storage capacity during the evening peak hour	Recommended Action Retime 9.9-second southeast-to-east-bound leading green arrow to 12.6 seconds during the evening peak hour, making necessary signal timing revisions at other approaches Lengthen northwest-to-westbound left-turn lane from 173 to 260 feet for increased storage capacity	- - $15,000	$15,000
W. Fond du Lac Avenue and N. Sherman Boulevard	Congested north-to-northwest-bound left turn during the evening peak hour (265 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive	Cost not included	Cost not included
W. Fond du Lac Avenue, W. Burleigh Street, and N. 35th Street	Congested through traffic movement from northwest-bound approach during the evening peak hour (905 vehicles per hour at level-of-service E)	Recommended Action Prohibit on-street parking on northwest-bound far-side roadway during the evening peak hour Alternative Action Retime 90-second cycle so that all vehicles can negotiate this movement on through green phase during the evening peak hour (Not recommended because the 90-second cycle could not provide a sufficient percentage of green time to accommodate this traffic volume during the evening peak hour)	$ 200	$ 200
W. Fond du Lac Avenue and W. Locust Street	Congested southeast-bound-to-eastbound left turn during the evening peak hour (112 vehicles per hour at level-of-service E)	Recommended Action Add traffic-actuated 7.2-second leading green arrow to traffic signal sequence for the southeast-bound-to-eastbound movement to operate concurrently with the exiting northwest-bound-to-westbound leading green arrow during the evening peak hour, and reduce existing 10.8-second leading green arrow in the morning peak hour to 7.2 seconds, followed by a 3.6-second yellow arrow, making necessary signal phasing changes on respective approaches Alternative Action Retime 90-second cycle so that all vehicles can negotiate this problem left-turn movement on through green phase during the evening peak hour (Not recommended because the controlling capacity factor for left-turn movements considered is the opposing traffic volume during the evening peak hour)	$ 2,000	$ 2,000

Table 69 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Fond du Lac Avenue and and N. 28th Street	Congested right-turn and through movements from southeast-bound approach during the morning peak hour (928 vehicles per hour at level-of-service E)	Recommended Actions Prohibit on-street parking on southeast-bound approach during the morning peak hour	$ 200	
		Retime 90-second cycle to agree with signal timing plan at intersection of W. Center Street and W. Fond du Lac Avenue to avoid queuing of vehicles from the intersections of W. Center Street and N. 27th Street with W. Fond du Lac Avenue across the intersection of W. Fond du Lac Avenue with N. 28th Street	- -	$ 200
		Alternative Action Retime 90-second cycle so that all vehicles can negotiate southeast-bound approach on through green phase (Not recommended because signal timing plan at intersection of W. Center Street, N. 27th Street, and W. Fond du Lac Avenue controls through green phase at intersection of N. 28th Street and W. Fond du Lac Avenue)		
W. Fond du Lac Avenue and N. 27th Street	Congested right-turn and through movements from northwest-bound approach during the evening peak hour (722 vehicles per hour entering the approach at level-of-service D)	Recommended Action Prohibit on-street parking on northwest-bound approach during the evening peak hour	$ 200	$ 200
		Alternative Action Retime 90-second cycle so that all vehicles can negotiate northwest-bound approach on through green phase (Not recommended because the 90-second cycle could not provide a sufficient percentage of green time on W. Fond du Lac Avenue to accommodate this traffic volume during the evening peak hour)		
W. Fond du Lac Avenue and and N. 17th Street	Congested right-turn and through movements from southeast-bound approach during the morning peak hour (1,044 vehicles per hour entering approach at level-of-service E)	Recommended Actions Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on W. Fond du Lac Avenue	$12,000	
		Prohibit on-street parking on southeast-bound approach during the morning peak hour	$ 200	$12,200
		Alternative Action Retime 60-second cycle so that all vehicles can negotiate southeast-bound approach on the through green phase (Not recommended because the 60-second cycle could not provide a sufficient percentage of green time on W. Fond du Lac Avenue to accommodate this traffic volume during the evening peak hour)		
W. Fond du Lac Avenue and W. Maxwell Street	Inefficient southeast-to-eastbound turn-lane storage capacity during the evening peak hour	Recommended Action Lengthen southeast-to-eastbound left-turn lane from 102 to 120 feet for increased storage capacity	$15,000	$15,000

Table 69 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Fond du Lac Avenue, W. North Avenue, and N. 21st Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 90-second cycle to increase northwest- and southeast-bound green time from 39.6 to 41.4 seconds, making necessary signal changes at other approaches to improve operating efficiency of intersection and provide a wider progression band on W. Fond du Lac Avenue	- -	- -
W. Fond du Lac Avenue and N. 16th Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Actions Retime 60-second cycle to increase northwest- and southeast-bound green time from 29.4 to 30.6 seconds, making necessary signal changes at other approaches to improve operating efficiency of intersection and provide a wider progression band on W. Fond du Lac Avenue Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on W. Fond du Lac Avenue	- - $12,000	$12,000
Subtotal				$27,000
Total				$56,800

Source: SEWRPC.

waukee for use in its demonstration project, so that its analyses may be oriented toward modification and/or extension of existing traffic signal interconnection to accommodate the traffic signal timing recommended under the northwest side study.

A total of nine new actions are recommended to be implemented at the eight problem intersections at a capital cost of approximately $29,800, in 1980 dollars. [5] An additional four actions are recommended to be implemented at the four intersections not displaying congestion problems, at a total capital cost of $27,000.

As indicated in Table 69, the retiming of the existing signal timing plan is the only action considered necessary to abate the existing congestion at the intersection of W. Fond du Lac Avenue with N. 51st Street. This action would require minimal cost.

The addition of separate signal phasing is the only action considered necessary to eliminate the congestion problem at another of the nine problem intersections, that of W. Fond du Lac Avenue and W. Locust Street. The capital cost of providing the additional signal phasing at this intersection is estimated at $2,000.

The prohibition of on-street parking on selected approaches to W. Fond du Lac Avenue was the only action considered necessary to eliminate the congestion problems at two of the other nine problem intersections: the intersections of W. Fond du Lac Avenue with W. Burleigh and N. 35th Streets, and with N. 27th Street.

The retiming of the existing traffic signal timing plan at minimal cost, in addition to the prohibition of on-street parking at an approximate capital cost

[5] *This cost of short-range improvement of W. Fond du Lac Avenue (STH 145) does not include the cost of the improvements recommended at the intersection of W. Fond du Lac Avenue with N. Sherman Boulevard. The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive. At the intersection of N. Sherman Boulevard and W. Fond du Lac Avenue, it was recommended that the traffic signals be retimed, that one additional signal phase be added, and that on-street parking be prohibited on the approach during the evening peak hour. The capital cost of improvement of the intersection was estimated at $12,200.*

Table 70

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. FOND DU LAC AVENUE (STH 145)

Phase	Intersection (time in seconds)		
	W. Fond du Lac Avenue	N. 60th Street	
		Northbound	Southbound
Green	39.6	39.6	29.7
Yellow	3.6	3.6	3.6
Red	46.8	48.8	56.7
Green Arrow	--	7.2	--
Yellow Arrow	--	2.7	--
Total Cycle[a,b]	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue			W. Congress Street
	Morning	Evening		
		Northwest-bound	Southeast-bound	
Green	56.7	57.6	47.7	21.6
Yellow	4.5	3.6	3.6	3.6
Red	28.8	28.8	38.7	64.8
Green Arrow	--	7.2	--	--
Yellow Arrow	--	2.7	--	--
Total Cycle[a,b]	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue		W. Maxwell Street	
	Morning	Evening	Morning	Evening
Green	61.2	56.7	17.1	21.6
Yellow	4.5	4.5	3.6	3.6
Red	24.3	28.8	69.3	64.8
Total Cycle[a]	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				N. 51st Street			
	Morning		Evening		Morning		Evening	
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound	Northbound	Southbound	Northbound	Southbound
Green	51.3	27.0	54.0	29.7	17.1	27.9	14.4	25.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	35.1	59.4	32.4	56.7	69.3	58.5	72.0	61.2
Green Right-Turn Arrow	--	24.3[c]	--	24.3[c]	--	--	--	--
Yellow Right-Turn Arrow	--	3.6	--	3.6	--	--	--	--
Green Left-Turn Arrow	--	--	--	--	--	7.2[d]	--	7.2[d]
Yellow Left-Turn Arrow	--	--	--	--	--	3.6	--	3.6
Total Cycle[a]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				W. Capitol Drive (STH 190)	
	Morning		Evening		Morning	Evening
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound		
Green	27.9	47.7	28.8	45.0	29.7	32.4
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	57.6	37.8	56.7	40.5	55.8	53.1
Green Arrow	--	16.2[d]	--	12.6[d]	--	--
Yellow Arrow	--	3.6	--	3.6	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 70 (continued)

Phase	Intersection (time in seconds)	
	W. Fond du Lac Avenue	W. Roosevelt Drive
Green.	48.6	30.6
Yellow	3.6	3.6
Red.	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Fond du Lac Avenue		N. Sherman Boulevard			
	Morning	Evening	Morning		Evening	
			Northbound	Southbound	Northbound	Southbound
Green.	36.0	31.5	30.6	41.4	45.9	26.1
Yellow	3.6	3.6	4.5	4.5	4.5	4.5
Red.	50.4	54.9	54.9	44.1	39.6	59.4
Green Arrow. . .	- -	- -	- -	7.2[d]	16.2[d]	- -
Yellow Arrow . .	- -	- -	- -	3.6	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue				W. Townsend Street
	Morning		Evening		
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound	
Green.	47.7	58.5	58.5	47.7	19.8
Yellow	4.5	4.5	4.5	4.5	3.6
Red.	37.8	27.0	27.0	37.8	66.6
Green Arrow. . .	- -	7.2[d]	7.2[d]	- -	- -
Yellow Arrow . .	- -	3.6	3.6	- -	- -
Total Cycle[a]	90.0	90.0	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue	W. Burleigh Street	N. 35th Street
Green.	27.9	24.3	19.8
Yellow	3.6	3.6	3.6
Red.	58.5	62.1	66.6
Total Cycle	90.0	90.0	90.0

Phase	W. Fond du Lac Avenue			W. Locust Street
	Morning		Evening	
	Northwest-bound	Southeast-bound		
Green.	35.1	48.6	37.8	30.6
Yellow	3.6	3.6	3.6	3.6
Red.	51.3	37.8	48.6	55.8
Green Arrow. . .	- -	7.2[d]	7.2[e]	- -
Yellow Arrow . .	- -	3.6	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0

Table 70 (continued)

Phase	Intersection (time in seconds)						
	W. Fond du Lac Avenue				N. 28th Street		
	Northwest-bound		Southeast-bound				
Green.	41.4		30.6		37.8		
Yellow	3.6		3.6		3.6		
Red.	45.0		55.8		48.6		
Total Cycle	90.0		90.0		90.0		
	W. Fond du Lac Avenue				W. Center Street		
	Northwest-bound		Southeast-bound		Westbound		Eastbound
Green.	44.1		30.6		35.1		28.8
Yellow	3.6		3.6		3.6		3.6
Red.	42.3		55.8		51.3		57.6
Total Cycle	90.0		90.0		90.0		90.0
	W. Fond du Lac Avenue				N. 27th Street		
	Northwest-bound		Southeast-bound		Northbound		Southbound
Green.	32.4		52.2		21.6		27.0
Yellow	3.6		3.6		3.6		3.6
Red.	54.0		34.2		64.8		59.4
Total Cycle	90.0		90.0		90.0		90.0
	W. Fond du Lac Avenue				W. Oak Street		N. 23rd Street[f]
	Morning		Evening		Morning	Evening	
Green.	33.0		53.1		16.2	26.1	- -
Yellow	3.6		3.6		3.6	3.6	- -
Red.	23.4		33.3		40.2	60.3	- -
Total Cycle	60.0		90.0		60.0	90.0	- -
	W. Fond du Lac Avenue				W. North Avenue		N. 21st Street[f]
	Morning		Evening				
	Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound			
Green.	30.6	41.4	41.4	30.6	37.8		- -
Yellow	3.6	3.6	3.6	3.6	3.6		- -
Red.	55.8	45.0	45.0	55.8	48.6		- -
Green Arrow. . .	- -	8.1[d]	8.1[d]	- -	- -		- -
Yellow Arrow . .	- -	2.7	2.7	- -	- -		- -
Total Cycle	90.0	90.0	90.0	90.0	90.0		- -

Table 70 (continued)

Phase	Intersection (time in seconds)				
	W. Fond du Lac Avenue		N. 20th Street		
	Morning	Evening	Morning	Evening	
				Northbound	Southbound
Green.	48.6	44.1	30.6	35.1	25.2
Yellow	3.6	3.6	3.6	3.6	3.6
Red.	37.8	42.3	55.8	51.3	61.2
Green Arrow. . .	--	--	--	7.2[d]	--
Yellow Arrow . .	--	--	--	2.7	--
Total Cycle	90.0	90.0	90.0	90.0	90.0
	W. Fond du Lac Avenue		N. 17th Street[g]		
Green.	30.6		18.6		
Yellow	3.6		3.6		
Red.	25.8		37.8		
Total Cycle[a]	60.0		60.0		
	W. Fond du Lac Avenue		N. 16th Street[h]	W. Brown Street[f]	
Green.	30.6		17.4	--	
Yellow	4.2		3.6	--	
Red.	25.2		39.0	--	
Total Cycle[a]	60.0		60.0	--	
	W. Walnut Street		N. 13th Street[g]		
	Morning	Evening	Morning	Evening	
Green.	19.2	28.8	31.2	21.6	
Yellow	3.6	3.6	3.6	3.6	
Red.	37.2	27.6	25.2	34.8	
Total Cycle	60.0	60.0	60.0	60.0	

[a]Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.

[b]Signal is traffic-actuated.

[c]Lagging right-turn arrow.

[d]Leading left-turn arrow concurrent with through green phase.

[e]Leading left-turn arrow.

[f]One-way street proceeding away from intersection.

[g]One-way street southbound.

[h]One-way street northbound.

Source: SEWRPC.

of $200, was considered necessary to alleviate the congestion at the intersection of W. Fond du Lac Avenue and N. 28th Street. The prohibition of on-street parking at an estimated capital cost of $200, as well as the addition of a pedestrian-actuated signal sequence along with a new traffic controller at an estimated capital cost of $12,000, is necessary to eliminate the existing traffic congestion at the intersection of W. Fond du Lac Avenue and N. 17th Street.

The remaining intersection which exhibited congestion problems requires some turn-lane construction. The intersection of W. Fond du Lac Avenue with W. Capitol Drive (STH 190) requires the lengthening of an existing northwest-bound left-turn lane from 173 to 260 feet within the existing median, at an approximate capital cost of $15,000. Also required at this intersection to abate existing traffic congestion is the retiming of the existing signal timing plan at minimal cost.

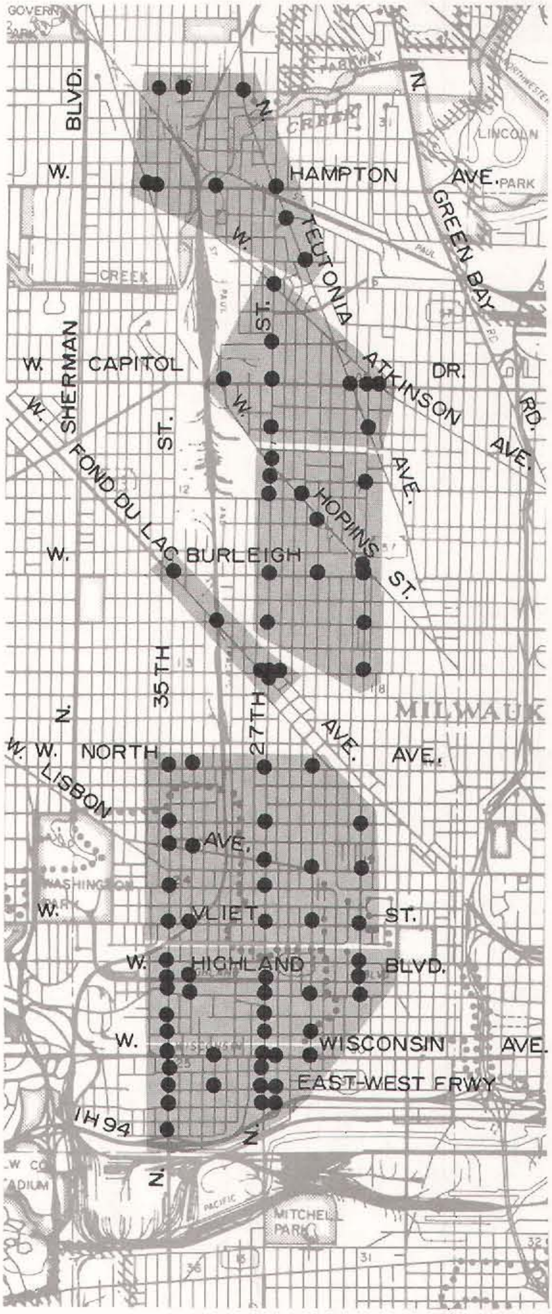
As indicated in Table 69 and as already noted, three other intersections, although not exhibiting traffic congestion problems, were found to warrant traffic management actions to improve traffic operating conditions. These were the intersections of W. Fond du Lac Avenue with W. Maxwell Street, W. North Avenue, and N. 16th Street. The retiming of the existing signal timing plan recommended at the intersection of W. Fond du Lac Avenue with W. North Avenue would involve minimal cost. To improve operating conditions at the intersection of W. Fond du Lac Avenue and W. Congress Street, however, a signal phase change is required at an approximate cost of $500. At the intersection of W. Fond du Lac Avenue and N. 16th Street, the addition of a pedestrian-actuated signal phase and the installation of a new traffic controller is required at an estimated cost of $12,000, in addition to the retiming of the existing signal timing plan at minimal cost. To alleviate the problem of insufficient storage capacity in an existing southeast-to-eastbound left-turn lane during the evening peak hour at the intersection of W. Fond du Lac Avenue and W. Maxwell Street, it is recommended that that lane be lengthened from 102 to 120 feet at an estimated capital cost of $15,000.

In addition, the existing offsets between the traffic signal timing plans of the 19 signalized intersections along this segment of W. Fond du Lac Avenue should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions, and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Fond du Lac Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is. as shown on Map 112, N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue, a distance of 4.8 miles. Map 113 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 27th Street. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 27th Street. Retail sales and service uses, however, abut N. 27th Street at its intersections with W. Clybourn Street, W. Wisconsin Avenue, W. Wells Street, W. State Street, W. Vliet Street, W. Lisbon Avenue, W. North Avenue, W. Fond du Lac Avenue (STH 145), W. Center Street, W. Burleigh Street, W. Capitol Drive (STH 190), and W. Atkinson Avenue, and otherwise occur in a scattered fashion along the corridor. Industrial land use is evident along the western one-half of this corridor from W. North Avenue to N. Teutonia Avenue. Governmental and institutional land uses occur frequently along the entire corridor, as do transportation-related land uses, especially off-street parking. Vacant land, consisting of the cleared Park Freeway-West right-of-way, is evident in the central portion of this corridor between W. North Avenue and W. Meinecke Avenue.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 27th Street. Between W. St. Paul Avenue and W. State Street, N. 27th Street is not median divided and has a curb-to-curb width of 50 to 52 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted between W. St. Paul Avenue and W. State Street on this segment of N. 27th Street. Between W. State Street and W. Lisbon Avenue, N. 27th Street is divided by a median ranging in width from 4 to 28 feet, with the curb-to-curb pavement



Map 112

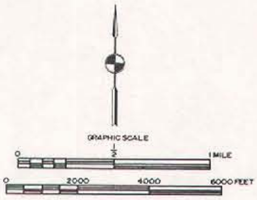
DETAIL OF THE PROBLEM SEGMENT OF N. 27TH STREET–TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

LEGEND

SIGNAL JURISDICTION

● CITY OF MILWAUKEE

SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON N. 27 TH STREET INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR



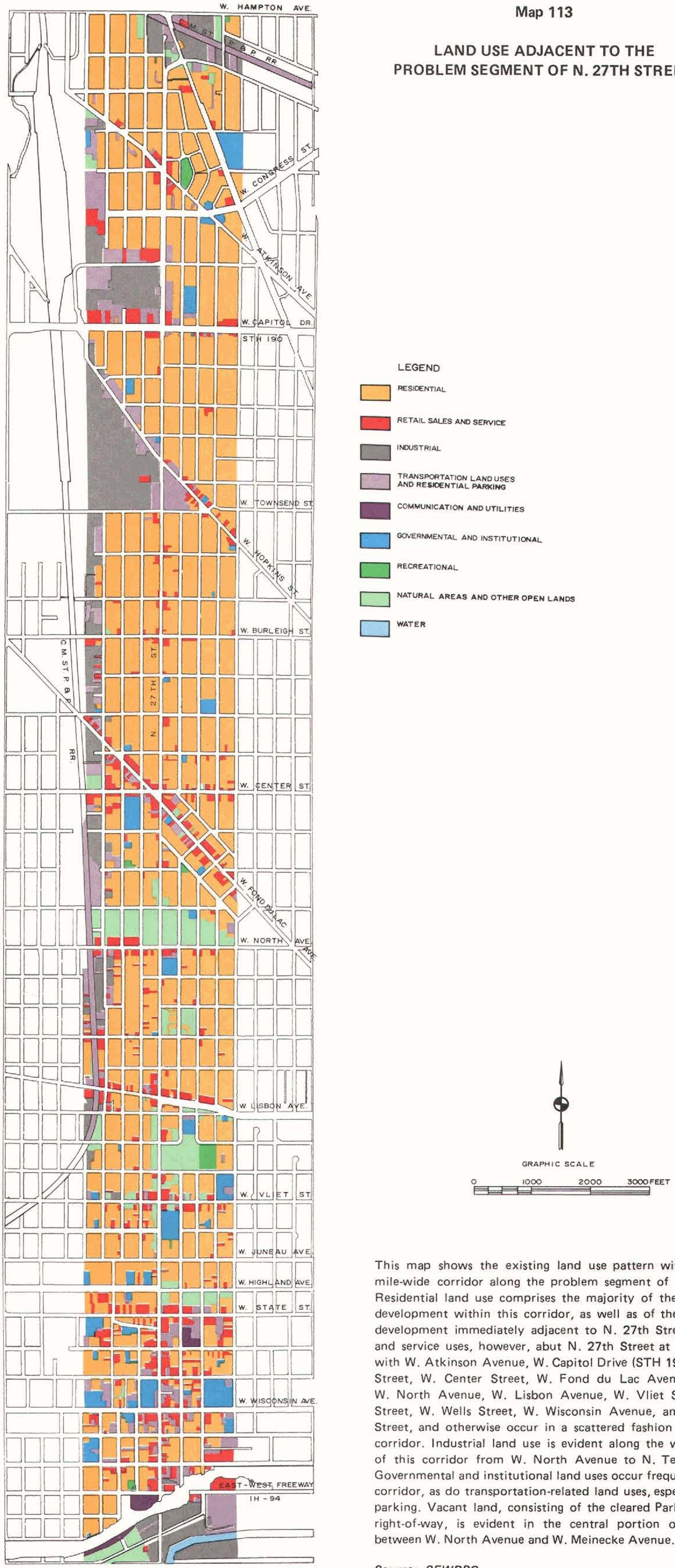
Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue, a distance of 4.8 miles. This map also shows the location and jurisdiction of each of the 25 traffic signals along this arterial segment, including the relationship of each of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 27th Street and are directly affected by the timing plans of the traffic signals on N. 27th Street.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

widths of the dual roadways ranging from 34 to 38 feet, except at the intersection with W. State Street, where N. 27th Street has dual roadway widths of 28 and 24 feet. This segment of N. 27th Street, with the exception of the W. State Street intersection, is adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted on this part of N. 27th Street. Between W. Lisbon Avenue and W. Glendale Avenue, N. 27th Street is not median divided and has a curb-to-curb pavement width of between 50 and 53 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted on this segment of N. 27th Street with the exception of that segment between W. Hopkins Street and W. Fond du Lac Avenue. North of its intersection with W. Glendale Avenue, N. 27th Street curves easterly to join W. Cornell Street before its intersection with N. Teutonia Avenue. Between W. Glendale Avenue and N. Teutonia Avenue, this segment of N. 27th Street and W. Cornell Street is divided by a median ranging in width from three to six feet. The curb-to-curb widths of the dual roadways

Map 113

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. 27TH STREET



This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of N. 27th Street. Residential land use comprises the majority of the existing urban development within this corridor, as well as of the existing urban development immediately adjacent to N. 27th Street. Retail sales and service uses, however, abut N. 27th Street at its intersections with W. Atkinson Avenue, W. Capitol Drive (STH 190), W. Burleigh Street, W. Center Street, W. Fond du Lac Avenue (STH 145), W. North Avenue, W. Lisbon Avenue, W. Vliet Street, W. State Street, W. Wells Street, W. Wisconsin Avenue, and W. Clybourn Street, and otherwise occur in a scattered fashion throughout the corridor. Industrial land use is evident along the western one-half of this corridor from W. North Avenue to N. Teutonia Avenue. Governmental and institutional land uses occur frequently along this corridor, as do transportation-related land uses, especially off-street parking. Vacant land, consisting of the cleared Park Freeway-West right-of-way, is evident in the central portion of this corridor between W. North Avenue and W. Meinecke Avenue.

Source: SEWRPC.

range from 26 to 34 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted on this segment of N. 27th Street and W. Cornell Street except on the eastbound approach of W. Cornell Street at N. Teutonia Avenue, where parking is prohibited at all times.

As shown in Table 71, the problem segment of N. 27th Street has 25 signalized intersections, at which the N. 27th Street approaches range in width from 19 to 36 feet. Six of the northbound and five of the southbound approaches to these 25 intersections provide separate lanes for the exclusive use of left-turning vehicles. On-street

Table 71

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 27TH STREET

Intersection	Roadway Approach Width (feet)							
	Eastbound or Southeast-bound		Westbound or Northwest-bound		Northbound		Southbound	
N. 27th Street and W. St. Paul Avenue[a]	26	FS	26	NSPM	25 L	NP	26 L	NP
N. 27th Street and W. Clybourn Street	26	P	28	P	26	P	26	P
N. 27th Street and W. Michigan Street	20	P	20	P	26	P	26	NS
N. 27th Street and W. Wisconsin Avenue	32 ML	NPAM	32 ML	NP	21 L	NP	20 L	NP
N. 27th Street and W. Wells Street[b]	50	P	- -	- -	25	P	25	P
N. 27th Street and W. Kilbourn Avenue	15	P	15	NS	25	P	25	P
N. 27th Street and W. State Street[c]	- -	- -	50 L	P	25	P	24	P
N. 27th Street and W. Highland Boulevard	30 ML	P	36 ML	P	34 ML	P	36 ML	P
N. 27th Street and W. Vliet Street	25	P	25	P	36 ML	P	36 ML	P
N. 27th Street and W. Galena Street	17	P	17	P	36 M	P	36 M	P
N. 27th Street and W. Lisbon Avenue	36 MLR	P	36 ML	P	22 ML	NS	25	NSPM
N. 27th Street and W. Brown Street	16	NSAM	18	P	25	P	25	P
N. 27th Street and W. North Avenue	25	NPAM	25	P	25	NSPM	25	P
N. 27th Street and W. Fond du Lac Avenue (STH 145)	25	NPAM	25	FSPM	25	NP	25	NS
N. 27th Street and W. Center Street	25	NS	25	P	25	NS	25	FS
N. 27th Street and W. Locust Street	11 L	NP	12 L	NS	25	P	25	P
N. 27th Street and W. Burleigh Street	22	P	20	P	25	P	25	P
N. 27th Street and W. Townsend Street	20	NP	15	NP	25	P	25	P
N. 27th Street and W. Keefe Avenue	18	NP	9	NP	25	P	25	NS
N. 27th Street and W. Hopkins Street	25	P	25	P	25	P	25	FS
N. 27th Street and W. Vienna Avenue	15	P	15	P	25	P	25	P
N. 27th Street and W. Capitol Drive (STH 190)	34 ML	NPAM	34 ML	NPPM	19 L	NP	23 L	NP
N. 27th Street and W. Hope Avenue	22	P	15	NP	28	P	28	NS
N. 27th Street and W. Atkinson Avenue	31	NS	21	P	25	P	26	P
W. Cornell Street and N. Teutonia Avenue	34 MLR	NP	15	FS	20	NPPM	21	NPAM

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a] *Roadway approach widths represent construction associated with N. 27th Street viaduct reconstruction project.*

[b] *One-way street eastbound.*

[c] *One-way street westbound.*

Source: SEWRPC.

parking restrictions at each of the signalized intersection approaches along this segment of N. 27th Street are also indicated in Table 71.

Traffic Control Measures: The timing plan for each of the 25 traffic signals along N. 27th Street between the East-West Freeway (IH 94) and N. Teutonia Avenue is shown in Table 72. Map 112 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 27th Street and are directly affected by the timing plans of the traffic signals on N. 27th Street. Fifteen of the traffic signals are located at the intersections of N. 27th Street with other arterial streets, and 10 are located at intersections of N. 27th Street with nonarterial streets—specifically, W. St. Paul Avenue, W. Michigan Street, W. Kilbourn Avenue, W. Galena Street, W. Brown Street, W. Locust Street, W. Keefe Avenue, W. Vienna Avenue, W. Hope Avenue, and W. Atkinson Avenue. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. 27th Street. The stop sign control at the intersection of W. Medford Avenue with N. 27th Street is supplemented by a flashing signal beacon which displays red on the W. Medford Avenue approach and amber on the N. 27th Street approaches. The intersection of N. 27th Street and W. Galena Street is controlled by a pedestrian-actuated traffic signal which displays a flashing red indication on the W. Galena Street approaches and amber on the N. 27th Street approaches, except when actuated by a pedestrian. This entire segment of N. 27th Street is posted for 30-mile-per-hour (mph) speed limit. A 20-mph speed limit is advised, however, on the curve between W. Glendale Avenue and N. Teutonia Avenue.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 25 signalized intersections along the problem segment of N. 27th Street in Figures 18 and 19. The locations along N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach tp the 25 controlled intersections to the maximum hourly capacity of each approach. All traffic volumes used in the analysis of N. 27th Street south of its intersection with W. Wells Street were from years immediately prior to closure of the 27th Street viaduct for reconstruction. It is assumed in the analysis that, following the reopening of the 27th Street viaduct, traffic volumes south of W. Wells Street along 27th Street will return to these levels. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. 27th Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 73.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 27th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 18 and 19. Three congested traffic movements were found to occur along this segment of N. 27th Street during the morning peak hour, and five were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The two morning and five evening peak-hour traffic congestion problems identified along N. 27th Street are associated with the following five signalized intersections: W. Clybourn Street, W. Michigan Street, W. Fond du Lac Avenue (STH 145), W. Capitol Drive (STH 190), and N. Teutonia Avenue.

One intersection along N. 27th Street—W. Lisbon Avenue—while not displaying congestion problems, was found to lack adequate vehicle storage capacity within an existing exclusive turn lane. Four other intersections—N. 27th Street and W. St. Paul Avenue, W. Highland Boulevard, W. Burleigh Street, and W. Townsend Street—while not displaying congestion problems, were found to have signals that could be retimed to serve existing traffic volumes more efficiently. Transportation systems management actions were accordingly also considered for these intersections.

Table 74 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 75 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of

Table 72

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 27TH STREET

Phase	Intersection (time in seconds)						
	N. 27th Street				W. St. Paul Avenue		
	Morning		Evening		Morning	Evening	
	Northbound	Southbound	Northbound	Southbound		Westbound	Eastbound
Green.	48.6	29.7	48.6	34.2	30.6	30.6	17.1
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	37.8	56.7	37.8	52.2	55.8	55.8	69.3
Green Arrow. . .	16.2[a]	--	11.7[a]	--	--	10.8[a]	--
Yellow Arrow . .	2.7	--	2.7	--	--	2.7	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 27th Street		W. Clybourn Street	
	Morning	Evening	Morning	Evening
Green.	48.6	39.6	30.6	39.6
Yellow	3.6	3.6	3.6	3.6
Red.	37.8	46.8	55.8	46.8
Total Cycle	90.0	90.0	90.0	90.0

Phase	N. 27th Street	W. Michigan Street
Green.	53.1	26.1
Yellow	3.6	3.6
Red.	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 27th Street		W. Wisconsin Avenue			
	Morning	Evening	Morning		Evening	
			Westbound	Eastbound	Westbound	Eastbound
Green.	20.7	24.3	44.1	33.3	27.0	23.4
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	51.3	46.8	42.3	53.1	46.8	63.0
Green Arrow. . .	--	--	7.2[a]	--	12.6[a]	--
Yellow Arrow . .	--	--	3.6	--	3.6	--
Green Through Only.	14.4[b]	15.3[b]	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 27th Street				W. Wells Street	
	Morning		Evening		Eastbound	
	Northbound	Southbound	Northbound	Southbound	Morning	Evening
Green.	29.7	39.6	38.7	48.6	39.6	30.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	56.7	46.8	47.7	37.8	46.8	55.8
Green Arrow. . .	--	7.2[a]	--	7.2[a]	--	--
Yellow Arrow . .	--	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 27th Street	W. Kilbourn Avenue
Green.	57.6	21.6
Yellow	3.6	3.6
Red.	28.8	64.8
Total Cycle	90.0	90.0

Table 72 (continued)

Phase	Intersection (time in seconds)				
	N. 27th Street			W. State Street	
	Morning	Evening		Morning	Evening
Green.	44.1	35.1		35.1	44.1
Yellow	3.6	3.6		3.6	3.6
Red	42.3	51.3		51.3	42.3
Total Cycle	90.0	90.0		90.0	90.0
	N. 27th Street			W. Highland Boulevard	
	Morning	Evening			
		Northbound	Southbound		
Green.	44.1	44.1	32.4	35.1	
Yellow	3.6	3.6	3.6	3.6	
Red	42.3	42.3	54.0	51.3	
Green Arrow. . .	--	9.0[a]	--	--	
Yellow Arrow . .	--	2.7	--	--	
Total Cycle	90.0	90.0	90.0	90.0	
	N. 27th Street			W. Vliet Street	
Green.	28.2			22.2	
Yellow	3.6			3.6	
Red	28.2			34.2	
Total Cycle[c]	60.0			60.0	
	N. 27th Street			W. Galena Street	
Green.	22.2			28.2	
Yellow	3.6			3.6	
Red	34.2			28.2	
Total Cycle[d]	60.0			60.0	
	N. 27th Street			W. Lisbon Avenue	
Green.	31.2			19.2	
Yellow	3.6			3.6	
Red	25.2			37.2	
Total Cycle	60.0			60.0	
	N. 27th Street			W. Brown Street	
Green.	35.4			15.0	
Yellow	3.6			3.6	
Red	21.0			41.4	
Total Cycle	60.0			60.0	
	N. 27th Street			W. North Avenue	
Green.	25.2			25.2	
Yellow	3.6			3.6	
Red	31.2			31.2	
Total Cycle	60.0			60.0	

Table 72 (continued)

Phase	Intersection (time in seconds)			
	N. 27th Street		W. Fond du Lac Avenue (STH 145)	
	Northbound	Southbound	Northwest-bound	Southeast-bound
Green.	21.6	27.0	32.4	52.2
Yellow	3.6	3.6	3.6	3.6
Red.	64.8	59.4	54.0	34.2
Total Cycle	90.0	90.0	90.0	90.0
	N. 27th Street		W. Center Street	
	Northbound	Southbound	Westbound	Eastbound
Green.	49.5	26.1	26.1	29.7
Yellow	3.6	3.6	3.6	3.6
Red.	36.9	60.3	60.3	56.7
Total Cycle	90.0	90.0	90.0	90.0
	N. 27th Street		W. Locust Street	
Green.	28.2		22.2	
Yellow	3.6		3.6	
Red.	28.2		34.2	
Total Cycle	60.0		60.0	
	N. 27th Street		W. Burleigh Street	
Green.	31.2		19.2	
Yellow	3.6		3.6	
Red.	25.2		37.2	
Total Cycle	60.0		60.0	
	N. 27th Street		W. Townsend Street	
	Morning	Evening	Morning	Evening
Green.	44.1	53.1	35.1	26.1
Yellow	3.6	3.6	3.6	3.6
Red.	42.3	33.3	51.3	60.3
Total Cycle	90.0	90.0	90.0	90.0
	N. 27th Street		W. Keefe Avenue	
			Westbound	Eastbound
Green.	48.6		13.5	17.1
Yellow	3.6		3.6	3.6
Red.	37.8		72.9	69.3
Total Cycle	90.0		90.0	90.0
	N. 27th Street		W. Hopkins Street	
Green.	48.6		30.6	
Yellow	3.6		3.6	
Red.	37.8		55.8	
Total Cycle	90.0		90.0	

Table 72 (continued)

Phase	Intersection (time in seconds)		
	N. 27th Street		W. Vienna Avenue
	Morning[e]		Morning[e]
Green.	57.6		21.6
Yellow	3.6		3.6
Red	28.8		64.8
Total Cycle	90.0		90.0
	N. 27th Street		W. Capitol Drive (STH 190)
Green.	25.2		41.4
Yellow	4.5		3.6
Red	60.3		45.0
Green Arrow. . .	--		9.0[f]
Yellow Arrow . .	--		4.5
Total Cycle	90.0		90.0
	N. 27th Street		W. Hope Avenue
Green.	49.5		28.8
Yellow	4.5		3.6
Red	36.0		57.6
Total Cycle	90.0		90.0
	N. 27th Street		W. Atkinson Avenue
	Northbound	Southbound	
Green.	44.1	31.5	33.3
Yellow	3.6	3.6	4.5
Red	42.3	54.9	52.2
Green Arrow. . .	9.0[a]	--	--
Yellow Arrow . .	--	--	--
Total Cycle	90.0	90.0	90.0
	W. Cornell Street		N. Teutonia Avenue
	Eastbound	Westbound	
Green.	10.2	11.4	24.0
Yellow	3.6	3.6	3.6
Red	46.2	45.0	32.4
Green Arrow. . .	10.2[a]	--	--
Yellow Arrow . .	--	--	--
Total Cycle	60.0	60.0	60.0

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Leading through arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Signal is operated as a flashing beacon, with red controlling W. Galena Street and yellow controlling N. 27th Street, except when signal control is actuated by a pedestrian.*

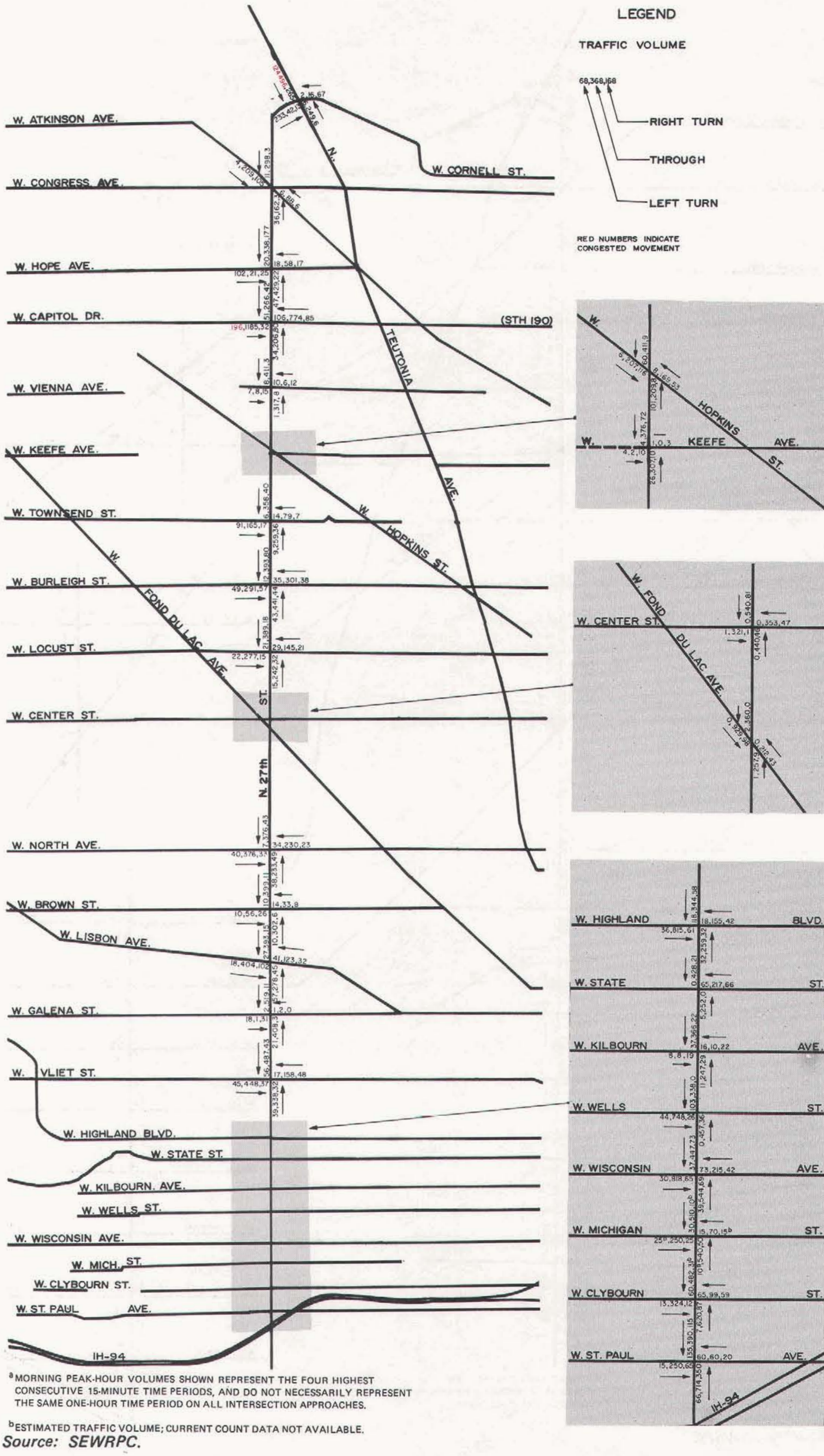
[e]*Signal is operating during evening peak hour as flashing beacon, with red controlling W. Vienna Avenue and yellow controlling N. 27th Street.*

[f]*Lagging left-turn arrow.*

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

Figure 18

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 27TH STREET DURING THE MORNING PEAK HOUR[a]



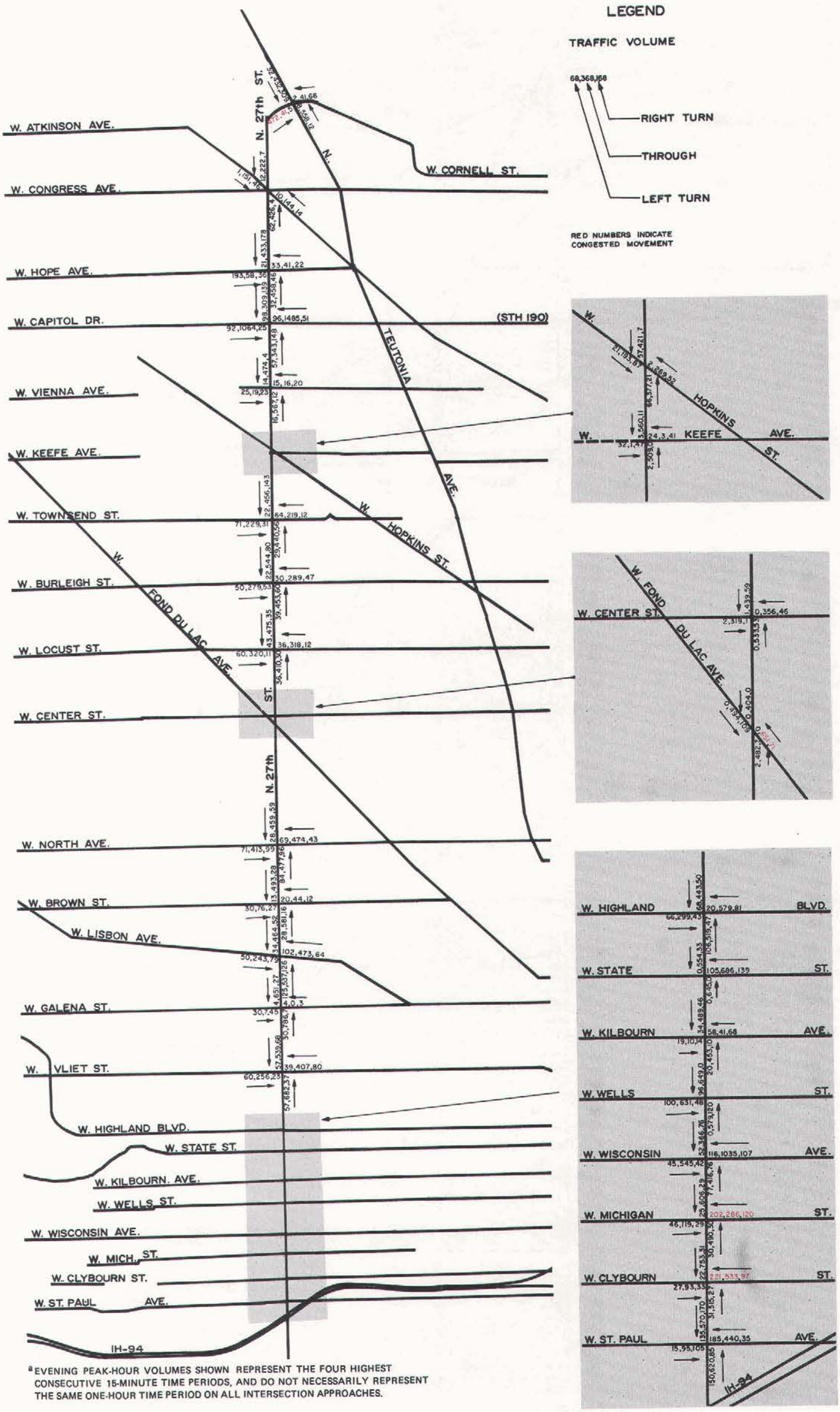
[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

[b]ESTIMATED TRAFFIC VOLUME; CURRENT COUNT DATA NOT AVAILABLE.

Source: SEWRPC.

Figure 19

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 27TH STREET DURING THE EVENING PEAK HOUR[a]



[a] EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 73

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 27TH STREET

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 27th Street and W. St. Paul Avenue	Eastbound	20	4	5	49	7	5
	Westbound	16	42	5	5	28	5
	Northbound	31	6	5	10	18	5
	Southbound	18	21	5	20	15	5
N. 27th Street and W. Clybourn Street	Eastbound	4	4	5	21	18	5
	Westbound	27	29	5	11	26	5
	Northbound	12	1	5	5	5	5
	Southbound	5	10	5	4	3	5
N. 27th Street and W. Michigan Street[a]	Eastbound	8	8	5	15	24	5
	Westbound	15	15	5	20	33	5
	Northbound	8	2	5	5	5	5
	Southbound	2	5	5	4	4	5
N. 27th Street and W. Wisconsin Avenue	Eastbound	7	3	5	7	7	5
	Westbound	13	22	5	9	9	5
	Northbound	11	6	5	13	14	5
	Southbound	13	7	5	15	11	5
N. 27th Street and W. Wells Street	Eastbound	3	5	4	6	13	8
	Westbound	--	--	--	--	--	--
	Northbound	7	--	14	17	--	8
	Southbound	--	23	11	--	13	8
N. 27th Street and W. Kilbourn Avenue	Eastbound	54	23	9	33	44	2
	Westbound	46	33	2	41	35	1
	Northbound	10	4	10	2	4	5
	Southbound	5	9	5	8	6	4
N. 27th Street and W. State Street	Eastbound	--	--	--	--	--	--
	Westbound	19	19	7	15	11	8
	Northbound	--	2	11	--	--	8
	Southbound	5	--	10	6	--	8
N. 27th Street and W. Highland Boulevard	Eastbound	7	4	3	11	16	2
	Westbound	20	8	7	12	3	1
	Northbound	10	10	11	7	16	3
	Southbound	11	23	6	15	11	4
N. 27th Street and W. Vliet Street	Eastbound	7	8	5	7	18	5
	Westbound	21	8	15	15	8	3
	Northbound	8	9	11	5	7	4
	Southbound	7	10	7	10	9	6
N. 27th Street and W. Galena Street	Eastbound	62	36	2	55	37	2
	Westbound	--	33	33	43	57	--
	Northbound	1	5	12	1	4	5
	Southbound	2	1	10	4	1	6
N. 27th Street and W. Lisbon Avenue	Eastbound	20	3	2	21	14	6
	Westbound	16	21	9	10	16	3
	Northbound	12	15	6	16	16	7
	Southbound	4	6	4	10	6	6

Table 73 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 27th Street and W. Brown Street	Eastbound	28	11	14	20	23	10
	Westbound	15	25	20	16	26	8
	Northbound	2	3	11	3	4	7
	Southbound	3	2	8	5	3	8
N. 27th Street and W. North Avenue	Eastbound	7	9	5	17	12	6
	Westbound	8	12	11	7	12	4
	Northbound	15	12	7	15	13	4
	Southbound	10	2	5	11	5	7
N. 27th Street and W. Fond du Lac Avenue (STH 145)	Southeast-bound	10	- -	3	18	- -	7
	Northwest-bound	17	- -	13	10	- -	4
	Northbound	3	- -	12	1	- -	4
	Southbound	- -	- -	10	- -	- -	5
N. 27th Street and W. Center Street	Eastbound	1	- -	2	1	- -	5
	Westbound	12	- -	3	11	- -	4
	Northbound	9	- -	2	9	- -	2
	Southbound	13	- -	2	12	- -	7
N. 27th Street and W. Locust Street	Eastbound	5	7	5	3	15	5
	Westbound	11	15	5	3	10	5
	Northbound	11	5	6	6	8	6
	Southbound	4	5	6	6	8	6
N. 27th Street and W. Burleigh Street	Eastbound	15	12	8	14	13	9
	Westbound	10	9	8	13	8	8
	Northbound	8	8	6	11	7	5
	Southbound	17	2	6	12	4	6
N. 27th Street and W. Townsend Street	Eastbound	6	61	1	10	21	5
	Westbound	7	14	1	4	22	2
	Northbound	12	3	4	11	5	5
	Southbound	10	1	11	23	4	5
N. 27th Street and W. Keefe Avenue	Eastbound	63	25	19	59	40	- -
	Westbound	75	25	- -	60	35	- -
	Northbound	3	8	6	- -	1	6
	Southbound	16	1	11	2	1	5
N. 27th Street and W. Hopkins Street	Eastbound	28	4	5	29	7	5
	Westbound	23	4	5	16	1	5
	Northbound	2	32	5	5	14	5
	Southbound	2	12	5	1	12	5
N. 27th Street and W. Vienna Avenue	Eastbound	50	23	27	34	37	1
	Westbound	43	36	14	39	30	17
	Northbound	2	1	6	2	3	6
	Southbound	1	2	9	1	3	6
N. 27th Street and W. Capitol Drive (STH 190)	Eastbound	2	14	4	2	8	6
	Westbound	9	11	8	3	6	3
	Northbound	25	11	4	27	10	8
	Southbound	12	14	11	25	18	4
N. 27th Street and W. Hope Avenue	Eastbound	17	69	3	13	67	2
	Westbound	18	19	4	23	34	2
	Northbound	4	10	2	9	6	9
	Southbound	33	4	9	28	3	4

Table 73 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 27th Street and W. Atkinson Avenue	Eastbound	33	1	5	23	1	5
	Westbound	6	6	5	8	6	5
	Northbound	1	18	5	1	13	5
	Southbound	1	4	5	3	5	5
W. Cornell Street and N. Teutonia Avenue	Eastbound	4	81	2	1	91	2
	Westbound	79	2	4	60	2	2
	Northbound	2	2	3	2	1	1
	Southbound	30	14	3	31	6	1

[a]Morning peak-hour percentages represent estimated values; current traffic data not available.

Source: SEWRPC.

Table 74

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. 27TH STREET

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 27th Street and and W. Clybourn Street	Congested left-turn, right-turn, and through movements from westbound-approach during the evening peak hour (851 vehicles per hour at level-of-service D)	Recommended Actions Retime 90-second cycle to increase north- and southbound green time from 39.6 to 45.9 seconds during the evening peak hour, making necessary signal changes at other approaches to improve operating efficiency and provide a wider progression band on N. 27th Street	--	
		Prohibit on-street parking on near side of westbound approach during the evening peak hour	$ 200	$ 200
N. 27th Street and W. Michigan Street	Congested left-turn, right-turn, and through movements from west-bound approach during the evening peak hour (608 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle to increase east- and westbound green time from 26.1 to 37.8 seconds during the evening peak hour, making necessary signal changes at other approaches to improve operating efficiency	--	
		Prohibit on-street parking on near side of westbound approach during the evening peak hour	$ 200	$ 200
N. 27th Street and W. Fond du Lac Avenue	Congested right-turn and through movements from northwest-bound approach during the evening peak hour (722 vehicles per hour entering approach at level-of-service D)	Recommended Action Refer to analysis of W. Fond du Lac Avenue from W. Walnut Street to W. Capitol Drive	Cost not included	Cost not included
N. 27th Street and W. Capitol Drive (STH 190)	Congested east-to-northbound left-turn movement during the morning peak hour (196 vehicles per hour at level-of-service E) Insufficient east-to-northbound and south-to-eastbound left-turn-lane storage capacity during the morning and evening peak hours, respectively, and on northbound approach for right-turn and through movements during the evening peak hour	Recommended Actions Retime 90-second cycle and change lagging east-to-northbound and west-to-south-bound left-turn arrow to leading during the morning peak hour, increasing their allotted green time from 9.0 to 12.6 seconds, and decrease their allotted green time from 9.0 to 7.2 seconds during the evening peak hour, making necessary signal changes at other approaches	$14,000	
		Increase storage length of east-to-north-bound and west-to-southbound left-turn lanes from 117 to 195 feet and 86 to 100 feet, respectively. Increase storage length of northbound approach by lengthening on-street parking restrictions from 132 to 180 feet south of intersection	$30,200	$44,200

Table 74 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Cornell Street and N. Teutonia Avenue	Congested left-turn and through movements from southeast-bound approach during the morning peak hour (620 vehicles per hour at level-of-service E) and congested left-turn and through movements from eastbound approach during the evening peak hour (513 vehicles per hour at level-of-service E)	Recommended Actions Retime 60-second cycle to increase eastbound green time from 10.2 to 15.0 seconds during the evening peak hour, making necessary signal changes to other approaches as necessary	--	
		Prohibit on-street parking on far side of southbound approach during the evening peak hour	$ 200	
		Construct exclusive 250-foot south-to-westbound right-turn lane	$20,000 (right-of-way and possible relocation costs associated with right-turn lane will add between $15,000 and $80,000 to this construction cost, depending upon whether the entire property at this location is purchased or whether a strip of right-of-way is purchased from the property)	$35,200 to $100,200 (including right-of-way and possible relocation costs associated with southbound right-turn lane at intersection of W. Cornell Street and N. Teutonia Avenue)
Subtotal				$79,800-$144,800 (including right-of-way and possible relocation costs associated with southbound right-turn lane at intersection of W. Cornell Street and N. Teutonia Avenue)
N. 27th Street and W. St. Paul Avenue	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 90-second cycle to decrease north-to-westbound left-turn arrow from 16.2 to 7.2 seconds during the morning peak hour and from 11.7 to 9.9 seconds during the evening peak hour, making necessary signal changes at other approaches to improve operating efficiency	--	--
N. 27th Street and W. Highland Boulevard	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 90-second cycle to increase west- and eastbound green time from 35.1 to 36.9 seconds during the morning peak period, making necessary signal changes at other approaches to improve operating efficiency of intersection and provide a wider progression band on W. Highland Avenue	--	--
N. 27th Street and W. Lisbon Avenue	Insufficient north-to-westbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Increase storage length of north-to-westbound left-turn lane from 76 to 125 feet	$15,000	$15,000
N. 27th Street and W. Burleigh Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 60-second cycle to increase west- and eastbound green time from 19.2 to 21.0 seconds, making necessary signal changes at other approaches to improve operating efficiency and provide a wider progression band on W. Burleigh Street	--	--
N. 27th Street and W. Townsend Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 90-second cycle to increase east- and westbound green time from 26.1 to 27.9 seconds during the evening peak hour, making necessary signal changes at other approaches to improve efficiency and provide a wider progression band on W. Townsend Street	--	--
Subtotal				$15,000
Total				$94,800-$159,800

Source: SEWRPC.

Table 75

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 27TH STREET

Phase	Intersection (time in seconds)						
	N. 27th Street				W. St. Paul Avenue		
	Morning		Evening		Morning	Evening	
	Northbound	Southbound	Northbound	Southbound		Westbound	Eastbound
Green.	48.6	38.7	48.6	36.0	30.6	30.6	17.1
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	37.8	47.7	37.8	50.4	55.8	55.8	69.3
Green Arrow. . .	7.2[a]	- -	9.9[a]	- -	- -	10.8[a]	- -
Yellow Arrow . .	2.7	- -	2.7	- -	- -	2.7	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 27th Street		W. Clybourn Street	
	Morning	Evening	Morning	Evening
Green.	48.6	45.9	30.6	33.3
Yellow	3.6	3.6	3.6	3.6
Red	37.8	40.5	55.8	53.1
Total Cycle	90.0	90.0	90.0	90.0

Phase	N. 27th Street		W. Michigan Street	
	Morning	Evening	Morning	Evening
Green.	53.1	41.4	26.1	37.8
Yellow	3.6	3.6	3.6	3.6
Red	33.3	45.0	60.3	48.6
Total Cycle	90.0	90.0	90.0	90.0

Phase	N. 27th Street		W. Wisconsin Avenue			
	Morning	Evening	Morning		Evening	
			Westbound	Eastbound	Westbound	Eastbound
Green.	20.7	24.3	44.1	33.3	27.0	23.4
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	46.8	42.3	53.1	46.8	63.0
Green Arrow. . .	- -	- -	7.2[a]	- -	12.6[a]	- -
Yellow Arrow . .	- -	- -	3.6	- -	3.6	- -
Green Through Only.	14.4[b]	15.3[b]	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 27th Street				W. Wells Street	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green.	29.7	39.6	38.7	48.6	39.6	30.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	56.7	46.8	47.7	37.8	46.8	55.8
Green Arrow. . .	- -	7.2[a]	- -	7.2[a]	- -	- -
Yellow Arrow . .	- -	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 75 (continued)

Phase	Intersection (time in seconds)	
	N. 27th Street	W. Kilbourn Avenue
Green.	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle	90.0	90.0

	N. 27th Street		W. State Street	
	Morning	Evening	Morning	Evening
Green.	44.1	35.1	35.1	44.1
Yellow	3.6	3.6	3.6	3.6
Red	42.3	51.3	51.3	42.3
Total Cycle	90.0	90.0	90.0	90.0

	N. 27th Street			W. Highland Boulevard	
	Morning	Evening		Morning	Evening
		Northbound	Southbound		
Green.	42.3	44.1	32.4	36.9	35.1
Yellow	3.6	3.6	3.6	3.6	3.6
Red	44.1	42.3	54.0	49.5	51.3
Green Arrow. . .	- -	9.0[a]	- -	- -	- -
Yellow Arrow . .	- -	2.7	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

	N. 27th Street	W. Vliet Street
Green.	28.2	22.2
Yellow	3.6	3.6
Red	28.2	34.2
Total Cycle[c]	60.0	60.0

	N. 27th Street	W. Galena Street
Green.	22.2	28.2
Yellow	3.6	3.6
Red	34.2	28.2
Total Cycle[d]	60.0	60.0

	N. 27th Street	W. Lisbon Avenue
Green.	31.2	19.2
Yellow	3.6	3.6
Red	25.2	37.2
Total Cycle	60.0	60.0

Table 75 (continued)

<table>
<tr><th rowspan="2">Phase</th><th colspan="4">Intersection (time in seconds)</th></tr>
<tr><th colspan="2">N. 27th Street</th><th colspan="2">W. Brown Street</th></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td colspan="2">35.4
3.6
21.0</td><td colspan="2">15.0
3.6
41.4</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
<tr><td></td><td colspan="2">N. 27th Street</td><td colspan="2">W. North Avenue</td></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td colspan="2">25.2
3.6
31.2</td><td colspan="2">25.2
3.6
31.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
<tr><td rowspan="2"></td><td colspan="2">N. 27th Street</td><td colspan="2">W. Fond du Lac Avenue (STH 145)</td></tr>
<tr><td>Northbound</td><td>Southbound</td><td>Northwest-bound</td><td>Southeast-bound</td></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td>21.6
3.6
64.8</td><td>27.0
3.6
59.4</td><td>32.4
3.6
54.0</td><td>52.2
3.6
34.2</td></tr>
<tr><td>Total Cycle</td><td>90.0</td><td>90.0</td><td>90.0</td><td>90.0</td></tr>
<tr><td rowspan="2"></td><td colspan="2">N. 27th Street</td><td colspan="2">W. Center Street</td></tr>
<tr><td>Northbound</td><td>Southbound</td><td>Westbound</td><td>Eastbound</td></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td>49.5
3.6
36.9</td><td>26.1
3.6
60.3</td><td>26.1
3.6
60.3</td><td>29.7
3.6
56.7</td></tr>
<tr><td>Total Cycle</td><td>90.0</td><td>90.0</td><td>90.0</td><td>90.0</td></tr>
<tr><td></td><td colspan="2">N. 27th Street</td><td colspan="2">W. Locust Street</td></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td colspan="2">28.2
3.6
28.2</td><td colspan="2">22.2
3.6
34.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
<tr><td></td><td colspan="2">N. 27th Street</td><td colspan="2">W. Burleigh Street</td></tr>
<tr><td>Green. . . . . . .
Yellow . . . . . .
Red . . . .</td><td colspan="2">29.4
3.6
27.0</td><td colspan="2">21.0
3.6
35.4</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
</table>

Table 75 (continued)

Phase	Intersection (time in seconds)			
	N. 27th Street		W. Townsend Street	
	Morning	Evening	Morning	Evening
Green.	44.1	51.3	35.1	27.9
Yellow	3.6	3.6	3.6	3.6
Red	42.3	35.1	51.3	58.5
Total Cycle	90.0	90.0	90.0	90.0
	N. 27th Street		W. Keefe Avenue	
			Westbound	Eastbound
Green.	48.6		13.5	17.1
Yellow	3.6		3.6	3.6
Red	37.8		72.9	69.3
Total Cycle	90.0		90.0	90.0
	N. 27th Street		W. Hopkins Street	
Green.	48.6		30.6	
Yellow	3.6		3.6	
Red	37.8		55.8	
Total Cycle	90.0		90.0	
	N. 27th Street		W. Vienna Avenue	
Green.	57.6		21.6	
Yellow	3.6		3.6	
Red	28.8		64.8	
Total Cycle[e]	90.0		90.0	
	N. 27th Street		W. Capitol Drive (STH 190)	
	Morning	Evening	Morning	Evening
Green.	24.3	26.1	37.8	41.4
Yellow	4.5	4.5	3.6	3.6
Red	61.2	59.4	48.6	45.0
Green Arrow. . .	- -	- -	12.6	7.2[f]
Yellow Arrow . .	- -	- -	3.6	3.6
Total Cycle	90.0	90.0	90.0	90.0
	N. 27th Street		W. Hope Avenue	
Green.	49.5		28.8	
Yellow	4.5		3.6	
Red	36.0		57.6	
Total Cycle	90.0		90.0	

Table 75 (continued)

Phase	Intersection (time in seconds)		
	N. 27th Street		W. Atkinson Avenue
	Northbound	Southbound	
Green.	44.1	31.5	38.3
Yellow	3.6	3.6	4.5
Red.	42.3	54.9	52.2
Green Arrow. . .	9.0[a]	--	--
Yellow Arrow . .	--	--	--
Total Cycle	90.0	90.0	90.0

Phase	W. Cornell Street				N. Teutonia Avenue	
	Morning		Evening		Morning	Evening
	Westbound	Eastbound	Westbound	Eastbound		
Green.	11.4	10.2	10.8	15.0	24.0	19.8
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	45.0	46.2	45.6	41.4	32.4	36.6
Green Arrow. . .	--	10.2[g]	--	15.0[g]	--	--
Yellow Arrow . .	--	--	--	--	--	--
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Leading through green.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Signal is operated as a flashing beacon, with red controlling W. Galena Street and yellow controlling N. 27th Street, except when signal control is actuated by a pedestrian.*

[e]*Signal is operating during the evening peak hour as flashing beacon, with red controlling W. Vienna Avenue and yellow controlling N. 27th Street.*

[f]*Leading left-turn arrow.*

[g]*Concurrent left-turn green arrow.*

Source: SEWRPC.

N. 27th Street. A total of nine actions are recommended to be implemented at the five problem intersections at a capital cost of approximately $64,800, expressed in 1980 dollars, not including right-of-way and relocation costs.[6] Right-of-way and relocation costs would be associated only with improvements recommended at the intersection of W. Cornell Street and N. Teutonia Avenue, and would represent an additional $15,000 to $80,000, as shown in Table 74. An additional five actions are recommended to be implemented at the five intersections not displaying congestion problems at a total capital cost of $15,000.

As indicated in Table 74, the retiming of the existing traffic signals and on-street parking prohibition were considered necessary to alleviate the congestion at the intersections of N. 27th Street and Clybourn Street and N. 27th Street and W. Michigan Street. The capital cost associated with elimination of on-street parking at each of these two intersections is estimated at $200. The signal timing revision recommended at these intersections would require minimal cost.

[6] *This cost of short-range improvement of N. 27th Street does not include the cost of the improvements recommended at the intersection of N. 27th Street and W. Fond du Lac Avenue (STH 145). The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street. At the intersection of N. 27th Street and W. Fond du Lac Avenue, the prohibition of parking on one approach was recommended. The estimated capital cost of this action is $200.*

The remaining two intersections exhibiting congestion problems require some turn-lane construction. The intersection of N. 27th Street and W. Capitol Drive (STH 190) requires the lengthening of the existing eastbound left-turn lane from 117 to 195 feet and the existing westbound left-turn lane from 86 to 100 feet within the existing median to alleviate the insufficient storage capacity in these lanes, at an approximate total capital cost of $30,200. To abate existing traffic congestion at this intersection, the retiming of the existing signal timing plan is required at minimal cost, and a change in signal phasing, including the installation of a new traffic controller, is required at an estimated capital cost of $14,000.

The other problem intersection requiring turn-lane construction is the intersection of W. Cornell Street and N. Teutonia Avenue. This intersection displays two congested traffic movements during the morning and evening peak hours. Abating morning and evening peak-hour congestion at this intersection would require the retiming of the existing traffic signal at minimal capital cost; the prohibition of on-street parking on the far side of the southbound approach during the evening peak hour at an approximate capital cost of $200; and the construction of a new, exclusive, 250-foot-long right-turn lane on the southbound approach at an approximate capital cost of $20,000. The estimated cost of recommended improvements at this intersection is thus $20,200. The recommended construction of the southbound exclusive right-turn lane at this intersection would not be possible, however, within the existing right-of-way. A minimum of 10 feet of additional right-of-way would have to be acquired for the length of this turn lane from Wisconsin Magneto, Inc., an automotive electrical parts wholesaling company, and from a private residence located on the northwest corner of the intersection. The cost of obtaining the additional 10-foot-wide strip of right-of-way from both of these properties is estimated at $15,000. The cost of obtaining a 10-foot-wide strip of land from Wisconsin Magneto, Inc., plus the entire residential property at this location, which may be necessary to obtain the 10-foot-wide strip at the residence, is estimated at $80,000. The total cost of implementing all the recommended improvements at this intersection, including right-of-way costs, would thus be $35,200 to $100,200, depending on the extent of right-of-way required.

As indicated in Table 74 and as already noted, five other intersections, although not exhibiting specific congestion problems, were found to warrant traffic management actions to improve operations. The intersection of N. 27th Street and W. Lisbon Avenue was found to have insufficient left-turn-lane storage capacity during the evening peak hour; while the intersections of N. 27th Street with W. St. Paul Avenue, W. Highland Avenue, W. Burleigh Street, and W. Townsend Street were found to have timing plans which could be revised to more efficiently balance traffic operating conditions. At the intersection of N. 27th Street and W. Lisbon Avenue, lengthening of the existing left-turn lane on the northbound approach from 76 to 125 feet, along with appropriate signing and pavement marking, should alleviate storage capacity problems during the evening peak hour, at an approximate capital cost of $15,000. The retiming of the existing signal timing plans to improve operations at the intersections of N. 27th Street with W. St. Paul Avenue, W. Highland Avenue, W. Burleigh Street, and W. Townsend Street would require minimal cost.

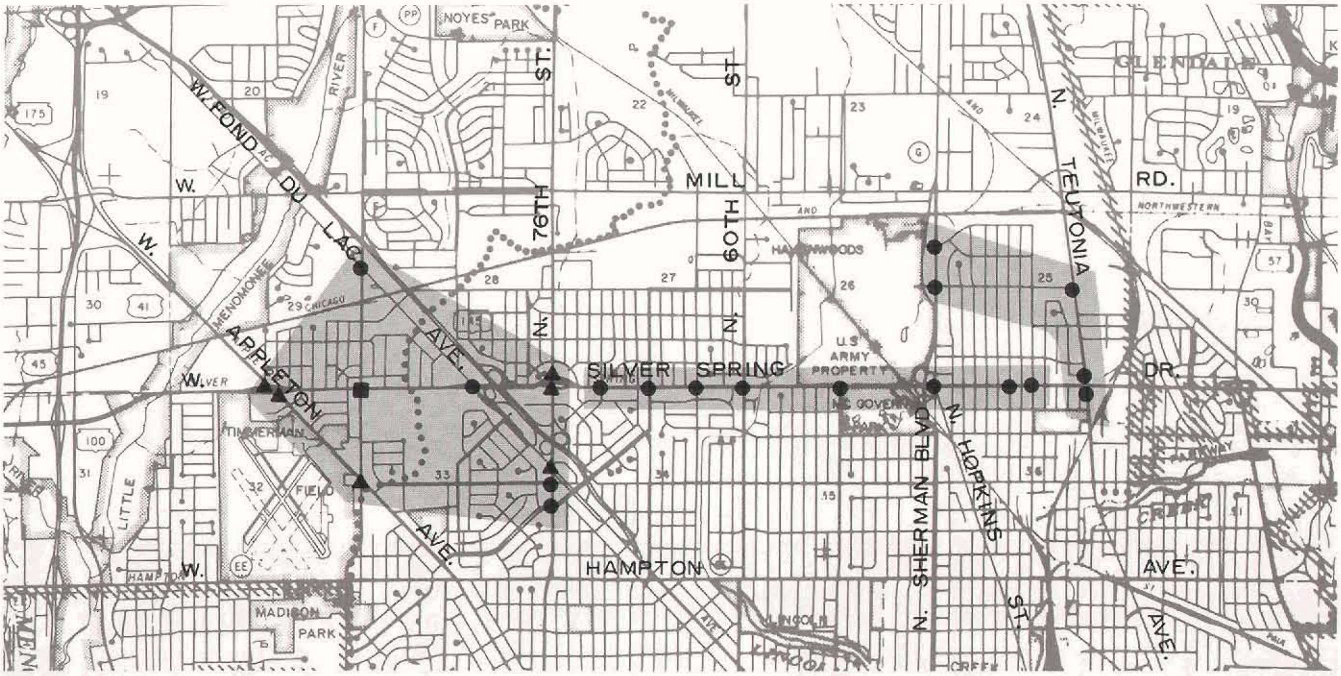
In addition, the existing offsets between the traffic signal timing plans of the 25 signalized intersections along this segment of N. 27th Street should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation systems management actions and to assure efficient signal progression along the segment. Efficient progression is intended to yield increased average vehicle operating speeds and to reduce vehicular delays at the signalized intersections along this segment of N. 27th Street. Furthermore, it must be recognized that the stretch of this problem segment of N. 27th Street from W. St. Paul Avenue to W. State Street has a signalized intersection spacing of less than 1,000 feet. As a result, the recommended traffic management actions may not fully resolve the existing congestion problems of this stretch if the traffic signals along the stretch are not sufficiently coordinated to assure efficient progression. Without efficient progression, vehicle queues from upstream intersections may prevent the increased capacity of downstream intersections from being fully utilized.

<u>W. Silver Spring Drive from W. Appleton Avenue to N. Teutonia Avenue</u>

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe problems to warrant investigation of short-range traffic management improvements is, as shown on Map 114, W. Silver Spring Drive from W. Appleton Avenue (USH 41) to N. Teutonia Avenue, a distance of 4.1 miles. Map 115 shows the existing land use pattern within a one-half-mile wide

Map 114

DETAIL OF THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE–
TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



LEGEND

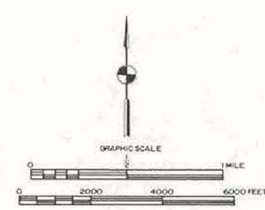
SIGNAL JURISDICTION

▲ WISCONSIN DEPARTMENT OF TRANSPORTATION

■ MILWAUKEE COUNTY

● CITY OF MILWAUKEE

SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON W. SILVER SPRING DRIVE INCLUDED AS PART OF THE TOTAL PPOGRESSION SYSTEM ALONG THE CORRIDOR



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to exhibit sufficiently severe existing problems to warrant investigation of short-range improvements—W. Silver Spring Drive from W. Appleton Avenue to N. Teutonia Avenue, a distance of 4.1 miles. This map also shows the location and jurisdiction of each of the 10 traffic signals along this arterial segment, including the relationship of these signals to the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Silver Spring Drive and are directly affected by the timing plans of the traffic signals on W. Silver Spring Drive.

Source: Wisconsin Department of Transportation, Milwaukee County, City of Milwaukee, and SEWRPC.

corridor along this problem segment of W. Silver Spring Drive. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to W. Silver Spring Drive. Retail sales and service land uses abut W. Silver Spring Drive at its intersections with N. 91st Street, W. Fond du Lac Avenue (STH 145), N. 64th Street, N. 60th Street, N. 43rd Street, and N. 35th Street. Recreational land uses abut this segment of W. Silver Spring Drive between N. 51st Street and N. 43rd Street at McGovern and Havenswood Parks.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Silver Spring Drive. For the entire length of the problem segment, W. Silver Spring Drive is divided by a median ranging in width from 13 to 30 feet. The curb-to-curb pavement widths of the dual roadways range from 35 to 40 feet, with the exception of those segments between the W. Appleton Avenue (USH 41) overpass and N. 96th Street, which range in width from 29 to 30 feet, and those segments at the N. 76th Street (STH 181) overpass and the Milwaukee Road overpass just west of N. Sherman

Map 115

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of W. Silver Spring Drive. Residential land use comprises the majority of the existing urban development in this corridor, as well as of the existing urban development immediately adjacent to W. Silver Spring Drive. Retail sales and service land uses abut W. Silver Spring Drive at its intersections with N. 91st Street, W. Fond du Lac Avenue (STH 145), N. 64th Street, N. 60th Street, N. 43rd Street, and N. 35th Street. Recreational land uses abut this segment of W. Silver Spring Drive between N. 51st Street and N. 43rd Street at McGovern and Havenswood Parks.

Source: SEWRPC.

Boulevard, which are 28 feet in width. With the exception of the latter two segments, which have sufficient width to permit two lanes of moving traffic in each direction with parking prohibited, the dual roadways of this problem segment of W. Silver Spring Drive have widths adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted on this segment of W. Silver Spring Drive except on those segments between the W. Appleton Avenue (USH 41) overpass and N. 96th Street, between N. 84th Street and N. 74th Street, between N. 50th Street and N. 42nd Street, and between N. 33rd Street and N. Teutonia Avenue, where parking is prohibited.

As indicated in Table 76, the problem segment of W. Silver Spring Drive in the study area has 10 signalized intersections, at which the W. Silver Spring Drive approaches are all 36 feet in width. Seven of the eastbound and eight of the westbound approaches to these 10 intersections provide separate lanes for the exclusive use of left-turning vehicles. Only two approaches, both eastbound, provide separate lanes for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches are also indicated in Table 76.

Traffic Control Measures: The timing plan for each of the 10 traffic signals along W. Silver Spring Drive between W. Appleton Avenue (USH 41) and N. Teutonia Avenue is indicated in Table 77. Map 114 shows the location and jurisdiction of each of these signals and their relationship to the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Silver Spring Drive and are directly affected by the timing plans of the traffic signals on W. Silver Spring Drive. Four of the 10 traffic signals are

Table 76

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound or Northwest-bound		Southbound or Southeast-bound	
W. Silver Spring Drive and N. 91st Street . .	36 ML	NS	36 ML	NS	33 ML	P	33 ML	FS
W. Silver Spring Drive and W. Fond du Lac Avenue (STH 145).	36 M	NP	36 ML	NP	28 ML	NP	27 M	NP
W. Silver Spring Drive and N. 72nd Street . .	36 M	NS	36 M	P	18	P	18	P
W. Silver Spring Drive and N. 68th Street . .	36 MLR	P	36 ML	P	34 ML	P	31 M	P
W. Silver Spring Drive and N. 64th Street . .	36 ML	P	36 ML	P	20 M	NS	22	NP
W. Silver Spring Drive and N. 60th Street . .	36 ML	P	36 ML	P	32 M	P	32 M	P
W. Silver Spring Drive and N. 51st Street . .	36 ML	P	36 ML	P	31 M	NS	N/A	N/A
W. Silver Spring Drive and N. 43rd Street . .	36 M	NP	36 M	NP	21	NS	20	N
W. Silver Spring Drive and N. 37th Street . .	36 ML	P	36 ML	P	18	P	17	P
W. Silver Spring Drive and N. 35th Street . .	36 MLR	FSAM	36 ML	NSPM	20	P	22	P

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.
N/A = data not available.

Source: SEWRPC.

Table 77

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

Phase	Intersection (time in seconds)	
	W. Silver Spring Drive	N. 91st Street
Green	40.5	22.5
Yellow	4.5	4.5
Red	45.0	63.0
Green Arrow	9.0[a]	- -
Yellow Arrow	3.6	- -
Total Cycle	90.0	90.0

Phase	W. Silver Spring Drive	W. Fond du Lac Avenue (STH 145)
Green	47.7	30.6
Yellow	4.5	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Silver Spring Drive	N. 72nd Street
Green	47.9	31.7
Yellow	3.6	3.6
Red	38.5	54.7
Total Cycle[b,d]	90.0	90.0

Phase	W. Silver Spring Drive		N. 68th Street	
	Morning	Evening	Morning	Evening
Green	39.6	48.6	39.6	30.6
Yellow	3.6	3.6	3.6	3.6
Red	46.8	37.8	46.8	55.8
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Silver Spring Drive	N. 64th Street
Green	61.2	18.0
Yellow	3.6	3.6
Red	25.2	68.4
Total Cycle[d]	90.0	90.0

Phase	W. Silver Spring Drive	N. 60th Street
Green	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Silver Spring Drive	N. 51st Street
Green	62.1	17.1
Yellow	3.6	3.6
Red	24.3	69.3
Total Cycle[d]	90.0	90.0

Table 77 (continued)

Phase	Intersection (time in seconds)		
	W. Silver Spring Drive	N. 43rd Street	
		Northbound	Southbound
Green	62.1	17.1	17.1
Yellow	3.6	3.6	3.6
Red	24.3	69.3	69.3
Green Arrow	--	17.1[c]	--
Yellow Arrow	--	3.6	--
Total Cycle[d]	90.0	90.0	90.0
	W. Silver Spring Drive	N. 37th Street	
Green	62.1	17.1	
Yellow	3.6	3.6	
Red	24.3	69.3	
Total Cycle[d]	90.0	90.0	
	W. Silver Spring Drive	N. 35th Street	
Green	53.1	26.1	
Yellow	3.6	3.6	
Red	33.3	60.3	
Total Cycle	90.0	90.0	

[a] *Leading left-turn arrow.*

[b] *Traffic-actuated signal normally set for green indication on W. Silver Spring Drive and red indication on N. 72nd Street.*

[c] *Right-turn arrow concurrent with green northbound through green phase.*

[d] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

Source: Wisconsin Department of Transportation, Milwaukee County, City of Milwaukee, and SEWRPC.

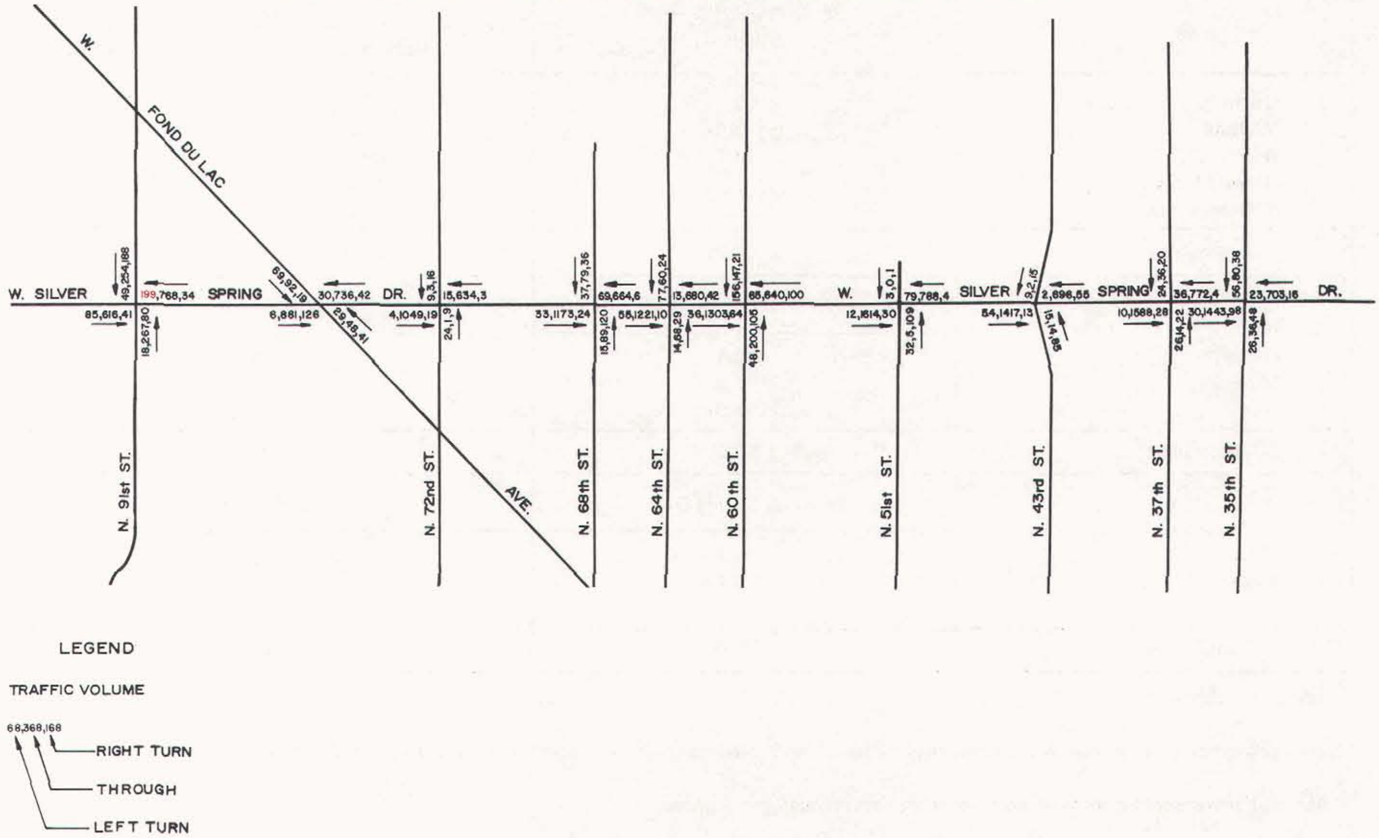
located at intersections of W. Silver Spring Drive with other arterial streets, and six are located at intersections of W. Silver Spring Drive with nonarterial streets—specifically, N. 72nd Street, N. 68th Street, N. 64th Street, N. 51st Street, N. 37th Street, and N. 35th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Silver Spring Drive. This segment of W. Silver Spring Drive is posted for a 40-mile-per-hour (mph) speed limit from W. Appleton Avenue (USH 41) to N. 76th Street (STH 181), and a 35-mph speed limit from N. 76th Street to N. Teutonia Avenue.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 10 signalized intersections along the problem segment of W. Silver Spring Drive in Figures 20 and 21. The locations along W. Silver Spring Drive from W. Appleton Avenue to N. Teutonia Avenue where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening peak-hour traffic volumes for each approach to the 10 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Silver Spring Drive, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 78.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Silver Spring

Figure 20

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE DURING THE MORNING PEAK HOUR[a]



RED NUMBERS INDICATE CONGESTED MOVEMENT

[a] MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Drive, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 20 and 21. One congested traffic movement was found to occur along this segment of W. Silver Spring Drive during the morning peak hour, and four were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The one morning and four evening peak-hour traffic congestion problems identified along W. Silver Spring Drive are associated with the following three signalized intersections: N. 91st Street, N. 68th Street, and N. 51st Street.

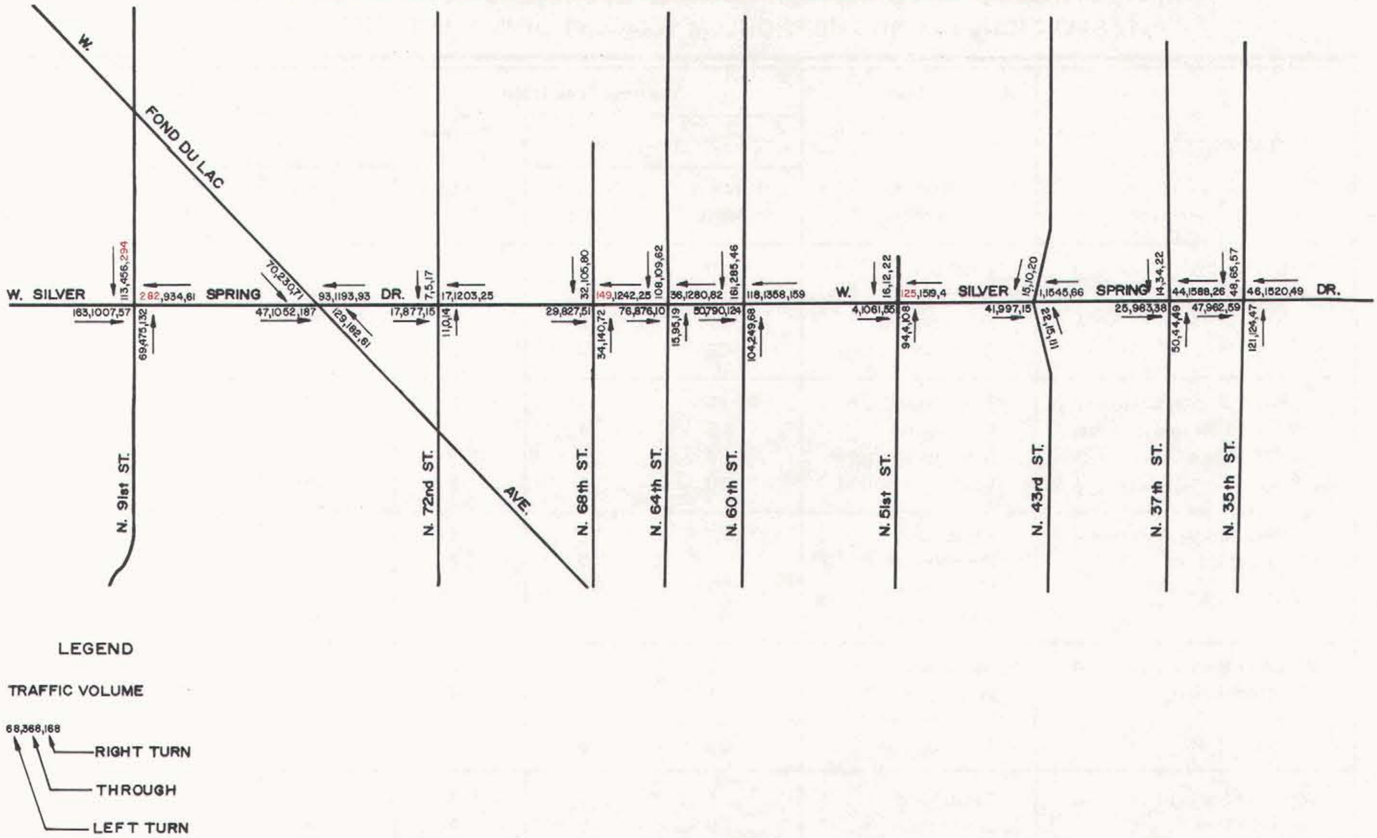
Table 79 provides a summary of the congestion problems at each intersection, the alternative actions considered for their abatement, the recommended actions, and the associated costs. Table 80 summarizes changes in traffic signal timing recommended for the problem intersections along this segment of W. Silver Spring Drive. A total of five actions are recommended to be implemented at the three problem intersections, at a capital cost of approximately $47,000.

As indicated in Table 79, the addition of separate signal phasing along with the addition of new traffic controllers is the only action considered necessary to abate the congestion problems at two of the three problem intersections—the intersections of W. Silver Spring Drive with N. 68th Street and N. 51st Street. The capital cost of providing the additional signal phasing at each of these intersections is estimated at $14,000.

The remaining intersection exhibiting congestion problems requires turn-lane reconstruction. The intersection of W. Silver Spring Drive and N. 91st Street requires the reconstruction of an exclusive

Figure 21

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE DURING THE EVENING PEAK HOUR[a]



RED NUMBERS INDICATE CONGESTED MOVEMENT

[a] EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

west-to-southbound single left-turn lane to a double left-turn lane with 175 feet of storage capacity within the existing median at an approximate capital cost of $15,000. Also required at this intersection to abate existing traffic congestion is the addition of a separate signal turn phase at an estimated capital cost of $2,000, as well as the retiming of existing turn phasing, and the addition of a circular red indication to follow the west-to-southbound left-turn arrow while the westbound through green phase is operating for pedestrian crossing safety, also at an estimated cost of $2,000.

In addition, the existing offsets between the traffic signal timing plans of the 10 signalized intersections along this segment should be reviewed by the implementing agencies and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of W. Silver Spring Drive by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

Related Street Segments Proceeding from the Terminus of the Stadium Freeway-North (USH 41) "Stub End"

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is comprised, as shown on Map 116, of a set of related street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end," including W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue; W. Lisbon Avenue from N. 60th Street to its intersection with W. Walnut Street; N. 60th Street from

Table 78

PERCENTAGE OF RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Silver Spring Drive and N. 91st Street	Eastbound	6	11	8	5	13	5
	Westbound	3	20	9	5	22	5
	Northbound	22	5	3	20	10	1
	Southbound	38	10	6	34	13	4
W. Silver Spring Drive and W. Fond du Lac Avenue (STH 145)	Easthbound	12	1	7	14	4	7
	Westbound	5	4	7	7	7	7
	Northwest-bound	34	25	5	16	35	5
	Southeast-bound	10	37	5	19	19	5
W. Silver Spring Drive and N. 72nd Street	Eastbound	2	1	4	2	2	2
	Westbound	1	2	8	2	1	4
	Northbound	27	70	- -	56	44	4
	Southbound	57	32	- -	59	24	- -
W. Silver Spring Drive and N. 68th Street	Eastbound	2	3	2	6	3	5
	Westbound	1	9	4	2	10	3
	Northbound	53	7	4	29	14	1
	Southbound	25	25	4	37	15	5
W. Silver Spring Drive and and N. 64th Street	Eastbound	1	4	5	1	8	7
	Westbound	5	2	9	6	2	2
	Northbound	26	12	6	14	12	3
	Southbound	15	48	14	22	39	6
W. Silver Spring Drive and N. 60th Street	Eastbound	4	3	5	13	5	5
	Westbound	12	8	9	10	7	3
	Northbound	29	14	4	16	25	3
	Southbound	7	48	5	9	33	7
W. Silver Spring Drive and N. 51st Street	Eastbound	2	1	4	5	1	6
	Westbound	1	9	8	1	7	3
	Northbound	75	22	3	52	46	1
	Southbound	25	75	- -	44	32	2
W. Silver Spring Drive and N. 43rd Street	Eastbound	1	4	4	1	4	4
	Westbound	7	1	8	4	1	3
	Northbound	75	13	8	75	15	4
	Southbound	58	34	19	45	33	4
W. Silver Spring Drive and N. 37th Street	Eastbound	2	1	4	4	2	7
	Westbound	1	4	10	1	3	3
	Northbound	35	42	5	34	35	1
	Southbound	25	30	1	31	20	1
W. Silver Spring Drive and N. 35th Street	Eastbound	7	2	4	6	4	5
	Westbound	2	3	9	3	3	3
	Northbound	43	24	13	16	42	1
	Southbound	22	32	3	34	28	1

Source: SEWRPC.

Table 79

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Silver Spring Drive and N. 91st Street	Congested west-to-southbound left turn during the morning and evening peak hours (199 and 282 vehicles per hour, respectively, at level-of-service E) and congested south-to-westbound right turn during the evening peak hour (294 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle to increase west-to-southbound and east-to-northbound left-turn arrows from 9.0 to 10.8 seconds, making necessary signal changes at other approaches	- -	
		The west-to-southbound left-turn arrow should be followed by a circular red indication while the westbound through green phase is operating for pedestrian crossing safety	$ 2,000	
	Insufficient west-to-southbound left-turn-lane storage capacity during the evening peak hour	Add a 10.8-second south-to-westbound right-turn arrow to operate concurrently with existing east- and west-bound left-turn arrows	$ 2,000	
		Reconstruct exclusive west-to-south-bound left-turn lane to double lane with 175 feet of storage	$15,000	$19,000
W. Silver Spring Drive and N. 68th Street	Congested west-to-southbound left turn during the evening peak hour (149 vehicles per hour at level-of-service E)	Recommended Action Add traffic-actuated, 8.1-second, west-to-southbound leading left-turn arrow to operate concurrently with the existing westbound green phase during the evening peak hour	$14,000	$14,000
		Alternative Action Retime 90-second cycle so that all vehicles can negotiate these problem left-turn movements on the through green phase during the evening peak hour (Not recommended because the controlling capacity factor for left-turn movements considered is the opposing through traffic volume during the evening peak hour)		
W. Silver Spring Drive and N. 51st Street	Congested west-to-southbound left turn during the evening peak hour (125 vehicles per hour at level-of-service E)	Recommended Action Add traffic-actuated, 7.2-second, west-to-southbound leading left-turn arrow to operate concurrently with the existing westbound green phase during the evening peak hour	$14,000	$14,000
		Alternative Action Retime 90-second cycle so that all vehicles can negotiate these problem left-turn movements on the through green phase during the evening peak hour (Not recommended because the controlling capacity factor for left-turn movements considered is the opposing through traffic volume during the evening peak hour)		
Total				$47,000

Source: SEWRPC.

Table 80

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. SILVER SPRING DRIVE

Phase	Intersection (time in seconds)			
	W. Silver Spring Drive		N. 91st Street	
			Northbound	Southbound
Green	38.7	38.7	22.5	22.5
Yellow	4.5	4.5	4.5	4.5
Red	46.8	46.8	63.0	63.0
Green Arrow	10.8[a]	10.8[a]	--	10.8[b]
Yellow Arrow	3.6	3.6	--	3.6
Red-Turn Indication	--	75.6	--	--
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Silver Spring Drive	W. Fond du Lac Avenue (STH 145)
Green	47.7	30.6
Yellow	4.5	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	W. Silver Spring Drive	N. 72nd Street
Green	47.9	31.7
Yellow	3.6	3.6
Red	38.5	54.7
Total Cycle[c,d]	90.0	90.0

Phase	W. Silver Spring Drive			N. 68th Street	
	Morning	Evening		Morning	Evening
		Eastbound	Westbound		
Green	39.6	40.5	52.2	39.6	27.0
Yellow	3.6	3.6	3.6	3.6	3.6
Red	46.8	45.9	34.2	46.8	59.4
Green Arrow	--	--	8.1[e]	--	--
Yellow Arrow	--	--	3.6	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Silver Spring Drive	N. 64th Street
Green	61.2	18.0
Yellow	3.6	3.6
Red	25.2	68.4
Total Cycle[d]	90.0	90.0

Phase	W. Silver Spring Drive	N. 60th Street
Green	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Table 80 (continued)

Intersection (time in seconds)

Phase	W. Silver Spring Drive: Morning	W. Silver Spring Drive: Evening, Eastbound	W. Silver Spring Drive: Evening, Westbound	N. 51st Street
Green	62.1	51.3	62.1	17.1
Yellow	3.6	3.6	3.6	3.6
Red	24.3	35.1	24.3	69.3
Green Arrow	--	--	7.2[d]	--
Yellow Arrow	--	--	3.6	--
Total Cycle[d]	90.0	90.0	90.0	90.0

Phase	W. Silver Spring Drive	N. 43rd Street: Northbound	N. 43rd Street: Southbound
Green	62.1	17.1	17.1
Yellow	3.6	3.6	3.6
Red	24.3	69.3	69.3
Green Arrow	--	17.1[f]	--
Yellow Arrow	--	3.6	--
Total Cycle[d]	90.0	90.0	90.0

Phase	W. Silver Spring Drive	N. 37th Street
Green	62.1	17.1
Yellow	3.6	3.6
Red	24.3	69.3
Total Cycle[d]	90.0	90.0

Phase	W. Silver Spring Drive	N. 35th Street
Green	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

[a]*Leading left-turn arrow.*

[b]*Leading right-turn arrow concurrent with leading left-turn arrow.*

[c]*Traffic-actuated signal normally set for green indication on W. Silver Spring Drive and red indication on N. 72nd Street.*

[d]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

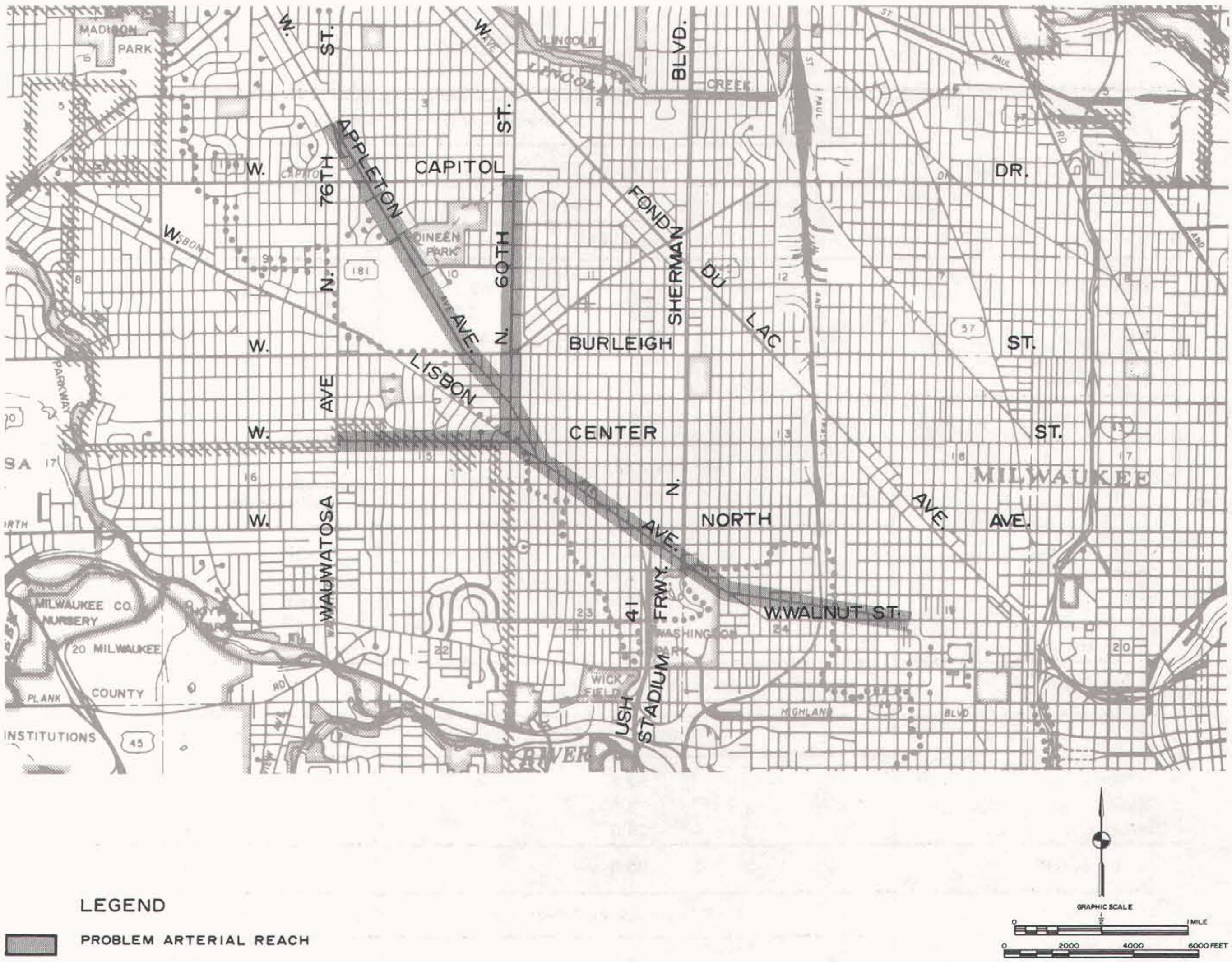
[e]*Leading left-turn arrow concurrent with through green phase.*

[f]*Right-turn arrow concurrent with northbound through green phase.*

Source: SEWRPC.

Map 116

DETAIL OF THE RELATED PROBLEM STREET SEGMENTS PROCEEDING FROM THE TERMINUS OF THE STADIUM FREEWAY-NORTH (USH 41) "STUB END"



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements. This segment is actually composed of a set of four related problem arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end," including W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue, W. Lisbon Avenue from N. 60th Street to its intersection with W. Walnut Street, N. 60th Street from W. Center Street to its intersection with W. Capitol Drive (STH 190) and W. Center Street from N. 76th Street to its intersection with W. Lisbon Avenue. The combined length of these roadway segments is 7.2 miles.

Source: Milwaukee County and SEWRPC.

W. Center Street to its intersection with W. Capitol Drive (STH 190); and W. Center Street from N. 76th Street to its intersection with W. Lisbon Avenue. The combined length of these roadway segments is about 7.2 miles.

The existing land use pattern within a one-half-mile-wide corridor along each of these four related problem arterial street segments is shown on Map 117. Residential land use comprises the majority of the existing urban development within each of the four corridors, and the majority of the existing urban development immediately adjacent to the problem segments of W. Appleton Avenue (USH 41), W. Center Street, and N. 60th Street. Retail sales and service land use comprises the majority of the existing urban development immediately adjacent to the problem segment of W. Lisbon Avenue, and also abuts the problem segment of W. Appleton Avenue at its intersections with N. 76th Street and W. Capitol Drive; the problem segment of N. 60th Street at its intersections with W. Capitol Drive at the Capitol Court Shopping Center and with W. Keefe Avenue; and the prob-

Map 117

LAND USE ADJACENT TO THE RELATED PROBLEM STREET SEGMENTS PROCEEDING FROM THE TERMINUS OF THE STADIUM FREEWAY-NORTH "STUB END"

This map shows the existing land use pattern within a one-half-mile-wide corridor along each of the set of related street segments proceeding from the terminus of the Stadium Freeway-North "stub end," including W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue; W. Lisbon Avenue from N. 60th Street to its intersection with W. Walnut Street; N. 60th Street from W. Center Street to its intersection with W. Capitol Drive (STH 190); and W. Center Street from N. 76th Street to its intersection with W. Lisbon Avenue. Residential land use comprises the majority of the existing urban development within each of the four corridors, and comprises the majority of existing urban development immediately adjacent to the problem segments of W. Appleton Avenue, W. Center Street, and N. 60th Street. Retail sales and service land use comprises the majority of the existing urban development immediately adjacent to the problem segment of W. Lisbon Avenue, and also abuts the problem segment of W. Appleton Avenue at its intersections with N. 76th Street and W. Capitol Drive; the problem segment of N. 60th Street at its intersections with W. Capitol Drive at the Capitol Court Shopping Center and at W. Keefe Avenue; and the problem segment of W. Center Street at its intersections with N. 76th Street and N. 72nd Street. Recreational land uses occur along the problem segment of W. Lisbon Avenue between N. Sherman Boulevard and N. 40th Street at Washington Park, and abut the problem segment of W. Appleton Avenue at W. Keefe Avenue at Dineen Park.

Source: SEWRPC.

lem segment of W. Center Street at its intersections with N. 76th Street and N. 72nd Street. Recreational land uses occur along the problem segment of W. Lisbon Avenue between N. Sherman Boulevard and N. 40th Street at Washington Park, and abut the problem segment of W. Appleton Avenue at W. Keefe Avenue at Dineen Park. Governmental and institutional land uses abut the problem segment of W. Appleton Avenue between W. Vienna Court and W. Burleigh Street at the Holy Cross and Wanderer's Rest cemeteries.

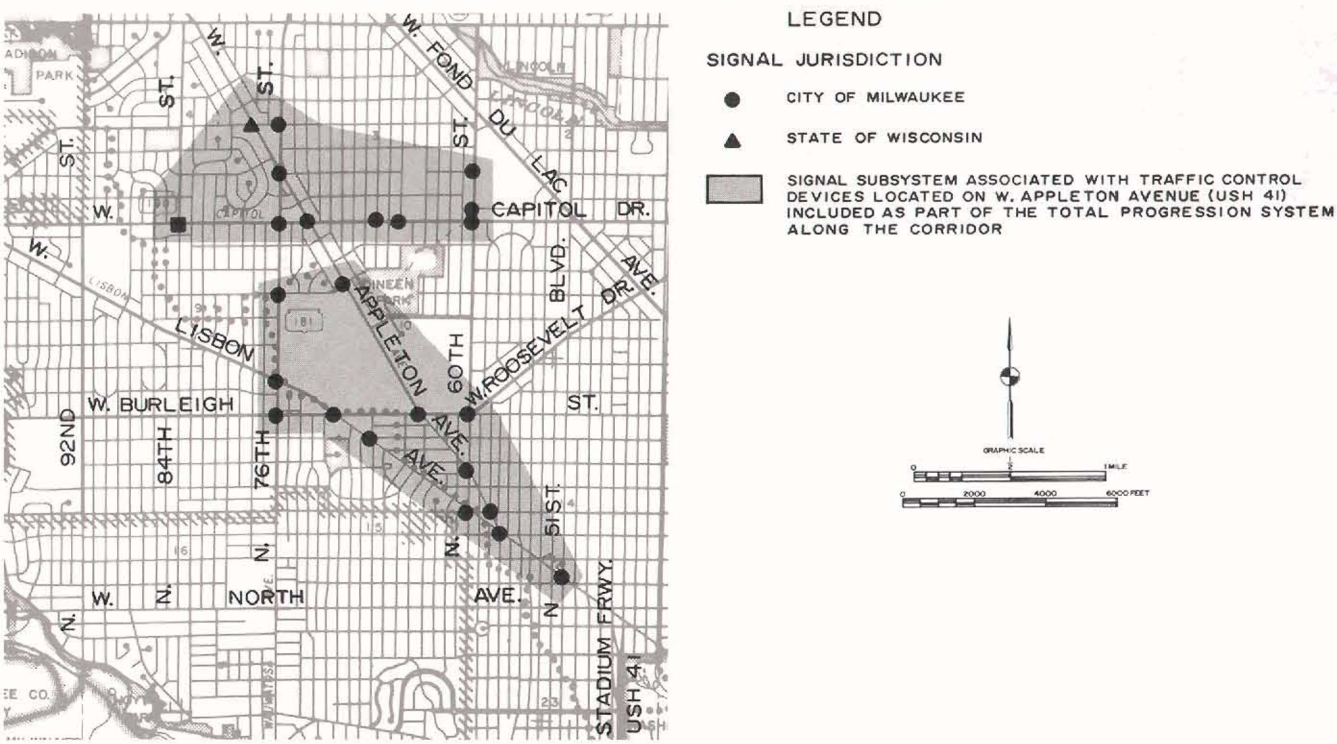
The existing physical characteristics, traffic control measures, and traffic conditions and problems of the four arterial street segments, as well as the transportation systems management actions recommended to abate the congestion problems on the four segments, are discussed separately for each segment in the following sections.

W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to W. Lisbon Avenue: One of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" identified as having sufficiently severe traffic problems to warrant investigation of short-range improvements is W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue, a distance of about 2.2 miles, as shown on Map 118.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Appleton Avenue. Between N. 76th Street and W. Burleigh Street, this section of W. Appleton Avenue is divided by a median ranging in width from 21 to 24 feet. The curb-to-curb pavement widths of the dual roadways on this section of W. Appleton Avenue range

Map 118

DETAIL OF THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)—
TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is one of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue, a distance of about 2.2 miles. This map also shows the location and jurisdiction of each of the seven traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Appleton Avenue and are directly affected by the timing plans of the traffic signals on W. Appleton Avenue.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

from 36 to 38 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted, with the exception of the northwest-bound roadway at the intersection of W. Appleton Avenue and W. Burleigh Street which is 28 feet in width, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Between W. Burleigh Street and W. Lisbon Avenue, W. Appleton Avenue is not median divided and has a curb-to-curb width of between 50 and 52 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along most of this segment of W. Appleton Avenue, with parking being prohibited only between W. Chambers Street and N. 61st Street and between N. 57th Street and W. Lisbon Avenue.

As shown in Table 81, the problem segment of W. Appleton Avenue has seven signalized intersections, at which the W. Appleton Avenue approaches range in width from 24 to 38 feet. Three of the southeast-bound and three of the northwest-bound approaches to these seven intersections provide separate lanes for the exclusive use of left-turning vehicles; and three of the southeast-bound and two of the northwest-bound approaches provide separate lanes for the exclusive use of right-turning vehicles. The exclusive left-turn lane on the northwest-bound approach and the exclusive right-turn lane on the southeast-bound approach at the intersection of W. Appleton Avenue and W. Burleigh Street are provided by pavement marking rather than by channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. Appleton Avenue are also indicated in Table 81.

Traffic Control Measures: The timing plan for each of the seven traffic signals along W. Appleton Avenue between N. 76th Street and W. Lisbon Avenue is shown in Table 82. Map 118 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Appleton Avenue and are directly affected by the timing plans of the traffic signals on W. Appleton Avenue. Six of the traffic signals are located at the intersections of W. Appleton Avenue with other arterial streets, and one is located at the intersection of W. Appleton Avenue with a nonarterial street, W. Nash Street. Stop signs are located at all other approaches collector or local street crossings of this segment of W. Appleton Avenue. The segment of W. Appleton Avenue from N. 76th Street to W. Burleigh Street is posted for a 35-mile-per-hour (mph) speed limit, and a 30-mph speed limit is posted for the segment from W. Burleigh Street to W. Lisbon Avenue.

Table 81

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)

Intersection	Roadway Approach Width (feet)															
	Southeast-bound		Northwest-bound		Northbound		Southbound		Eastbound		Westbound		W. Lisbon Avenue Southeast-bound		W. Lisbon Avenue Northwest-bound	
W. Appleton Avenue and N. 76th Street (STH 181) . .	36 MR	P	36 MR	P	36 ML	P	36 ML	NS	- -	- -	- -	- -	- -	- -	- -	- -
W. Appleton Avenue and W. Capitol Drive (STH 190) .	36 MLR	P	36 MLR	P	- -	- -	- -	- -	36 MLR	NP	36 MLR	NPPM	- -	- -	- -	- -
W. Appleton Avenue and W. Nash Street.	36 ML	NP	36 ML	P	- -	- -	- -	- -	30 ML	P	30 ML	P	- -	- -	- -	- -
W. Appleton Avenue and W. Burleigh Street.	38 MLR[a]	NPAM	31 L[a]	NSPM	- -	- -	- -	- -	30 M	P	32 M	NPPM	- -	- -	- -	- -
W. Appleton Avenue and N. 60th Street	25	P	25	P	24	NPPM	24	NPAM	- -	- -	- -	- -	- -	- -	- -	- -
W. Appleton Avenue and W. Center Street.	24	P	24	NS	- -	- -	- -	- -	25	P	25	P	- -	- -	- -	- -
W. Appleton Avenue and W. Lisbon Avenue.	25	FS	N/A	N/A	- -	- -	- -	- -	- -	- -	- -	- -	25	NPAM	22	NPPM

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.
N/A = data not available.

[a]*Exclusive turn lane included as part of roadway approach and identified with pavement markings.*

Source: SEWRPC.

Table 82

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)

Intersection (time in seconds)

Phase	W. Appleton Avenue	N. 76th Street (STH 181)
Green	32.4	34.2
Yellow	4.5	4.5
Red	53.1	51.3
Green Arrow	- -	7.2[a]
Yellow Arrow	- -	3.6
Total Cycle	90.0	90.0

Phase	W. Appleton Avenue	W. Capitol Drive (STH 190)
Green	38.7	38.7
Yellow	4.5	4.5
Red	46.8	46.8
Total Cycle	90.0	90.0

Phase	W. Appleton Avenue	W. Nash Street
Green	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle[b]	90.0	90.0

Phase	W. Appleton Avenue				W. Burleigh Street
	Morning		Evening		
	Southeast-bound	Northwest-bound	Southeast-bound	Northwest-bound	
Green	39.6	27.0	27.0	39.6	39.6
Yellow	3.6	3.6	3.6	3.6	3.6
Red	46.8	59.4	59.4	46.8	46.8
Green Arrow	9.0[c]	- -	- -	9.0[c]	- -
Yellow Arrow	3.6	- -	- -	3.6	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Appleton Avenue	N. 60th Street	
		Southbound	Northbound
Green	37.8	40.5	29.7
Yellow	3.6	3.6	3.6
Red	48.6	45.0	55.8
Green Arrow	- -	8.1[c]	- -
Yellow Arrow	- -	2.7	- -
Total Cycle[b]	90.0	90.0	90.0

Phase	W. Appleton Avenue		W. Center Street
	Southeast-bound	Northwest-bound	
Green	50.4	38.7	28.8
Yellow	3.6	3.6	3.6
Red	36.0	47.7	57.6
Green Arrow	9.0[d]	- -	- -
Yellow Arrow	- -	- -	- -
Total Cycle	90.0	90.0	90.0

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the seven signalized intersections along the problem segment of W. Appleton Avenue in Figures 22 and 23. The locations along W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and

Table 82 (continued)

Phase	Intersection (time in seconds)					
	W. Appleton Avenue		W. Lisbon Avenue			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	44.1	37.8	35.1	35.1	41.4	41.4
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	42.3	48.6	51.3	51.3	45.0	45.0
Green Arrow. . .	--	--	--	90.0[e]	--	90.0[e]
Yellow Arrow . .	--	--	--	--	--	--
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

[a] *Lagging left-turn arrow.*

[b] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[c] *Leading left-turn arrow concurrent with through green phase.*

[d] *Leading southbound through green arrow concurrent with through green phase.*

[e] *Continuous right turn except when signal control is actuated by a pedestrian.*

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

evening traffic volumes for each approach to the seven controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Appleton Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 83.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Appleton Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 22 and 23. Six congested traffic movements were found to occur along this segment of W. Appleton Avenue during the morning peak hour, and eight were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The six morning and eight evening peak-hour traffic congestion problems identified along W. Appleton Avenue are associated with the following six intersections: N. 76th Street (STH 181), W. Capitol Drive (STH 190), W. Burleigh Street, N. 60th Street, W. Center Street, and W. Lisbon Avenue.

Table 84 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 85 summarizes the changes in traffic signal timing recommended for problem intersections along this segment of W. Appleton Avenue. A total of 12 new actions are recommended to be implemented at the six problem intersections at a capital cost of approximately $60,200, in 1980 dollars.[7]

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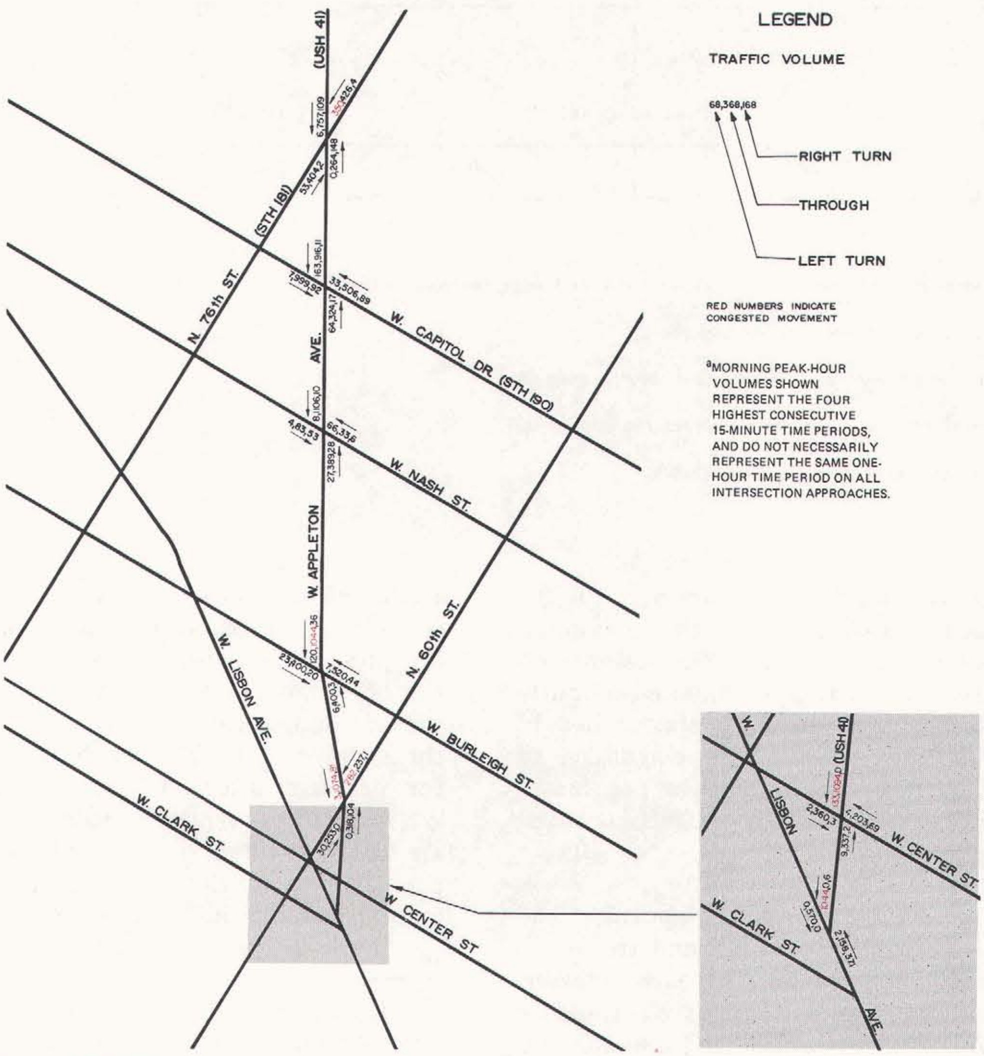
[7] *This cost of short-range improvement of W. Appleton Avenue does not include the cost of the improvements recommended at the intersection of W. Appleton Avenue with N. 76th Street (STH 181). The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road. At the intersection of W. Appleton Avenue and N. 76th Street, it was recommended that the traffic signals be retimed and that a separate red indication for pedestrian crossing protection be added in addition to a new traffic controller, and that a south-to-southeast-bound left-turn lane be reconstructed to a double left-turn lane, and that a north-to-northwest-bound left-turn lane be lengthened. The capital cost of improvement of this intersection was estimated at $42,000.*

Figure 22

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41) DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

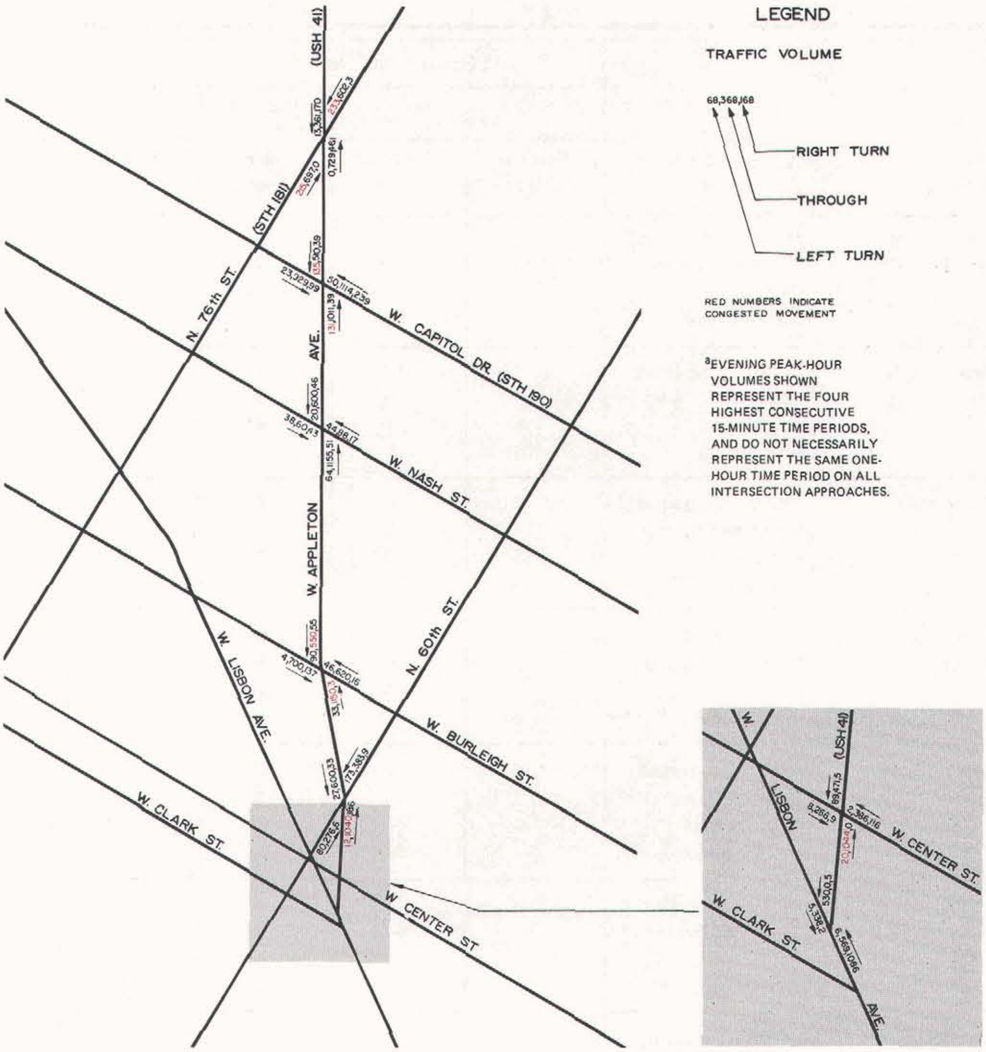
As indicated in Table 84, the prohibition of on-street parking is the only action considered necessary to abate the congestion problems at two of the six problem intersections—the intersections of W. Appleton Avenue with W. Center Street and with W. Lisbon Avenue. The capital cost associated with the removal of on-street parking at these two intersections is estimated at $400 at the intersection of W. Appleton Avenue with W. Center Street, and at $200 at the intersection of W. Appleton Avenue with W. Lisbon Avenue.

The addition of separate signal phasing, in addition to a new traffic controller, is the only action considered necessary to abate the congestion problems at another of the six problem intersections—the intersection of W. Appleton Avenue and W. Capitol Drive. The capital cost of improving this intersection is estimated at $16,000.

To abate the congestion problems at the intersection of W. Appleton Avenue and W. Burleigh Street, the retiming of the existing signal plan at

Figure 23

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41) DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

minimal cost, a change in signal phasing at an estimated cost of $1,000, and the prohibition of on-street parking at an estimated cost of $200 is required. The total cost of the improvements at this intersection is estimated at $1,200.

The remaining intersection which exhibited congestion problems—the intersection of W. Appleton Avenue and N. 60th Street—requires some turn-lane construction. In order to provide sufficient turn-lane storage capacity at this intersection, the left-turn lane on the southbound approach should be lengthened at an estimated cost of $30,000. In order to accommodate this lengthening, it will be necessary to widen the entire southbound approach to this intersection by reconstructing the existing right lane, moving the associated curb line outward 10 to 12 feet within the existing right-of-way. To abate all but one congested movement at this intersection, it will be necessary to retime the existing signal plan at minimal cost, and to prohibit on-street parking at an estimated cost of $400.

Table 83

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Appleton Avenue and N. 76th Street (STH 181)	Northwest-bound	36	- -	4	39	- -	1
	Southeast-bound	12	1	2	31	3	1
	Northbound	1	11	4	- -	24	1
	Southbound	1	45	2	1	27	1
W. Appleton Avenue and W. Capitol Drive (STH 190)	Northwest-bound	4	16	4	3	11	1
	Southeast-bound	1	15	2	6	20	1
	Eastbound	8	1	4	10	2	4
	Westbound	14	5	5	17	4	2
W. Appleton Avenue and W. Nash Street	Northwest-bound	6	6	4	4	5	1
	Southeast-bound	1	1	2	7	3	1
	Eastbound	38	3	1	30	27	- -
	Westbound	6	63	2	11	30	1
W. Appleton Avenue and W. Burleigh Street	Northwest-bound	1	1	5	- -	3	5
	Southeast-bound	3	10	5	8	13	5
	Eastbound	4	5	5	16	- -	5
	Westbound	8	1	5	2	7	5
W. Appleton Avenue and N. 60th Street	Northwest-bound	25	- -	6	15	1	5
	Southeast-bound	7	- -	2	5	4	5
	Northbound	- -	1	2	2	22	5
	Southbound	- -	54	3	2	30	5
W. Appleton Avenue and W. Center Street	Northwest-bound	1	3	7	- -	2	2
	Southeast-bound	- -	11	1	1	16	3
	Eastbound	1	1	4	3	3	6
	Westbound	25	1	6	23	1	4
W. Appleton Avenue and W. Lisbon Avenue	Southeast-bound	1	99	2	1	98	1
	Eastbound	- -	- -	1	1	1	4
	Westbound	69	1	7	65	1	1

Source: SEWRPC.

Also, in order to provide adequate pedestrian crossing time at this intersection, a new pedestrian-actuated signal sequence will be required, in addition to a new traffic controller, at an estimated capital cost of $12,000. These two actions would abate the following congestion problems at this intersection: the congested left-turn, right-turn, and through movements from the southeast-bound approach during the morning peak hour; and the congested left-turn and through movements from the northwest-bound approach during the evening peak hour. Although, as stated earlier, the lengthening of the exclusive south-to-southeast-bound left-turn lane would provide sufficient vehicle storage capacity during the morning and evening peak hours on the southeast-bound approach, the congestion affecting the south-to-southeast-bound left turn during the morning peak hour cannot be abated at this intersection without the construction of a double left-turn lane on the southbound approach. Because an accident potential would be created by the construction of a double left-turn lane at this intersection, this alternative would require an exclusive south-to-southeast-bound left-

Table 84

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Appleton Avenue and N. 76th Street (STH 181)	Congested north-to-northwest-bound left-turn movement during the evening peak hour (215 vehicles per hour at level-of-service E), congested south-to-southeast-bound left-turn movement during the morning and evening peak hours (350 and 233 vehicles per hour, respectively, at level-of-service E) Insufficient north-to-northwest-bound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road	Cost not included	Cost not included
W. Appleton Avenue and W. Capitol Drive (STH 190)	Congested northwest-to-westbound and southeast-to-eastbound left-turn movements during the evening peak hour (131 and 135 vehicles per hour, respectively, at level-of-service E)	Recommended Action Add traffic-actuated, 7.2-second, northwest-to-westbound and southeast-to-eastbound leading left-turn arrows during the evening peak hour, making necessary signal changes at other approaches Alternative Action Retime 90-second cycle so that all vehicles can negotiate northwest-to-westbound and southeast-to-eastbound left turns on through green time (Not recommended because the existing 90-second cycle could not provide sufficient green time to accommodate all traffic movements during the evening peak hour)	$16,000	$16,000
W. Appleton Avenue and W. Burleigh Street	Congested through movement from southeast-bound approach during the morning and evening peak hours (1,044 and 550 vehicles per hour at levels-of-service D and E, respectively) and congested northwest-bound right-turn and through movements from northwest-bound approach during the evening peak hour (1,153 vehicles per hour at level-of-service D)	Recommended Actions Retime 90-second cycle to increase southeast- and northwest-bound green time from 39.6 to 47.7 seconds during the evening peak hour, and increase southeast-bound green time from 39.6 to 43.2 seconds during the morning peak hour, making necessary signal changes at other approches Remove existing 9.0-second northwest-to westbound left-turn arrow from signal sequence during the evening peak hour Prohibit on-street parking on north-west-bound far-side approach during evening peak hour	 $ 1,000 $ 200	 $ 1,200

Table 84 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Appleton Avenue and N. 60th Street	Congested left-turn, right-turn, and through movements from southeast-bound approach during the morning peak hour (1,158 vehicles per hour at level-of-service E) and congested left-turn and through movements from northwest-bound approach during the evening peak hour (1,052 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle to increase southeast- and northwest-bound green time from 37.8 to 39.6 seconds and increase south-to-southeast-bound left-turn arrow from 8.1 to 12.6 seconds, making necessary signal changes at other approches	- -	
	Insufficient south-to-southeast-bound left-turn-lane storage capacity during the morning and evening peak hours	Add pedestrian-actuated signal sequence to provide adequate pedestrian crossing time on W. Appleton Avenue	$12,000	
		Prohibit on-street parking on southeast bound near-side approach during the morning peak hour and on far-side northwest-bound approach during the evening peak hour	$ 400	
		Reconstruct right lane of southbound approach to extend divided roadway cross-section farther north of intersection to allow for an increase in storage length on the south-to-southeast-bound left-turn lane of from 132 to 250 feet	$30,000	$42,400
	Congested south-to-southeast-bound left turn during the morning peak hour (282 vehicles per hour at level-of-service E)	NOTE: A double left-turn lane on the southbound approach, necessary to abate this congestion problem, cannot be constructed owing to accident potential, and to required signal timing revisions to accommodate operation of a double left turn, and was therefore not recommended		
W. Appleton Avenue and W. Center Street	Congested left-turn and through movements from southeast-bound and northwest-bound approaches during the morning and evening peak hours, respectively (1,227 vehicles per hour at level-of-service E during the morning peak hour and 1,064 vehicles per hour at level-of-service E during the evening peak hour)	Recommended Action Prohibit on-street parking on the southeast-bound approach during the morning peak hour and on the northwest-bound approach during the evening peak hour	$ 400	$ 400
		Alternative Action Retime 90-second cycle, taking green time from W. Center Street and allotting it to W. Appleton Avenue in order to alleviate congested movements (Not recommended, as adequate green time cannot be allotted to alleviate southeast-to-northwest-bound congestion)		
W. Appleton Avenue and W. Lisbon Avenue	Congested left-turn movement on southbound approach during the morning peak hour (1,044 vehicles per hour at level-of-service D)	Recommended Action Prohibit on-street parking on nearside of southbound approach during the morning peak hour	$ 200	$ 200
		Alternative Action Retime existing 90-second cycle, taking green time from southeast-bound W. Lisbon Avenue and allotting it to W. Appleton Avenue in order to alleviate congested movement (Not recommended, as adequate green time cannot be allotted to alleviate southbound congestion)		
Total				$60,200

Source: SEWRPC.

Table 85

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. APPLETON AVENUE (USH 41)

Phase	Intersection (time in seconds)		
	W. Appleton Avenue	N. 76th Street (STH 181)	
		Northbound	Southbound
Green	31.5	31.5	31.5
Yellow	4.5	4.5	4.5
Red	54.0	54.0	54.0
Green Arrow	--	9.9[a]	9.9[a]
Yellow Arrow	--	4.5	4.5
Red-Turn Indication	--	--	75.6
Total Cycle	90.0	90.0	90.0

Phase	W. Appleton Avenue		W. Capitol Drive (STH 190)	
	Morning	Evening	Morning	Evening
Green	38.7	28.8	38.7	37.8
Yellow	4.5	4.5	4.5	4.5
Red	46.8	44.1	46.8	47.7
Green Arrow	--	7.2[b]	--	--
Yellow Arrow	--	3.6	--	--
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Appleton Avenue	W. Nash Street
Green	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle[c]	90.0	90.0

Phase	W. Appleton Avenue			W. Burleigh Street	
	Morning		Evening	Morning	Evening
	Southeast-bound	Northwest-bound			
Green	43.2	30.6	47.7	36.0	31.5
Yellow	3.6	3.6	3.6	3.6	3.6
Red	43.2	55.8	38.7	50.4	54.8
Green Arrow	9.0[d]	--	--	--	--
Yellow Arrow	3.6	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Appleton Avenue	N. 60th Street	
		Northbound	Southbound
Green	39.6	23.4	38.7
Yellow	3.6	4.5	4.5
Red	46.8	62.1	46.8
Green Arrow	--	--	12.6[d]
Yellow Arrow	--	--	2.7
Total Cycle[c]	90.0	90.0	90.0

Phase	W. Appleton Avenue		W. Center Street
	Southeast-bound	Northwest-bound	
Green	50.4	38.7	28.8
Yellow	3.6	3.6	3.6
Red	36.0	47.7	57.6
Green Arrow	9.0[e]	--	--
Yellow Arrow	--	--	--
Total Cycle	90.0	90.0	90.0

Table 85 (continued)

Phase	Intersection (time in seconds)					
	W. Appleton Avenue		W. Lisbon Avenue			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	44.1	37.8	35.1	35.1	41.4	41.4
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	42.3	48.6	51.3	51.3	45.0	45.0
Green Arrow.	--	--	--	90.0[f]	--	90.0[f]
Yellow Arrow	--	--	--	--	--	--
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0	90.0

[a]*Lagging left-turn arrow.*

[b]*Leading left-turn arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Leading left-turn arrow concurrent with through green phase.*

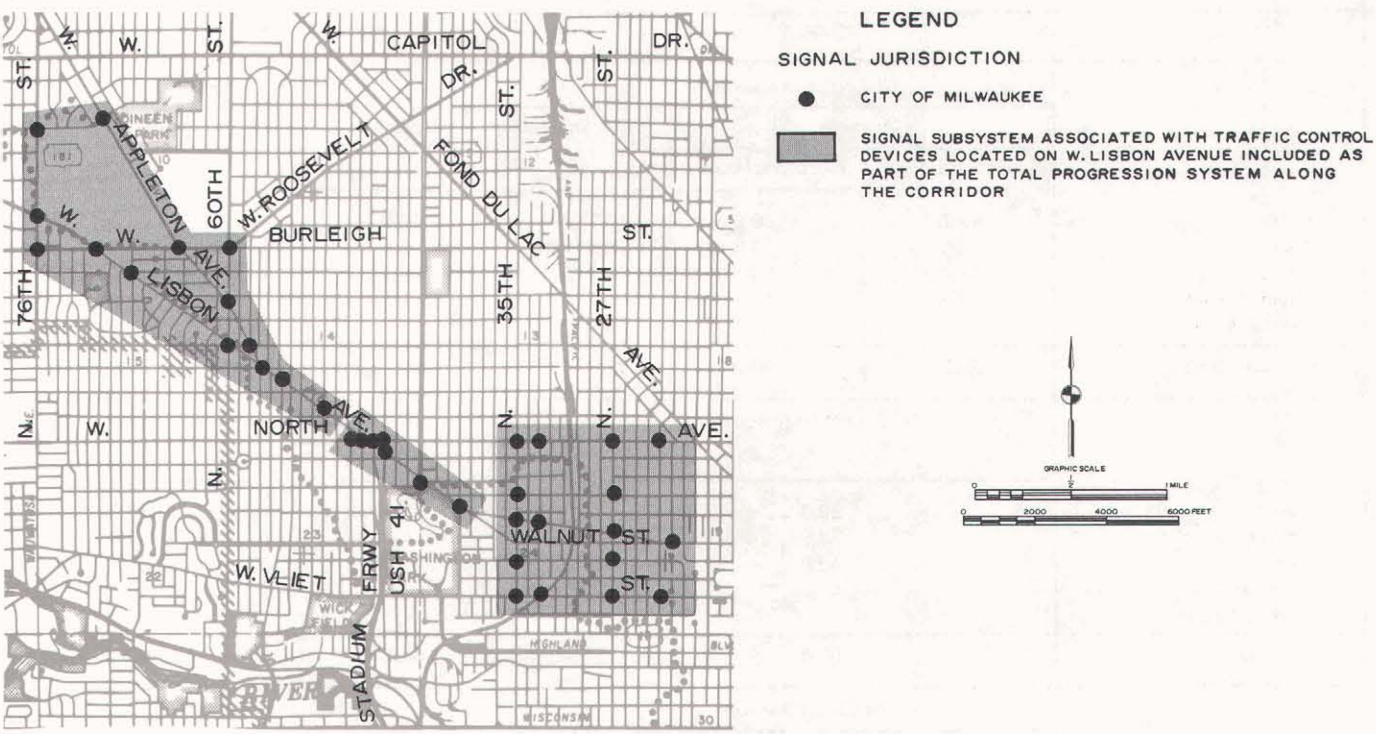
[e]*Leading southbound through green arrow concurrent with through green phase.*

[f]*Continuous right turn except when signal control is actuated by a pedestrian.*

Source: SEWRPC.

Map 119

DETAIL OF THE PROBLEM SEGMENT OF W. LISBON AVENUE—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" which were identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Lisbon Avenue from N. 60th Street to W. Walnut Street, a distance of 2.5 miles. This map also shows the location and jurisdiction of each of the 12 traffic signals along this arterial segment, including the relationship of each of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Lisbon Avenue and are directly affected by the traffic timing plans of the traffic signals on W. Lisbon Avenue.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

turn green arrow allowing this movement, in addition to an exclusive red arrow specifically prohibiting this turning movement during all other traffic movements. As the allotment of sufficient time for this exclusive left-turn green arrow would cause other intersection approaches to be congested, the construction of such a double left-turn lane is not recommended.

In addition, the existing offsets between the traffic signal timing plans of the seven signalized intersections along this segment of W. Appleton Avenue should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation systems management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Appleton Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

W. Lisbon Avenue from N. 60th Street to W. Walnut Street: Another of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" which were identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 119, W. Lisbon Avenue from N. 60th Street to W. Walnut Street, a distance of about 2.5 miles.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Lisbon Avenue. With the exception of that segment of W. Lisbon Avenue between N. Sherman Boulevard and a point west of N. 41st Street, which is channelized, W. Lisbon Avenue between N. 60th Street and N. 41st Street is not median divided, and has a curb-to-curb width of between 50 and 54 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. The curb-to-curb widths of the dual roadways at N. 42nd Street and N. 41st Street are 36 feet and 28 feet, adequate to provide three and two lanes, respectively, for moving traffic with parking prohibited. With the exception of the channelized intersections of N. 40th Street and N. 39th Street, W. Lisbon Avenue is not median divided between N. 41st Street and N. 39th Street and has a curb-to-curb width of 62 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. The widths of the dual roadways at the intersections of N. 40th Street and N. 39th Street are 28 and 24 feet, respectively, adequate to provide two lanes for moving traffic in each direction with parking prohibited. With the exception of the channelized intersections of N. 37th Street and N. 36th Street, W. Lisbon Avenue between N. 39th Street and N. 30th Street also is not median divided and has a curb-to-curb width of between 50 and 51 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. The curb-to-curb widths of the dual roadways at the intersections of N. 37th Street and N. 36th Street are each 23 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Between N. 30th Street and W. Walnut Street, this segment of W. Lisbon Avenue is divided by a median ranging in width from 4 to 26 feet, and the curb-to-curb widths of the dual roadways are 36 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted along most of this segment of W. Lisbon Avenue, with parking being prohibited only between W. Wright Street and N. 53rd Street, between W. Meinecke Street and N. 50th Street, and between W. North Avenue and N. 47th Street.

As shown in Table 86, this problem segment of W. Lisbon Avenue has 12 signalized intersections, at which the W. Lisbon Avenue approaches range in width from 21 to 36 feet. Two of the southeast-bound and two of the northwest-bound approaches to these 12 intersections provide separate lanes for the exclusive use of left-turning vehicles, and two of the southeast-bound and one of the northwest-bound approaches provide separate lanes for the exclusive use of right-turning vehicles. The exclusive right-turn lane at the intersection of W. Lisbon Avenue and N. Sherman Boulevard is provided by regulatory pavement marking rather than by channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. Lisbon Avenue are also indicated in Table 86.

Traffic Control Measures: The timing plans for each of the 12 traffic signals along W. Lisbon Avenue between N. 60th Street and W. Walnut Street are shown in Table 87. Map 119 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Lisbon Avenue and are directly affected by the timing plans of the traffic signals on W. Lisbon Avenue. Eight of the traffic signals are located at the

Table 86

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE

Intersection	Roadway Approach Width (feet)															
	Southeast-bound		Northwest-bound		Northbound		Southbound		Eastbound		Westbound		W. Appleton Avenue (USH 41) Southeast-bound		W. Appleton Avenue (USH 41) Northwest-bound	
W. Lisbon Avenue, W. Center Street, and N. 60th Street	36	FSAM	21	NSPM	24	NPPM	24	NPAM	26	P	24	NS	--	--	--	--
W. Lisbon Avenue and W. Appleton Avenue (USH 41)	25	NPAM	22	NPPM	--	--	--	--	--	--	--	--	25	FS	N/A	N/A
W. Lisbon Avenue and N. 55th Street	25	NPAM	25	NSPM	22 L[a]	NP	22 L[a]	NP	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. 51st Street	25	NPAM	25	NPPM	19	P	18	NS	--	--	--	--	--	--	--	--
W. Lisbon Avenue and W. North Avenue	24	NP	27	NP	--	--	--	--	22	NP	22	NP	--	--	--	--
W. Lisbon Avenue and N. 46th Street	25	FS	25	NPPM	48[b] L[a]	NP	N/A	N/A	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. Sherman Boulevard	25	NPAM	34 MR[a]	NS	34 MR[a]	NS	28 ML	NPAM	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. 40th Street	32 R	NP	28	P	26 ML[a]	P	37[b] L[a]	NP	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. 35th Street	25	P	25	P	21	NPPM	25	NPAM	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. 33rd Street	25	P	25	P	18	FS	15	P	--	--	--	--	--	--	--	--
W. Lisbon Avenue and N. 27th Street	36 MLR	P	36 ML	P	22 ML	NS	25	NSPM	--	--	--	--	--	--	--	--
W. Lisbon Avenue and W. Walnut Street	36 ML	P	36 ML	P	18	P	17	P	--	--	--	--	--	--	--	--

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.
N/A = data not available.

[a] *Exclusive turn lane included as part of roadway width.*

[b] *One-way street northbound.*

Source: SEWRPC.

intersections of W. Lisbon Avenue with other arterial streets, and four are located at the intersection of W. Lisbon Avenue with nonarterial streets—specifically, N. 55th Street, N. 51st Street, N. 33rd Street, and N. 24th Street. Stop signs are located at all other approaches of collector or local street crossings of this segment of W. Lisbon Avenue. This entire segment of W. Lisbon Avenue is posted for a 30-mile-per-hour speed limit.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 12 signalized intersections along the problem segment of W. Lisbon Avenue in Figures 24 and 25. The locations along W. Lisbon Avenue from N. 60th Street to N. 24th Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the 12 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Lisbon Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 88.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Lisbon Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 24 and 25. Five congested traffic movements were found to occur along this segment of W. Lisbon Avenue during the morning peak hour, and seven were found to occur during the evening peak hour. That portion of the problem segment of W. Lisbon Avenue between N. Sherman Boulevard and W. Walnut Street was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to alleviate traffic safety problems which may exist on this segment.

Table 87

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE

Phase	Intersection (time in seconds)		
	W. Lisbon Avenue	W. Center Street	N. 60th Street
Green	29.7	23.4	20.7
Yellow	3.6	3.6	3.6
Red	56.7	63.0	65.7
Total Cycle	90.0	90.0	90.0

Phase	W. Lisbon Avenue				W. Appleton Avenue (USH 41)	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green	35.1	35.1	41.4	41.4	44.1	37.8
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	51.3	45.0	45.0	42.3	48.6
Green Arrow	--	90.0[a]	--	90.0[a]	--	--
Yellow Arrow	--	--	--	--	--	--
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Lisbon Avenue	N. 55th Street		
		Morning	Evening	
			Northbound	Southbound
Green	48.6	30.6	30.6	20.7
Yellow	3.6	3.6	3.6	3.6
Red	37.8	55.8	55.8	65.7
Green Arrow	--	--	7.2[c]	--
Yellow Arrow	--	--	2.7	--
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Lisbon Avenue		N. 51st Street	
	Morning	Evening	Morning	Evening
Green	55.8	60.3	23.4	18.9
Yellow	3.6	3.6	3.6	3.6
Red	30.6	26.1	63.0	67.5
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Lisbon Avenue	W. North Avenue
Green	47.7	21.6
Yellow	4.5	3.6
Red	37.8	64.8
Total Cycle	90.0	90.0

Phase	W. Lisbon Avenue			N. 46th Street	
	Eastbound		Westbound		
	Morning	Evening		Morning	Evening
Green	44.1	38.7	18.9	35.1	40.5
Yellow	3.6	3.6	3.6	3.6	3.6
Red	42.3	47.7	67.5	51.3	45.9
Green Arrow	21.6[d]	16.2[d]	--	--	--
Yellow Arrow	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0

Table 87 (continued)

Phase	Intersection (time in seconds)							
	W. Lisbon Avenue				N. Sherman Boulevard			
	Morning		Evening		Morning		Evening	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound	Northbound	Southbound
Green.	31.5	31.5	31.5	31.5	18.9	47.7	28.8	47.7
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	54.9	54.9	54.9	54.9	67.5	38.7	57.6	38.7
Green Arrow. . .	- -	23.4[e]	- -	13.5[e]	- -	25.2[d]	- -	15.3[d]
Yellow Arrow . .	- -	3.6	- -	3.6	- -	3.6	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	W. Lisbon Avenue				N. 40th Street			
	Morning		Evening		Morning		Evening	
					Northbound	Southbound	Northbound	Southbound
Green.	19.8		36.9		16.8	9.0	29.7	9.0
Yellow	3.6		3.6		3.6	3.6	3.6	3.6
Red.	36.6		49.5		39.6	47.4	56.7	77.4
Green Arrow. . .	- -		- -		16.8[f]	- -	29.7[f]	- -
Yellow Arrow . .	- -		- -		- -	- -	- -	- -
Total Cycle[b]	60.0		90.0		60.0	90.0	60.0	90.0
	W. Lisbon Avenue				N. 35th Street			
					Morning		Evening	
	Morning		Evening		Northbound	Southbound	Northbound	Southbound
Green.	18.6		15.6		30.6	20.4	33.6	23.4
Yellow	3.6		3.6		3.6	3.6	3.6	3.6
Red.	37.8		40.8		25.8	36.0	22.8	33.0
Green Arrow. . .	- -		- -		7.2[c]	- -	7.2[c]	- -
Yellow Arrow . .	- -		- -		3.0	- -	3.0	- -
Total Cycle	60.0		60.0		60.0	60.0	60.0	60.0
	W. Lisbon Avenue				N. 33rd Street			
Green.	34.2				16.2			
Yellow	3.6				3.6			
Red.	22.2				40.2			
Total Cycle	60.0				60.0			
	W. Lisbon Avenue				N. 27th Street			
Green.	19.2				31.2			
Yellow	3.6				3.6			
Red.	37.2				25.2			
Total Cycle	60.0				60.0			
	W. Lisbon Avenue				N. 24th Street			
Green.	34.2				16.2			
Yellow	3.6				3.6			
Red.	22.2				40.2			
Total Cycle[b]	60.0				60.0			

[a] *Continuous right turn except when signal control is actuated by a pedestrian.*

[b] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[c] *Leading left-turn arrow concurrent with through green phase.*

[d] *Lagging left-turn arrow concurrent with through green phase.*

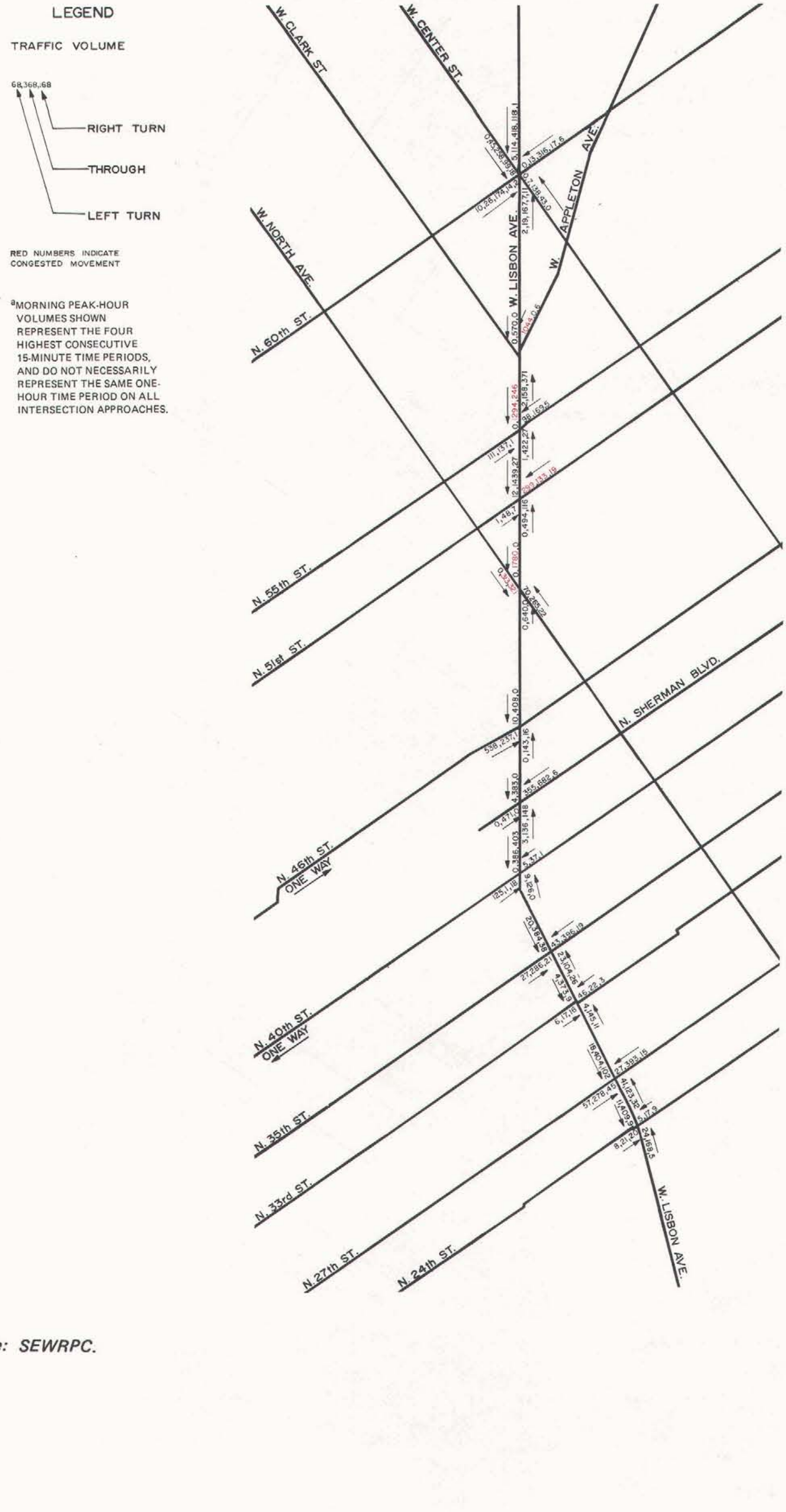
[e] *Leading right-turn arrow.*

[f] *Through green arrow concurrent with through green bulb indication.*

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

Figure 24

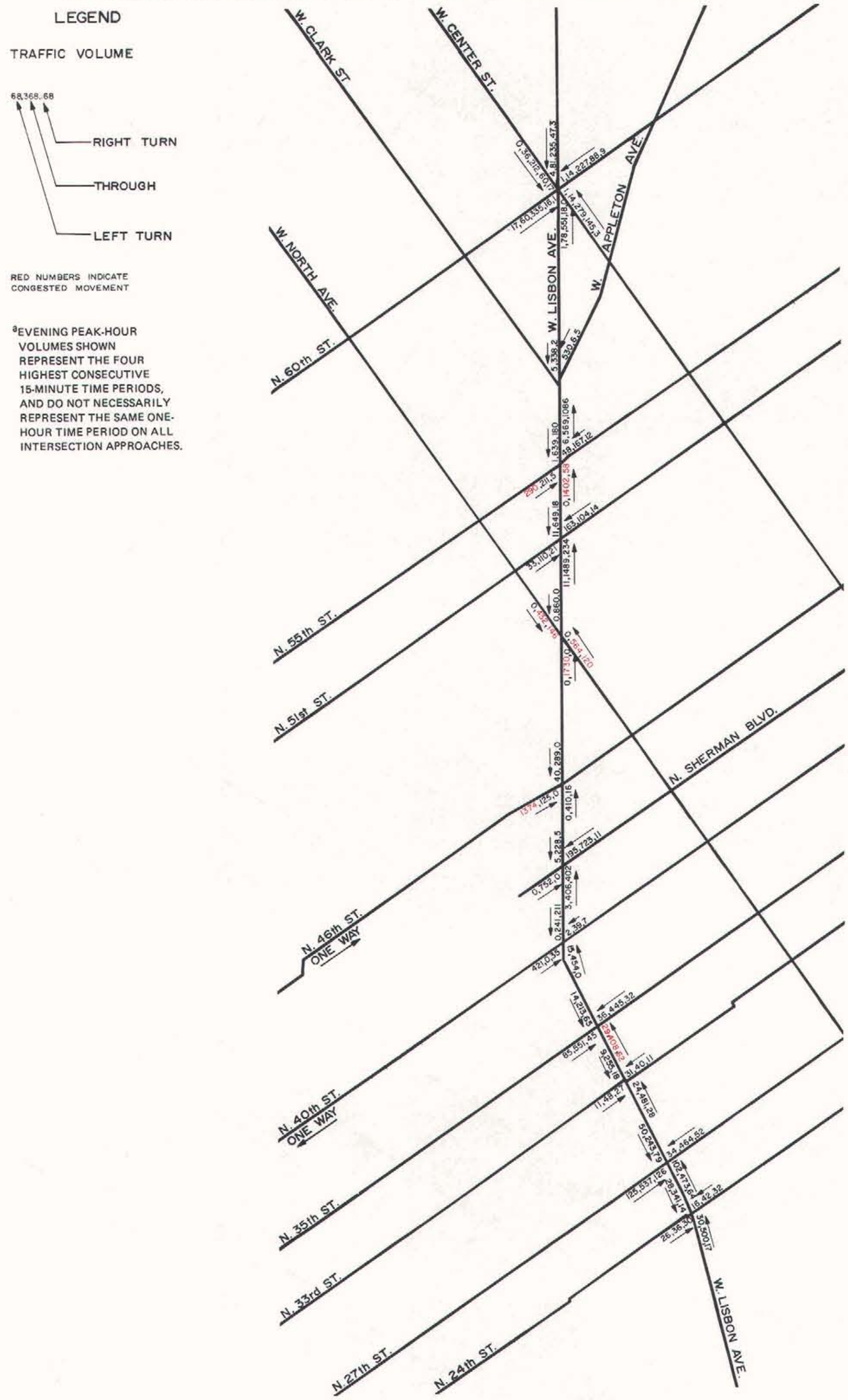
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 25

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 88

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Lisbon Avenue, W. Center Street, and N. 60th Street	Eastbound	4	11	5	5	11	5
	Westbound	- -	4	5	1	3	5
	Southeast-bound	1	18	5	1	23	5
	Northwest-bound	5	10	5	- -	12	5
	Northbound	7	16	5	4	18	5
	Southbound	6	4	5	25	4	5
W. Lisbon Avenue and W. Appleton Avenue (USH 41)	Southeast-bound	- -	- -	1	1	1	4
	Northwest-bound	69	1	7	65	1	1
	Southbound	1	99	2	1	98	1
W. Lisbon Avenue and N. 55th Street	Southeast-bound	16	- -	2	22	- -	2
	Northwest-bound	6	- -	8	4	- -	1
	Northbound	1	44	5	1	57	1
	Southbound	2	36	1	5	19	1
W. Lisbon Avenue and N. 51st Street	Southeast-bound	2	1	5	2	2	5
	Northwest-bound	19	- -	5	13	1	5
	Northbound	17	- -	5	13	20	5
	Southbound	5	66	5	5	58	5
W. Lisbon Avenue and W. North Avenue	Eastbound	51	- -	5	25	- -	5
	Westbound	8	- -	5	18	- -	5
	Northwest-bound	- -	- -	5	- -	- -	5
	Southeast-bound	- -	- -	5	- -	- -	5
W. Lisbon Avenue and N. 46th Street	Southeast-bound	- -	2	5	- -	12	5
	Northwest-bound	10	- -	5	4	- -	5
	Northbound	1	69	5	- -	92	5
W. Lisbon Avenue and N. Sherman Boulevard	Southeast-bound	- -	1	6	2	2	6
	Northwest-bound	52	1	13	49	1	3
	Northbound	- -	- -	4	- -	- -	1
	Southbound	1	34	4	1	21	4
W. Lisbon Avenue and N. 40th Street	Southeast-bound	51	- -	5	47	- -	6
	Northwest-bound	- -	7	13	- -	3	2
	Northbound	13	87	14	8	92	4
	Southbound	2	12	- -	15	4	- -
W. Lisbon Avenue and N. 35th Street	Southeast-bound	9	4	4	20	5	6
	Northwest-bound	17	15	16	12	6	3
	Northbound	6	8	10	7	12	5
	Southbound	4	9	8	6	7	8
W. Lisbon Avenue and N. 33rd Street	Southeast-bound	2	1	3	7	3	5
	Northwest-bound	7	2	16	5	5	3
	Northbound	41	15	- -	31	13	1
	Southbound	4	65	1	13	38	1
W. Lisbon Avenue and N. 27th Street	Southeast-bound	20	3	2	21	14	6
	Northwest-bound	16	21	9	10	16	3
	Northbound	12	15	6	16	16	7
	Southbound	4	6	4	10	6	6
W. Lisbon Avenue and N. 24th Street	Southeast-bound	2	3	3	4	7	5
	Northwest-bound	3	12	7	4	5	3
	Northbound	41	16	2	33	28	- -
	Southbound	29	16	- -	35	18	2

Source: SEWRPC.

Alternative and Recommended Transportation Systems Management Actions: The five morning and seven evening peak-hour traffic congestion problems identified along W. Lisbon Avenue are associated with the following six intersections: W. Appleton Avenue (STH 145), N. 55th Street, N. 51st Street, W. North Avenue, N. 46th Street, and N. 35th Street.

Table 89 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 90 summarizes the changes in traffic signal timing recommended for problem intersections along this segment of W. Lisbon Avenue. A total of five actions are recommended to be implemented at the six problem intersections at a capital cost of approximately $200, in 1980 dollars.[8]

[8] *The costs of short-range improvements to solve the congestion problem at the intersection of W. Lisbon Avenue and W. Appleton Avenue are not included in the total cost of short-range improvements of W. Lisbon Avenue. This is because the improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue. At the intersection of W. Lisbon Avenue and W. Appleton Avenue it was recommended that on-street parking be prohibited on the southbound approach during the morning peak hour, at an estimated capital cost of $200. The costs of short-range improvements at the two intersections not displaying congestion problems along W. Lisbon Avenue—W. Lisbon Avenue at N. Sherman Boulevard and W. Lisbon Avenue at N. 27th Street—are also not included in the costs of short-range improvements of W. Lisbon Avenue. The improvement of these intersections, and the attendant cost, was considered in this chapter in the analysis of the problem segments of N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive and N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue. At the intersection of W. Lisbon Avenue and N. Sherman Boulevard, it was recommended that the storage length of the southbound double left-turn lane be increased at an estimated capital cost of $20,000; and at the intersection of W. Lisbon Avenue and N. 27th Street, it was recommended that the storage length of the northbound left-turn lane be increased at an estimated capital cost of $15,000.*

As indicated in Table 89, the retiming of the existing signal plan is the only action considered necessary to abate the congestion problems at three of the six problem intersections: the intersections of W. Lisbon Avenue with N. 51st Street, N. 46th Street, and N. 35th Street. These actions would require minimal cost.

The prohibition of on-street parking during the evening peak hour and the retiming of the existing signal plan were the only actions considered necessary to abate the congestion problems at the intersection of W. Lisbon Avenue and N. 55th Street. The capital cost of prohibiting on-street parking at this intersection was estimated at $200. The signal retiming necessary at this intersection would require minimal cost.

The other problem intersection along this segment of W. Lisbon Avenue is that of W. Lisbon Avenue and W. North Avenue. This intersection was found to have traffic congestion on the eastbound and southeast-bound approaches during the morning peak hour and on the westbound, eastbound, and northwest-bound approaches during the evening peak hour. All approaches during each peak hour were found to operate at level-of-service E.

Analysis of the segment of W. Lisbon Avenue from approximately W. Appleton Avenue to N. 46th Street indicated that all of the conventional transportation systems management actions have already been implemented by the City of Milwaukee. A to-date unconventional transportation systems management action which was investigated as a low-cost action to abate the traffic congestion problems at the intersection of W. Lisbon Avenue and W. North Avenue, as well as all congested movements along W. Lisbon Avenue between W. Appleton Avenue and N. 46th Street, was the provision of reversible traffic lanes. This action would be implemented along the segment of W. Lisbon Avenue from W. Appleton Avenue to N. 46th Street in a southeast-bound direction during the morning peak period and in a north west-bound direction during the evening peak period.

Under this recommended action, three moving lanes of traffic would operate in the direction of peak flow, with one moving lane of traffic operating in the opposite direction during each peak period. Designation of traffic flow direction in each lane under this action would be accomplished by pavement marking, in addition to the utilization of a minimum of six overhead sign bridges which would display variable message signs and lane con-

Table 89

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. LISBON AVENUE

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Lisbon Avenue and W. Appleton Avenue	Congested left-turn movement on the southbound approach during the morning peak hour (1,044 vehicles per hour at level-of-service D)	<u>Recommended Action</u> Refer to analysis of W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue	Cost not included	Cost not included
W. Lisbon Avenue and N. 55th Street	Congested right-turn and through movements from southeast-bound approach during the morning peak hour and from northwest-bound approach during the evening peak hour (1,540 vehicles per hour at level-of-service D and 1,460 vehicles per hour at level-of-service E), and congested north-to-northwest-bound left-turn during the evening peak hour (290 vehicles per hour at level-of-service E)	<u>Recommended Actions</u> Retime 90-second cycle to increase southeast- and northwest-bound green time from 48.6 to 54.0 seconds during the morning peak hour, and to increase north-to-northwest-12.6 seconds during the evening peak hour, making necessary signal changes at other approaches Prohibit on-street parking on far side of northwest-bound approach during the evening peak hour	- - $ 200	$ 200
W. Lisbon Avenue and N. 51st Street	Congested left-turn, right-turn, and through movements from southbound approach during the morning peak hour (451 vehicles per hour at level-of-service D)	<u>Recommended Action</u> Retime 90-second cycle to increase southbound green time from 23.4 to 28.8 seconds during the morning peak hour, making necessary changes at other approaches	- -	- -
W. Lisbon Avenue and W. North Avenue	Congested right-turn and through movements from eastbound approach and through movement from south-east-bound approach during the morning peak hour (634 and 1,780 vehicles per hour, respectively, at level-of-service E); congested right-turn and through movements from westbound approach and through ment from northwest-bound approach during the evening peak hour (684 and 1,730 vehicles per hour, respectively, at level-of-service E); and congested right-turn and through movements from the eastbound approach during the evening peak hour (578 vehicles per hour at level-of-service D)	<u>Alternative Actions</u> Operate reversible lane on W. Lisbon Avenue from W. Appleton Avenue to N. 46th Street with three lanes southeast-bound during the morning peak hour and northwest-bound during the evening peak hour, and one lane during those respective time periods in the opposing direction The prohibition of left turns from the W. Lisbon Avenue single-lane approaches, the prohibition of all on-street parking, and the retiming of the 90-second-cycle traffic signals along this segment of W. Lisbon Avenue would be an integral part of this recommendation during the morning and evening peak hours, when the reversible lane is in operation Although this action would be expected to abate the traffic congestion at this intersection, it was not recommended for implementation principally because of the safety, breakdown, and turn prohibition problems attendant to the single-lane operation in the nonpeak direction during the peak period. Thus, the congestion problems associated with this intersection were considered unsolvable using traffic management techniques.		

Table 89 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Lisbon Avenue and N. 46th Street	Congested north-to-northwest-bound left-turn movement during the evening peak hour (1,374 vehicles per hour at level-of-service D)	Recommended Action Retime 90-second cycle to increase northbound green time from 40.5 to 43.2 seconds during the evening peak hour, making necessary signal changes at other approaches	--	--
W. Lisbon Avenue and N. 35th Street	Congested left-turn, right-turn, and through movements from westbound approach during the evening peak hour (499 vehicles per hour at level-of-service D)	Recommended Action Retime 60-second cycle to increase east- and westbound green time from 15.6 to 18.6 seconds, making necessary signal changes at other approaches	--	--
Subtotal				$ 200
W. Lisbon Avenue and N. Sherman Boulevard	Insufficient south-to-westbound left-turn-lane storage capacity during the morning peak hour	Recommended Action Refer to analysis of N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive	Cost not included	Cost not included
W. Lisbon Avenue and N. 27th Street	Insufficient north-to-westbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of N. 27th Street from IH 94 to N. Teutonia Avenue	Cost not included	Cost not included
Subtotal				--
Total				$ 200

Source: SEWRPC.

trol signals that would indicate a green signal to vehicles permitted to use the reversible lanes and a red signal to vehicles prohibited from using the reversible lanes. Integral parts of this recommended action would include the prohibition of all left-turn movements from the single lane, the prohibition of all on-street parking along this segment of W. Lisbon Avenue, and the retiming of all traffic signals along W. Lisbon Avenue from W. Appleton Avenue to N. 46th Street to efficiently accommodate reversible lane operation, and to allow for the safe merging of traffic at the terminal points of this recommendation. Although this action would be expected to abate the traffic congestion at the intersection of W. Lisbon Avenue and W. North Avenue, as well as all traffic congestion along W. Lisbon Avenue from W. Appleton Avenue to N. 46th Street, it was not recommended for implementation by the Advisory Committee. The principal reasons for the rejection of this concept by the Advisory Committee were the potential safety, breakdown, and turn prohibition problems attendant to the single-lane operation in the nonpeak direction in the peak period. It was thus concluded that the traffic congestion problems associated with this intersection could not be satisfactorily abated using transportation systems management measures.

In addition, the existing offsets between the traffic signal timing plans of the 12 signalized intersections along this segment of W. Lisbon Avenue should be reviewed by the implementing agency and altered as necessary to accommodate the recommended transportation system management actions and to assure efficient signal progression. Efficient progression is intended to yield increased vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of W. Lisbon Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

W. Center Street from N. 76th Street (STH 181) to W. Lisbon Avenue: Another of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" identified as having sufficiently severe existing traffic problems to warrant investigation of short-

Table 90

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. LISBON AVENUE

Phase	Intersection (time in seconds)		
	W. Lisbon Avenue	W. Center Street	N. 60th Street
Green.	29.7	23.4	20.7
Yellow	3.6	3.6	3.6
Red.	56.7	63.0	65.7
Total Cycle	90.0	90.0	90.0

	W. Lisbon Avenue				W. Appleton Avenue (USH 41)	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green.	35.1	35.1	41.4	41.4	44.1	37.8
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	51.3	51.3	45.0	45.0	42.3	48.6
Green Arrow. . .	- -	90.0[a]	- -	90.0[a]	- -	- -
Yellow Arrow . .	- -	- -	- -	- -	- -	- -
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

	W. Lisbon Avenue		N. 55th Street		
	Morning	Evening	Morning	Evening	
				Northbound	Southbound
Green.	54.0	44.1	25.2	35.1	19.8
Yellow	3.6	3.6	3.6	3.6	3.6
Red.	32.4	42.3	61.2	51.3	66.6
Green Arrow. . .	- -	- -	- -	12.6[c]	- -
Yellow Arrow . .	- -	- -	- -	2.7	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

	W. Lisbon Avenue		N. 51st Street	
	Morning	Evening	Morning	Evening
Green.	49.5	60.3	28.8	18.9
Yellow	3.6	3.6	3.6	3.6
Red.	36.9	26.1	57.6	67.5
Total Cycle	90.0	90.0	90.0	90.0

	W. Lisbon Avenue	W. North Avenue
Green.	47.7	21.6
Yellow	4.5	3.6
Red.	37.8	64.8
Total Cycle	90.0	90.0

	W. Lisbon Avenue				N. 46th Street	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green.	44.1	18.9	36.0	19.8	35.1	43.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	42.3	67.5	50.4	66.6	51.3	43.2
Green Arrow. . .	21.6[d]	- -	10.8[d]	- -	- -	- -
Yellow Arrow . .	- -	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 90 (continued)

Phase	Intersection (time in seconds)							
	W. Lisbon Avenue				N. Sherman Boulevard			
	Morning		Evening		Morning		Evening	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound	Northbound	Southbound
Green.	31.5	31.5	31.5	31.5	18.9	47.7	28.8	47.7
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	54.9	54.9	54.9	54.9	67.5	38.7	57.6	38.7
Green Arrow. . .	--	23.4[e]	--	13.5[e]	--	25.2[d]	--	15.3[d]
Yellow Arrow . .	--	3.6	--	3.6	--	3.6	--	3.6
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Lisbon Avenue		N. 40th Street			
	Morning	Evening	Morning		Evening	
			Northbound	Southbound	Northbound	Southbound
Green.	19.8	36.9	16.8	9.0	29.7	9.0
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	36.6	49.5	39.6	47.4	56.7	77.4
Green Arrow. . .	--	--	16.8[f]	--	29.7[f]	--
Yellow Arrow . .	--	--	--	--	--	--
Total Cycle[b]	60.0	90.0	60.0	60.0	90.0	90.0

Phase	W. Lisbon Avenue	N. 35th Street	
		Northbound	Southbound
Green.	18.6	30.6	20.4
Yellow	3.6	3.6	3.6
Red	37.8	25.8	36.0
Green Arrow. . .	--	7.2[c]	--
Yellow Arrow . .	--	3.0	--
Total Cycle	60.0	60.0	60.0

Phase	W. Lisbon Avenue	N. 33rd Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle	60.0	60.0

Phase	W. Lisbon Avenue	N. 27th Street
Green.	19.2	31.2
Yellow	3.6	3.6
Red	37.2	25.2
Total Cycle	60.0	60.0

Phase	W. Lisbon Avenue	N. 24th Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle[b]	60.0	60.0

[a] *Continuous right turn except when signal control is actuated by a pedestrian.*

[b] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[c] *Leading left-turn arrow concurrent with through green phase.*

[d] *Lagging green left-turn arrow concurrent with through green phase.*

[e] *Leading right-turn arrow.*

[f] *Through green arrow concurrent with through green bulb indication.*

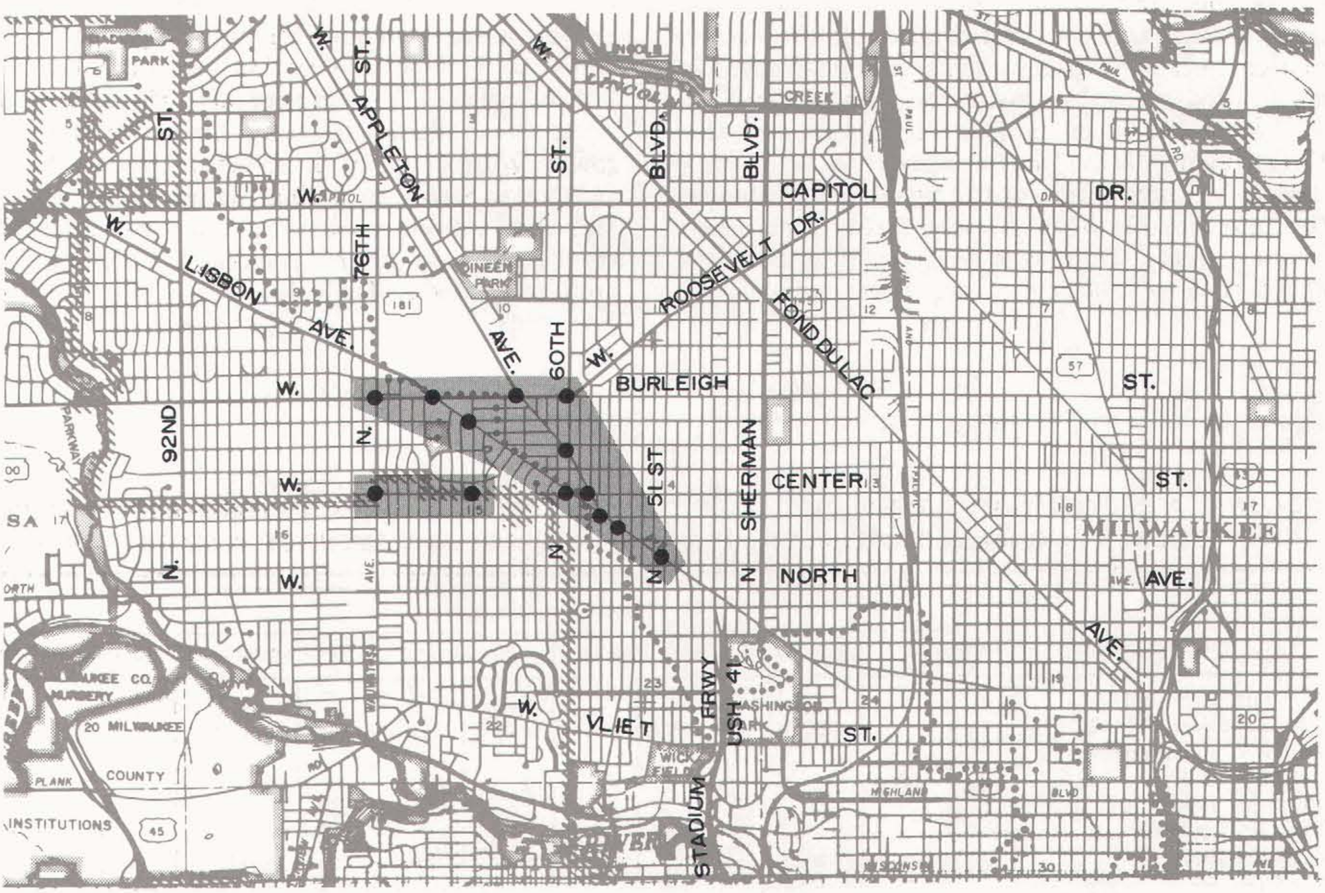
Source: SEWRPC.

range improvements is, as shown on Map 120, W. Center Street from N. 76th Street (STH 181) to its intersection with W. Lisbon Avenue, a distance of 1.0 mile.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Center Street. Other than the intersection of W. Center Street with W. Lisbon Avenue and N. 60th Street, which is channelized with a four-foot-wide median, this segment of W. Center Street is not median divided and has a curb-to-curb width of between 50 and 52 feet, adequate to provide four lanes for moving traffic in each direction with parking prohibited. The widths of the dual roadways at the intersection of W. Center Street with W. Lisbon Avenue and N. 60th Street are 24 and 26 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along this entire segment of W. Center Street.

Map 120

DETAIL OF THE PROBLEM SEGMENT OF W. CENTER STREET— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



LEGEND

SIGNAL JURISDICTION

● CITY OF MILWAUKEE

▭ SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON W. CENTER STREET INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR

GRAPHIC SCALE

0 ½ 1 MILE

0 2000 4000 6000 FEET

Shown on this map is another of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Center Street from N. 76th Street (STH 181), to its intersection with W. Lisbon Avenue, a distance of 1.0 mile. This map also shows the location and jurisdiction of each of the three traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Center Street and are directly affected by the timing plans of the traffic signals on W. Center Street.

Source: Milwaukee County, City of Milwaukee, and SEWRPC.

As shown in Table 91, the problem segment of W. Center Street has three signalized intersections, at which the W. Center Street approaches range in width from 24 to 26 feet. None of these signalized intersections provide separate lanes for the exclusive use of left-turning or right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. Center Street are also indicated in Table 91.

Traffic Control Measures: The timing plans for each of the three traffic signals along W. Center Street between N. 76th Street (STH 181) and W. Lisbon Avenue are shown in Table 92. Map 120 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Center Street and are directly affected by the timing plans of the traffic signals on W. Center Street. All three of the traffic signals are located at the intersections of W. Center Street with other arterial streets. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Center Street. This entire segment of W. Center Street is posted for a 30-mile-per-hour speed limit.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the three signalized intersections along the problem segment of W. Center Street in Figures 26 and 27. The locations along W. Center Street from N. 76th Street (STH 181) to W. Lisbon Avenue where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the three controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Center Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 93.

Table 91

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. CENTER STREET

Intersection	Roadway Approach Width (feet)											
	Eastbound		Westbound		Northbound		Southbound		Northwest-bound		Southeast-bound	
W. Center Street and N. 76th Street (STH 181)	25	P	25	P	32 ML	P	34 ML	FS	--	--	--	--
W. Center Street and N. 68th Street	25	FSAM	25	P	16	NS	20	NS	--	--	--	--
W. Center Street, W. Lisbon Avenue, and N. 60th Street	26	P	24	NS	24	NPPM	24	NPAM	21	NSPM	36	FSAM

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on neat- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

Source: SEWRPC.

Table 92

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. CENTER STREET

Phase	Intersection (time in seconds)		
	W. Center Street	N. 76th Street (STH 181)	
Green. . . . . . . Yellow . . . . . . Red.	25.2 3.6 31.2	25.2 3.6 31.2	
Total Cycle	60.0	60.0	
	W. Center Street	N. 68th Street	
Green. . . . . . . Yellow . . . . . . Red.	25.2 3.6 31.2	25.2 3.6 31.2	
Total Cycle	60.0	60.0	
	W. Center Street	N. 60th Street	W. Lisbon Avenue
Green. . . . . . . Yellow . . . . . . Red.	23.4 3.6 63.0	20.7 3.6 65.7	29.7 3.6 56.7
Total Cycle	90.0	90.0	90.0

Source: City of Milwaukee and SEWRPC.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Center Street, no vehicular traffic movements were found to be currently experiencing traffic congestion during either peak hour—that is, operating at level-of-service D or E.

Alternative and Recommended Transportation Systems Management Actions: Although no traffic congestion problems were found to occur along this segment of W. Center Street, the intersection of W. Center Street and N. 76th Street was found to have signals that could be retimed to more efficiently serve existing traffic volumes. Transportation systems management actions were considered for this intersection.

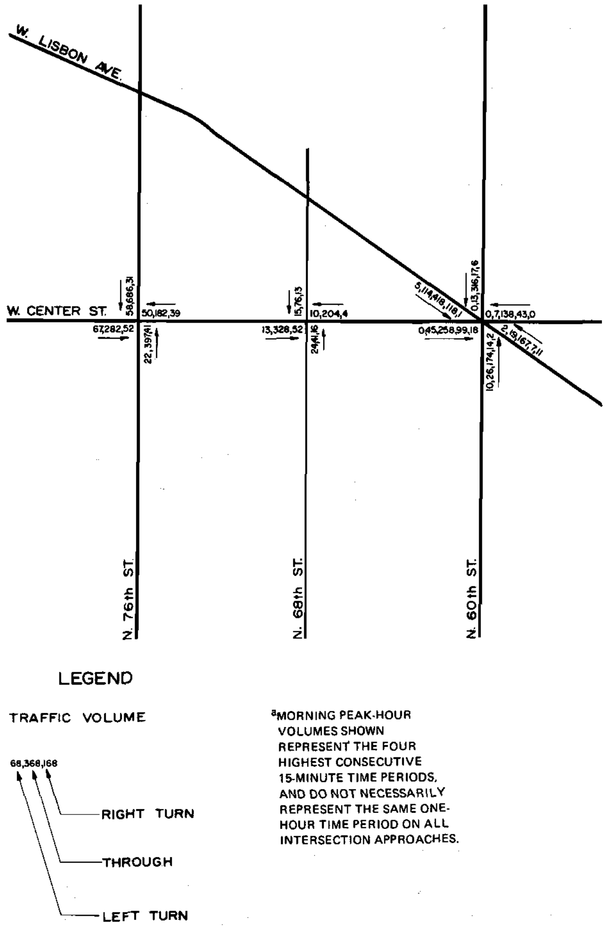
Table 94 sets forth the specific problem found along this segment of W. Center Street, the action recommended for the alleviation of this problem, and the costs associated with this action. The recommended action on this segment of W. Center Street can be implemented at minimal cost.[9] Table 95 summarizes the changes in signal timing recommended for the three intersections along this segment of W. Center Street.

In addition, the existing offsets between the traffic signal timing plans of the three signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic manage-

[9] *Consideration of the costs of short-range improvement of W. Center Street does not include the cost of the improvements recommended at the intersection of W. Center Street and N. 76th Street. The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of N. 76th Street from W. Harwood Avenue to W. Bradley Road. At the intersection of W. Center Street and N. 76th Street, only the retiming of the existing signal timing plan is required to improve operating conditions, at minimal cost.*

Figure 26

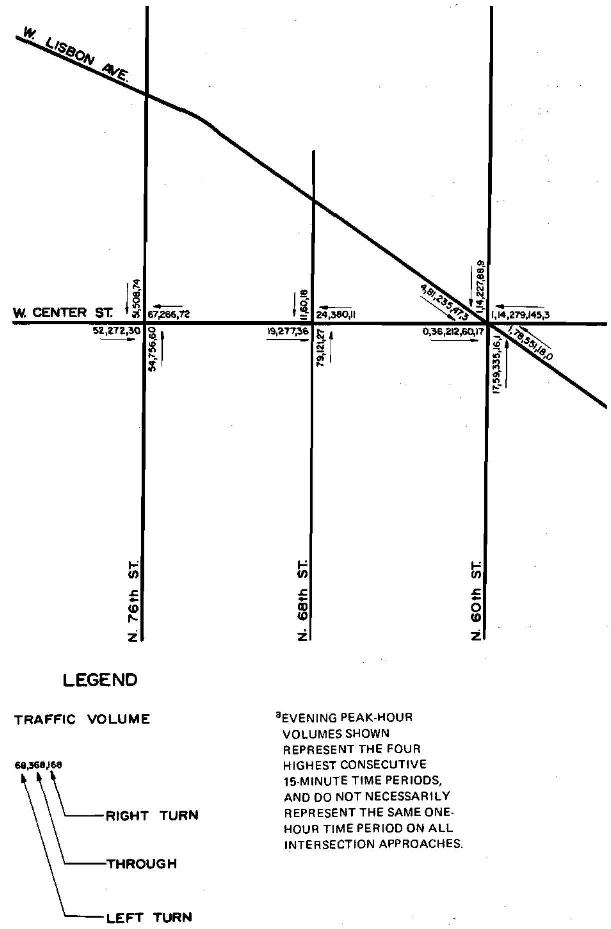
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. CENTER STREET DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 27

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. CENTER STREET DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

ment action at the one problem intersection and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Center Street by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

N. 60th Street from W. Center Street to W. Capitol Drive: Another of the four arterial street segments proceeding from the terminus of the Stadium Freeway-North (USH 41) "stub end" identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 121, N. 60th Street from W. Center Street to its intersection with W. Capitol Drive (STH 190), a distance of 1.5 miles.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 60th Street. Between W. Center Street and W. Appleton Avenue (USH 41), the roadway is not median divided and has a curb-to-curb width that ranges from 40 to 57 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Between W. Appleton Avenue (USH 41) and W. Locust Street this segment of N. 60th Street is divided by a four-foot-wide median, and the curb-to-curb pavements widths of the dual roadways

Table 93

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. CENTER STREET

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Center Street and N. 76th Street (STH 181)	Eastbound	13	17	3	8	15	3
	Westbound	14	19	3	18	16	3
	Northbound	9	5	3	7	6	3
	Southbound	4	7	3	12	8	3
W. Center Street and N. 68th Street	Eastbound	13	3	2	11	6	3
	Westbound	2	5	5	2	6	1
	Northbound	20	30	- -	12	35	1
	Southbound	13	14	2	20	12	3
W. Center Street, W. Lisbon Avenue, and N. 60th Street	Eastbound	4	11	5	5	11	5
	Westbound	- -	4	5	1	3	5
	Northbound	7	16	5	4	18	5
	Southbound	6	4	5	25	4	5
	Northwest-bound	5	10	5	- -	12	5
	Southeast-bound	1	18	5	1	23	5

Source: SEWRPC.

Table 94

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTION TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. CENTER STREET

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
W. Center Street and N. 76th Street	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Refer to analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road	Cost not included	Cost not included
Total				- -

Source: SEWRPC.

range from 24 to 34 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Between W. Locust Street and W. Burleigh Street, this segment of N. 60th Street is not median divided and has a curb-to-curb width of 40 feet, also adequate to provide two lanes for moving traffic in each direction with parking prohibited. Between W. Burleigh Street and a point north of W. Roosevelt Drive, this segment of N. 60th Street is divided by an eight-foot-wide median, and the widths of the dual roadways are 32 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. With the exception of the intersection of N. 60th Street and W. Capitol Drive (STH 190), which is channelized, this segment of N. 60th Street between a point north of W. Roosevelt Drive and W. Capitol Drive is divided by an eight-foot-wide painted

Table 95

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. CENTER STREET

Phase	Intersection (time in seconds)		
	W. Center Street	N. 76th Street (STH 181)	
Green	36.9	42.3	
Yellow	3.6	3.6	
Red	49.5	44.1	
Total Cycle	90.0	90.0	
	W. Center Street	N. 68th Street	
Green	25.2	25.2	
Yellow	3.6	3.6	
Red	31.2	31.2	
Total Cycle	60.0	60.0	
	W. Center Street	N. 60th Street	W. Lisbon Avenue
Green	23.4	20.7	29.7
Yellow	3.6	3.6	3.6
Red	63.0	65.7	56.7
Total Cycle	90.0	90.0	90.0

Source: SEWRPC.

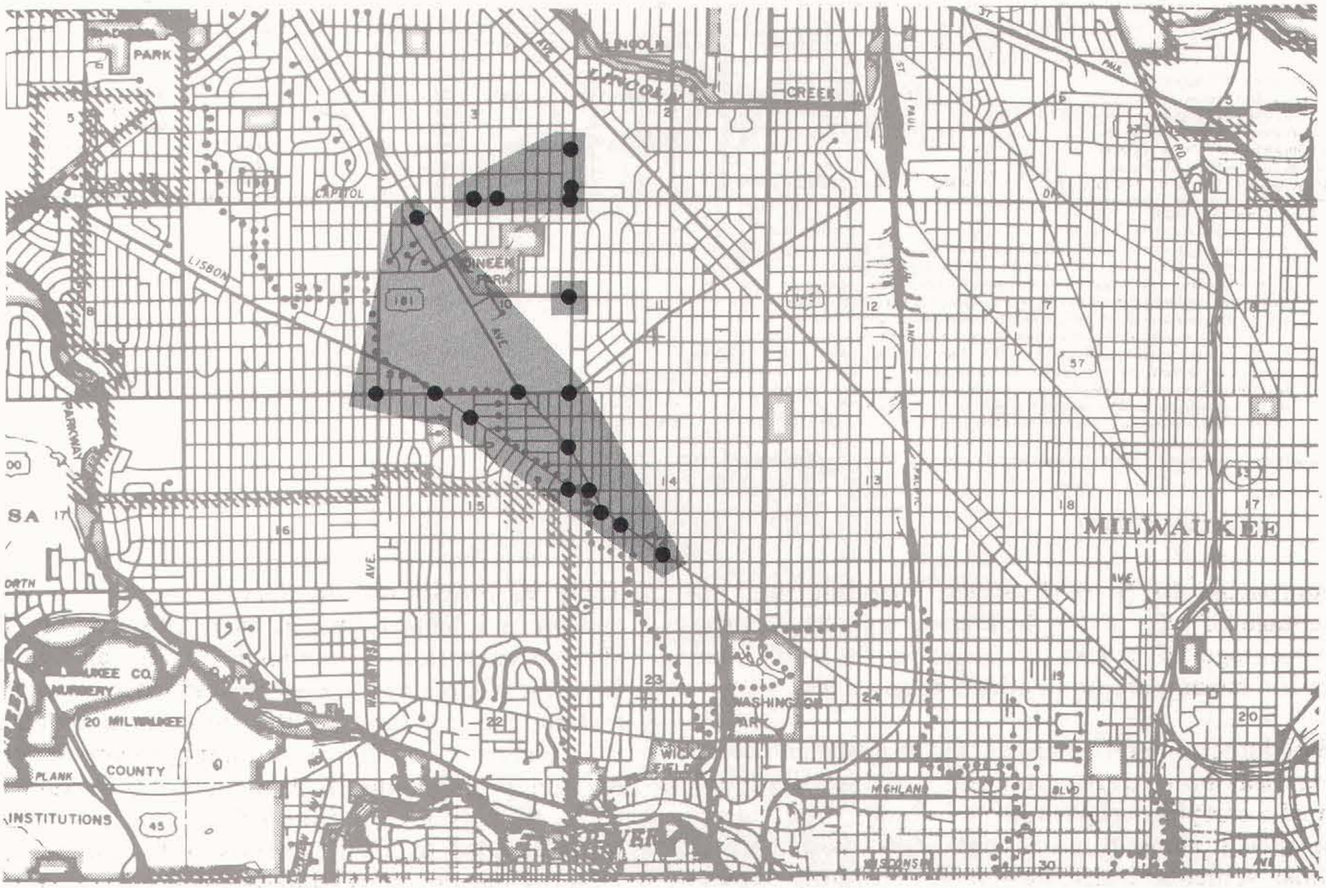
median, and the curb-to-curb widths of the dual roadways are 32 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. The curb-to-curb widths of the dual roadways at the intersection of N. 60th Street and W. Capitol Drive are 33 and 43 feet, also adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted on most of this segment of N. 60th Street, with parking being prohibited only on those segments of N. 60th Street between W. Appleton Avenue (USH 41) and W. Locust Street and between W. Roosevelt Drive and W. Philip Place.

As shown in Table 96, the problem segment of N. 60th Street has six signalized intersections, at which the N. 60th Street approaches range in width from 20 to 33 feet. Two of the northbound and three of the southbound approaches to these six intersections provide separate lanes for the exclusive use of left-turning vehicles, and three of the southbound approaches provide a separate lane for the exclusive use of right-turning vehicles. In each case, these exclusive right-turn lanes are provided by regulatory pavement marking rather than by channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of N. 60th Street are also indicated in Table 96.

Traffic Control Measures: The timing plan for each of the six traffic signals along N. 60th Street between W. Center Street and W. Capitol Drive (STH 190) is shown in Table 97. Map 121 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 60th Street and are affected by the timing plans of the traffic signals on N. 60th Street. Five of the traffic signals are located at the intersections of N. 60th Street with other arterial streets, and one is located at the intersection of N. 60th Street with a nonarterial street, W. Keefe Avenue. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. 60th Street. This entire segment of N. 60th Street is posted for a 30-mile-per-hour speed limit.

Map 121

DETAIL OF THE PROBLEM SEGMENT OF N. 60TH STREET— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

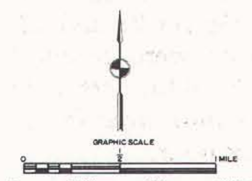


LEGEND

SIGNAL JURISDICTION

● CITY OF MILWAUKEE

SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON N 60TH STREET INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR



Shown on this map is another of the four arterial street segments proceeding from the terminus of the Stadium Freeway—North (USH 41) "stub end" identified as having sufficiently severe existing problems to warrant investigation of short-range improvements—N. 60th Street from W. Center Street to its intersection with W. Capitol Drive (STH 190), a distance of 1.5 miles. This map also shows the location and jurisdiction of each of the five traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 60th Street and are directly affected by the timing plans of the traffic signals on N. 60th Street.

Source: City of Milwaukee and SEWRPC.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the six signalized intersections along the problem segment of N. 60th Street in Figures 28 and 29. The locations along N. 60th Street from W. Center Street to W. Capitol Drive where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the six controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection

Table 96

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 60TH STREET

Intersection	Roadway Approach Width (feet)													
	Eastbound		Westbound		Southeast-bound		Northwest-bound		Northbound		Southbound		Southwest-bound	
N. 60th Street, W. Center Street, and W. Lisbon Avenue	26	P	24	NS	36	FSAM	21	NSPM	24	NPPM	24	NPAM	--	--
N. 60th Street and W. Appleton Avenue (USH 41)	--	--	--	--	25	P	25	P	24	NPPM	24	NPAM	--	--
N. 60th Street and W. Burleigh Street	23 ML	NP	32 M	NP	--	--	--	--	20 M	NP	32 MLR[a]	NPAM	--	--
N. 60th Street and W. Roosevelt Drive	--	--	--	--	--	--	20	NP	33 M	NP	21 MR[a]	NP	28 M	FS
N. 60th Street and W. Keefe Avenue	20	P	18	P	--	--	--	--	32 L	P	32 L	P	--	--
N. 60th Street and W. Capitol Drive (STH 190)	34 ML	NPAM	34 ML	NPPM	--	--	--	--	33 ML	P	32 MLR[a]	FS	--	--

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a] *Exclusive turn lane included as a part of roadway approach width and delineated with pavement markings.*

Source: SEWRPC.

approaches to N. 60th Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 98.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 60th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 28 and 29. Two congested traffic movements were found to occur along this segment of N. 60th Street during the morning peak hour, and four were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The two morning and four evening peak-hour traffic congestion problems identified along N. 60th Street are associated with the following three intersections: W. Appleton Avenue (USH 41), W. Roosevelt Drive, and W. Capitol Drive (STH 190).

One intersection along N. 60th Street—W. Burleigh Street—while not having a congestion problem, was found to have a signal timing plan that could be retimed to more efficiently serve existing traffic volumes. Transportation systems management actions were accordingly also considered for this intersection.

Table 99 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 100 summarizes all of the changes in traffic signal timing recommended for the problem intersections along this segment of N. 60th Street. A total of six new actions are recommended to be implemented at the three intersections having congestion problems at a capital cost of approximately $32,200, in 1980 dollars.[10]

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[10] *Consideration of the costs of short-range improvements of N. 60th Street does not include the cost of the improvements recommended at the intersection of N. 60th Street and W. Appleton Avenue (USH 41). The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue. At the intersection of W. Appleton Avenue and N. 60th Street, the prohibition of on-street parking in addition to the retiming of the existing traffic signal plan, plus the addition of a new traffic controller, is required to abate congestion, at a capital cost of $12,400; and the reconstruction of an existing left-turn lane is recommended at a capital cost of $30,000. One congested vehicular movement, the south-to-southeast-bound left-turn movement, cannot be abated at this intersection.*

Table 97

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 60TH STREET

Phase	Intersection (time in seconds)		
	N. 60th Street	W. Center Street	W. Lisbon Avenue
Green	20.7	23.4	29.7
Yellow	3.6	3.6	3.6
Red	65.7	63.0	56.7
Total Cycle	90.0	90.0	90.0

Phase	N. 60th Street		W. Appleton Avenue (USH 41)
	Northbound	Southbound	
Green	29.7	40.5	37.8
Yellow	4.5	4.5	3.6
Red	55.8	45.0	48.6
Green Arrow	--	8.1[a]	--
Yellow Arrow	--	2.7	--
Total Cycle	90.0	90.0	90.0

Phase	N. 60th Street				W. Burleigh Street			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green	27.0	37.8	27.0	41.4	41.4	24.3	37.8	24.3
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	59.4	48.6	59.4	45.0	45.0	62.1	48.6	62.1
Green Arrow	10.8[b]	--	14.4[b]	--	14.4[a]	--	10.8[a]	--
Yellow Arrow	--	--	--	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 60th Street			W. Roosevelt Drive		
	Northbound		Southbound	Southwest-bound		Northwest-bound W. Burleigh Street Bypass
	Morning	Evening		Morning	Evening	
Green	44.1	40.5	18.0	12.6	16.2	20.7
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	42.3	45.9	68.4	73.8	70.2	65.7
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 60th Street	W. Keefe Avenue
Green	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle[c]	60.0	60.0

Phase	N. 60th Street	W. Capitol Drive (STH 190)
		Westbound
		Evening
Green	17.1	35.1
Yellow	3.6	3.6
Red	69.3	51.3
Green Arrow	7.2[d]	18.0[e]
Yellow Arrow	3.6	3.6
Total Cycle[c]	90.0	90.0

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Leading right-turn arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

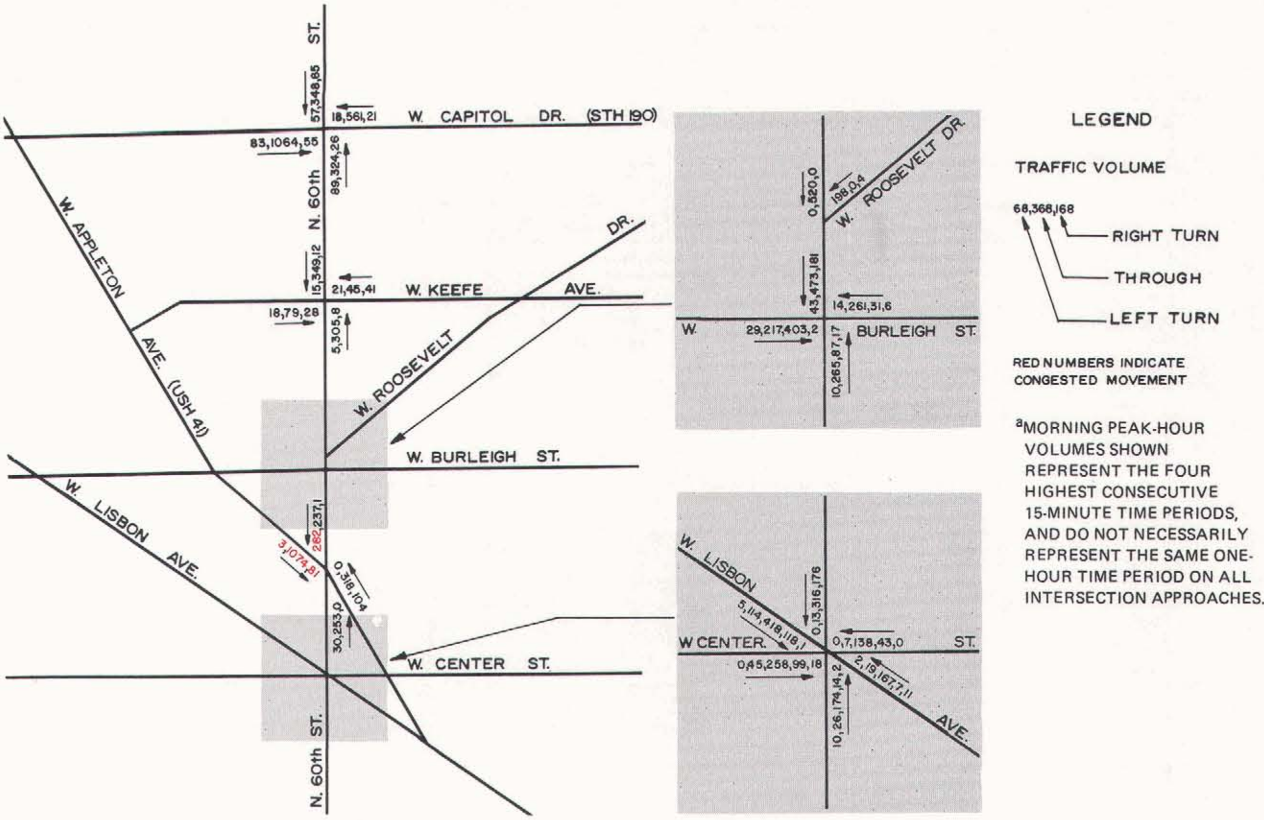
[d]*Lagging left-turn arrow.*

[e]*Leading left-turn arrow.*

Source: City of Milwaukee and SEWRPC.

Figure 28

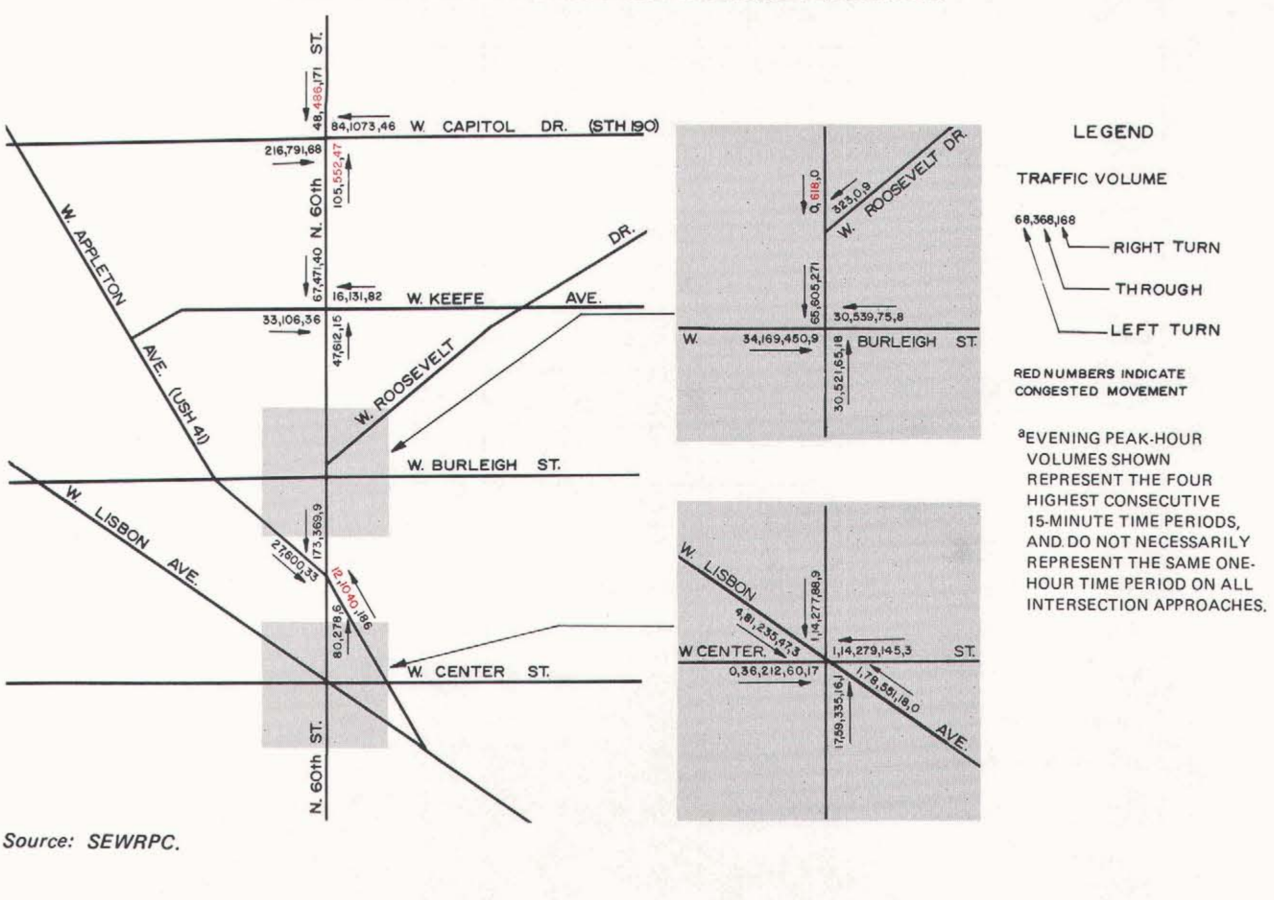
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 60TH STREET DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 29

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 60TH STREET DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 98

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 60TH STREET

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 60th Street, W. Center Street, and W. Lisbon Avenue	Eastbound	4	11	5	5	11	5
	Westbound	- -	4	5	1	3	5
	Northbound	7	16	5	4	18	5
	Southbound	6	4	5	25	4	5
	Southeast-bound	1	18	5	1	23	5
	Northwest-bound	5	10	5	- -	12	5
N. 60th Street and W. Appleton Avenue (USH 41)	Southeast-bound	7	- -	2	5	4	5
	Northwest-bound	25	- -	6	15	2	5
	Northbound	- -	11	2	2	22	5
	Southbound	- -	54	3	2	30	5
N. 60th Street and W. Burleigh Street	Eastbound	1	38	3	1	36	4
	Westbound	12	4	7	13	4	3
	Northbound	27	3	2	13	5	1
	Southbound	26	6	4	29	7	2
N. 60th Street and W. Roosevelt Drive	Southwest-bound	2	98	2	3	97	2
	Northwest-bound	- -	- -	5	- -	- -	5
	Northbound	- -	- -	2	- -	- -	2
	Southbound	- -	- -	4	- -	- -	2
N. 60th Street and W. Keefe Avenue	Eastbound	23	14	9	20	19	4
	Westbound	38	20	7	36	7	3
	Northbound	2	2	3	2	7	1
	Southbound	3	4	4	7	12	1
N. 60th Street and W. Capitol Drive (STH 190)	Eastbound	4	7	4	6	20	4
	Westbound	3	3	6	4	7	2
	Northbound	6	20	3	7	15	2
	Southbound	14	12	5	24	7	4

Source: SEWRPC.

An additional two actions are recommended to be implemented at the intersection not displaying congestion problems, at an estimated cost of $14,000.

As indicated in Table 99, two intersections which exhibited congestion problems require the addition of some turn-lane capacity. One of the intersections, that of N. 60th Street and W. Roosevelt Drive, requires an increase in the prohibition of on-street parking in order to lengthen the storage capacity for left and right turns from the southwest-bound approach, at an estimated cost of $200. Also at this intersection, the retiming of the existing signal timing plan is required in order to abate existing congestion, at minimal cost. The total cost of improvements recommended for this intersection is thus estimated at $200. At the intersection of N. 60th Street and W. Capitol Drive, the reconstruction of an existing single left-turn lane to provide for a double left-turn lane is necessary in order to provide sufficient storage capacity on the eastbound approach, at an estimated capital cost of $15,000. Also required at this intersection is the changing of the existing signal timing plan on N. 60th Street from pretimed operation to traffic-actuated operation, at an estimated cost of $15,000 and the addition of a separate red left-turn phase for pedestrian crossing safety at an estimated cost of $2,000. The total cost of recommended improvements at this intersection is thus estimated at $32,000.

Table 99

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. 60TH STREET

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 60th Street and W. Appleton Avenue	Congested left-turn, right-turn, and through movements from southeast-bound approach during the morning peak hour (1,158 vehicles per hour at level-of-service E) and congested left-turn and through movements from northwest-bound approach during the evening peak hour (1,052 vehicles per hour at level-of-service E) Insufficient south-to-southeast-bound left-turn-lane storage capacity during the morning and evening peak hours Congested south-to-southeast-bound left turn during the morning peak hour (282 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue	Cost not included	Cost not included
N. 60th Street and W. Roosevelt Drive	Congested through movement from southbound approach during the evening peak hour (543 vehicles per hour at level-of-service D) Insufficient storage capacity during the evening peak hour on southwest-bound approach from W. Roosevelt Drive	Recommended Actions Retime 90-second cycle to increase southbound green time from 18.0 to 20.7 seconds, making necessary signal changes at other approaches Increase storage length of southwest-bound approach by lengthening on-street parking restriction from 91 to 150 feet southeast of intersection during the evening peak hour	- - $ 200	$ 200
N. 60th Street and W. Capitol Drive	Congested southbound through and northbound through and right-turn movements during the evening peak hour (486 vehicles per hour southbound at level-of-service D and 599 vehicles per hour northbound at level-of-service E) Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour	Recommended Actions Retime 90-second cycle to increase north- and southbound green time from 17.1 to 20.7 seconds and reduce east-to-northbound left-turn arrow from 14.4 to 7.2 seconds, making necessary signal changes at other approaches Add separate red phase to control east-to-northbound left turn for pedestrian crossing safety Change existing north- and southbound pretimed left-turn arrows to traffic-actuated operation Reconstruct existing east-to-northbound exclusive left-turn lane to provide for a double left-turn lane	- - $ 2,000 $15,000 $15,000	$32,000
Subtotal				$32,200
N. 60th Street and W. Burleigh Street	Inefficient signal timing plan; update to reflect current traffic conditions	Recommended Actions Retime 90-second cycle to remove north-to-northeast-bound, N. 60th Street-to-W. Roosevelt Drive directional green arrow conflict with south-to-eastbound left-turn movements from N. 60th Street to W. Burleigh Street during green through phase, making necessary signal changes at other approaches Add 9.0-second south-to-eastbound leading left-turn green arrow to operate during both the morning and evening peak hours	- - $14,000	$14,000
Subtotal				$14,000
Total				$44,200

Source: SEWRPC.

Table 100

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 60TH STREET

Phase	Intersection (time in seconds)			
	N. 60th Street	W. Center Street	W. Lisbon Avenue	
Green	20.7	23.4	29.7	
Yellow	3.6	3.6	3.6	
Red	65.7	63.0	56.7	
Total Cycle	90.0	90.0	90.0	
	N. 60th Street		W. Appleton Avenue (USH 41)	
	Northbound	Southbound		
Green	23.4	38.7	39.6	
Yellow	4.5	4.5	3.6	
Red	62.1	46.8	46.8	
Green Arrow	--	12.6[a]	--	
Yellow Arrow	--	2.7	--	
Total Cycle	90.0	90.0	90.0	
	N. 60th Street		W. Burleigh Street	
	Northbound	Southbound	Eastbound	Westbound
Green	29.7	42.3	36.9	24.3
Yellow	3.6	3.6	3.6	3.6
Red	56.7	44.1	49.5	62.1
Green Arrow	--	9.0[a]	9.9[a]	--
Yellow Arrow	--	3.6	2.7	--
Total Cycle	90.0	90.0	90.0	90.0
	N. 60th Street		W. Roosevelt Drive	
	Northbound	Southbound	Southwest-bound	Northwest-bound W. Burleigh Street Bypass
Green	42.3	20.7	14.4	20.7
Yellow	3.6	3.6	3.6	3.6
Red	44.1	65.7	72.0	65.7
Total Cycle	90.0	90.0	90.0	90.0
	N. 60th Street		W. Keefe Avenue	
Green	34.2		16.2	
Yellow	3.6		3.6	
Red	22.2		40.2	
Total Cycle[c]	60.0		60.0	
	N. 60th Street		W. Capitol Drive (STH 190)	
	Eastbound	Westbound		
Green	20.7	20.7	38.7	
Yellow	3.6	3.6	3.6	
Red	65.7	65.7	47.7	
Green Arrow	7.2[b]	7.2[b]	7.2[d]	
Yellow Arrow	3.6	3.6	3.6	
Red Indication	35.1	--	--	
Total Cycle[c]	90.0	90.0	90.0	

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Lagging left-turn arrow.*

[c] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d] *Leading left-turn arrow.*

Source: SEWRPC.

As indicated in Table 99 and as already noted, one other intersection, although not exhibiting congestion problems, was found to warrant traffic management actions to improve its operation. This was the intersection of N. 60th Street and W. Burleigh Street. This intersection was found to warrant the addition of separate signal phasing, in addition to a new traffic controller, at an estimated cost of $14,000, in addition to the retiming of the existing signal timing plan at minimal cost.

In addition, the existing offsets between the traffic signal timing plans of the six signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speed and reduced vehicular delay at the signalized intersections along this segment of N. 60th Street by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190)

Another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 122, N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), a distance of 4.0 miles. Map 123 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 35th Street. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 35th Street. Retail sales and service uses, however, abut N. 35th Street at its intersections with W. Wisconsin Avenue, W. State Street, W. Vliet Street, W. Lisbon Avenue, W. North Avenue, W. Center Street, W. Fond du Lac Avenue (STH 145), W. Burleigh Street, and W. Capitol Drive (STH 190). A large segment of industrial land use borders N. 35th Street north of W. Concordia Street. Recreational land use occurs along N. 35th Street south of W. Wisconsin Avenue at Merrill Park, and there is a strip of unused land use along this corridor between W. North Avenue and W. Meinecke Street in the vicinity of the cleared Park Freeway-West corridor.

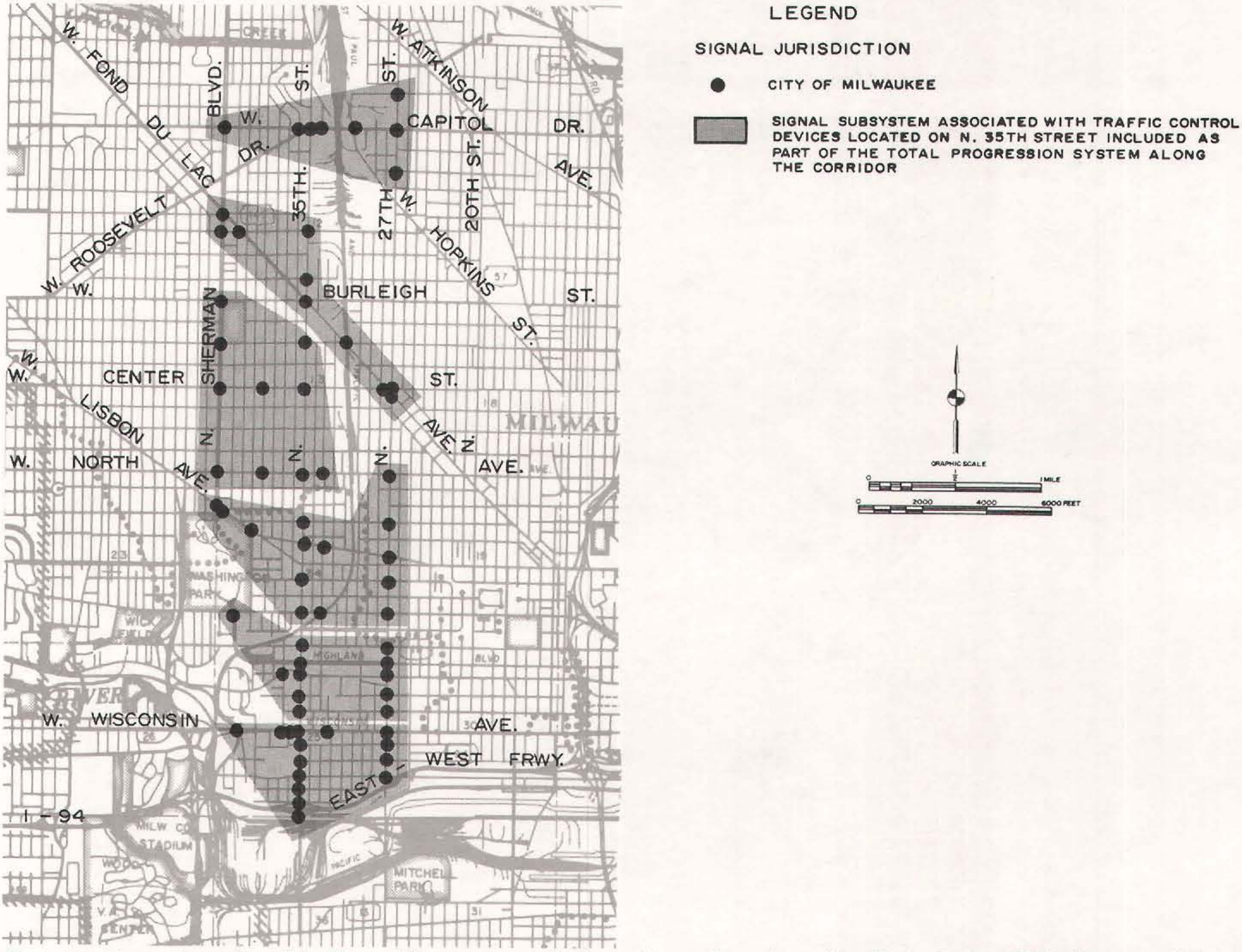
Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 35th Street. Except for the intersection of N. 35th Street with W. Park Hill Avenue, which is channelized, this segment of N. 35th Street is not median divided. Between W. Park Hill Avenue and W. Wisconsin Avenue this segment of N. 35th Street has a curb-to-curb pavement width of 50 to 51 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited; from W. Wisconsin Avenue to W. Juneau Avenue this segment has a curb-to-curb pavement width of 60 to 68 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted; from W. Juneau Avenue to W. Vliet Street this segment has a curb-to-curb pavement width of 49 to 50 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited; from W. Vliet Street to W. Townsend Street this segment has a curb-to-curb pavement width of between 41 and 49 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited; and from W. Townsend Street to W. Capitol Drive (STH 190) this segment has a curb-to-curb pavement width of 57 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along much of this segment of N. 35th Street, with parking being prohibited only between W. Juneau Avenue and W. Vliet Street on the west side of the street; between W. Locust Street and W. Chambers Street on the east side of the street; and between W. Townsend Street and W. Capitol Drive on the east side of the street.

As shown in Table 101, this segment of N. 35th Street has 22 signalized intersections, at which the N. 35th Street approaches range in width from 20 to 36 feet. Four of the northbound and two of the southbound approaches to these 22 signalized intersections provide separate lanes for the exclusive use of left-turning vehicles. Of these, the left-turn lanes on the north- and southbound approaches of N. 35th Street at W. Highland Boulevard and W. Juneau Avenue are provided by regulatory pavement marking rather than by channelization. On-street parking restrictions for each of the signalized intersection approaches along this segment of N. 35th Street are also indicated in Table 101.

Traffic Control Measures: The timing plan for each of the 22 traffic signals along N. 35th Street between the East-West Freeway (IH 94) and W. Capitol Drive (STH 190) is indicated in Table 102. Map 122 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 35th Street and are directly

Map 122

DETAIL OF THE PROBLEM SEGMENT OF N. 35TH STREET— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing traffic problems to warrant investigation of short-range improvements—N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), a distance of 4.0 miles. This map also shows the location and jurisdiction of each of the 22 traffic signals along this arterial segment, including the interconnected progressive signal subsystems which are located within approximately one-half mile of N. 35th Street and are directly affected by the timing plans of the traffic signals on N. 35th Street.

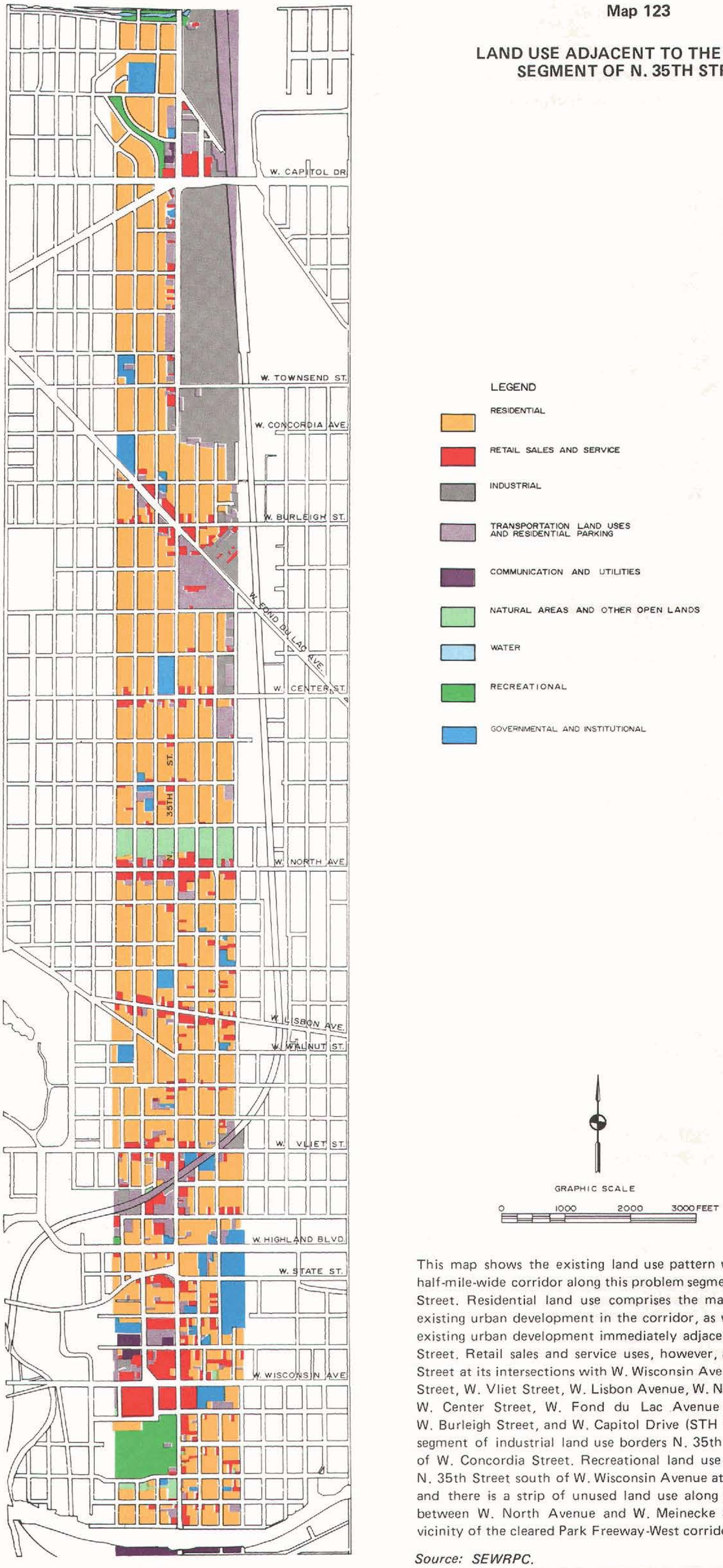
Source: City of Milwaukee and SEWRPC.

affected by the timing plans of the traffic signals on N. 35th Street. Twelve of the traffic signals are located at intersections of N. 35th Street with other arterial streets, and 10 are located at intersections of N. 35th Street with nonarterial streets—specifically, W. Park Hill Avenue, W. Mount Vernon Avenue, W. St. Paul Avenue, W. Michigan Street, W. Kilbourn Avenue, W. Juneau Avenue, W. Galena Street, W. Brown Street, W. Locust Street, and W. Auer Avenue. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. 35th Street. This entire segment of N. 35th Street is posted for a 30-mile-per-hour speed limit.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 22 signalized intersections along the problem segment of N. 35th Street in Figures 30 and 31. The locations along N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190) where traffic man-

Map 123

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. 35TH STREET



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 35th Street. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 35th Street. Retail sales and service uses, however, abut N. 35th Street at its intersections with W. Wisconsin Avenue, W. State Street, W. Vliet Street, W. Lisbon Avenue, W. North Avenue, W. Center Street, W. Fond du Lac Avenue (STH 145), W. Burleigh Street, and W. Capitol Drive (STH 190). A large segment of industrial land use borders N. 35th Street north of W. Concordia Street. Recreational land use occurs along N. 35th Street south of W. Wisconsin Avenue at Merrill Park, and there is a strip of unused land use along this corridor between W. North Avenue and W. Meinecke Street in the vicinity of the cleared Park Freeway-West corridor.

Source: SEWRPC.

Table 101

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 35TH STREET

Intersection	Roadway Approach Width (feet)											
	Eastbound		Westbound		Northbound		Southbound		Southeast-bound		Northwest-bound	
N. 35th Street and W. Park Hill Avenue[a]	--	--	36 LP[d]	NSPM	33 ML	NP	25	NPPM	--	--	--	--
N. 35th Street and W. Mount Vernon Avenue	16	P	17	P	25	NPPM	25	NPPM	--	--	--	--
N. 35th Street and W. St. Paul Avenue	20	P	20	P	25	NPPM	25	NPPM	--	--	--	--
N. 35th Street and W. Clybourn Street	--	--	20	P	25	NP	25	NPPM	--	--	--	--
N. 35th Street and W. Michigan Street	25	P	20	P	25	NP	25	NPPM	--	--	--	--
N. 35th Street and W. Wisconsin Avenue	35 ML	NPAM	34 ML	NSPM	25	NPPM	32	FSPM	--	--	--	--
N. 35th Street and W. Wells Street[b]	31	P	--	--	32	NPPM	32	NSPM	--	--	--	--
N. 35th Street and W. Kilbourn Avenue	16	P	15	NS	30	NPPM	30	NPPM	--	--	--	--
N. 35th Street and W. State Street[c]	33M	NP	31 LR[d]	FS	32	NPPM	27 R	NPPM	--	--	--	--
N. 35th Street and W. Highland Boulevard	34 ML	NPAM	34 ML	NPPM	34 L[d]	NPPM	34 L[d]	NP	--	--	--	--
N. 35th Street and W. Juneau Avenue[c]	20	NP	35	FS	30 L[d]	NPPM	30 L[d]	NP	--	--	--	--
N. 35th Street and W. Vliet Street	25	P	25	P	20 L	NPPM	24	NPAM	--	--	--	--
N. 35th Street and W. Galena Street	20	P	20	P	21	NPPM	21	NPAM	--	--	--	--
N. 35th Street and W. Lisbon Avenue	--	--	--	--	21	NPPM	25	NPAM	25	P	25	P
N. 35th Street and W. Brown Street	15	NPAM	15	NPPM	25	NPPM	25	NPAM	--	--	--	--
N. 35th Street and W. North Avenue	25	P	25	P	25	NPPM	22	NPAM	--	--	--	--
N. 35th Street and W. Center Street	25	P	25	P	22	NPPM	22	NP	--	--	--	--
N. 35th Street and W. Locust Street	17	P	20	FS	22	NPPM	22	NPAM	--	--	--	--
N. 35th Street and W. Burleigh Street/ W. Fond du Lac Avenue (STH 145)	22	NSAM	22	NP	22	FS	22	NPAM	34 M	NPAM	31 M	NS
N. 35th Street and W. Auer Avenue	12	NP	15	P	22	NP	22	P	--	--	--	--
N. 35th Street and W. Townsend Street	15	NP	20	NS	22	NP	28	P	--	--	--	--
N. 35th Street and W. Capitol Drive (STH 190)	36 ML	NP	56 ML	NPPM	36	NS	28	NP	--	--	--	--

NOTE: M = median provided.
L = exclusive left-turn lane provided.
R = exclusive right-turn lane provided (does not include minor right-turn channelizations).
P = parking permitted on near- and far-side approaches during morning and evening peak hours.
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours.
NPAM = parking prohibited on near- and far-side approaches during morning peak hour.
NPPM = parking prohibited on near- and far-side approaches during evening peak hour.
FS = parking prohibited on far-side approach during morning and evening peak hours.
FSAM = parking prohibited on far-side approach during morning peak hour.
FSPM = parking prohibited on far-side approach during evening peak hour.
NS = parking prohibited on near-side approach during morning and evening peak hours.
NSAM = parking prohibited on near-side approach during morning peak hour.
NSPM = parking prohibited on near-side approach during evening peak hour.

[a] *One-way street westbound.*

[b] *One-way street eastbound, east of intersection.*

[c] *One-way street westbound approaching intersection from the east.*

[d] *Exclusive turn-lane width included as a part of roadway approach width.*

Source: SEWRPC.

agement actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the 22 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity for N. 35th Street intersection approaches, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 103.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 35th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 30 and 31. While no congested traffic movements were found to occur along this segment of N. 35th Street during the morning peak hour, six congested movements were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The six evening peak-hour traffic congestion problems identified along N. 35th Street are associated with the following six signalized intersections: W. Michigan Street, W. Wisconsin Avenue, W. Vliet Street, W. Lisbon Avenue, W. Fond du Lac Avenue (STH 145)/ Burleigh Street, and W. Capitol Drive (STH 190).

One intersection along N. 35th Street—the intersection of N. 35th Street and W. State Street—while not displaying congestion problems, was found to lack adequate vehicle storage capacity within an

Table 102

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 35TH STREET

Phase	Intersection (time in seconds)				
	N. 35th Street				W. Park Hill Avenue
	Morning		Evening		
	Northbound	Southbound	Northbound	Southbound	
Green.	59.4	36.9	59.4	45.9	19.8
Yellow	3.6	3.6	3.6	3.6	3.6
Red	27.0	49.5	27.0	40.5	66.6
Green Arrow. . .	7.2[a]/9.9[b]	- -	9.9[b]	- -	- -
Yellow Arrow . .	- -	- -	- -	- -	- -
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Mount Vernon Avenue
Green.	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. St. Paul Avenue
Green.	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. Clybourn Street
Green.	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street		W. Michigan Street
	Northbound	Southbound	
Green.	53.1	38.7	26.1
Yellow	3.6	3.6	3.6
Red	33.3	47.7	60.3
Green Arrow. . .	10.8[a]	- -	- -
Yellow Arrow . .	- -	- -	- -
Total Cycle	90.0	90.0	90.0

Phase	N. 35th Street				W. Wisconsin Avenue	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green.	27.0	41.4	28.8	39.6	37.8	39.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	59.4	45.0	57.6	46.8	48.6	46.8
Green Arrow. . .	- -	10.8[a]	- -	7.2[a]	- -	- -
Yellow Arrow . .	- -	3.6	- -	3.6	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 102 (continued)

Phase	Intersection (time in seconds)					
	N. 35th Street				W. Wells Street	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green.	35.1	48.6	39.6	53.1	30.6	26.1
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	37.8	46.8	33.3	55.8	60.3
Green Arrow. . .	9.9[d]	10.8[a]	5.4[d]	10.8[a]	- -	- -
Yellow Arrow . .	- -	2.7	- -	2.7	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Kilbourn Avenue
Green.	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle	90.0	90.0

Phase	N. 35th Street		W. State Street			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	39.6	35.1	39.6	23.4	44.1	34.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	46.8	51.3	46.8	63.0	42.3	52.2
Green Arrow. . .	- -	- -	13.5[a]	- -	7.2[a]	- -
Yellow Arrow . .	- -	- -	2.7	- -	2.7	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Highland Boulevard
Green.	41.4	26.1
Yellow	3.6	3.6
Red	45.0	60.3
Green Arrow. . .	8.1	- -
Yellow Arrow . .	3.6	- -
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. Juneau Avenue
Green.	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street				W. Vliet Street			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	16.2	25.8	25.8	16.2	24.6	15.0	15.0	24.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	40.2	30.6	30.6	40.2	31.8	41.1	41.4	31.8
Green Arrow. . .	- -	7.2[a]	7.2[a]	- -	7.2[a]	- -	- -	7.2[a]
Yellow Arrow . .	- -	- -	- -	- -	- -	- -	- -	- -
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Table 102 (continued)

Phase	Intersection (time in seconds)					
	N. 35th Street				W. Galena Street	
Green.	34.2				16.2	
Yellow	3.6				3.6	
Red.	22.2				40.2	
Total Cycle	60.0				60.0	
	N. 35th Street				W. Lisbon Avenue	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green.	30.6	20.4	33.6	23.4	18.6	15.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	25.8	36.0	22.8	33.0	37.8	40.8
Green Arrow. . .	7.2[a]	- -	7.2[a]	- -	- -	- -
Yellow Arrow . .	3.0	- -	3.0	- -	- -	- -
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0
	N. 35th Street				W. Brown Street	
Green.	31.2				19.2	
Yellow	3.6				3.6	
Red.	25.2				37.2	
Total Cycle	60.0				60.0	
	N. 35th Street				W. North Avenue	
Green.	25.2				25.2	
Yellow	3.6				3.6	
Red.	31.2				31.2	
Total Cycle	60.0				60.0	
	N. 35th Street				W. Center Street	
Green.	25.2				25.2	
Yellow	3.6				3.6	
Red.	31.2				31.2	
Total Cycle	60.0				60.0	
	N. 35th Street				W. Locust Street	
Green.	28.2				22.2	
Yellow	3.6				3.6	
Red.	28.2				34.2	
Total Cycle	60.0				60.0	
	N. 35th Street				W. Burleigh Street	W. Fond du Lac Avenue (STH 145)
Green.	19.8				24.3	27.9
Yellow	3.6				3.6	3.6
Red.	66.6				62.1	58.5
Total Cycle	90.0				90.0	90.0
	N. 35th Street				W. Auer Avenue	
Green.	57.5				21.5	
Yellow	3.5				3.5	
Red.	29.0				65.0	
Total Cycle	90.0				90.0	

Table 102 (continued)

Phase	Intersection (time in seconds)	
	N. 35th Street	W. Townsend Street
Green.	28.2	22.2
Yellow	3.6	3.6
Red	28.2	34.2
Total Cycle	60.0	60.0
	N. 35th Street	W. Capitol Drive (STH 190)
Green.	21.6	48.6
Yellow	3.6	3.6
Red	64.8	37.8
Green Arrow. . .	--	7.2[e]
Yellow Arrow . .	--	3.6
Total Cycle[c]	90.0	90.0

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Lagging left-turn arrow concurrent with through green phase.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Leading through arrow concurrent with through green phase.*

[e]*Lagging left-turn arrow.*

Source: City of Milwaukee and SEWRPC.

exclusive turn lane. Transportation systems management actions were accordingly also considered for this intersection.

Table 104 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 105 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of N. 35th Street. A total of six new actions are recommended to be implemented at the six intersections having congestion problems at a total capital cost of approximately $56,000, expressed in 1980 dollars.[11]

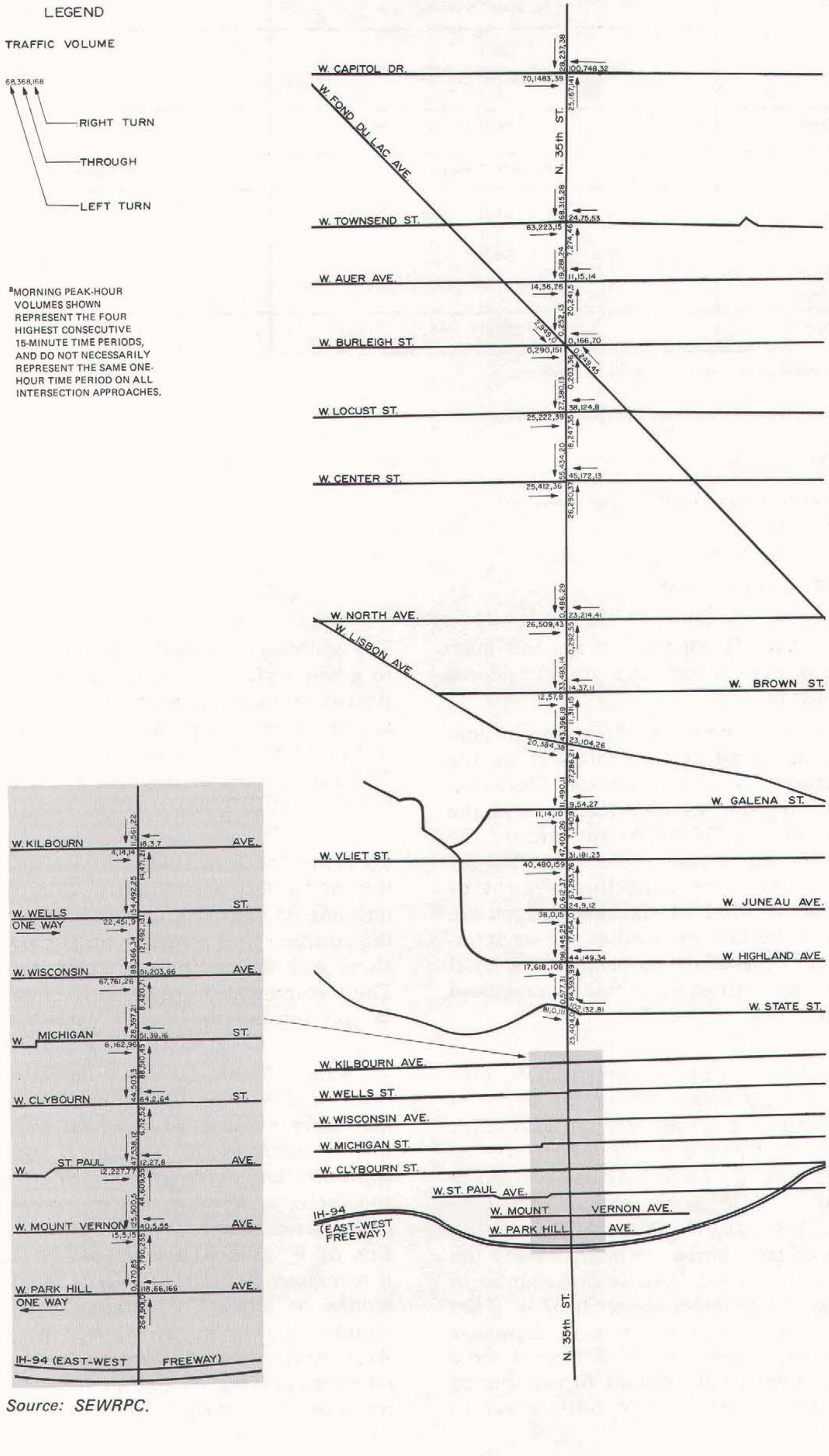
The addition of separate signal phasing, in addition to a new traffic controller, is the only action considered necessary to abate the congestion problems at one of the four problem intersections—the intersection of N. 35th Street and W. Wisconsin Avenue. The capital cost of improving this intersection is estimated at $14,000.

To abate the congestion problems at the intersection of N. 35th Street and W. Michigan Street, the retiming of the existing signal plan, in addition to the addition of a separate signal phase, is required, along with the addition of a new traffic controller. The recommended change in the signal timing plan at this intersection would require minimal cost,

[11] *This cost of short-range improvement of N. 35th Street does not include the cost of the improvements recommended at the intersection of N. 35th Street with W. Vliet Street; at the intersection of N. 35th Street with W. Lisbon Avenue; or at the intersection of N. 35th Street with W. Fond du Lac Avenue (STH 145)/W. Burleigh Street. The improvements of these three intersections and the attendant costs were considered in this chapter in the analyses of the problem segments of W. Vliet Street and Milwaukee Avenue from W. Harwood Avenue to N. 20th Street, of W. Lisbon Avenue from N. 60th Street to W. Walnut Street, and of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street. At the intersection of N. 35th Street and W. Vliet Street, an addition to the existing signal phasing, plus a new traffic controller, the prohibition of on-street parking on one approach, and the lengthening of an existing north-to-westbound left-turn lane are recommended at an estimated capital cost of $16,800. At the intersection of W. Lisbon Avenue and N. 35th Street, it is recommended that the traffic signals at the intersection be retimed, at minimal cost. At the intersection of N. 35th Street and W. Fond du Lac Avenue/W. Burleigh Street, the prohibition of on-street parking on one intersection approach is recommended, at an estimated cost of $200.*

Figure 30

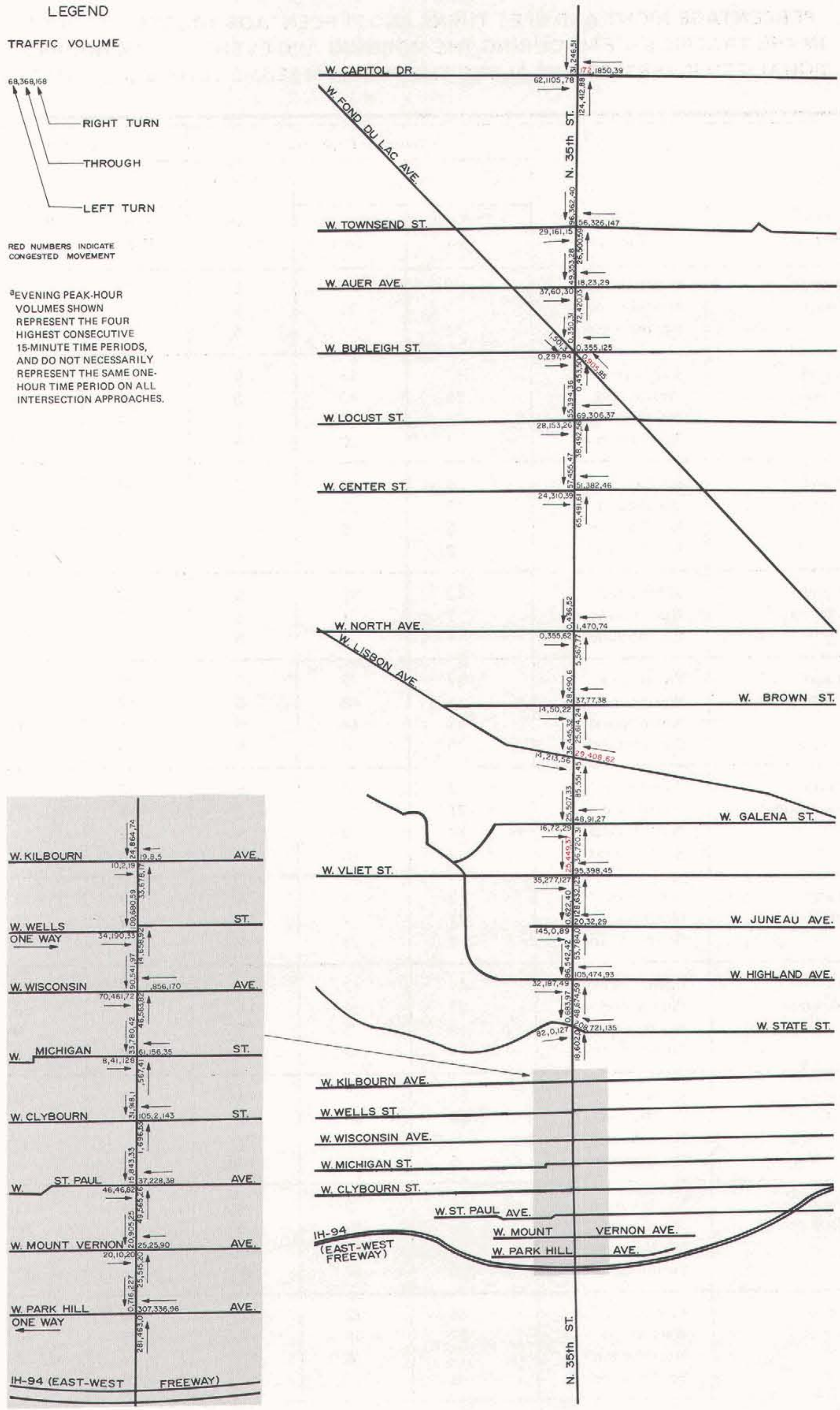
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 35TH STREET DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 31

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 35TH STREET DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 103

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 35TH STREET

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
N. 35th Street and W. Park Hill Avenue	Westbound	47	34	5	13	42	5
	Northbound	- -	23	5	- -	38	5
	Southbound	15	- -	5	24	- -	5
N. 35th Street and W. Mount Vernon Avenue	Eastbound	43	43	5	40	40	5
	Westbound	55	40	5	64	18	5
	Northbound	24	1	5	4	4	5
	Southbound	1	20	5	3	2	5
N. 35th Street and W. St. Paul Avenue	Eastbound	24	4	5	48	26	5
	Westbound	17	26	5	13	12	5
	Northbound	8	6	5	4	8	5
	Southbound	2	8	5	3	2	5
N. 35th Street and W. Clybourn Street	Westbound	49	49	5	57	42	5
	Northbound	7	1	5	7	1	5
	Southbound	1	8	5	1	3	5
N. 35th Street and W. Michigan Street	Eastbound	37	2	5	72	5	5
	Westbound	15	48	5	14	24	5
	Northbound	7	14	5	5	26	5
	Southbound	5	6	5	5	4	5
N. 35th Street and W. Wisconsin Avenue	Eastbound	3	8	5	12	12	5
	Westbound	21	16	5	15	10	5
	Northbound	14	2	5	12	7	5
	Southbound	7	18	5	14	12	5
N. 35th Street and W. Wells Street	Eastbound	2	4	4	13	13	5
	Northbound	21	2	10	12	2	5
	Southbound	4	23	7	7	13	5
N. 35th Street and W. Kilbourn Avenue	Eastbound	44	12	3	61	32	- -
	Westbound	25	64	11	16	59	- -
	Northbound	4	3	17	2	5	6
	Southbound	4	2	6	8	2	5
N. 35th Street and W. State Street	Eastbound	58	42	18	61	39	5
	Westbound	26	32	8	13	19	5
	Northbound	- -	5	19	- -	3	5
	Southbound	5	- -	10	12	- -	5
N. 35th Street and W. Highland Boulevard	Eastbound	15	2	4	18	12	2
	Westbound	15	19	6	14	16	2
	Northbound	17	15	14	8	6	2
	Southbound	5	17	8	6	13	2
N. 35th Street and W. Juneau Avenue	Eastbound	28	72	32	38	62	1
	Westbound	27	53	7	25	36	2
	Northbound	- -	4	13	- -	6	2
	Southbound	6	- -	7	6	- -	3

Table 103 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 35th Street and W. Vliet Street	Eastbound	23	6	4	29	8	4
	Westbound	10	13	13	8	18	2
	Northbound	18	15	17	14	14	5
	Southbound	5	10	10	7	5	6
N. 35th Street and W. Galena Street	Eastbound	30	10	1	25	14	5
	Westbound	29	31	3	16	29	2
	Northbound	3	2	17	4	5	3
	Southbound	2	2	6	6	4	5
N. 35th Street and W. Lisbon Avenue	Southeast-bound	9	4	4	20	5	6
	Northwest-bound	17	15	16	12	6	3
	Northbound	6	8	10	7	12	5
	Southbound	4	9	8	6	7	8
N. 35th Street and W. Brown Street	Eastbound	10	16	6	26	16	13
	Westbound	18	22	8	25	24	6
	Northbound	5	3	18	4	4	5
	Southbound	3	6	10	1	5	8
N. 35th Street and W. North Avenue	Eastbound	7	5	8	15	--	4
	Westbound	15	8	15	14	--	5
	Northbound	16	--	15	12	--	6
	Southbound	6	--	13	11	--	7
N. 35th Street and W. Center Street	Eastbound	8	5	5	11	6	8
	Westbound	6	19	17	9	11	6
	Northbound	11	7	18	10	10	6
	Southbound	4	11	10	9	10	5
N. 35th Street and W. Locust Street	Eastbound	14	9	2	13	13	6
	Westbound	5	22	8	9	17	4
	Northbound	12	6	11	10	6	8
	Southbound	3	6	9	8	11	8
N. 35th Street and W. Burleigh Street/ W. Fond du Lac Avenue (STH 145)	Eastbound	34	--	6	24	--	5
	Westbound	30	--	10	26	--	3
	Northbound	15	--	5	10	--	5
	Southbound	5	--	5	8	--	5
	Northwest-bound	15	--	9	9	--	3
	Southeast-bound	--	--	3	1	--	2
N. 35th Street and W. Auer Avenue	Eastbound	34	19	9	24	29	9
	Westbound	35	27	25	41	26	1
	Northbound	2	7	12	3	14	8
	Southbound	6	7	7	7	11	9
N. 35th Street and W. Townsend Street	Eastbound	5	21	1	7	14	4
	Westbound	35	16	9	28	10	2
	Northbound	14	2	11	10	4	8
	Southbound	7	16	11	8	19	8
N. 35th Street and W. Capitol Drive (STH 190)	Eastbound	3	4	2	6	5	3
	Westbound	4	11	5	2	8	2
	Northbound	42	8	14	14	20	6
	Southbound	13	9	10	16	9	7

Source: SEWRPC.

Table 104

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. 35TH STREET

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 35th Street and W. Michigan Street	Congested north-to-westbound left turn during the evening peak hour (210 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle to increase north-to-westbound left-turn arrow from 10.8 to 12.6 seconds during the evening peak hour, making necessary signal changes at other approaches Add 2.7-second yellow clearance arrow in the signal sequence on northbound N. 35th Street approach during the morning and evening peak hours	- - $13,000	$13,000
N. 35th Street and W. Wisconsin Avenue	Congested west-to-southbound left turn during the evening peak hour (114 vehicles per hour at level-of-service E)	Recommended Action Add 7.2-second west-to-southbound leading left-turn arrow to operate concurrently with the existing westbound green phase during the evening peak hour Alternative Action Retime 90-second cycle so that all vehicles can negotiate this problem left-turn movement on the through green phase during the evening peak hour (Not recommended because the controlling capacity factor for left-turn movement considered is the opposing through traffic volume during the evening peak hour)	$14,000	$14,000
N. 35th Street and W. Vliet Street	Congested right-turn, left-turn, and through movements from southbound approach during the evening peak hour (511 vehicles per hour at level-of-service D) Inefficient north-to-westbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of W. Vliet Street and Milwaukee Avenue from W. Harwood Avenue to N. 20th Street	Cost not included	Cost not included
N. 35th Street and W. Lisbon Avenue	Congested left-turn, right-turn, and through movements from westbound approach during the evening peak hour (499 vehicles per hour at level-of-service D)	Recommended Action Refer to analysis of W. Lisbon Avenue from N. 60th Street to W. Walnut Street	Cost not included	Cost not included
N. 35th Street and W. Fond du Lac Avenue/ W. Burleigh Street	Congested through traffic movement from northwest-bound approach during the evening peak hour (905 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street	Cost not included	Cost not included

Table 104 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 35th Street and W. Capitol Drive	Congested west-to-southbound left turn during the evening peak hour (172 vehicles per hour at level-of-service E) Insufficient west-to-southbound left-turn-lane storage capacity during the evening peak hour	Recommended Actions Retime 90-second cycle to increase west-to-southbound left-turn arrow from 7.2 to 15.3 seconds, making necessary signal changes at other approaches at this *intersection and at the intersection* of W. Capitol Drive with W. Roosevelt Drive. Bi-directional lagging arrows at this intersection should be timed to end simultaneously Add a separate east-to-northbound left-turn red indication to eliminate conflicting traffic movements owing to an increase in the difference in duration between the west-to-southbound and east-to-northbound left-turn arrows Lengthen west-to-southbound left-turn lane from 123 to 170 feet for increased storage capacity	 $14,000 $15,000	$29,000
Subtotal				$56,000
N. 35th Street and W. State Street	Insufficient west-to-northbound right-turn-lane storage capacity during the evening peak hour	Recommended Action Extend existing on-street parking prohibition on north side of westbound approach from 94 to 140 feet during the evening peak hour	$ 200	$ 200
Subtotal			$ 200	$ 200
Total				$56,200

Source: SEWRPC.

and the addition of the required separate signal phase and traffic controller at this intersection would cost an estimated $13,000.

The remaining intersection which exhibited congestion problems—the intersection of N. 35th Street and W. Capitol Drive (STH 190)—requires some turn-lane reconstruction. In order to provide sufficient turn-lane storage capacity in the west-to-southbound left-turn lane at this intersection, the lengthening of the left-turn lane on the westbound approach is required within the existing median at an estimated capital cost of $15,000. To abate existing congestion at this intersection, the addition of a separate signal phase in addition to a new traffic controller is necessary, as is the retiming of the existing signal timing plan. Minimal cost would be associated with the retiming of the signal plan at this intersection, and an estimated cost of $14,000 would be associated with the addition of the separate signal phase and traffic controller. The total cost of improvements at this intersection is thus estimated at $29,000.

Table 105

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 35TH STREET

Phase	Intersection (time in seconds)				
	N. 35th Street				W. Park Hill Avenue
	Morning		Evening		
	Northbound	Southbound	Northbound	Southbound	
Green	59.4	36.9	59.4	45.9	19.8
Yellow	3.6	3.6	3.6	3.6	3.6
Red	27.0	49.5	27.0	40.5	66.6
Green Arrow	7.2[a]/9.9[b]	- -	9.9[b]	- -	- -
Yellow Arrow	- -	- -	- -	- -	- -
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Mount Vernon Avenue
Green	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. St. Paul Avenue
Green	48.6	30.6
Yellow	3.6	3.6
Red	37.8	55.8
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. Clybourn Street
Green	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street				W. Michigan Street	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green	53.1	38.7	53.1	36.9	26.1	25.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	33.3	47.7	33.3	49.5	60.3	61.2
Green Arrow	10.8[a]	- -	12.6[a]	- -	- -	- -
Yellow Arrow	2.7	- -	2.7	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street				W. Wisconsin Avenue		
	Morning		Evening		Morning	Evening	
	Northbound	Southbound	Northbound	Southbound		Eastbound	Westbound
Green	27.0	41.4	28.8	39.6	37.8	28.8	39.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	59.4	45.0	57.6	46.8	48.6	57.6	46.8
Green Arrow	- -	10.8[a]	- -	7.2[a]	- -	- -	7.2[a]
Yellow Arrow	- -	3.6	- -	3.6	- -	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Table 105 (continued)

Phase	Intersection (time in seconds)					
	N. 35th Street				W. Wells Street	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green.	35.1	48.6	39.6	53.1	30.6	26.1
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	37.8	46.8	33.3	55.8	60.3
Green Arrow. . .	9.9[d]	10.8[a]	5.4[d]	10.8[a]	- -	- -
Yellow Arrow . .	- -	2.7	- -	2.7	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Kilbourn Avenue
Green.	57.6	21.6
Yellow	3.6	3.6
Red	28.8	64.8
Total Cycle	90.0	90.0

Phase	N. 35th Street		W. State Street			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	39.6	35.1	39.6	23.4	44.1	34.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	46.8	51.3	46.8	63.0	42.3	52.2
Green Arrow. . .	- -	- -	13.5[a]	- -	7.2[a]	- -
Yellow Arrow . .	- -	- -	2.7	- -	2.7	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	N. 35th Street	W. Highland Boulevard
Green.	41.4	26.1
Yellow	3.6	3.6
Red	45.0	60.3
Green Arrow. . .	8.1[e]	- -
Yellow Arrow . .	3.6	- -
Total Cycle	90.0	90.0

Phase	N. 35th Street	W. Juneau Avenue
Green.	53.1	26.1
Yellow	3.6	3.6
Red	33.3	60.3
Total Cycle	90.0	90.0

Phase	N. 35th Street				W. Vliet Street			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	18.6	23.4	25.8	16.2	24.6	15.0	15.0	24.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red	37.8	33.0	30.6	40.2	31.8	41.1	41.4	31.8
Green Arrow. . .	- -	6.6[a]	6.6[a]	- -	6.6[a]	- -	- -	6.6[a]
Yellow Arrow . .	- -	3.0	3.0	- -	3.0	- -	- -	3.0
Total Cycle	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Table 105 (continued)

Phase	Intersection (time in seconds)	
	N. 35th Street	W. Galena Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle	60.0	60.0

Phase	N. 35th Street		W. Lisbon Avenue
	Northbound	Southbound	
Green.	30.6	20.4	18.6
Yellow	3.6	3.6	3.6
Red	25.8	36.0	37.8
Green Arrow. . .	7.2[a]	- -	- -
Yellow Arrow . .	3.0	- -	- -
Total Cycle	60.0	60.0	60.0

Phase	N. 35th Street	W. Brown Street
Green.	31.2	19.2
Yellow	3.6	3.6
Red	25.2	37.2
Total Cycle	60.0	60.0

Phase	N. 35th Street	W. North Avenue
Green.	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Phase	N. 35th Street	W. Center Street
Green.	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Phase	N. 35th Street	W. Locust Street
Green.	28.2	22.2
Yellow	3.6	3.6
Red	28.2	34.2
Total Cycle	60.0	60.0

Phase	N. 35th Street	W. Burleigh Street	W. Fond du Lac Avenue (STH 145)
Green.	19.8	24.3	27.9
Yellow	3.6	3.6	3.6
Red	66.6	62.1	58.5
Total Cycle	90.0	90.0	90.0

Table 105 (continued)

Phase	Intersection (time in seconds)					
	N. 35th Street		W. Auer Avenue			
Green.	57.5		21.5			
Yellow	3.5		3.5			
Red.	29.0		65.0			
Total Cycle	90.0		90.0			
	N. 35th Street		W. Townsend Street			
Green.	28.2		22.2			
Yellow	3.6		3.6			
Red.	28.2		34.2			
Total Cycle	60.0		60.0			
	N. 35th Street		W. Capitol Drive (STH 190)			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	21.6	18.0	44.1	48.6	44.1	52.2
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	64.8	68.4	42.3	37.8	42.3	34.2
Green Arrow. . .	- -	- -	7.2[e]	7.2[e]	7.2[e]	15.3[e]
Yellow Arrow . .	- -	- -	3.6	3.6	3.6	3.6
Red Indication .	- -	- -	47.7	- -	47.7	- -
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0	90.0

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Lagging left-turn arrow concurrent with through green phase.*

[c] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d] *Leading through arrow concurrent with through green phase.*

[e] *Lagging left-turn arrow.*

Source: SEWRPC.

As indicated earlier, one intersection along the problem segment of N. 35th Street—the intersection of N. 35th Street and W. State Street—although not exhibiting congestion problems, was found to lack adequate vehicle storage capacity within an exclusive turn lane. The extension of on-street parking prohibition on the north side of the westbound approach at this intersection is required in order to lengthen the existing west-to-northbound, right-turn-lane storage capacity. The estimated cost of this action is $200.

In addition, the existing offsets between the traffic signal timing plans of the 22 signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of N. 35th Street by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals. Furthermore, it must be recognized that a portion of this problem segment of N. 35th Street from the East-West Freeway (IH 94) to W. Vliet Street has a series of signalized intersections spaced less than 1,000 feet apart. As a result, the recommended traffic management actions may not fully resolve the congestion problems of this stretch if the traffic signals along the stretch cannot be sufficiently coordinated to assure efficient progression. Without efficient progression, vehicle queues from upstream intersections may prevent the increased capacity of downstream intersections from being fully utilized.

W. Wisconsin Avenue from N. 35th Street to N. 16th Street

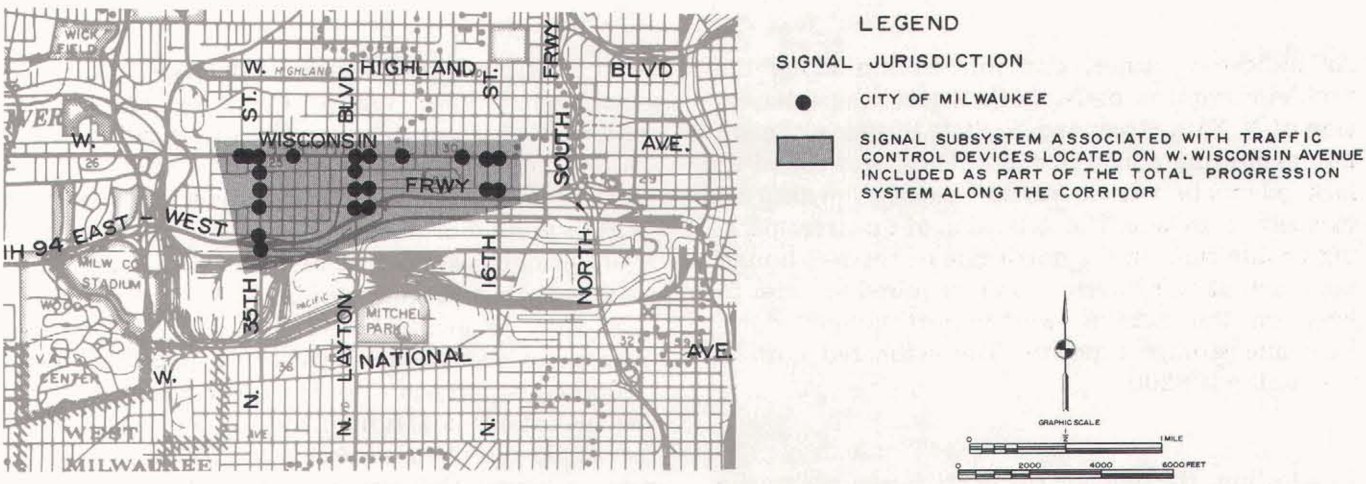
Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 124, W. Wisconsin Avenue from N. 35th Street to N. 16th Street, a distance of 1.2 miles. Map 125 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Wisconsin Avenue. Residential land use comprises the majority of the existing urban development in the corridor, while retail sales and service land uses comprise the majority of the existing urban development immediately adjacent to W. Wisconsin Avenue. Retail sales and service land uses abut W. Wisconsin Avenue at nearly all its intersections along this segment. A large segment of governmental and institutional land use occurs along this segment of W. Wisconsin Avenue between N. 30th Street and N. 27th Street at Family Hospital, Marquette High School, and Wisconsin Avenue School and between N. 19th Street and N. 16th Street at Deaconess Hospital, Milwaukee Children's Hospital, and Marquette University.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Wisconsin Avenue. The segment is divided by a median which is 10 feet wide from N. 35th Street to N. 27th Street and 14 feet wide from N. 27th Street to N. 16th Street. The curb-to-curb widths of the dual roadways along this segment of W. Wisconsin Avenue range from 32 to 35 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently permitted along much of this segment of W. Wisconsin Avenue, with parking being prohibited between N. 32nd and N. 31st Streets, between N. 24th and N. 23rd Streets, between N. 22nd and N. 19th Streets, and between N. 18th and N. 17th Streets on the north side of Wisconsin Avenue only, and between N. 26th and N. 25th Streets on the south side of W. Wisconsin Avenue only.

As indicated in Table 106, this segment of W. Wisconsin Avenue has eight signalized intersections, at which the W. Wisconsin Avenue approaches range in width from 32 to 35 feet. Six of the eastbound and seven of the westbound approaches to these eight intersections provide separate lanes for

Map 124

DETAIL OF THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

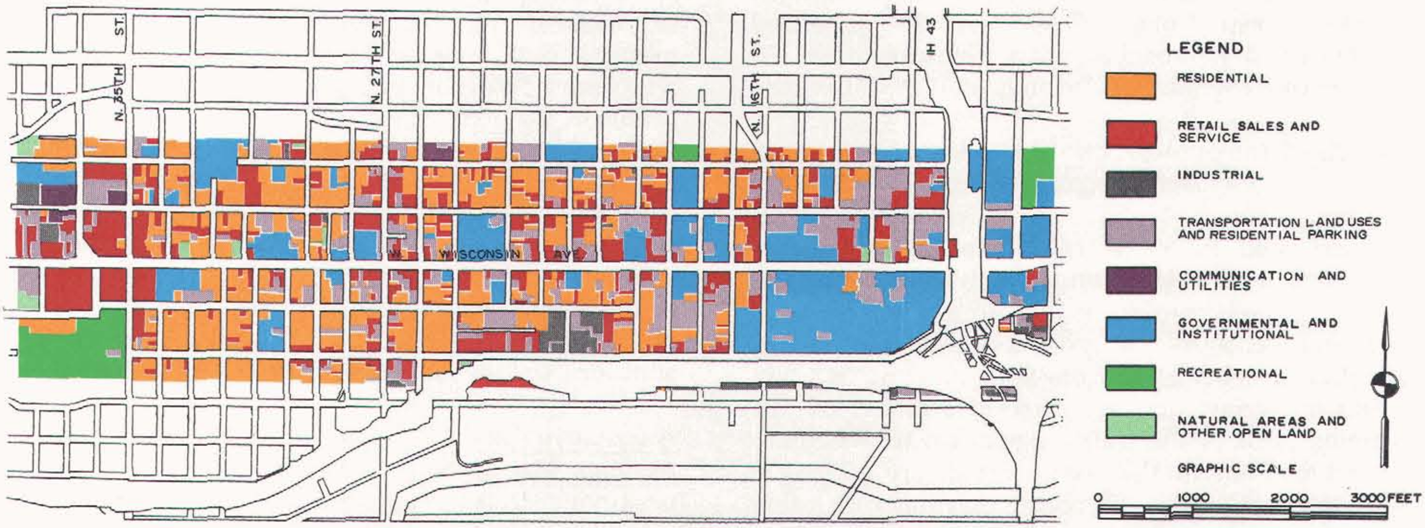


Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—W. Wisconsin Avenue from N. 35th Street to N. 16th Street, a distance of 1.2 miles. This map also shows the location and jurisdiction of each of the eight traffic signals along this arterial segment, including the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Wisconsin Avenue and are directly affected by the timing plans of the traffic signals on W. Wisconsin Avenue.

Source: City of Milwaukee and SEWRPC.

Map 125

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Wisconsin Avenue. Residential land use comprises the majority of the existing urban development in the corridor, while retail sales and service land uses comprise the majority of the existing urban development immediately adjacent to W. Wisconsin Avenue. Retail sales and service land uses abut W. Wisconsin Avenue at nearly all its intersections along this segment. A large segment of governmental and institutional land use occurs along this segment of W. Wisconsin Avenue between N. 30th Street and N. 27th Street at Family Hospital, Marquette High School, and Wisconsin Avenue School, and between N. 19th Street and N. 16th Street at Deaconess Hospital, Milwaukee Children's Hospital, and Marquette University.

Source: SEWRPC.

Table 106

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
W. Wisconsin Avenue and N. 35th Street. . . .	35 ML	NPAM	34 ML	NSPM	25	NPPM	32	FSPM
W. Wisconsin Avenue and N. 32nd Street . . .	32 M	NPAM	32 ML	NPPM	15	NSPM	--	--
W. Wisconsin Avenue and N. 27th Street. . . .	32 ML	NPAM	32 ML	NP	21 L	NP	20 L	NP
W. Wisconsin Avenue and N. 26th Street. . . .	32 ML	NPAM	32 ML	NPPM	15	NS	14	NS
W. Wisconsin Avenue and N. 24th Street. . . .	32 ML	NPAM	32 ML	NP	18	NP	15	P
W. Wisconsin Avenue and N. 19th Street. . . .	32 ML	NPAM	32 ML	NPPM	18	NP	21	P
W. Wisconsin Avenue and N. 17th Street[a] . . .	32 M	NPAM	32 ML	NPPM	--	--	36	NP
W. Wisconsin Avenue and N. 16th Street[b] . . .	32 ML	NPAM	32 M	NPPM	38	NP	--	--

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a]*One-way street southbound.*

[b]*One-way street northbound.*

Source: SEWRPC.

the exclusive use of left-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. Wisconsin Avenue are also indicated in Table 106.

Traffic Control Measures: The timing plan for each of the eight traffic signals along W. Wisconsin Avenue between N. 35th Street and N. 16th Street is indicated in Table 107. Map 124 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of W. Wisconsin Avenue and are directly affected by the timing plans of the traffic signals on W. Wisconsin Avenue. Four of the traffic signals are located at intersections of W. Wisconsin Avenue with other arterial streets, and four are located at intersections of W. Wisconsin Avenue with nonarterial streets—specifically, N. 32nd Street, N. 26th Street, N. 24th Street, and N. 19th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Wisconsin Avenue. This entire segment of W. Wisconsin Avenue is posted for a 30-mile-per-hour speed limit.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the eight signalized intersections along the problem segment of W. Wisconsin Avenue in Figures 32 and 33. The locations along W. Wisconsin Avenue from N. 35th Street to N. 16th Street where traffic management actions are to be considered as a means of reducing congestion and improving operation conditions were identified by comparing morning and evening traffic volumes for each approach to the eight controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Wisconsin Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 108.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Wisconsin Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 32 and 33. No congested traffic movements were found to occur along this segment of W. Wisconsin Avenue during the morning peak hour, and one congested movement was found to occur during the evening hour. This problem segment of W. Wisconsin Avenue was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment in addition to the identified congestion problem.

Alternative and Recommended Transportation Systems Management Actions: The one evening peak-hour traffic congestion problem identified along W. Wisconsin Avenue occurs at the intersection of W. Wisconsin Avenue and N. 35th Street.

Table 109 provides a summary of the congestion problem found at the intersection of W. Wisconsin Avenue and N. 35th Street and of the costs associated with the improvement of this intersection.[12] Table 110 summarizes the changes in signal timing recommended for the intersection of N. 35th Street and W. Wisconsin Avenue.

In addition, the existing offsets between the traffic signal timing plans of the eight signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the one recommended traffic management action and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Wisconsin Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

[12] *The costs of short-range improvement of W. Wisconsin Avenue do not include the cost of the improvements recommended at the intersection of W. Wisconsin Avenue and N. 35th Street. The improvement of this intersection, and attendant cost, was considered in this chapter in the analysis of the problem segment of N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive. At the intersection of N. 35th Street and W. Wisconsin Avenue, the addition of a separate signal phase in addition to a new traffic controller is required to improve operating conditions, at a capital cost of approximately $14,000.*

Table 107

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE

Phase	Intersection (time in seconds)					
	W. Wisconsin Avenue		N. 35th Street			
	Morning	Evening	Morning		Evening	
			Northbound	Southbound	Northbound	Southbound
Green.	37.8	39.6	27.0	41.4	28.8	39.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	48.6	46.8	59.4	45.0	57.6	46.8
Green Arrow. . . .	--	--	--	10.8[a]	--	7.2[a]
Yellow Arrow . . .	--	--	--	3.6	--	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Wisconsin Avenue	N. 32nd Street
Green.	62.1	17.1
Yellow	3.6	3.6
Red.	24.3	69.3
Total Cycle[b]	90.0	90.0

Phase	W. Wisconsin Avenue				N. 27th Street	
	Morning		Evening		Morning	Evening
	Westbound	Eastbound	Westbound	Eastbound		
Green.	44.1	33.3	27.0	23.4	20.7	24.3
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	42.3	53.1	46.8	63.0	51.3	46.8
Green Arrow. . . .	7.2[a]	--	12.6[a]	--	--	--
Yellow Arrow . . .	3.6	--	3.6	--	--	--
Green Through Only.	--	--	--	--	14.4[c]	15.3[c]
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Wisconsin Avenue	N. 26th Street
Green.	53.1	26.1
Yellow	3.6	3.6
Red.	33.3	60.3
Total Cycle	90.0	90.0

Phase	W. Wisconsin Avenue	N. 24th Street
Green.	52.6	26.6
Yellow	3.6	3.6
Red.	33.8	59.8
Total Cycle[d]	90.0	90.0

Phase	W. Wisconsin Avenue	N. 19th Street
Green.	62.1	17.1
Yellow	3.6	3.6
Red.	24.3	69.3
Total Cycle[d]	90.0	90.0

Table 107 (continued)

Phase	Intersection (time in seconds)					
	W. Wisconsin Avenue				N. 17th Street	
	Morning		Evening			
	Westbound	Eastbound	Westbound	Eastbound		
Green.	44.1	33.3	44.1	27.0	35.1	
Yellow	3.6	3.6	3.6	3.6	3.6	
Red.	42.3	53.1	42.3	59.4	51.3	
Green Arrow. . . .	7.2[e]	--	13.5[e]	--	--	
Yellow Arrow . . .	--	--	--	--	--	
Total Cycle	90.0	90.0	90.0	90.0	90.0	
	W. Wisconsin Avenue				N. 16th Street	
	Morning		Evening		Morning	Evening
	Westbound	Eastbound	Westbound	Eastbound		
Green.	27.9	39.6	36.9	48.6	39.6	30.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	58.5	46.8	49.5	37.8	46.8	55.8
Green Arrow. . . .	--	8.1[e]	--	8.1[e]	--	--
Yellow Arrow . . .	--	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Signal operates as a flashing beacon, with red indication controlling N. 32nd Street and yellow indication controlling W. Wisconsin Avenue unless activated by pedestrian-actuated control.*

[c]*Leading through arrow.*

[d]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[e]*Lagging left-turn arrow concurrent with through green phase.*

Source: City of Milwaukee and SEWRPC.

N. 20th Street from W. North Avenue to W. Hopkins Street

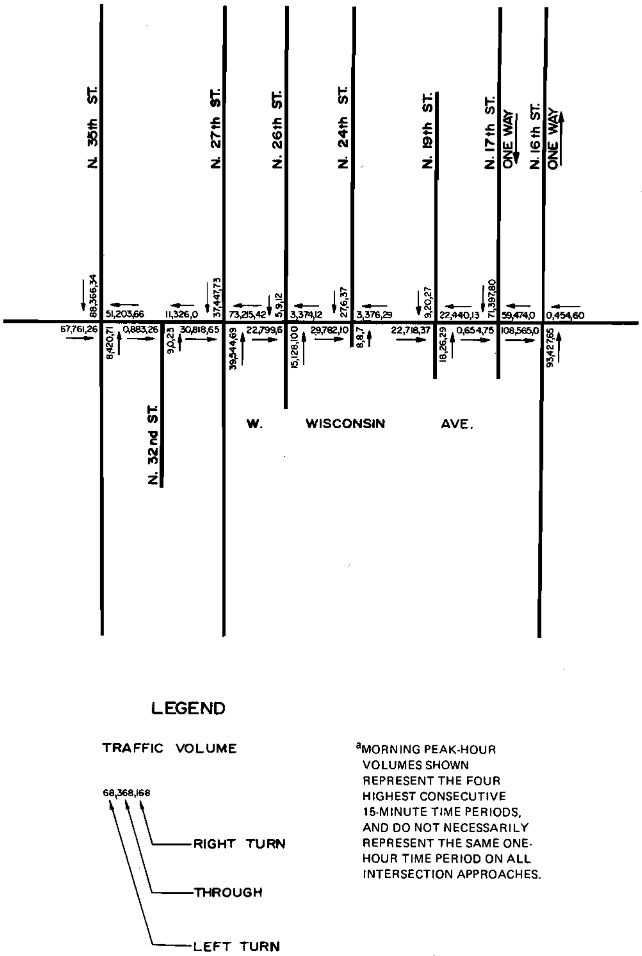
Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 126, N. 20th Street from W. North Avenue to W. Hopkins Street, a distance of one mile. The existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 20th Street is shown on Map 127. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 20th Street. Retail sales and service land uses abut N. 20th Street at its intersections with W. North Avenue, W. Center Street, W. Hadley Street, W. Burleigh Street, and W. Hopkins Street. Governmental and institutional land uses along this segment consist of the 20th Street School at the intersection of N. 20th Street and W. Meinecke Avenue.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 20th Street. None of this problem segment of N. 20th Street is median divided. The segment has a curb-to-curb width of 39 to 47 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along most of this segment of N. 20th Street, with parking being prohibited only between W. Burleigh Street and W. Hopkins Street on the east side of the roadway.

As indicated in Table 111, the problem segment of N. 20th Street has six signalized intersections, at which the N. 20th Street approaches are all

Figure 32

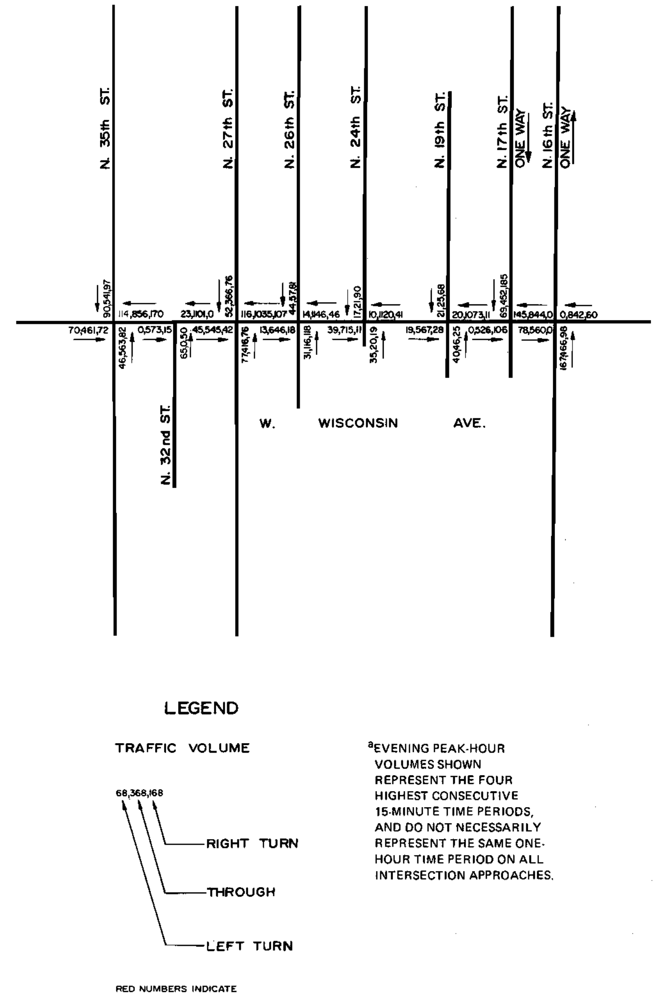
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 33

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

20 feet in width. None of these six signalized approaches provide separate lanes for the exclusive use of left- or right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches along this segment of N. 20th Street are also indicated in Table 111.

Traffic Control Measures: The timing plan for each of the six traffic signals along N. 20th Street between W. North Avenue and W. Hopkins Street is shown in Table 112. Map 126 shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 20th Street and are directly affected by the timing plans of the traffic signals on N. 20th Street. Four of the traffic signals are located at the intersections of N. 20th Street with other arterial streets, and two are located at the intersections of N. 20th Street with nonarterial streets—specifically, W. Wright Street and W. Locust Street. This entire segment of N. 20th Street is posted for a 30-mile-per-hour speed limit.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the six signalized intersections along the problem segment of N. 20th Street in Figures 34 and 35. The locations along N. 20th Street from W. North Avenue to W. Hopkins Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified

Table 108

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE

		Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
Intersection	Approach Direction	Percent Right	Percent Left		Percent Right	Percent Left	
W. Wisconsin Avenue and N. 35th Street	Eastbound	3	8	5	12	12	5
	Westbound	21	16	5	15	10	5
	Northbound	14	2	5	12	7	5
	Southbound	7	18	5	14	12	5
W. Wisconsin Avenue and N. 32nd Street	Eastbound	3	- -	3	3	- -	5
	Westbound	- -	3	12	- -	2	2
	Northbound	72	28	- -	43	57	1
W. Wisconsin Avenue and N. 27th Street	Eastbound	7	3	5	7	7	5
	Westbound	13	22	5	9	9	5
	Northbound	11	6	5	13	14	5
	Southbound	13	7	5	15	11	5
W. Wisconsin Avenue and N. 26th Street	Eastbound	1	3	2	3	2	5
	Westbound	3	1	11	4	1	3
	Northbound	41	6	2	44	12	1
	Southbound	46	19	15	45	24	1
W. Wisconsin Avenue and N. 24th Street	Eastbound	1	4	3	1	5	5
	Westbound	7	1	11	3	1	3
	Northbound	32	34	- -	26	46	1
	Southbound	53	39	- -	71	13	1
W. Wisconsin Avenue and N. 19th Street	Eastbound	5	3	3	5	3	5
	Westbound	2	5	8	1	2	3
	Northbound	39	25	1	23	36	1
	Southbound	48	16	5	60	18	4
W. Wisconsin Avenue and N. 17th Street	Eastbound	10	- -	3	17	- -	5
	Westbound	- -	11	11	- -	14	4
	Southbound	15	13	8	26	10	3
W. Wisconsin Avenue and N. 16th Street	Eastbound	- -	16	6	- -	12	4
	Westbound	12	- -	9	7	- -	5
	Northbound	11	16	3	13	23	3

Source: SEWRPC.

Table 109

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEM ON THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
W. Wisconsin Avenue and N. 35th Street	Congested west-to-southbound left turn during the evening peak hour (114 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of N. 35th Street from East-West Freeway (IH 94) to W. Capitol Drive	Cost not included	Cost not included

Source: SEWRPC.

Table 110

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. WISCONSIN AVENUE

Phase	Intersection (time in seconds)						
	W. Wisconsin Avenue			N. 35th Street			
	Morning	Evening		Morning		Evening	
		Westbound	Eastbound	Northbound	Southbound	Northbound	Southbound
Green.	37.8	39.6	28.8	27.0	41.4	28.8	39.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red.	48.6	46.8	57.6	59.4	45.0	57.6	46.8
Green Arrow. . . .	- -	7.2[a]	- -	- -	10.8[a]	- -	7.2[a]
Yellow Arrow . . .	- -	3.6	- -	- -	3.6	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Wisconsin Avenue	N. 32nd Street
Green.	62.1	17.1
Yellow	3.6	3.6
Red.	24.3	69.3
Total Cycle[b]	90.0	90.0

Phase	W. Wisconsin Avenue				N. 27th Street	
	Morning		Evening		Morning	Evening
	Westbound	Eastbound	Westbound	Eastbound		
Green.	44.1	33.3	27.0	23.4	20.7	24.3
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red.	42.3	53.1	46.8	63.0	51.3	46.8
Green Arrow. . . .	7.2[a]	- -	12.6[a]	- -	- -	- -
Yellow Arrow . . .	3.6	- -	3.6	- -	- -	- -
Green Through Only.	- -	- -	- -	- -	14.4[c]	15.3[c]
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Wisconsin Avenue	N. 26th Street
Green.	53.1	26.1
Yellow	3.6	3.6
Red.	33.3	60.3
Total Cycle	90.0	90.0

Phase	W. Wisconsin Avenue	N. 24th Street
Green.	52.6	26.6
Yellow	3.6	3.6
Red.	33.8	59.8
Total Cycle[d]	90.0	90.0

Phase	W. Wisconsin Avenue	N. 19th Street
Green.	62.1	17.1
Yellow	3.6	3.6
Red.	24.3	69.3
Total Cycle[d]	90.0	90.0

Table 110 (continued)

Phase	Intersection (time in seconds)				
	W. Wisconsin Avenue				N. 17th Street
	Morning		Evening		
	Westbound	Eastbound	Westbound	Eastbound	
Green.	44.1	33.3	44.1	27.0	35.1
Yellow	3.6	3.6	3.6	3.6	3.6
Red	42.3	53.1	42.3	59.4	51.3
Green Arrow. . . .	7.2[e]	--	13.5[e]	--	--
Yellow Arrow . . .	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Wisconsin Avenue				N. 16th Street	
	Morning		Evening		Morning	Evening
	Westbound	Eastbound	Westbound	Eastbound		
Green.	27.9	39.6	36.9	48.6	39.6	30.6
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	58.5	46.8	49.5	37.8	46.8	55.8
Green Arrow. . . .	--	8.1[e]	--	8.1[e]	--	--
Yellow Arrow . . .	--	--	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Signal operates as a flashing beacon, with red indication controlling N. 32nd Street and yellow indication controlling W. Wisconsin Avenue unless activated by pedestrian-actuated control.*

[c] *Leading through arrow.*

[d] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[e] *Lagging left-turn arrow concurrent with through green phase.*

Source: SEWRPC.

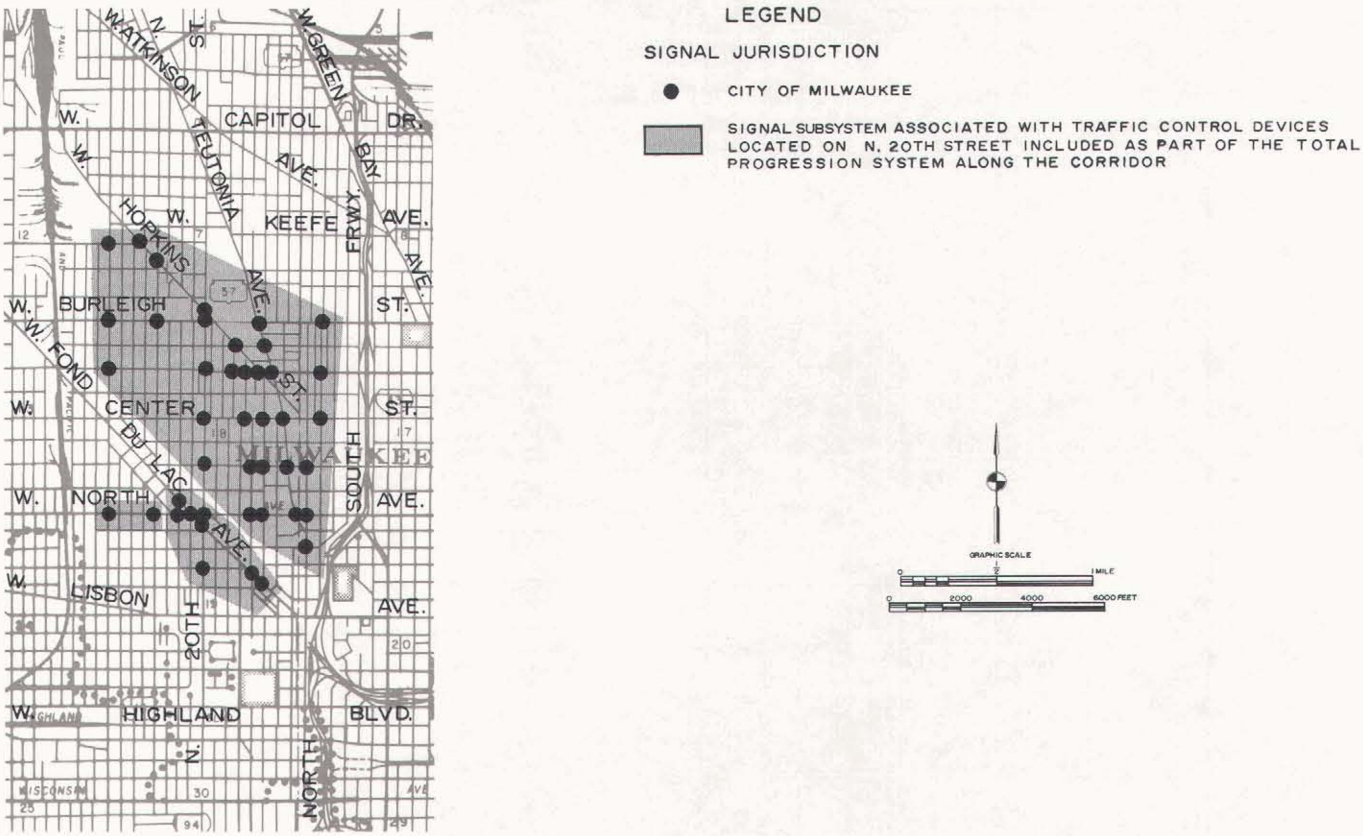
by comparing morning and evening traffic volumes for each approach to the six controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. 20th Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 113.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 20th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 34 and 35. As shown in these figures, no congested traffic movements were found to occur along this segment of N. 20th Street during either peak hour. This problem segment of N. 20th Street was included in the study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment.

Alternative and Recommended Transportation Systems Management Actions: No transportation systems management actions were recommended along this segment of N. 20th Street, and no changes were recommended in the traffic signal timing plans at intersections along this segment.

Map 126

DETAIL OF THE PROBLEM SEGMENT OF N. 20TH STREET TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—N. 20th Street from W. North Avenue to W. Hopkins Street, a distance of 1.0 mile. This map also shows the location and jurisdiction of each of the six traffic signals along this arterial segment, including the relationship of these signals to the other interconnected progressive signal subsystems which are located within approximately one-half mile of N. 20th Street and are directly affected by the timing plans of the traffic signals on N. 20th Street.

Source: City of Milwaukee and SEWRPC.

The City of Milwaukee is planning to implement the North Division Neighborhood Master Plan, which is intended to restore and stabilize the neighborhood generally bounded by N. 8th Street, W. North Avenue, N. 20th Street, and W. Burleigh Street. Included in this master plan are neighborhood traffic management actions which will divert many motorists who presently use the neighborhood streets for through movement to the major arterial routes. Implementation of this plan will have direct effects upon this problem segment of N. 20th Street.

<u>W. North Avenue from N. 124th Street to N. 76th Street (STH 181)</u>

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 128, W. North Avenue from N. 124th Street to N. 76th Street (STH 181), a distance of 3.0 miles. Map 129 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. North Avenue. Residential land use com-

Map 127

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. 20TH STREET

This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 20th Street. Residential land use comprises the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 20th Street. Retail sales and service land uses abut N. 20th Street at its intersections with W. North Avenue, W. Center Street, W. Hadley Street, W. Burleigh Street, and W. Hopkins Street. Governmental and institutional land uses along this segment include the 20th Street School at the intersection of N. 20th Street and W. Meinecke Avenue.

Source: SEWRPC.

prises the majority of the existing land uses within the corridor, while a combination of residential, retail sales and service, and off-street parking land uses comprise the majority of the existing urban development immediately adjacent to W. North Avenue. Retail sales and service land uses abut W. North Avenue, particularly at its intersection with N. 124th Street and with N. Mayfair Road (STH 100) at the Mayfair Mall Shopping Center, and between N. 92nd Street and N. 84th Street. Governmental and institutional land uses abut W. North Avenue between N. 122nd and N. 119th Streets, including the Fisher Elementary School; and between N. 80th and N. 76th Streets at Longfellow Junior High School, Wauwatosa Cemetery, and the Wauwatosa Civic Center. Recreational land uses abut this segment of W. North Avenue at N. Menomonee River Parkway.

Table 111

ROAD APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 20TH STREET

Intersection	Roadway Approach Width (feet)							
	Northbound		Southbound		Eastbound or Southeast-bound		Westbound or Northwest-bound	
N. 20th Street and W. North Avenue . . .	20	NSPM	20	NS	25	NP	25	NPPM
N. 20th Street and W. Wright Street . . .	20	NS	20	P	17	P	17	FSPM
N. 20th Street and W. Center Street . . .	20	FSPM	20	P	25	NPAM	25	P
N. 20th Street and W. Locust Street . . .	20	NPPM	20	P	24	NSAM	21	NS
N. 20th Street and W. Burleigh Street . .	20	NPPM	20	P	20	P	20	NS
N. 20th Street and W. Hopkins Street . .	20	NPPM	20	P	25	P	25	NS

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

Source: SEWRPC.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. North Avenue. The segment consists of dual roadways separated by a median which ranges in width from 16 to 28 feet between N. 124th Street and N. Menomonee River Parkway, by a median 4 feet in width between N. 93rd Street and N. 91st Street, and by a median 15 feet in width at N. 76th Street (STH 181). With the exception of the intersections of W. North Avenue with N. 114th Street and with N. Menomonee River Parkway, where the curb-to-curb widths of the dual roadways are 28 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited, the curb-to-curb widths of the dual roadways along W. North Avenue between N. 124th Street and N. Menomonee River Parkway are 36 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. The curb-to-curb widths of the dual roadways are 24 feet between N. 93rd Street and N. 91st Street, adequate to provide two lanes for moving traffic in each direction with parking prohibited, and 34 feet at the intersection of W. North Avenue and N. 76th Street (STH 181), adequate to provide two lanes for moving traffic in each direction with parking permitted. Between N. 91st Street and N. 77th Street, W. North Avenue is not median divided, and has a curb-to-curb width of 48 feet, adequate to provide two lanes for moving traffic in each direction with parking prohibited. Parking is currently permitted along much of the entire problem segment of W. North Avenue, with parking being prohibited only between N. 113th Street and N. 105th Street on the north side of the roadway, and between N. 101st Street and N. Menomonee River Parkway and N. 90th Street and N. Pasadena Boulevard on the south side of the roadway.

As shown in Table 114, this segment of W. North Avenue has eight signalized intersections, at which the W. North Avenue approaches range in width from 24 to 36 feet. Six of the eastbound and six of the westbound approaches to these eight intersections provide separate lanes for the exclusive use of left-turning vehicles, and one of the eastbound approaches provides a separate lane for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. North Avenue are also indicated in Table 114.

Table 112

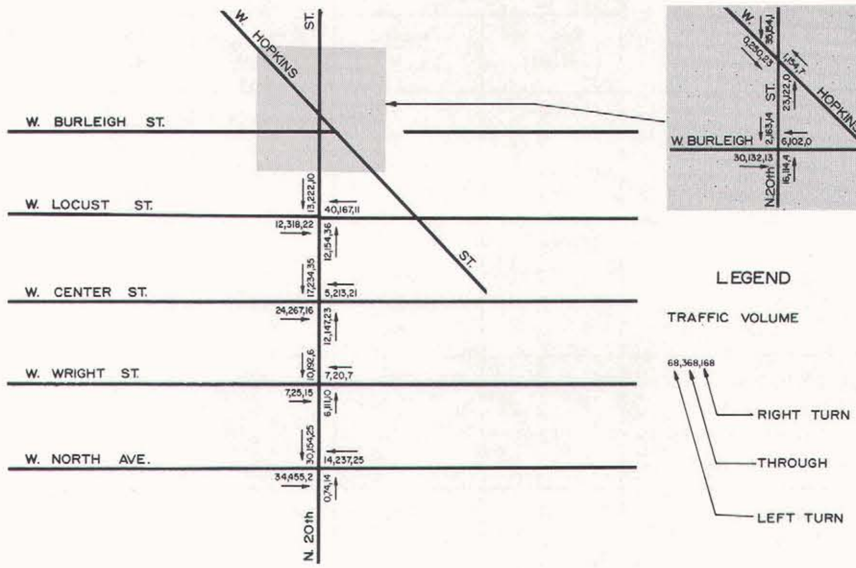
EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 20TH STREET

Phase	Intersection (time in seconds)			
	N. 20th Street		W. North Avenue	
Green	46.8		32.4	
Yellow	3.6		3.6	
Red	39.6		54.0	
Total Cycle	90.0		90.0	
	N. 20th Street		W. Wright Street	
Green	31.2		19.2	
Yellow	3.6		3.6	
Red	25.2		37.2	
Total Cycle	60.0		60.0	
	N. 20th Street		W. Center Street	
Green	25.2		25.2	
Yellow	3.6		3.6	
Red	31.2		31.2	
Total Cycle	60.0		60.0	
	N. 20th Street		W. Locust Street	
Green	22.2		28.2	
Yellow	3.6		3.6	
Red	34.2		28.2	
Total Cycle	60.0		60.0	
	N. 20th Street		W. Burleigh Street	
	Morning	Evening	Morning	Evening
Green	25.2	28.2	25.2	22.2
Yellow	3.6	3.6	3.6	3.6
Red	31.2	28.2	31.2	34.2
Total Cycle	60.0	60.0	60.0	60.0
	N. 20th Street		W. Hopkins Street	
Green	25.2		25.2	
Yellow	3.6		3.6	
Red	31.2		31.2	
Total Cycle	60.0		60.0	

Source: City of Milwaukee and SEWRPC.

Figure 34

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 20TH STREET DURING THE MORNING PEAK HOUR[a]

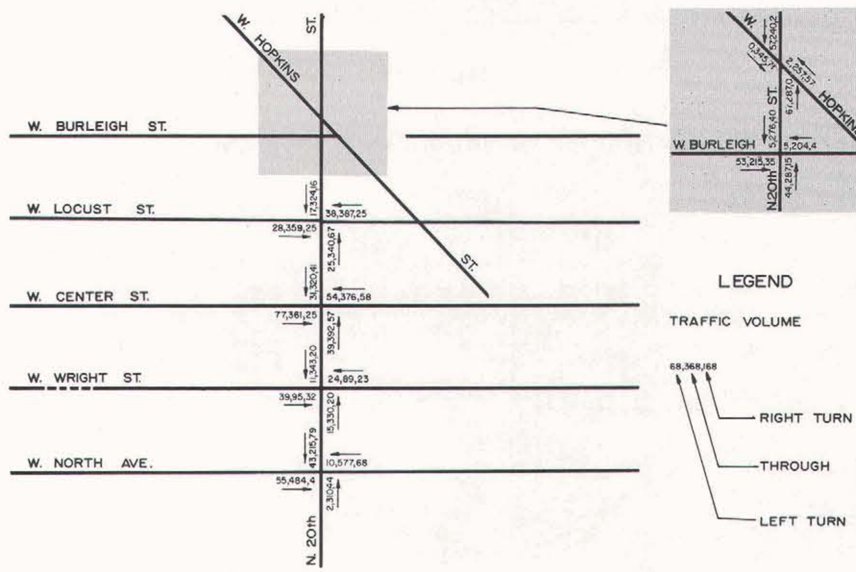


[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 35

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 20TH STREET DURING THE EVENING PEAK HOUR[a]



[a]EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 113

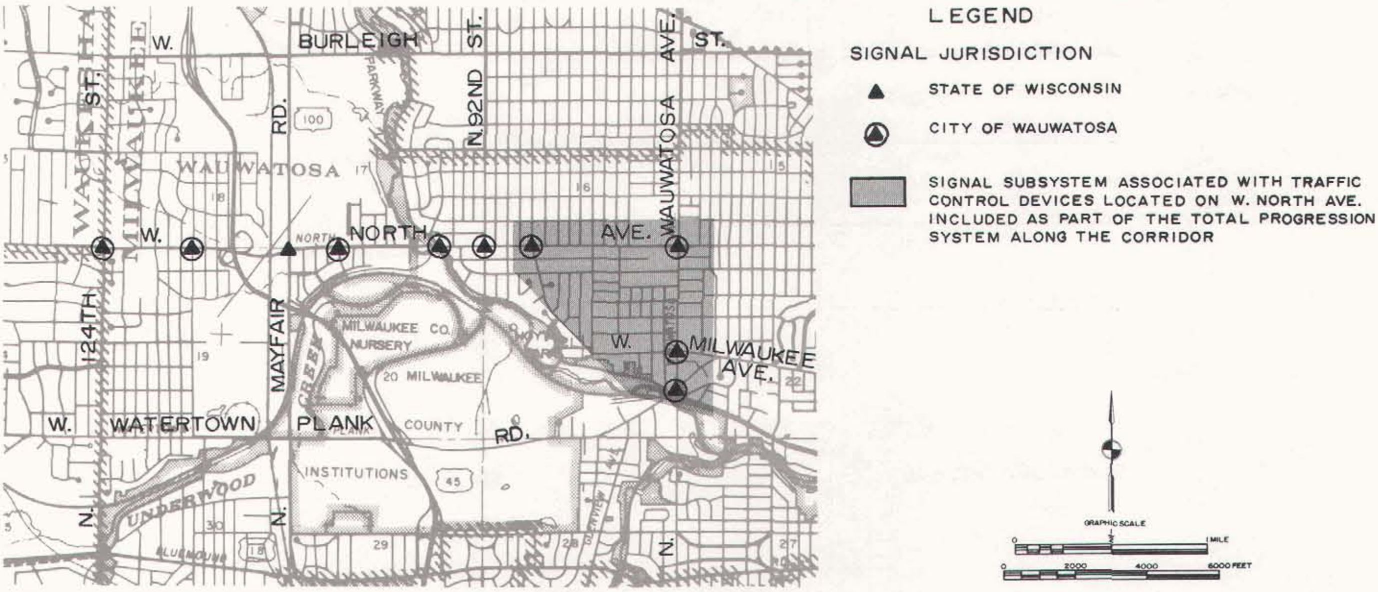
PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 20TH STREET

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
N. 20th Street and W. North Avenue	Eastbound	1	7	5	1	10	2
	Westbound	9	5	7	10	2	1
	Northbound	16	--	5	12	--	1
	Southbound	12	14	2	23	13	1
N. 20th Street and W. Wright Street	Eastbound	32	15	9	20	23	--
	Westbound	20	21	12	17	18	2
	Northbound	8	5	11	6	4	1
	Southbound	3	5	4	5	3	2
N. 20th Street and W. Center Street	Eastbound	5	8	5	5	17	5
	Westbound	9	2	5	12	11	5
	Northbound	12	7	5	12	8	5
	Southbound	12	6	5	10	8	5
N. 20th Street and W. Locust Street	Eastbound	6	3	5	6	7	5
	Westbound	5	18	5	6	8	5
	Northbound	18	6	5	15	6	5
	Southbound	4	5	5	4	5	5
N. 20th Street and W. Burleigh Street	Eastbound	8	17	7	12	17	4
	Westbound	--	6	6	2	2	3
	Northbound	3	12	7	4	13	1
	Southbound	8	1	1	12	2	2
N. 20th Street and W. Hopkins Street	Southeast-bound	8	--	3	17	--	3
	Northwest-bound	4	1	3	18	1	2
	Northbound	--	16	10	--	19	1
	Southbound	1	18	6	1	19	1

Source: SEWRPC.

Map 128

DETAIL OF THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181)—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—W. North Avenue from 124th Street to N. 76th Street (STH 181), a distance of 3.0 miles. This map also shows the location and jurisdiction of each of the eight traffic signals along this arterial segment, including the interconnected progressive signal subsystems which are located within approximately one-half mile of this segment of W. North Avenue and are directly affected by the timing plans of the traffic signals on W. North Avenue.

Source: Wisconsin Department of Transportation, City of Wauwatosa, and SEWRPC.

Map 129

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET

This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. North Avenue. Residential land use comprises the majority of the existing land uses within the corridor, while a combination of residential, retail sales and service, and off-street parking land uses comprise the majority of the existing urban development immediately adjacent to W. North Avenue. Retail sales and service land uses abut W. North Avenue particularly at its intersection with N. 124th Street, and with N. Mayfair Road (STH 100) at the Mayfair Mall Shopping Center, and between N. 92nd Street and N. 84th Street. Governmental and institutional land uses abut W. North Avenue between N. 122nd and N. 119th Streets, including the Fisher Elementary School; and between N. 80th and N. 76th Streets, including Longfellow Junior High School, Wauwatosa Cemetery, and the Wauwatosa Civic Center. Recreational land uses abut this segment of W. North Avenue at N. Menomonee River Parkway.

Source: SEWRPC.

Table 114

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
W. North Avenue and N. 124th Street	36 ML	P	36 ML	P	32 ML	P	32 ML	P
W. North Avenue and N. 116th Street	36 ML	P	36 ML	P	18	NP	18	FS
W. North Avenue and N. Mayfair Road (STH 100)	36 ML	NS	36 ML	NP	36 ML	NP	36 MLR	NP
W. North Avenue and N. 104th Street	36 ML	P	36 ML	P	18	NP	20 M	NS
W. North Avenue and N. Menomonee River Parkway	28 MR	NS	30	FS	20	FS	23	P
W. North Avenue and N. 92nd Street	24 ML	NSPM	24 ML	FS	24	NP	24	NP
W. North Avenue and N. 88th Street	24	NS	24	P	27	P	18	NS
W. North Avenue and N. 76th Street (STH 181)	34 ML	NP	34 ML	NP	32 ML	NP	32 ML	NP

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

Source: SEWRPC.

Traffic Control Measures: The timing plan for each of the eight traffic signals along W. North Avenue between N. 124th Street and N. 76th Street is indicated in Table 115. Map 128 shows the location and jurisdiction of each of these signals and their relationship to the interconnected progressive signal subsystems which are located within approximately one-half mile of this segment of W. North Avenue and are directly affected by the timing plans of the traffic signals on W. North Avenue. Five of the traffic signals are located at intersections of W. North Avenue with other arterial streets, and three are located at intersections of W. North Avenue with nonarterial streets—specifically N. 116th Street, N. 104th Street, and N. 88th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. North Avenue. This segment of W. North Avenue is posted for a 35-mile-per-hour (mph) speed limit from N. 124th Street to N. Menomonee River Parkway, and for a 30-mph speed limit between N. Menomonee River Parkway and N. 76th Street (STH 181).

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the eight signalized intersections along the problem segment of W. North Avenue in Figures 36 and 37. The locations along W. North Avenue from N. 124th Street to N. 76th Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the eight controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. North Avenue, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 116.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. North Avenue,

Table 115

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET

Phase	Intersection (time in seconds)					
	W. North Avenue			N. 124th Street		
Green.	24.0			24.0		
Yellow	3.6			3.6		
Red.	32.4			32.4		
Total Cycle	60.0			60.0		
	W. North Avenue			N. 116th Street		
Green.	40.0			30.0		
Yellow	4.0			4.0		
Red.	38.0			48.0		
Total Cycle[a]	82.0			82.0		
	W. North Avenue		N. Mayfair Road (STH 100)			
	Morning	Evening	Morning		Evening	
			Northbound	Southbound	Northbound	Southbound
Green.	24.3	25.2	25.2	25.2	24.3	24.3
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red.	61.2	60.3	60.3	60.3	61.2	61.2
Green Left-Turn Arrow . . .	11.7[b]	9.0[b]	9.0[b]	9.0[b]	11.7[b]	11.7[b]
Yellow Left-Turn Arrow . . .	3.6	3.6	3.6	3.6	3.6	3.6
Red Left-Turn Indication	- -	- -	77.4	- -	74.7	- -
Green Right-Turn Arrow . . .	- -	- -	- -	41.4[c]	- -	37.8[c]
Yellow Right-Turn Arrow . . .	- -	- -	- -	3.6	- -	3.6
Red Right-Turn Indication	- -	- -	- -	45.0	- -	48.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0
	W. North Avenue			N. 104th Street[a]		
Green.	40.0			30.0		
Yellow	5.0			5.0		
Red.	35.0			45.0		
Total Cycle[a]	80.0			80.0		
	W. North Avenue		N. Menomonee River Parkway			
	Eastbound	Westbound				
Green.	35.4	25.8	16.2			
Yellow	3.0	3.0	3.0			
Red.	21.6	31.2	40.8			
Green Arrow. . . .	6.0[d]	- -	- -			
Yellow Arrow . . .	2.4	- -	- -			
Total Cycle	60.0	60.0	60.0			

Table 115 (continued)

Phase	Intersection (time in seconds)	
	W. North Avenue	N. 92nd Street
Green.	25.8	17.4
Yellow	3.0	3.0
Red	31.2	39.6
Green Arrow. . . .	4.8[b]	- -
Yellow Arrow . . .	2.4	- -
Total Cycle	60.0	60.0
	W. North Avenue	N. 88th Street
Green.	33.6	16.8
Yellow	3.0	3.0
Red	23.4	40.2
Total Cycle	60.0	60.0
	W. North Avenue	N. 76th Street (STH 181)
Green.	26.1	26.1
Yellow	3.6	3.6
Red	60.3	60.3
Green Arrow. . . .	9.9[b]	9.9[b]
Yellow Arrow . . .	3.6	3.6
Total Cycle	90.0	90.0

[a]*Signal cycle is actuated by vehicular traffic on N. 116th Street and N. 104th Street.*

[b]*Leading left-turn arrow.*

[c]*Right-turn arrow concurrent with through green phase and extended as a lagging green arrow.*

[d]*Leading left-turn arrow concurrent with through green phase.*

Source: Wisconsin Department of Transportation, City of Wauwatosa, and SEWRPC.

those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 36 and 37. One congested traffic movement was found to occur along this segment of W. North Avenue during the morning peak hour and three were found to occur during the evening peak hour.

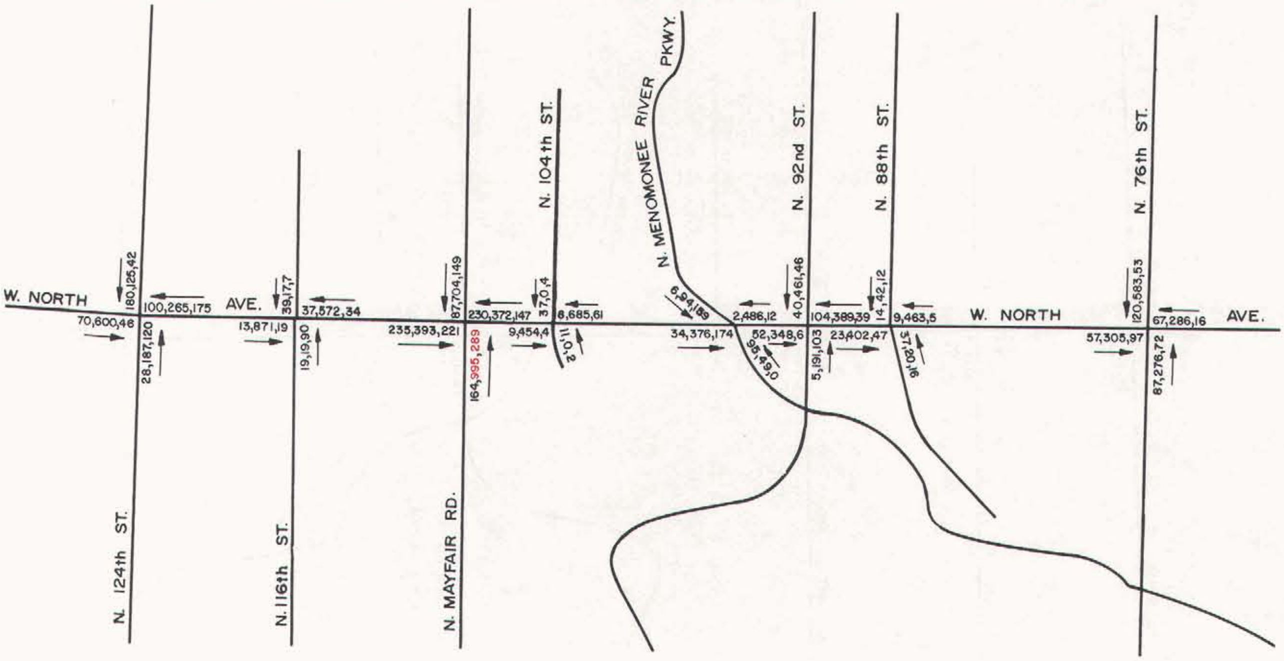
Alternative and Recommended Transportation Systems Management Actions: The one morning and three evening peak-hour traffic congestion problems identified along W. North Avenue from N. 124th Street to N. 76th Street are all associated with the intersection of W. North Avenue and N. Mayfair Road (STH 100).

One intersection along W. North Avenue—N. 124th Street—while not displaying congestion, was found to have signals that could be retimed to more efficiently serve existing traffic volumes, and one other intersection—N. 76th Street—also not displaying congestion, was found to lack adequate vehicle storage capacity within two existing turn lanes. Transportation systems management actions were accordingly also considered for these intersections.

Table 117 provides a summary of the specific congestion problems found along this segment of W. North Avenue, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions.

Figure 36

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181) DURING THE MORNING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

RED NUMBERS INDICATE CONGESTED MOVEMENT

[a] MORNING PEAK-HOUR VOLUMES SHOWN ABOVE REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

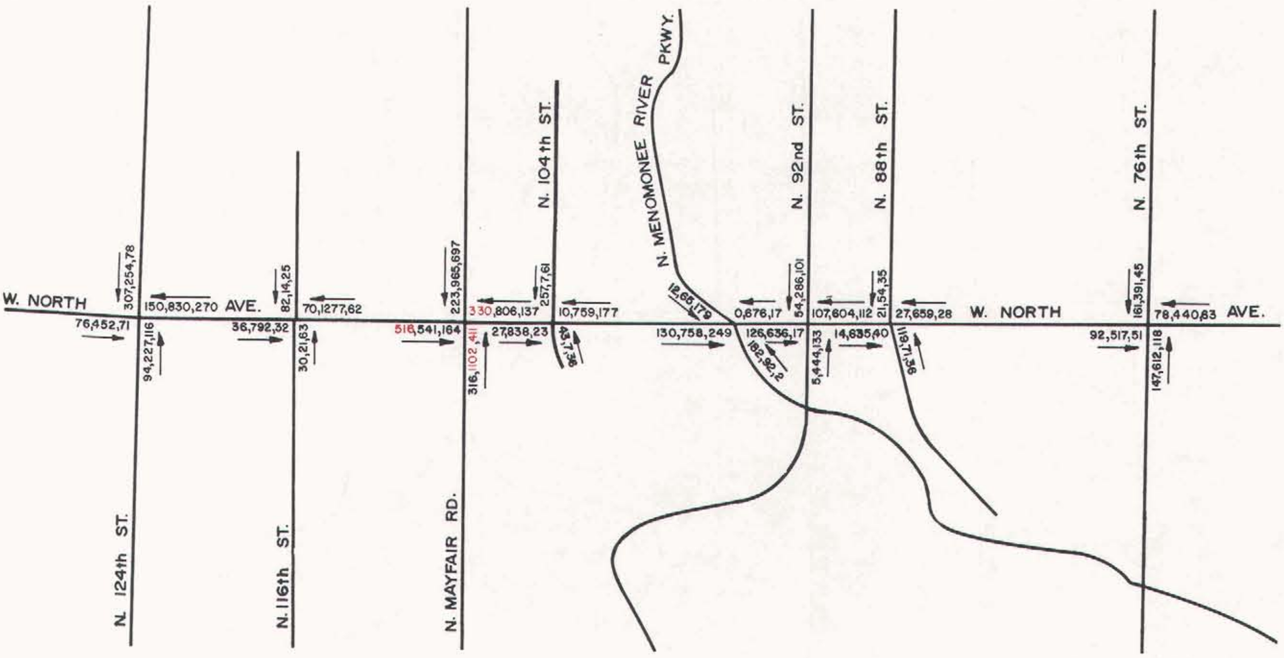
Source: SEWRPC.

Table 118 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of W. North Avenue. A total of four actions are recommended to be implemented to abate congestion along this problem segment of W. North Avenue, all at the intersection of W. North Avenue and N. Mayfair Road (STH 100), at a capital cost of approximately $73,000, expressed in 1980 dollars, not including right-of-way costs. Right-of-way costs associated with improvements recommended along this problem segment would represent an additional $80,000, as shown in Table 117. An additional action is recommended to be implemented along this segment of W. North Avenue at an intersection not displaying congestion problems at minimal capital cost.[13]

[13] *The costs of the short-range improvement of W. North Avenue do not include the cost of improvements recommended at the intersection of W. North Avenue and N. 76th Street. The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of N. 76th Street from W. Harwood Avenue to W. Bradley Road. At the intersection of W. North Avenue and N. 76th Street, it was recommended that the storage length of both the north-to-westbound left-turn lane and the south-to-eastbound left-turn lane be increased in order to provide sufficient turn-lane storage capacity during both the morning and evening peak hours, at a total capital cost of $31,000.*

Figure 37

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181) DURING THE EVENING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

RED NUMBERS INDICATE CONGESTED MOVEMENT

[a] EVENING PEAK-HOUR VOLUMES SHOWN ABOVE REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

The intersection of W. North Avenue and N. Mayfair Road (STH 100) experiences congestion during both the morning and evening peak hours. In order to alleviate the congestion at this intersection, it is recommended that the existing signal timing plan be retimed at minimal cost, that separate signal phasing be added to control a specific turning movement at a capital cost of about $3,000, that an exclusive north-to-eastbound right-turn lane with 250 feet of storage capacity be constructed at an estimated capital cost of $20,000, and that the exclusive west-to-southbound left-turn lane be reconstructed to a double left-turn lane with 170 feet of storage at a total capital cost of approximately $50,000. The estimated cost of recommended improvements at this intersection is thus $73,000. The recommended construction of the north-to-eastbound right-turn lane at this intersection is not possible, however, within the existing right-of-way. A minimum of 10 feet of additional right-of-way would have to be acquired for the length of this turn lane from the NCR Corporation, a business information systems hardware and software manufacturer and distributor. The cost of obtaining the additional 10-foot strip of right-of-way from this property is estimated at $80,000. The total cost of implementing all the recommended improvements at this intersection, including right-of-way costs, is thus estimated at $153,000.

As indicated in Table 117 and as already noted, another intersection along this segment of W. North Avenue, although not exhibiting specific congestion problems, was found to warrant traffic management actions to improve operations. The intersection of W. North Avenue and N. 124th Street was

Table 116

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. North Avenue and N. 124th Street	Eastbound	6	10	4	12	13	2
	Westbound	33	18	6	22	12	1
	Northbound	36	8	2	26	22	- -
	Southbound	12	52	5	12	48	2
W. North Avenue and N. 116th Street	Eastbound	2	1	3	4	4	2
	Westbound	5	6	7	4	5	1
	Northbound	70	15	5	55	27	- -
	Southbound	11	62	- -	20	68	- -
W. North Avenue and N. Mayfair Road (STH 100)	Eastbound	26	28	3	18	23	2
	Westbound	19	31	2	11	26	1
	Northbound	20	11	6	23	17	1
	Southbound	16	9	3	37	12	2
W. North Avenue and N. 104th Street	Eastbound	1	2	6	3	3	1
	Westbound	8	1	3	19	1	3
	Northbound	15	85	- -	42	50	- -
	Southbound	10	90	22	19	79	2
W. North Avenue and N. Menomonee River Parkway	Eastbound	30	6	7	22	11	1
	Westbound	2	1	5	2	- -	4
	Northbound	- -	66	1	1	66	- -
	Southbound	62	2	1	70	5	1
W. North Avenue and N. 92nd Street	Eastbound	1	13	7	2	16	2
	Westbound	7	20	4	14	13	2
	Northbound	34	2	1	23	1	1
	Southbound	9	7	1	23	12	1
W. North Avenue and N. 88th Street	Eastbound	10	5	10	6	2	1
	Westbound	1	2	3	4	4	1
	Northbound	22	51	5	16	53	4
	Southbound	17	21	- -	32	19	- -
W. North Avenue and N. 76th Street (STH 181)	Eastbound	21	12	3	8	14	1
	Westbound	4	18	2	11	13	1
	Northbound	17	20	5	14	16	1
	Southbound	7	16	1	8	27	1

Source: SEWRPC.

found to have a signal timing plan which could be revised to more efficiently balance traffic operating conditions. Minimal capital cost would be associated with this action.

In addition, the existing offsets between the traffic signal timing plans of the eight signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. North Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

Table 117

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. North Avenue and N. Mayfair Road (STH 100)	Congested northbound through and right-turn movements during the morning and evening peak hours (1,284 and 1,513 vehicles per hour, respectively, at level-of-service E), congested westbound left turn during the evening peak hour (330 vehicles per hour at level-of-service E), and congested eastbound left turn during the evening peak hour (217 vehicles per hour at level-of-service E)	Recommended Actions Retime 90-second cycle to increase east-to-northbound and west-to-southbound leading left-turn green arrows from 11.7 to 14.4 seconds during the morning peak hour and from 9.0 to 10.8 seconds during the evening peak hour, making necessary signal timing changes at other approaches	- -	
		Add separate signal phasing to control north-to-eastbound right-turn movement to operate concurrently with south-to-westbound right-turn phasing	$ 3,000	
		Construct an exclusive north-to-eastbound right-turn lane with 250 feet of storage	$20,000 (Right-of-way costs associated with northbound right-turn lane are estimated at an additional $80,000 for a strip of right-of-way from the NCR Corporation)	
		Reconstruct exclusive west-to-southbound left-turn lane to double lane with 170 feet of storage	$50,000	$153,000
		Alternative Action Retime existing 90-second cycle such that all problem movements can be accommodated at an acceptable level of service (Not recommended, as congested movements at this intersection are too extensive, and only significant increases in intersection capacity are seen as solutions)		
Subtotal			$153,000 (Including right-of-way costs associated with northbound right-turn lane at the intersection of W. North Avenue and N. Mayfair Road—(STH 100)	
W. North Avenue and N. 124th Street	Inefficient traffic signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Retime 60-second cycle to increase east- and westbound green time from 24.0 to 25.2 seconds, making necessary signal changes at other approaches to improve operating efficiency of intersection	- -	- -
W. North Avenue and N. 76th Street	Inefficient north-to-westbound left-turn-lane storage capacity during the evening peak hour and south-to-eastbound left-turn-lane storage capacity during the morning and evening peak hours	Recommended Action Refer to previous analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road	Cost not included	Cost not included
Total			$153,000 (Including right-of-way costs associated with northbound right-turn lane at the intersection of W. North Avenue and N. Mayfair Road—(STH 100)	

Source: SEWRPC.

Table 118

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 124TH STREET TO N. 76TH STREET (STH 181)

Phase	Intersection (time in seconds)					
	W. North Avenue			N. 124th Street		
Green	25.2			22.8		
Yellow	3.6			3.6		
Red	31.2			33.6		
Total Cycle	60.0			60.0		
	W. North Avenue			N. 116th Street[a]		
Green	40.0			30.0		
Yellow	4.0			4.0		
Red	38.0			48.0		
Total Cycle[a]	82.0			82.0		
	W. North Avenue				N. Mayfair Road (STH 100)	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green	22.5	22.5	22.5	22.5	25.2	25.2
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	63.0	63.0	63.0	63.0	60.3	60.3
Green Left-Turn Arrow	14.4[b]	14.4[b]	10.8[b]	10.8[b]	8.1[b]	11.7[b]
Yellow Left-Turn Arrow	3.6	3.6	3.6	3.6	3.6	3.6
Red Left-Turn Indication	--	72.0	--	75.6	78.3	74.7
Green Right-Turn Arrow	--	--	--	--	44.1[c]	40.5[c]
Yellow Right-Turn Arrow	--	--	--	--	3.6	3.6
Red Right-Turn Indication	--	--	--	--	42.3	45.9
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0
	W. North Avenue			N. 104th Street[a]		
Green	40.0			30.0		
Yellow	5.0			5.0		
Red	35.0			45.0		
Total Cycle[a]	80.0			80.0		
	W. North Avenue				N. Menomonee River Parkway	
	Eastbound		Westbound			
Green	35.4		25.8		16.2	
Yellow	3.0		3.0		3.0	
Red	21.6		31.2		40.8	
Green Arrow	6.0[d]				--	
Yellow Arrow	2.4				--	
Total Cycle	60.0		60.0		60.0	

Table 118 (continued)

Phase	Intersection (time in seconds)	
	W. North Avenue	N. 92nd Street
Green	25.8	17.4
Yellow	3.0	3.0
Red	31.2	39.6
Green Arrow	4.8[b]	
Yellow Arrow	2.4	
Total Cycle	60.0	60.0
	W. North Avenue	N. 88th Street
Green	33.6	16.8
Yellow	3.0	3.0
Red	23.4	40.2
Total Cycle	60.0	60.0
	W. North Avenue	N. 76th Street (STH 181)
Green	26.1	26.1
Yellow	3.6	3.6
Red	60.3	60.3
Green Arrow	9.9[b]	9.9[b]
Yellow Arrow	3.6	3.6
Total Cycle	90.0	90.0

[a] *Signal cycle is actuated by vehicular traffic on N. 124th Street.*

[b] *Leading left-turn arrow.*

[c] *Right-turn arrow concurent with through green phase and extended as a lagging green arrow.*

[d] *Leading left-turn arrow concurrent with through green phase.*

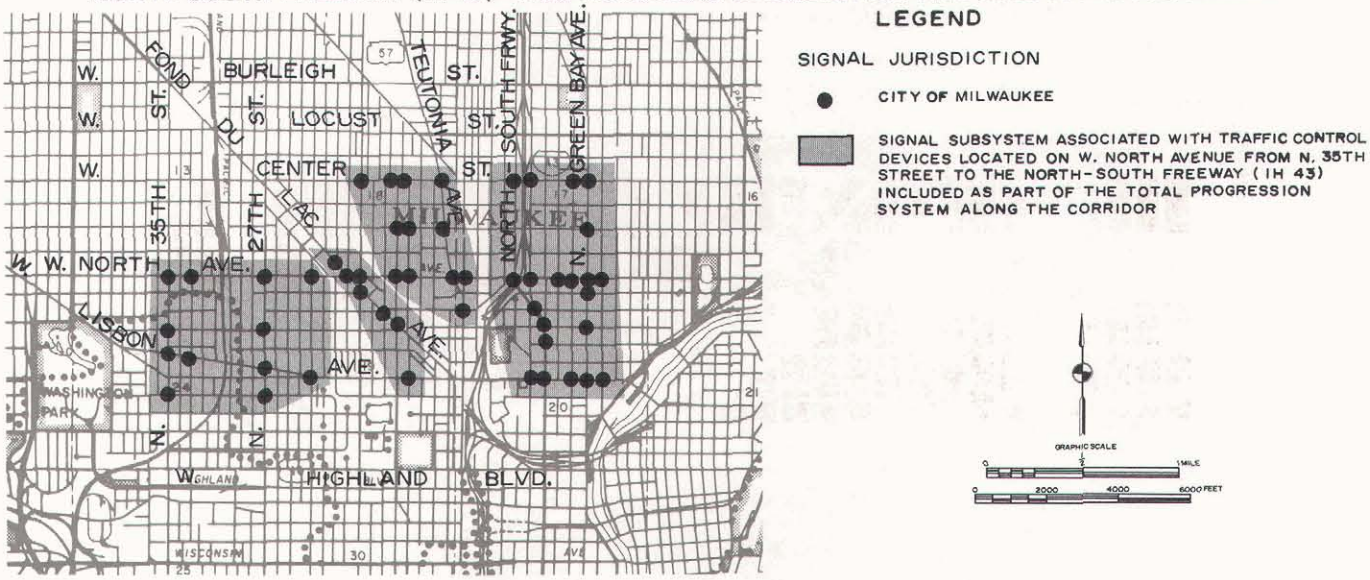
Source: SEWRPC.

W. North Avenue from N. 35th Street to the North-South Freeway (IH 43)

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 130, W. North Avenue from N. 35th Street to the North-South Freeway (IH 43), a distance of 1.8 miles. Map 131 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. North Avenue. Residential land use comprises the majority of the existing urban development in the corridor, while a combination of retail sales and service uses, open lands, and residential land uses comprises the majority of the land uses immediately adjacent to W. North Avenue. Retail sales and service land uses abut this segment of W. North Avenue, particularly between N. 35th Street and N. 24th Street and at the intersection of W. North Avenue with W. Fond du Lac Avenue (STH 145). There is a strip of industrial land use along this corridor immediately adjacent to the Milwaukee Road railroad crossing of W. North Avenue at approximately N. 31st Street. Land cleared for the previously proposed Park Freeway-West and Park Freeway spur lies within this corridor between W. Lloyd Street and W. Brown Street in the eastern section of this corridor, along W. Fond du Lac Avenue (STH 145) in the central

Map 130

DETAIL OF THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area identified as having sufficiently severe existing problems to warrant investigation of short-range improvements—W. North Avenue from N. 35th Street to the North-South Freeway (IH 43), a distance of 1.8 miles. This map also shows the location and jurisdiction of each of the 12 traffic signals along this arterial, including the interconnected progressive signal subsystems which are located within approximately one-half mile of this segment of W. North Avenue and are directly affected by the timing plans of the traffic signals on W. North Avenue.

Source: City of Milwaukee and SEWRPC.

portion of this corridor, and between W. North Avenue and W. Meinecke Avenue in the western section of this corridor.

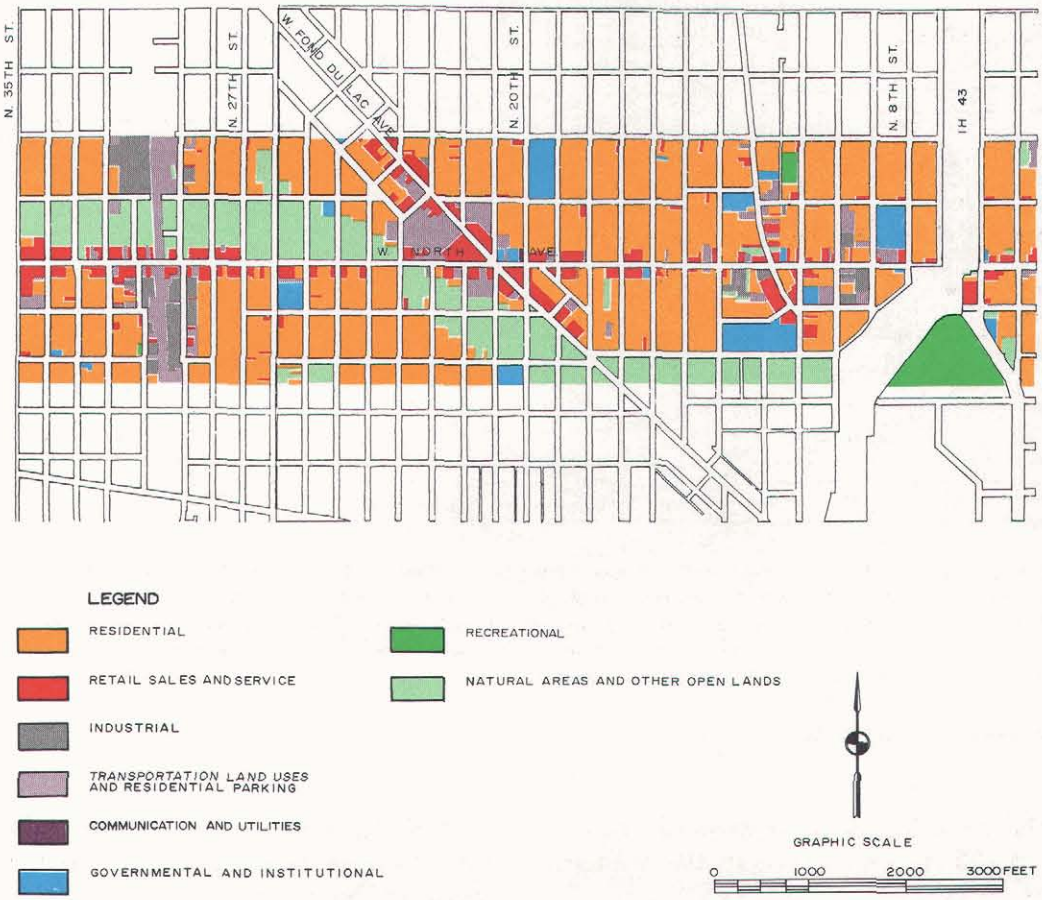
Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. North Avenue. With the exception of that portion between N. 9th Street and N. 7th Street, this segment of W. North Avenue is not median divided, and has a curb-to-curb roadway width of 50 feet along its entire length, adequate to provide two lanes for moving traffic in each direction with parking prohibited. The curb-to-curb widths of the dual roadways range from 23 to 27 feet at N. 9th Street, adequate to provide two lanes for moving traffic in each direction with parking prohibited; between 34 and 37 feet at N. 8th Street, adequate to provide two lanes for moving traffic in each direction with parking permitted; and between 26 and 37 feet at N. 7th Street, adequate to provide two lanes for moving traffic in the eastbound direction with parking prohibited and two lanes for moving traffic in the westbound direction with parking permitted. Parking is currently prohibited along this segment of W. North Avenue only between N. 23rd and N. 22nd Streets and N. 9th Street and N. 8th Street on the south side of the roadway only, and between N. 8th Street and N. 7th Street on both sides of the roadway.

As shown in Table 119, this segment of W. North Avenue has 12 signalized intersections, at which the W. North Avenue approaches range in width from 25 to 37 feet. One of the eastbound and one of the westbound approaches to these 12 intersections provide separate lanes for the exclusive use of left-turning vehicles. One of the eastbound and one of the westbound approaches also provide separate lanes for the exclusive use of right-turning vehicles, the right-turn lane at the intersection of W. North Avenue and N. 7th Street being provided by regulatory pavement marking rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of W. North Avenue are also indicated in Table 119.

Traffic Control Measures: The timing plan for each of the 12 traffic signals along W. North Avenue between N. 35th Street and the North-South Freeway (IH 43) is indicated in Table 120. Map 130

Map 131

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. North Avenue. Residential land use comprises the majority of the existing urban development in the corridor, while a combination of retail sales and service uses, open lands, and residential land uses comprise the majority of the land uses immediately adjacent to W. North Avenue. Retail sales and service uses abut this segment of W. North Avenue in particular between N. 35th Street and N. 24th Street and at the intersection of W. North Avenue and W. Fond du Lac Avenue (STH 145). There is a strip of industrial land use along this corridor immediately adjacent to the Milwaukee Road railroad crossing of W. North Avenue at approximately N. 31st Street. Land cleared for the previously proposed Park Freeway West and Park Freeway spur exits lies this corridor between W. Lloyd Street and W. Brown Street in the eastern section of this corridor, along W. Fond du Lac Avenue in the central portion of this corridor, and between W. North Avenue and W. Meinecke Avenue in the western section of this corridor.

Source: SEWRPC.

shows the location and jurisdiction of each of these signals and their relationship to the other interconnected progressive signal subsystems which are located within approximately one-half mile of this segment of W. North Avenue and are directly affected by the timing plans of the traffic signals on W. North Avenue. Nine of the traffic signals are located at intersections of W. North Avenue with other arterial streets, and three are located at intersections of W. North Avenue with nonarterial streets—specifically, N. 33rd Street, N. 24th Street, and N. 12th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. North Avenue. This entire segment of W. North Avenue is posted for a 30-mile-per-hour speed limit.

Table 119

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound or Northwest-bound		Southbound or Southeast-bound	
W. North Avenue and N. 35th Street . . .	25	P	25	P	25	NPPM	22	NPAM
W. North Avenue and N. 33rd Street . . .	25	P	25	P	18R	NS	18	NS
W. North Avenue and N. 27th Street . . .	25	NPAM	25	P	25	NSPM	25	P
W. North Avenue and N. 24th Street . . .	25	P	25	P	15	FS	22	NS
W. North Avenue, W. Fond du Lac Avenue (STH 145), and N. 21st Street[a]	25	NP	25	NPPM	25	P	25	NPAM
W. North Avenue and N. 20th Street . . .	25	NP	25	NPPM	20	NSPM	20	NS
W. North Avenue and N. 17th Street . . .	25	NPAM	25	P	- -	- -	36[b]	NP
W. North Avenue and N. 16th Street . . .	25	NPAM	25	FS	30[c]	NP	- -	- -
W. North Avenue and N. Teutonia Avenue	25	NPAM	25	P	25	P	25	P
W. North Avenue and N. 12th Street . . .	25	NPAM	25	P	25	P	25	P
W. North Avenue and N. 8th Street. . . .	34 MR	NP	37 ML	NS	- -	- -	62[b]ML[d]R[d]	NP
W. North Avenue and N. 7th Street. . . .	26 ML	NP	37MR[d]	NPPM	36[c]L	NPPM	- -	- -

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a] *One-way street proceeding away from intersection.*

[b] *One-way street southbound.*

[c] *One-way street northbound.*

[d] *Exclusive turn lane included as part of roadway width.*

Source: SEWRPC.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 12 signalized intersections along the problem segment of W. North Avenue in Figures 38 and 39. The locations along W. North Avenue from N. 35th Street to the North-South Freeway (IH 43) where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the 12 controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. North Avenue, including the percentage of

Table 120

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Phase	Intersection (time in seconds)	
	W. North Avenue	N. 35th Street
Green.	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0
	W. North Avenue	N. 33rd Street
Green.	34.8	15.6
Yellow	3.6	3.6
Red	21.6	40.8
Total Cycle	60.0	60.0
	W. North Avenue	N. 27th Street
Green.	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0
	W. North Avenue	N. 24th Street
Green.	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle	60.0	60.0

Phase	W. North Avenue N. 21st Street[a]		W. Fond du Lac Avenue (STH 145)			
			Morning		Evening	
			Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound
Green.	39.6	--	28.8	39.6	39.6	28.8
Yellow	3.6	--	3.6	3.6	3.6	3.6
Red	46.8	--	57.6	46.8	46.8	57.6
Green Arrow. . .	--	--	--	8.1[b]	8.1[b]	--
Yellow Arrow . .	--	--	--	2.7	2.7	--
Total Cycle	90.0	--	90.0	90.0	90.0	90.0

Phase	W. North Avenue	N. 20th Street
Green.	32.4	46.8
Yellow	3.6	3.6
Red	54.0	39.6
Total Cycle	90.0	90.0

Phase	W. North Avenue			N. 17th Street[c]
	Morning	Evening		
		Eastbound	Westbound	
Green.	34.2	24.2	34.2	16.2
Yellow	3.6	3.6	3.6	3.6
Red	22.2	32.2	22.2	40.2
Green Arrow. . .	--	--	7.0[b]	--
Yellow Arrow . .	--	--	3.0	--
Total Cycle	60.0	60.0	60.0	60.0

Table 120 (continued)

Phase	W. North Avenue Morning	W. North Avenue Evening	N. 16th Street[d] Morning	N. 16th Street[d] Evening
Green	31.2	34.2	19.2	16.2
Yellow	3.6	3.6	3.6	3.6
Red	25.2	22.2	37.2	40.2
Total Cycle	60.0	60.0	60.0	60.0

Phase	W. North Avenue	N. Teutonia Avenue
Green	31.2	19.2
Yellow	3.6	3.6
Red	25.2	37.2
Total Cycle	60.0	60.0

Phase	W. North Avenue	N. 12th Street
Green	31.2	19.2
Yellow	3.6	3.6
Red	25.2	37.2
Total Cycle	60.0	60.0

Phase	W. North Avenue Eastbound	W. North Avenue Westbound	N. 8th Street[c]
Green	18.6	29.4	22.2
Yellow	3.6	3.6	3.6
Red	37.8	27.0	34.2
Green Arrow	--	7.2[e]	--
Yellow Arrow	--	--	--
Total Cycle	60.0	60.0	60.0

Phase	W. North Avenue Eastbound	W. North Avenue Westbound	N. 7th Street[d]
Green	29.4	18.6	22.2
Yellow	3.6	3.6	3.6
Red	27.0	37.8	34.2
Green Arrow	7.2[e]	--	--
Yellow Arrow	--	--	--
Total Cycle	60.0	60.0	60.0

[a] *One-way street proceeding away from intersection.*

[b] *Leading left-turn arrow concurrent with through green phase.*

[c] *One-way street southbound.*

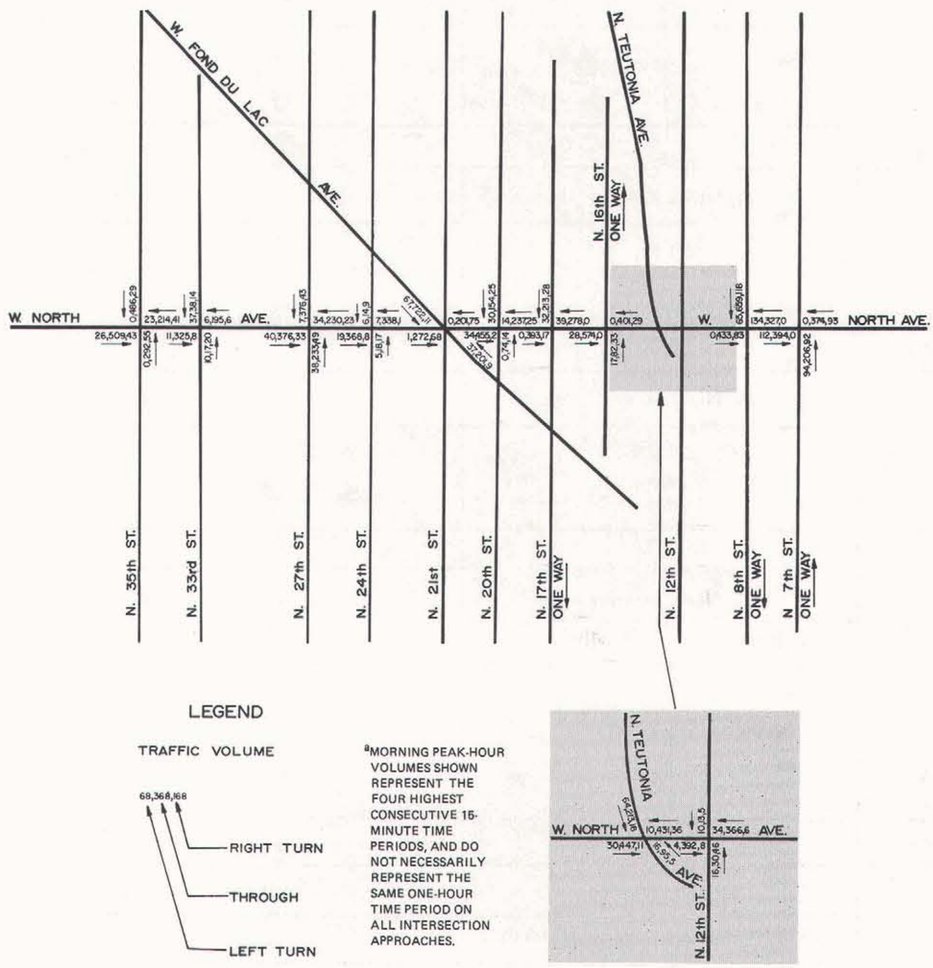
[d] *One-way street northbound.*

[e] *Lagging left-turn arrow concurrent with through green phase.*

Source: City of Milwaukee and SEWRPC.

Figure 38

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43) DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

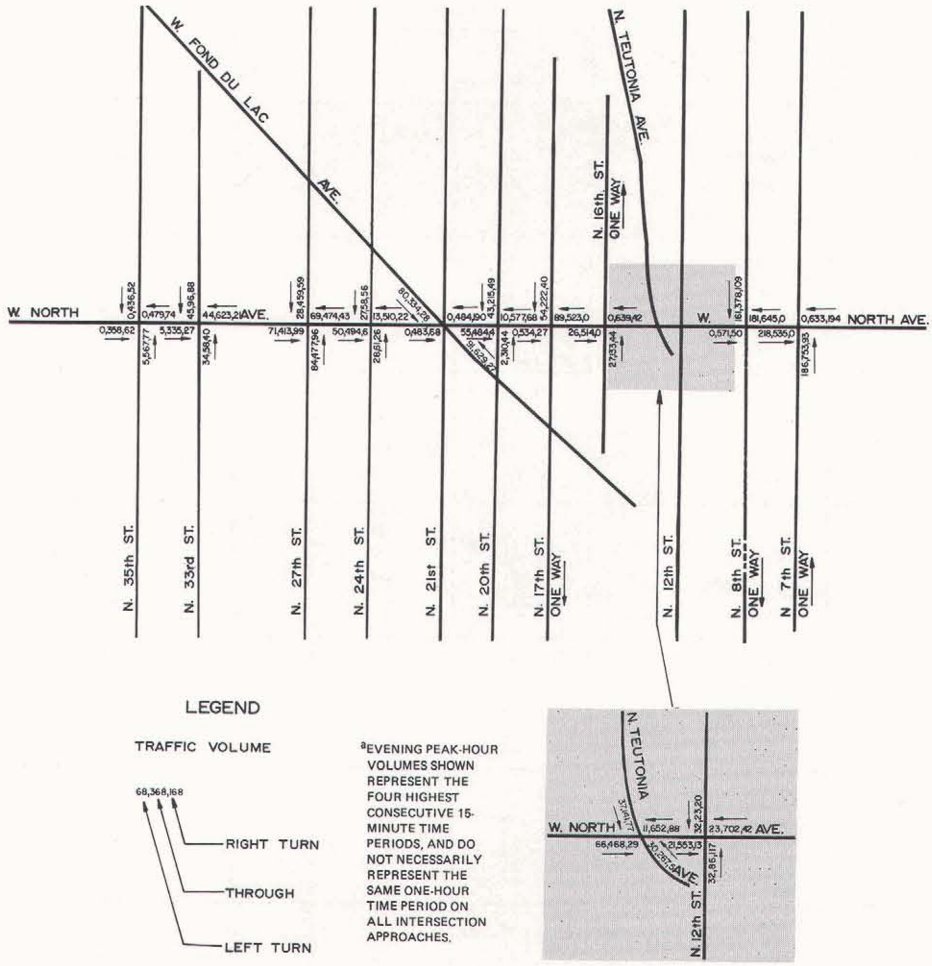
left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 121.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. North Avenue, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 38 and 39. No congested traffic movements were found to occur along this segment of W. North Avenue. This problem segment of W. North Avenue was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment.

Alternative and Recommended Transportation Systems Management Actions: Although no congested traffic movements were found to occur along this segment of W. North Avenue during either peak hour, one intersection along this segment of W. North Avenue—the intersection of W. North Avenue and W. Fond du Lac Avenue (STH 145)—while not displaying congestion prob-

Figure 39

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43) DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

lems, was found to have a signal timing plan which could be revised to more efficiently balance traffic operating conditions.

Table 122 provides a summary of the signal timing problem found along this segment of W. North Avenue and of the costs associated with the improvement of this intersection.[14] Table 123 summarizes the changes in traffic signal timing recommended for intersections along this problem segment of W. North Avenue.

In addition, the existing offsets between the traffic signal timing plans of the 12 signalized intersections along this segment should be reviewed by the

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[14] *The costs of short-range improvement of this segment of W. North Avenue do not include the cost of the improvement recommended at the intersection of W. North Avenue and W. Fond du Lac Avenue (STH 145). The improvement of this intersection, and the attendant cost, was considered in this chapter in the analysis of the problem segment of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street. At the intersection of W. North Avenue and W. Fond du Lac Avenue, only the retiming of the existing signal timing plan is required to improve operating conditions, at minimal cost.*

Table 121

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Intersection	Approach Direction	Morning Peak Hour: Turns Percent Right	Morning Peak Hour: Turns Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns Percent Right	Evening Peak Hour: Turns Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. North Avenue and N. 35th Street	Eastbound	7	5	8	15	- -	4
	Westbound	15	8	15	14	- -	5
	Northbound	16	- -	15	12	- -	6
	Southbound	6	- -	13	11	- -	7
W. North Avenue and N. 33rd Street	Eastbound	2	3	5	7	1	5
	Westbound	3	3	5	3	6	5
	Northbound	42	21	5	30	26	5
	Southbound	16	42	5	38	20	5
W. North Avenue and N. 27th Street	Eastbound	7	9	5	17	12	6
	Westbound	8	12	11	7	12	4
	Northbound	15	12	7	15	13	4
	Southbound	10	2	5	11	5	7
W. North Avenue and N. 24th Street	Eastbound	2	5	7	1	9	6
	Westbound	1	2	3	4	2	2
	Northbound	43	12	5	23	24	2
	Southbound	31	21	3	40	19	- -
W. North Avenue, W. Fond du Lac Avenue (STH 145), and N. 21st Street[a]	Eastbound	20	- -	20	12	- -	3
	Westbound	27	- -	27	28	- -	2
	Northwest-bound	4	15	4	4	12	2
	Southeast-bound	1	9	1	6	18	7
W. North Avenue and N. 20th Street	Eastbound	1	7	5	1	10	2
	Westbound	9	5	7	10	2	1
	Northbound	16	- -	5	12	- -	1
	Southbound	12	14	2	23	13	1
W. North Avenue and N. 17th Street[b]	Eastbound	4	- -	5	5	- -	5
	Westbound	- -	12	5	- -	15	5
	Southbound	10	12	5	13	17	5
W. North Avenue and N. 16th Street[c]	Eastbound	- -	5	2	- -	5	3
	Westbound	6	- -	2	6	- -	3
	Northbound	25	13	3	22	13	1
W. North Avenue and W. Teutonia Avenue	Eastbound	2	6	3	5	12	3
	Westbound	8	2	3	12	1	3
	Northwest-bound	4	14	5	2	10	5
	Southeast-bound	6	22	5	30	15	5
W. North Avenue and N. 12th Street	Eastbound	2	1	9	2	4	3
	Westbound	2	8	8	5	3	4
	Northbound	50	17	7	49	14	3
	Southbound	18	36	- -	27	42	3
W. North Avenue and N. 8th Street[b]	Eastbound	16	- -	3	8	- -	2
	Westbound	- -	29	3	- -	22	4
	Southbound	14	8	5	17	25	3
W. North Avenue and N. 7th Street[c]	Eastbound	- -	22	6	- -	29	1
	Westbound	20	- -	8	23	- -	3
	Northbound	24	24	5	9	18	4

[a] *One-way street proceeding away from intersection.*

[b] *One-way street southbound.*

[c] *One-way street northbound.*

Source: SEWRPC.

Table 122

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTION TO ABATE THE TRAFFIC CONGESTION PROBLEM ON THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
W. North Avenue and W. Fond du Lac Avenue (STH 145)	Inefficient signal timing plan; needs to be updated to reflect current traffic conditions	Recommended Action Refer to analysis of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street	Cost not included	Cost not included

Source: SEWRPC.

implementing agency and altered as necessary to accommodate the one recommended traffic management action and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of W. North Avenue by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

The City of Milwaukee is planning to implement the North Division Neighborhood Master Plan, which is intended to restore and stabilize the neighborhood generally bounded by N. 8th Street, W. North Avenue, N. 20th Street, and W. Burleigh Street. Included in this master plan are neighborhood traffic management actions which will divert many motorists who presently use the neighborhood streets for through movement to the major arterial routes. Implementation of this plan will have direct effects upon this problem segment of W. North Avenue.

STH 57 from Donges Bay Road to Highland Road

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 132, STH 57 from Donges Bay Road to Highland Road, a distance of 3.2 miles. This segment of STH 57 traverses the Village of Thiensville. Map 133 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of STH 57. Residential land use comprises the majority of the existing land uses within the corridor, while a combination of retail sales and service uses, open lands, and residential land uses comprises the majority of the development immediately adjacent to STH 57. Retail sales and service land uses abut this segment of STH 57, particularly at the intersection of STH 57 and Donges Bay Road and along STH 57 between Mequon Road and Freistadt Road in the Village of Thiensville. Open land uses abut this segment of STH 57 north of Freistadt Road. Agricultural land uses occur along the entire length of this problem segment.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of STH 57. STH 57 is not median divided along this segment. The width of the roadway is 24 feet between pavement edges, with 10-foot-wide gravel shoulders from Donges Bay Road to Mequon Road (STH 167), adequate to provide one lane for moving traffic in each direction; 52 feet from curb to curb at the intersection of STH 57 and Mequon Road (STH 167), adequate to provide two lanes for moving traffic in each direction with parking prohibited; 30 to 36 feet between pavement edges from Mequon Road (STH 167) to River View Drive in the Village of Thiensville, adequate to provide one lane for moving traffic in each direction, with the exception of the intersection of STH 57 and Green Bay Road (Wisconsin Street), which is 56 feet between pavement edges, adequate to provide two lanes for moving traffic in each direction; 48 to 52 feet between pavement edges from River View Drive to Freistadt Road (CTH F) in the Village of Thiensville, adequate to provide two lanes for moving traffic in each direction ; and 22 to 24 feet between pavement edges between Freistadt Road (CTH F) and Highland Road, adequate to provide one lane for moving traffic in each direction. Parking is currently prohibited along this segment of STH 57 only between River View Drive and Concord Drive in the Village of Thiensville on both sides of the roadway.

Table 123

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. NORTH AVENUE FROM N. 35TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Intersection (time in seconds)

Phase	W. North Avenue	N. 35th Street
Green	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Phase	W. North Avenue	N. 33rd Street
Green	34.8	15.6
Yellow	3.6	3.6
Red	21.6	40.8
Total Cycle	60.0	60.0

Phase	W. North Avenue	N. 27th Street
Green	25.2	25.2
Yellow	3.6	3.6
Red	31.2	31.2
Total Cycle	60.0	60.0

Phase	W. North Avenue	N. 24th Street
Green	34.2	16.2
Yellow	3.6	3.6
Red	22.2	40.2
Total Cycle	60.0	60.0

Phase	W. North Avenue	N. 21st Street[a]	W. Fond du Lac Avenue (STH 145)			
			Morning		Evening	
			Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound
Green	37.8	--	30.6	41.4	41.4	30.6
Yellow	3.6	--	3.6	3.6	3.6	3.6
Red	48.6	--	55.8	45.0	45.0	55.8
Green Arrow	--	--	--	8.1[b]	8.1[b]	--
Yellow Arrow	--	--	--	2.7	2.7	--
Total Cycle	90.0	--	90.0	90.0	90.0	90.0

Phase	W. North Avenue	N. 20th Street
Green	32.4	46.8
Yellow	3.6	3.6
Red	54.0	39.6
Total Cycle	90.0	90.0

Phase	W. North Avenue			N. 17th Street[c]
	Morning	Evening		
		Eastbound	Westbound	
Green	34.2	24.2	34.2	16.2
Yellow	3.6	3.6	3.6	3.6
Red	22.2	32.2	22.2	40.2
Green Arrow	--	--	7.0[d]	--
Yellow Arrow	--	--	3.0	--
Total Cycle	60.0	60.0	60.0	60.0

Table 123 (continued)

<table>
<tr><th rowspan="3">Phase</th><th colspan="4">Intersection (time in seconds)</th></tr>
<tr><th colspan="2">W. North Avenue</th><th colspan="2">N. 16th Street[d]</th></tr>
<tr><th>Morning</th><th>Evening</th><th>Morning</th><th>Evening</th></tr>
<tr><td>Green. . . . . . .</td><td>31.2</td><td>34.2</td><td>19.2</td><td>16.2</td></tr>
<tr><td>Yellow . . . . . .</td><td>3.6</td><td>3.6</td><td>3.6</td><td>3.6</td></tr>
<tr><td>Red . . . .</td><td>25.2</td><td>22.2</td><td>37.2</td><td>40.2</td></tr>
<tr><td>Total Cycle</td><td>60.0</td><td>60.0</td><td>60.0</td><td>60.0</td></tr>
<tr><td></td><td colspan="2">W. North Avenue</td><td colspan="2">N. Teutonia Avenue</td></tr>
<tr><td>Green. . . . . . .</td><td colspan="2">31.2</td><td colspan="2">19.2</td></tr>
<tr><td>Yellow . . . . . .</td><td colspan="2">3.6</td><td colspan="2">3.6</td></tr>
<tr><td>Red . . . .</td><td colspan="2">25.2</td><td colspan="2">37.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
<tr><td></td><td colspan="2">W. North Avenue</td><td colspan="2">N. 12th Street</td></tr>
<tr><td>Green. . . . . . .</td><td colspan="2">31.2</td><td colspan="2">19.2</td></tr>
<tr><td>Yellow . . . . . .</td><td colspan="2">3.6</td><td colspan="2">3.6</td></tr>
<tr><td>Red . . . .</td><td colspan="2">25.2</td><td colspan="2">37.2</td></tr>
<tr><td>Total Cycle</td><td colspan="2">60.0</td><td colspan="2">60.0</td></tr>
<tr><td rowspan="2"></td><td colspan="2">W. North Avenue</td><td colspan="2" rowspan="2">N. 8th Street[c]</td></tr>
<tr><td>Eastbound</td><td>Westbound</td></tr>
<tr><td>Green. . . . . . .</td><td>18.6</td><td>29.4</td><td colspan="2">22.2</td></tr>
<tr><td>Yellow . . . . . .</td><td>3.6</td><td>3.6</td><td colspan="2">3.6</td></tr>
<tr><td>Red . . . .</td><td>37.8</td><td>27.0</td><td colspan="2">34.2</td></tr>
<tr><td>Green Arrow. . .</td><td>- -</td><td>7.2[e]</td><td colspan="2">- -</td></tr>
<tr><td>Yellow Arrow . .</td><td>- -</td><td>- -</td><td colspan="2">- -</td></tr>
<tr><td>Total Cycle</td><td>60.0</td><td>60.0</td><td colspan="2">60.0</td></tr>
<tr><td rowspan="2"></td><td colspan="2">W. North Avenue</td><td colspan="2" rowspan="2">N. 7th Street[d]</td></tr>
<tr><td>Eastbound</td><td>Westbound</td></tr>
<tr><td>Green. . . . . . .</td><td>29.4</td><td>18.6</td><td colspan="2">22.2</td></tr>
<tr><td>Yellow . . . . . .</td><td>3.6</td><td>3.6</td><td colspan="2">3.6</td></tr>
<tr><td>Red . . . .</td><td>27.0</td><td>37.8</td><td colspan="2">34.2</td></tr>
<tr><td>Green Arrow. . .</td><td>7.2[e]</td><td>- -</td><td colspan="2">- -</td></tr>
<tr><td>Yellow Arrow . .</td><td>- -</td><td>- -</td><td colspan="2">- -</td></tr>
<tr><td>Total Cycle</td><td>60.0</td><td>60.0</td><td colspan="2">60.0</td></tr>
</table>

[a] *One-way street proceeding away from intersection.*

[b] *Leading left-turn arrow concurrent with through green phase.*

[c] *One-way street southbound.*

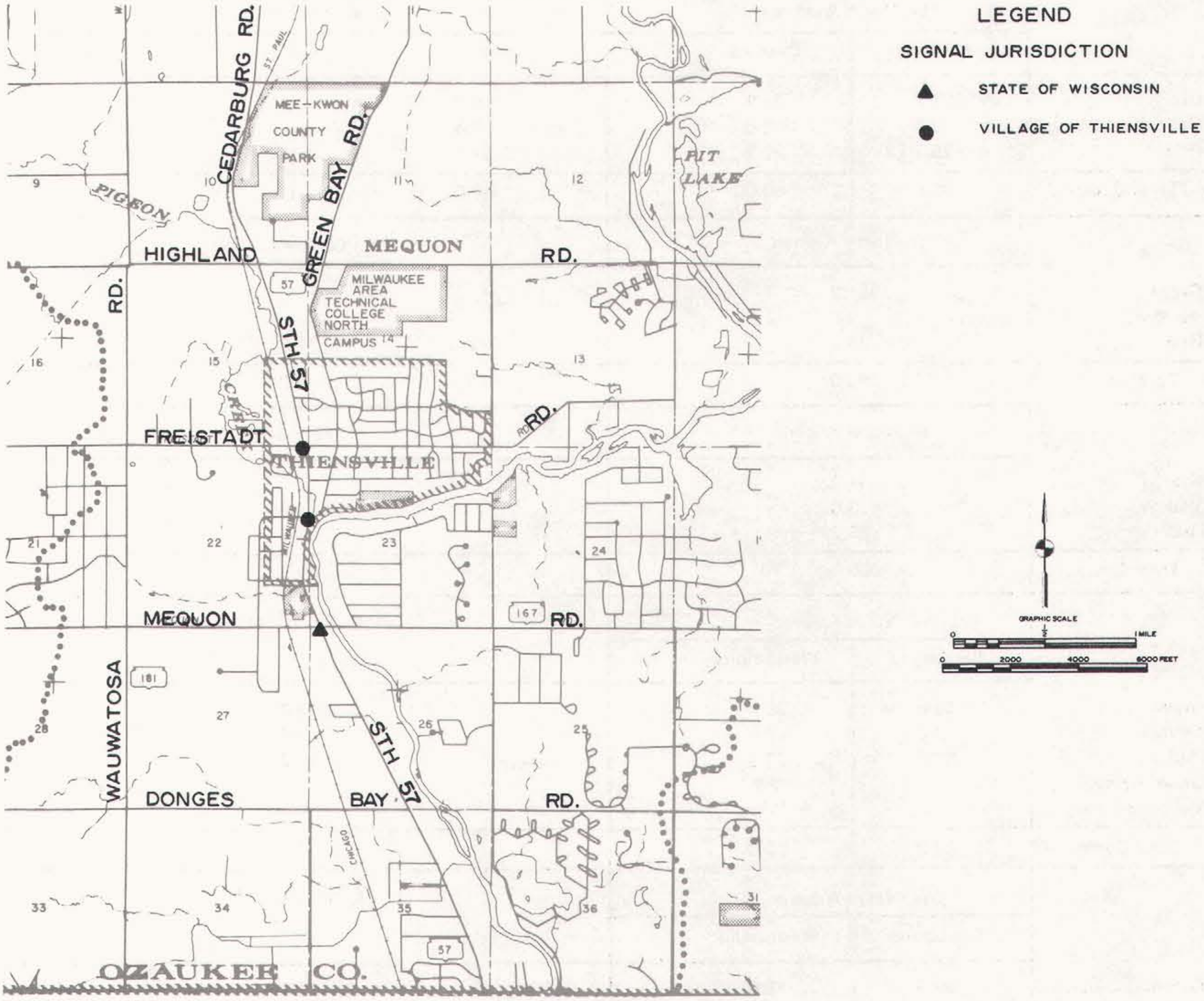
[d] *One-way street northbound.*

[e] *Lagging left-turn arrow concurrent with through green phase.*

Source: SEWRPC.

Map 132

DETAIL OF THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—STH 57 from Donges Bay Road to Highland Road, a distance of 3.2 miles. This segment of STH 57 traverses the Village of Thiensville. This map also shows the location and jurisdiction of each of the three traffic signals along this arterial segment.

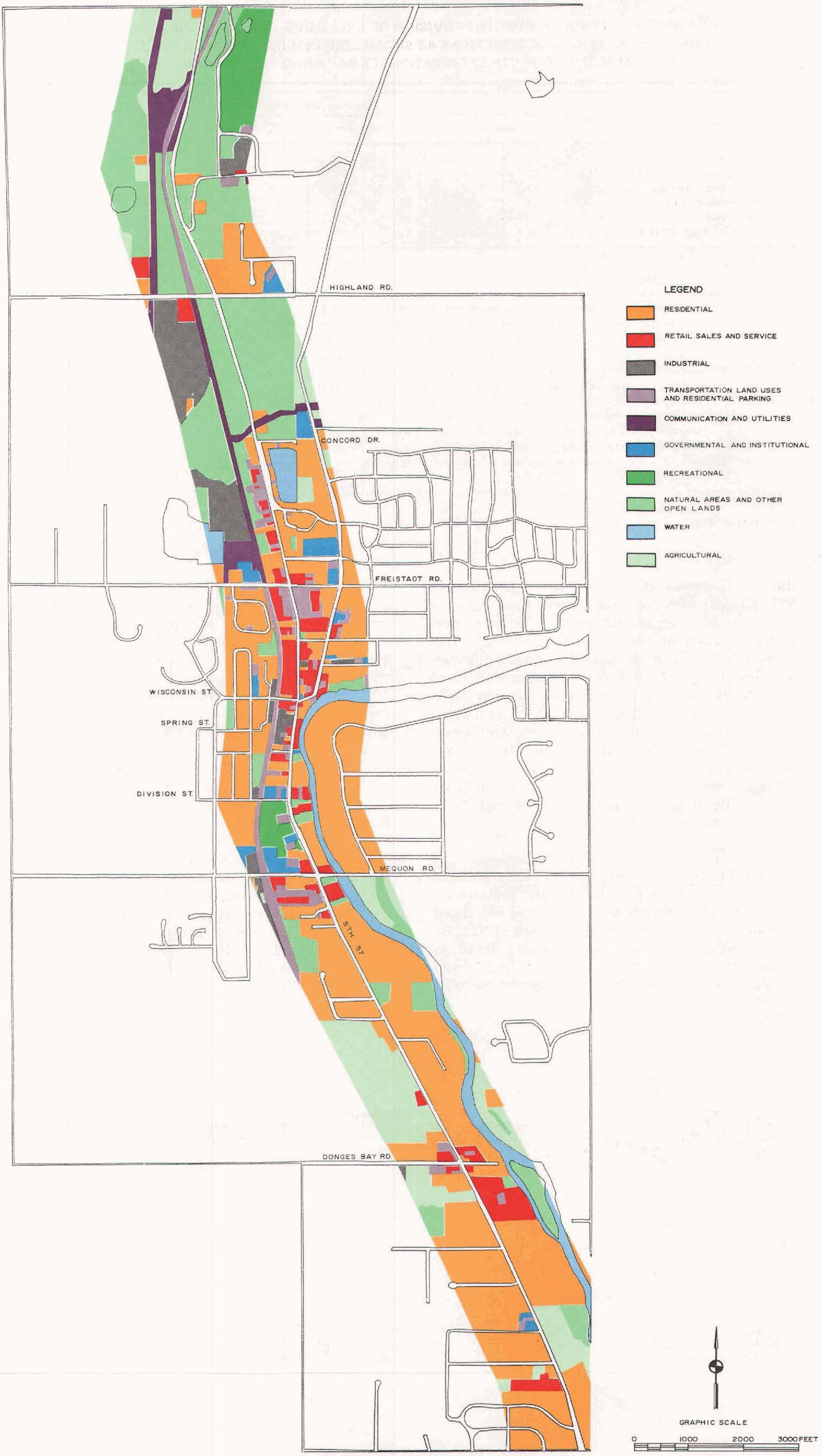
Source: Wisconsin Department of Transportation, Village of Thiensville, and SEWRPC.

As shown in Table 124, this segment of STH 57 has three signalized intersections, at which the STH 57 approaches range in width from 22 to 31 feet. The northbound approach to the intersection of STH 57 and Mequon Road (STH 167) provides a separate lane for the exclusive use of right-turning vehicles, with the right-turn lane at the intersection being provided by regulatory pavement marking rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of STH 57 are also indicated in Table 124.

Traffic Control Measures: The timing plan for each of the three traffic signals along STH 57 between Donges Bay Road and Highland Road is indicated in Table 125. Map 132 shows the location and jurisdiction of each of these signals. All three of

Map 133

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of STH 57. Residential land use comprises the majority of the existing land uses within the corridor, while a combination of retail sales and service uses, open lands, and residential land uses comprises the majority of the development immediately adjacent to STH 57. Retail sales and service land uses abut this segment of STH 57 in particular at the intersection of STH 57 and Donges Bay Road, and along STH 57 between Mequon Road and Freistadt Road in the Village of Thiensville. Open land uses abut this segment of STH 57 in particular north of Freistadt Road. Agricultural land uses occur along STH 57 throughout the length of this problem segment.

Source: SEWRPC.

Table 124

ROADWAY APPROACH WIDTHS, PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
STH 57 and Mequon Road (STH 167). . . .	25	NP	24	NP	25R[a]	NP	25	NP
STH 57 and Green Bay Road (Wisconsin Street)	13	NS	26	NS	31	NSPM	22	P
STH 57 and Freistadt Road (CTH F)	23	NS	19	NP	26	NP	26	NP

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a]*Exclusive turn lane included as a part of roadway approach width and delineated with pavement markings*

Source: SEWRPC.

the traffic signals are located at intersections of STH 57 with other arterial streets. Stop signs are located at all other approaches to collector or local street crossings of this segment of STH 57. This segment of STH 57 is posted for a 45-mile-per-hour (mph) speed limit from Donges Bay Road to a point immediately south of Mequon Road (STH 167), 30 mph from south of Mequon Road (STH 167) to Green Bay Road (Wisconsin Street) in the Village of Thiensville, 25 mph from Green Bay Road (Wisconsin Street) to River View Drive, 30 mph from River View Drive to Concord Drive in the Village of Thiensville, and 50 mph from Concord Drive to Highland Road.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the three signalized intersections along the problem segment of STH 57 from Donges Bay Road to Highland Road in Figures 40 and 41. Locations along STH 57 from Donges Bay Road to Highland Road where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions are identified by comparing the morning and evening traffic volumes for each approach to the three controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to STH 57, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 126.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of STH 57, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 40 and 41. No congested traffic movements were found to occur along this segment of STH 57.

Table 125

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD

Phase	Intersection (time in seconds)							
	STH 57				Mequon Road (STH 167)			
	Morning		Evening		Morning		Evening	
	Southbound	Northbound	Southbound	Northbound	Westbound	Eastbound	Westbound	Eastbound
Green.	34.8	21.0	52.0	34.4	16.8	16.8	20.0	20.0
Yellow	4.2	4.2	4.0	4.0	4.2	4.2	4.0	4.0
Red	21.0	34.8	24.0	41.6	39.0	39.0	56.0	56.0
Green Arrow. .	10.2[a]	- -	13.6[a]	- -	14.4[b]	- -	17.6[b]	- -
Yellow Arrow .	3.6	- -	4.0	- -	3.6	- -	4.0	- -
Total Cycle	60.0	60.0	80.0	80.0	60.0	60.0	80.0	80.0
	STH 57				Green Bay Road (Wisconsin Street)			
	Morning		Evening		Morning		Evening	
Green.	56.0		65.0		36.0		27.0	
Yellow	4.0		4.0		4.0		4.0	
Red	40.0		31.0		60.0		69.0	
Total Cycle	100.0		100.0		100.0		100.0	
	STH 57				Freistadt Road (CTH F)			
Green.	31.5				19.5			
Yellow	4.5				4.5			
Red	24.0				36.0			
Total Cycle	60.0				60.0			

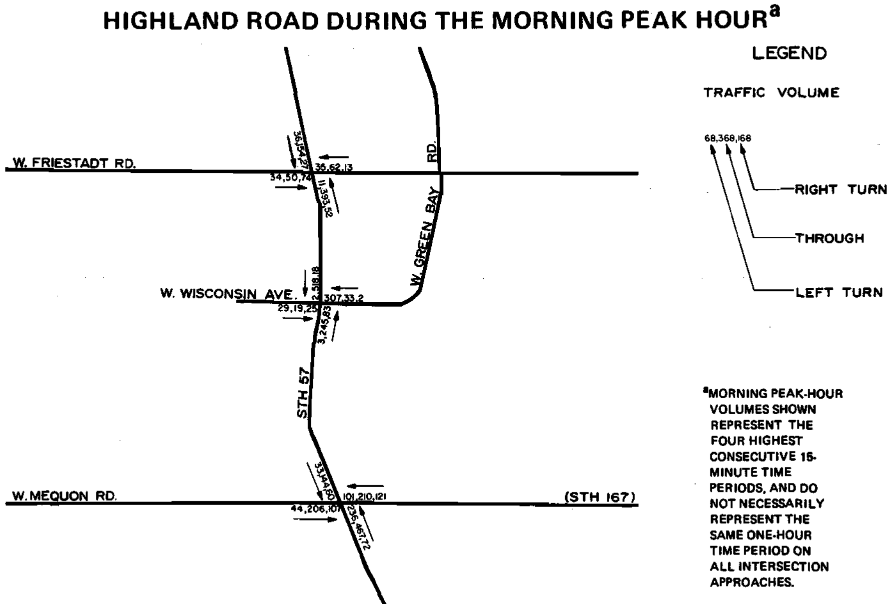
[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Lagging right-turn arrow concurrent with leading left-turn arrow.*

Source: Wisconsin Department of Transportation, Village of Thiensville, and SEWRPC.

Figure 40

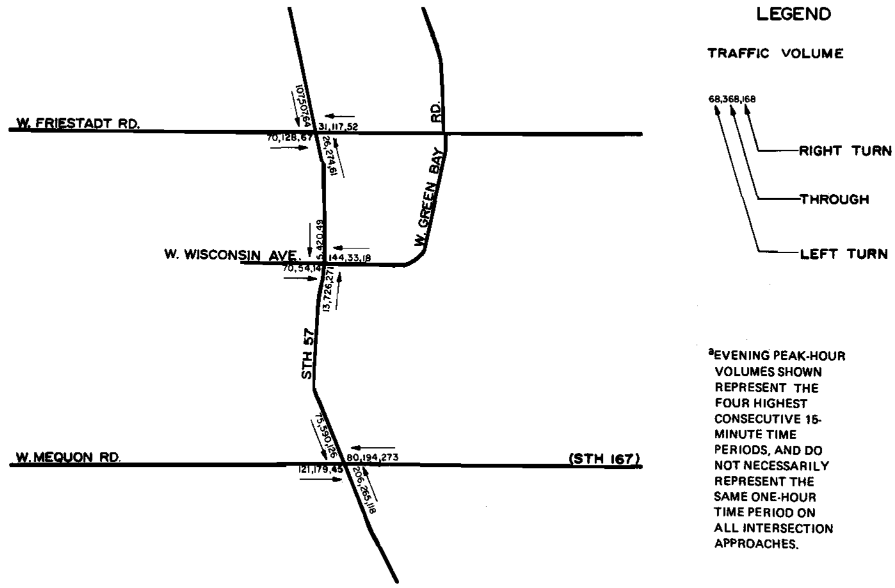
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

Figure 41

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 126

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD

		Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
Intersection	Approach Direction	Percent Right	Percent Left		Percent Right	Percent Left	
STH 57 and Mequon Road (STH 167)	Eastbound	30	12	7	13	35	3
	Westbound	28	23	3	50	15	8
	Northbound	25	14	7	16	9	2
	Southbound	10	30	2	20	35	4
STH 57 and Green Bay Road (Wisconsin Street)	Eastbound	34	40	12	10	51	5
	Westbound	1	90	3	9	74	2
	Northbound	25	1	9	27	1	1
	Southbound	3	1	3	10	1	4
STH 57 and Freistadt Road (CTH F)	Eastbound	46	22	5	26	26	1
	Westbound	12	32	5	26	16	1
	Northbound	12	17	10	9	16	2
	Southbound	12	2	2	17	7	8

Source: SEWRPC.

Alternative and Recommended Transportation Systems Management Actions: Although no congested traffic movements were found to occur along this segment of STH 57 during either peak hour, each of the intersections along this segment of STH 57—the intersections of STH 57 with Mequon Road (STH 167), Green Bay Road (Wisconsin Street), and Freistadt Road (CTH F)—was found to have signals that could be retimed to improve traffic flow. Transportation systems management actions were accordingly considered for these intersections.

Table 127 provides a summary of the traffic flow problem found along this segment of STH 57, the actions recommended for the alleviation of this problem, and the associated cost. Table 128 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of STH 57. The actions recommended to be implemented along this segment of STH 57, designed to alleviate the problems at each of the three problem intersections, have a total capital cost of approximately $15,000, expressed in 1980 dollars.

As indicated in Table 127, each of the traffic signals at the three signalized intersections along this segment of STH 57 operates independently of the other and has a different total cycle length. By retiming these signals to a 70-second total cycle length and providing separate morning and evening signal phasing at the intersection of STH 57 and Freistadt Road (CTH F), and by interconnecting each of the signals, efficient signal progression could be provided along this segment of STH 57. These actions would require a total capital cost of $15,000. Owing to the 0.6-mile distance between the signalized intersections at Mequon Road (STH 167) and Wisconsin Street, and to the potential interference to traffic flow by traffic entering and leaving adjacent commercial land uses between these intersections, the full benefits of traffic signal progression along this segment may not be achieved.

STH 57 from Pioneer Road (CTH C) to the Intersection of Washington Street (STH 60) and Grafton Avenue (STH 57)

Another of the 20 arterial street segments in the

Table 127

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
STH 57 at its intersections with Mequon Road (STH 167), Green Bay Road (Wisconsin Street), and Freistadt Road (CTH F)	Inefficient signal system	Recommended Action Retime traffic signal sequence at the intersection of STH 57 and Mequon Road (STH 167) from 60-second to 70-second cycle; at the intersection of STH 57 and Green Bay Road (Wisconsin Street) from 100-second to 70-second cycle; and at the intersection of STH 57 and Freistadt Road (CTH F) from 60-second to 70-second cycle, providing separate morning and evening phasing; and interconnect all three signals to provide efficient signal progression along STH 57, thus improving vehicle operating speed and reducing vehicular delay	$15,000	$15,000
Total			$15,000	

Source: SEWRPC.

Table 128

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF STH 57 FROM DONGES BAY ROAD TO HIGHLAND ROAD

Phase	Intersection (time in seconds)							
	STH 57				Mequon Road (STH 167)			
	Morning		Evening		Morning		Evening	
	Southbound	Northbound	Southbound	Northbound	Westbound	Eastbound	Westbound	Eastbound
Green.	38.5	20.3	44.8	30.1	20.3	20.3	16.8	16.8
Yellow	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Red	27.3	45.5	21.0	35.7	45.5	45.5	49.0	49.0
Green Arrow. .	14.7[a]	- -	11.2[a]	- -	14.7[b]	- -	11.2[b]	- -
Yellow Arrow .	3.5	- -	3.5	- -	3.5	- -	3.5	- -
Total Cycle	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
	STH 57				Green Bay Road (Wisconsin Street)			
	Morning		Evening		Morning		Evening	
Green.	35.0		43.4		25.2		16.8	
Yellow	3.5		3.5		3.5		3.5	
Red	31.5		23.1		41.3		49.7	
Total Cycle	70.0		70.0		70.0		70.0	
	STH 57				Freistadt Road (CTH F)			
	Morning		Evening		Morning		Evening	
Green.	35.7		37.8		23.1		21.0	
Yellow	4.2		4.2		4.2		4.2	
Red	30.1		28.0		42.7		44.8	
Total Cycle	70.0		70.0		70.0		70.0	

[a]*Leading left-turn arrow concurrent with through green phase.*

[b]*Lagging right-turn arrow concurrent with leading left-turn arrow.*

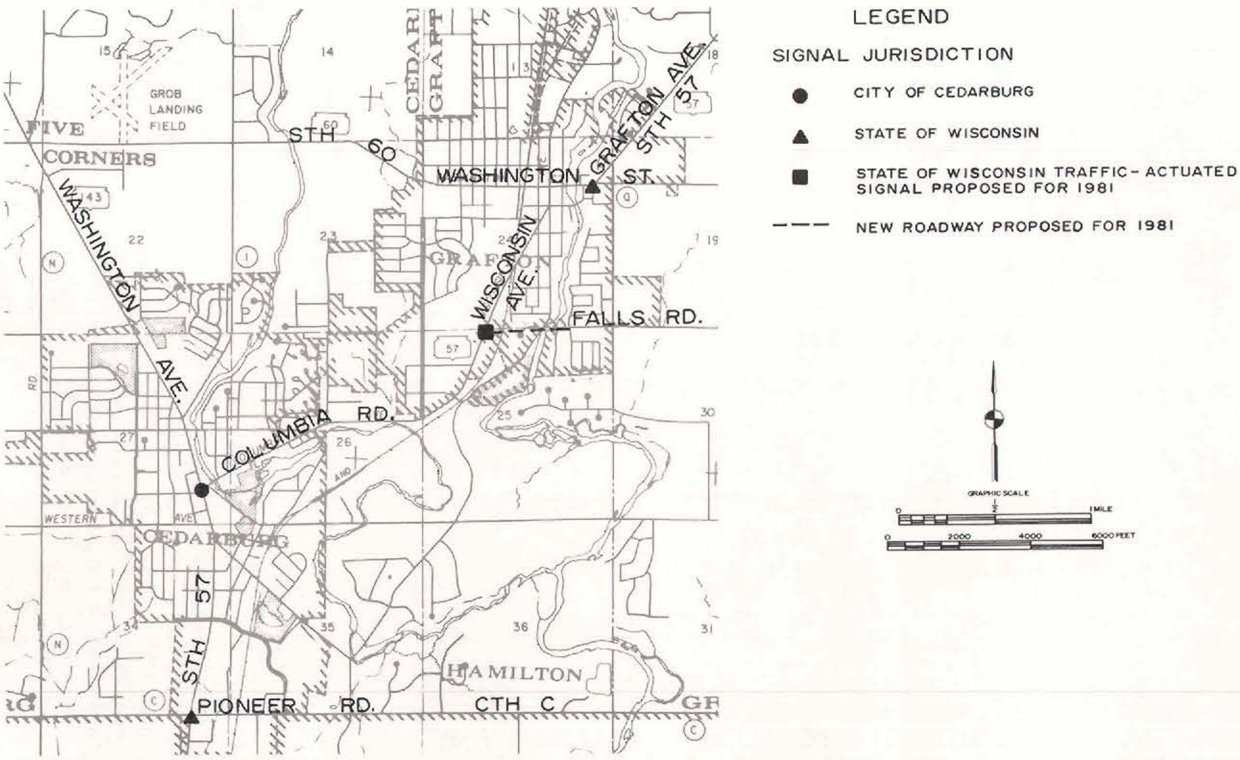
Source: SEWRPC.

northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 134, STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57), a distance of 4.0 miles. This segment of STH 57 traverses the central business districts of both the City of Cedarburg and the Village of Grafton. Map 135 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of STH 57. Residential land use comprises the majority of the existing land use within the corridor, as well as the majority of the existing urban development immediately adjacent to STH 57. Retail sales and service land uses abut this segment of STH 57 between Lincoln Boulevard and the intersection of STH 57 with Columbia Road—or along that segment of STH 57 which traverses the City of Cedarburg. Retail sales and service land uses also abut this segment of STH 57 between 1st Avenue and Washington Street (STH 60) and along that segment of STH 57 which traverses the Village of Grafton. There are also large segments of agricultural and other open land uses along the corridor. Industrial land use is located along the corridor between Lincoln Boulevard and Western Road and in the southern portion of the City of Cedarburg.

Physical Characteristics: There are no physical restrictions between intersections along the length of this segment of STH 57. Other than that segment of STH 57 between Oak Street and 7th

Map 134

DETAIL OF THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

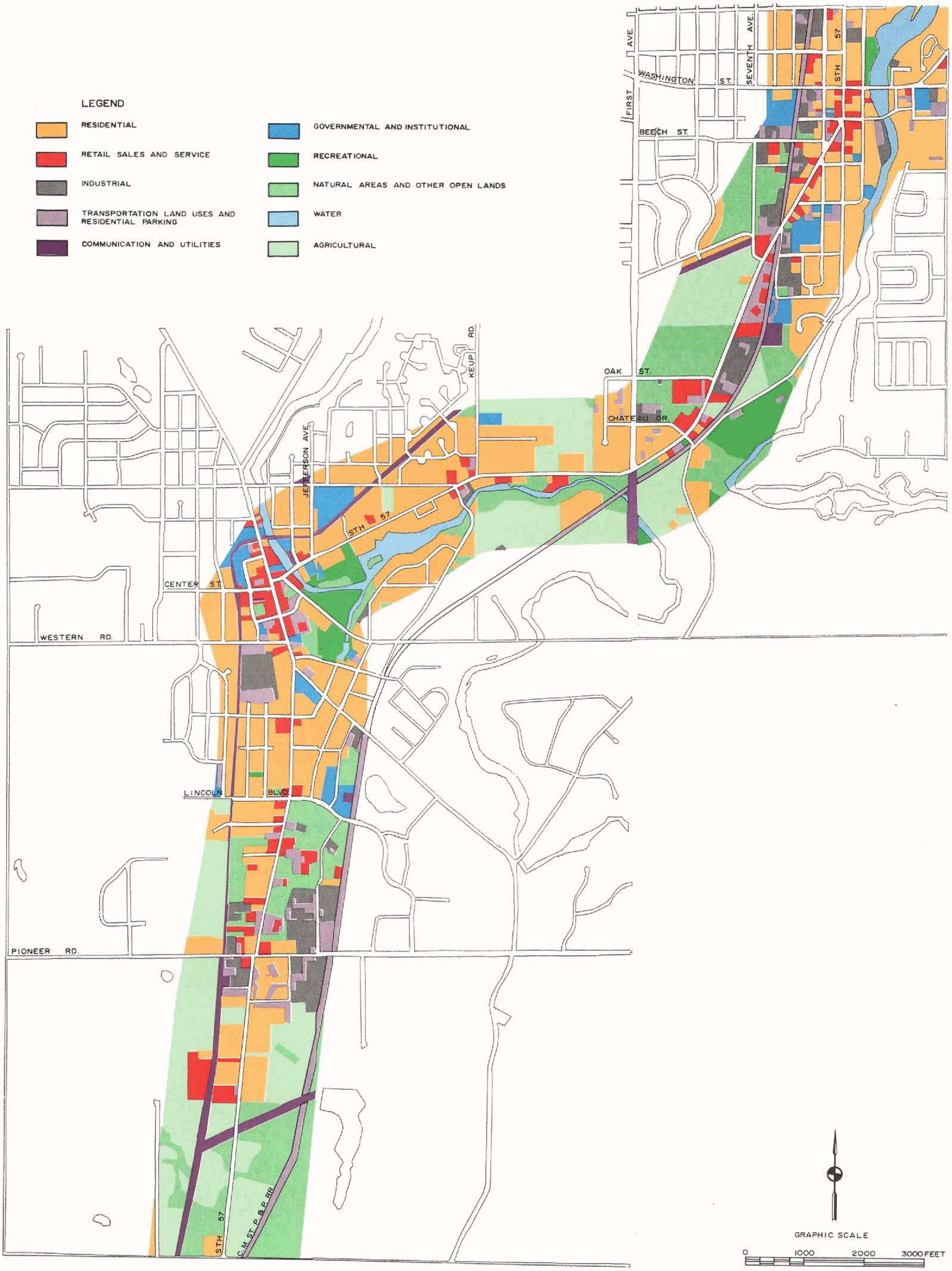


Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57), a distance of 4.0 miles. This segment of STH 57 traverses the central business districts of both the City of Cedarburg and the Village of Grafton. This map also shows the location and jurisdiction of each of the four traffic signals along this arterial segment.

Source: Wisconsin Department of Transportation, City of Cedarburg, and SEWRPC.

Map 135

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of STH 57. Residential land use comprises the majority of the existing land use within the corridor, as well as the majority of the existing urban development immediately adjacent to STH 57. Retail sales and service land uses abut this segment of STH 57 between Lincoln Boulevard and the intersection of STH 57 with Columbia Road—or along that segment of STH 57 which traverses the City of Cedarburg. Retail sales and service land uses also abut this segment of STH 57 between 1st Avenue and Washington Street (STH 60), and along that segment of STH 57 which traverses the Village of Grafton. There are also large segments of agricultural and other open land uses along the corridor, industrial land use exists along the corridor between Lincoln Boulevard and Western Road and in the southern portion of the City of Cedarburg.

Source: SEWRPC.

Avenue in the Village of Grafton, which is divided by a painted six-foot-wide median and has dual roadways 21 feet in width, adequate to provide two lanes for moving traffic in each direction with parking prohibited, this segment of STH 57 is not median divided. The curb-to-curb roadway width of STH 57 is 52 to 54 feet from Pioneer Road (CTH C) to Lincoln Boulevard in the City of Cedarburg, adequate to provide two lanes for moving traffic in each direction with parking prohibited; 28 to 30 feet from Lincoln Boulevard to Spring Street in the City of Cedarburg, adequate to provide one lane for moving traffic in each direction with parking prohibited; 40 to 46 feet from Spring Street to Jefferson Avenue in the City of Cedarburg, adequate to provide two lanes for moving traffic in each direction with parking prohibited; 30 to 36 feet between pavement edges from Jefferson Avenue to Chateau Drive, adequate to provide one lane for moving traffic in each direction; 42 to 58 feet from Chateau Drive to Washington Street (STH 60) in the Village of Grafton, adequate to provide two lanes for moving traffic in each direction with parking prohibited; and 44 feet from the intersection of STH 57 with Washington Street (STH 60) to the intersection of Washington Street with Grafton Avenue (STH 57), adequate to provide four lanes for moving traffic in each direction with parking prohibited. Parking is currently prohibited along this segment of STH 57 on both sides of the roadway from Pioneer Road (CTH C) to Lincoln Boulevard, on the bridge over Cedar Creek in the City of Cedarburg, and from Chateau Drive to 7th Avenue in the Village of Grafton; and on one side of the street only from Lincoln Boulevard to Spring Street, from Jefferson Avenue to Columbia Court, and from Columbia Court to Keup Road in the City of Cedarburg, and from 1st Avenue to Chateau Drive, from Beech Street to 12th Avenue, and on the bridge over the Milwaukee River in the Village of Grafton.

As shown in Table 129, this segment of STH 57 has three signalized intersections, at which the STH 57 approaches range in width from 20 to 26 feet. One of the westbound and one of the

Table 129

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
STH 57 and Pioneer Road (CTH C). . .	22	P	22	P	26	FS	26	NS
STH 57 and Columbia Road.	--	--	23L[a]	NS	22R[a]	NS	22L[a]	NP
Wisconsin Avenue (STH 57) and Washington Street (STH 60)[b]	26	P	24L[a]	NP	25R[a]	NP	21	P
							Southwest-bound	
Washington Street (STH 60) and Grafton Avenue (STH 57)	24L[a]	NP	20	NP	--	--	26R[a]	NP

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a] *Exclusive turn lane width included as a part of roadway approach width.*

[b] *Intersection is controlled by a four-way stop sign.*

Source: SEWRPC.

eastbound approaches to these three intersections provide a separate lane for the exclusive use of left-turning vehicles, and one westbound approach, two northbound approaches, and one southeast-bound approach provide a separate lane for the exclusive use of right-turning vehicles, each of these exclusive turn lanes being provided by regulatory pavement marking rather than channelization. On-street parking restrictions at each of the signalized intersection approaches along this segment of STH 57 are also indicated in Table 129. As shown on Map 134, a new traffic-actuated signal at the intersection of Falls Road and Wisconsin Avenue (STH 57) is programmed for installation by the Wisconsin Department of Transportation during 1981. This traffic signal will be necessary as a result of the extension of Falls Road to the east across the Milwaukee River on a new bridge to connect with Falls Street, thus becoming an important arterial in the area. The construction of this new roadway and bridge is also programmed for 1981.

Traffic Control Measures: The timing plan for each of the three traffic signals along STH 57 between Pioneer Road (CTH C) and the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57) is indicated in Table 130. Map 134 shows the location and jurisdiction of each of these sig-

Table 130

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)

Phase	Intersection (time in seconds)			
	STH 57		Pioneer Road (CTH C)	
Green	40.0		30.0	
Yellow	4.0		4.0	
Red	36.0		46.0	
Total Cycle[a]	80.0		80.0	
	STH 57		Columbia Road	
	Northbound	Southbound		
Green	22.0	32.8	20.0	
Yellow	3.2	3.2	3.2	
Red	54.8	44.0	56.8	
Green Arrow	20.0[b]	8.4[c]	- -	
Yellow Arrow	3.2	2.4	- -	
Total Cycle	80.0	80.0	80.0	
	Wisconsin Avenue (STH 57)		Washington Street (STH 60)	
Green	25.2		25.2	
Yellow	3.6		3.6	
Red	31.2		31.2	
Total Cycle	60.0		60.0	
	Washington Street (STH 60)		Grafton Avenue (STH 57)	
	Westbound		Southwest-bound	Eastbound
Green	40.0		20.0	80.0
Yellow	4.5		4.5	4.5
Red	72.0		92.0	32.0
Green Arrow	- -		40.0[d]	40.0[e]
Yellow Arrow	- -		4.5	4.5
Total Cycle	116.5		116.5	116.5

[a] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[b] *Lagging right-turn arrow concurrent with westbound green phase.*

[c] *Leading left-turn arrow concurrent with southbound green phase.*

[d] *Lagging left-turn green arrow.*

[e] *Right-turn green arrow concurrent with eastbound left-turn arrow.*

Source: *Wisconsin Department of Transportation, City of Cedarburg, and SEWRPC.*

nals. Each of the traffic signals is located at intersections of STH 57 with other arterial streets. Stop signs are located at all other approaches to collector or local street crossings of this segment of STH 57. The intersection of two arterial streets—Wisconsin Avenue (STH 57) and Washington Street (STH 60)—is controlled by a four-way stop sign. This segment of STH 57 is posted for a 35-mile-per-hour (mph) speed limit from Pioneer Road (CTH C) to Lincoln Boulevard, a 25-mph speed limit from Lincoln Boulevard to Jackson Street, and a 30-mph speed limit from Jackson Street to Keup Road in the City of Cedarburg; and a 35-mph speed limit from Keup Road to 7th Avenue and a 30-mph speed limit from 7th Avenue to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57) in the Village of Grafton.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the three signalized intersections, as well as for the one four-way stop sign-controlled intersection, along the problem segment of STH 57 in Figures 42 and 43. The locations along STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57) where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening traffic volumes for each approach to the four controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to STH 57, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 131.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacity of each intersection approach along this segment of STH 57, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 42 and 43. While no congested traffic movements were found to occur along this segment of STH 57 during the morning peak hour, four congested movements were found to occur during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The four evening peak-hour traffic congestion problems identified along STH 57 from Pioneer Road (CTH C) to the intersection of Washington Street (STH 60) and Grafton Avenue (STH 57) are associated with the intersection of Wisconsin Avenue (STH 57) and Washington Street (STH 60).

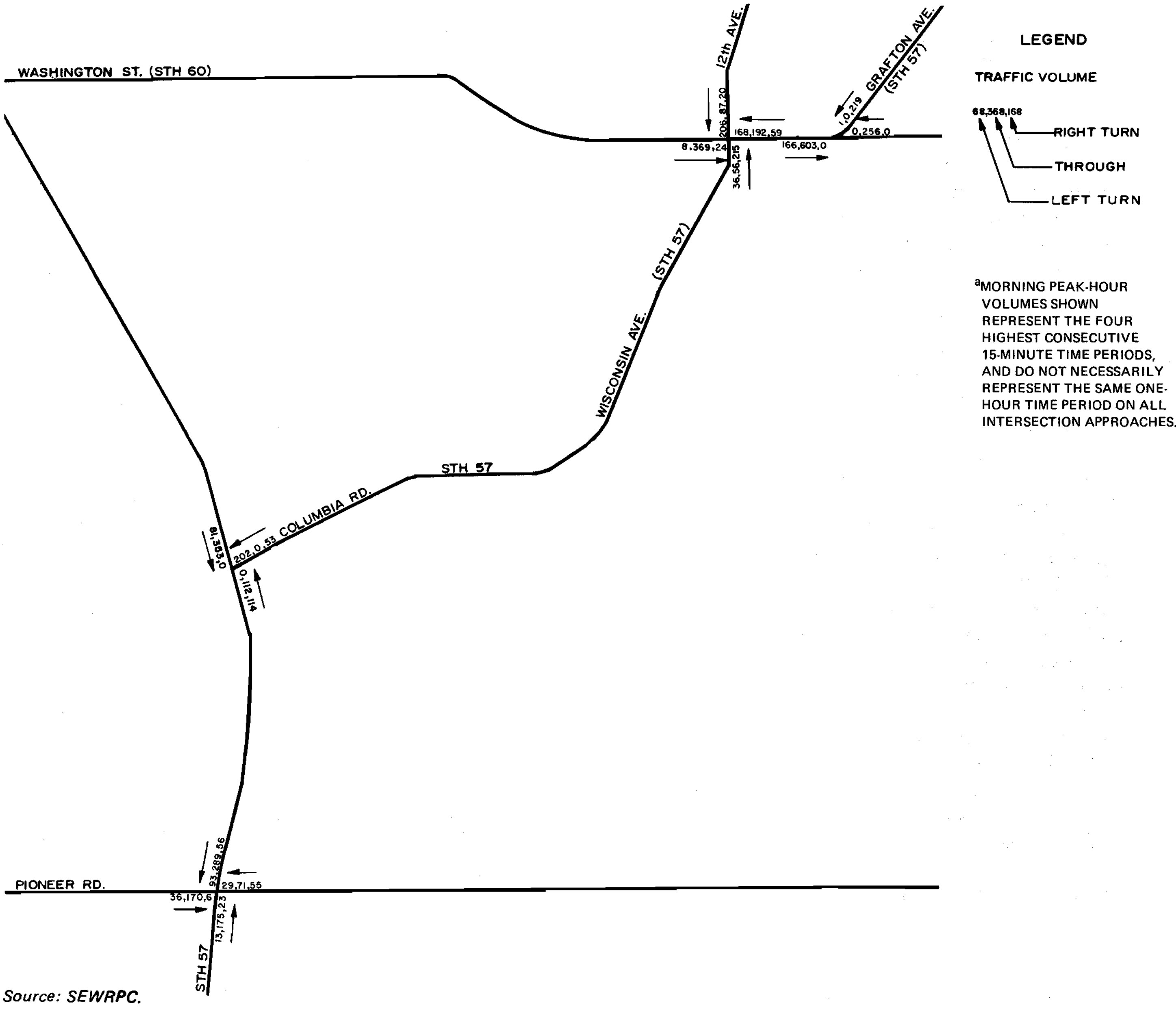
Table 132 provides a summary of the specific congestion problems found along this segment of STH 57, the recommended actions to abate the problems, and the estimated cost of the actions. Table 133 summarizes the changes in traffic signal timing recommended for the problem intersections along STH 57. One action is recommended to be implemented along this segment of STH 57, at an estimated total capital cost of $40,200. Because of the distance between the four signalized intersections along this segment of STH 57, no interconnection between these signals to provide signal progression is recommended.

The four-way stop sign-controlled intersection of Wisconsin Avenue (STH 57) and Washington Street (STH 60) operates at level-of-service E during the evening peak hour. In order to alleviate the existing congestion at this intersection, it is recommended that traffic signals be installed to replace the existing four-way stop sign control, at an estimated capital cost of $40,000, and that northbound trucks be rerouted onto the segment of 11th Avenue between Cedar Street and Washington Street because of the inadequate existing curb radius for north-to-eastbound right-turning trucks on the southeast corner of the intersection of Wisconsin Avenue and Washington Street. The cost of signing necessary for the regulation of this route for trucks is estimated at $200.

W. Capitol Drive (STH 190) from N. 76th Street (STH 181) to the North-South Freeway (IH 43) Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 136, W. Capitol Drive (STH 190) from N. 76th Street (STH 181) to the North-South Freeway (IH 43), a distance of 4.4 miles. Map 137 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Capitol Drive. Residential land use comprises the majority of the existing urban development in this corridor, while retail sales and service land uses comprise the majority of the existing urban development immediately adjacent to W. Capitol Drive. Retail sales and service land uses abut this segment of W. Capitol Drive from N. 76th Street to N. 61st Street, from N. 45th Street to N. 41st Street, and from N. 35th Street to W. Atkinson Avenue, and at its intersec-

Figure 42

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57) DURING THE MORNING PEAK HOUR[a]



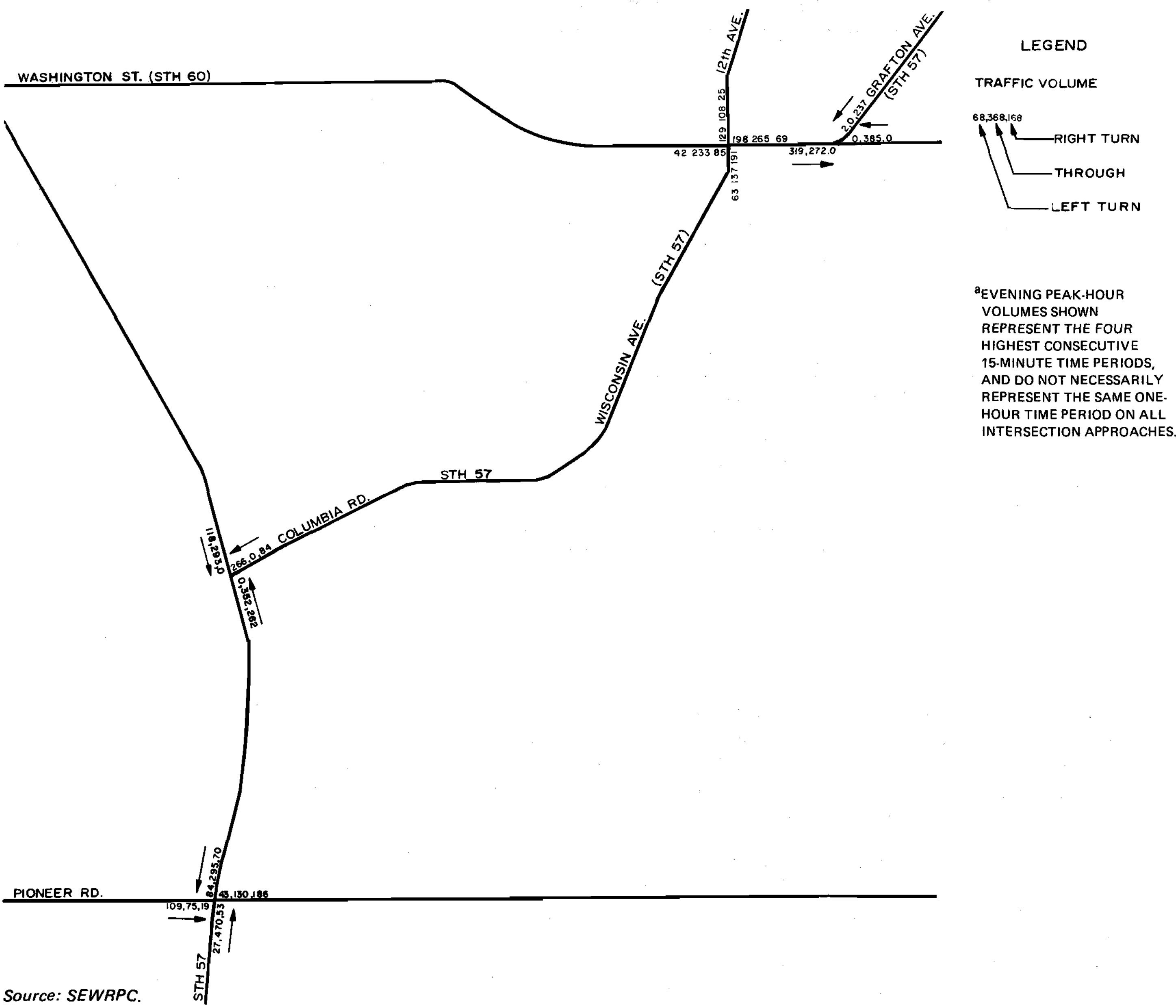
Source: SEWRPC.

tion with N. 60th Street at the Capitol Court Shopping Center, at its intersection with W. Fond du Lac Avenue, and at its intersection with N. Green Bay Avenue. Industrial land use abuts this segment of W. Capitol Drive between N. 35th Street and N. 27th Street. Governmental and institutional land uses, including the John Marshall and Rufus King Senior High Schools and Northwest General Hospital, occur within the corridor at or near the intersections of W. Capitol Drive with N. 65th Street, N. 18th Street, and N. 53rd Street, respectively. Recreational land uses are located along the corridor near N. 65th Street at Dineen Park.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Capitol Drive. For the entire length of the problem segment, W. Capitol Drive is divided by a median ranging in width from 18 to 30 feet, with the exception of that

Figure 43

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57) DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

portion of the median between N. 51st Street and W. Fond du Lac Avenue (STH 145), where the median is only four feet wide. The curb-to-curb pavement widths of the dual roadways along this segment of W. Capitol Drive range from 34 to 40 feet from N. 76th Street (STH 181) to N. 35th Street, adequate to provide two to three lanes for moving traffic in each direction with parking permitted; from 45 to 62 feet from N. 35th Street to W. Hopkins Street, adequate to provide three to five lanes for moving traffic in each direction with parking permitted; and 34 to 36 feet from W. Hopkins Street to the North-South Freeway (IH 43), adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently prohibited along those segments of W. Capitol Drive from W. Appleton Avenue (USH 41) to N. 73rd Street and from N. 36th Street to N. 35th Street on the north side of the roadway only; from N. 75th Street to N. 74th

Table 131

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
STH 57 and Pioneer Road (CTH C)	Eastbound	3	17	1	9	54	2
	Westbound	35	19	5	52	12	4
	Northbound	11	6	8	10	5	1
	Southbound	13	21	4	15	19	3
STH 57 and Columbia Road	Westbound	21	79	4	24	76	2
	Northbound	50	- -	8	43	- -	1
	Southbound	- -	19	3	- -	29	4
Wisconsin Avenue (STH 57) and Washington Street (STH 60)	Eastbound	6	2	1	24	11	3
	Westbound	14	40	6	11	38	2
	Northbound	70	12	2	49	16	2
	Southbound	6	66	3	5	52	3
Washington Street (STH 60) and Grafton Avenue (STH 57)	Eastbound	- -	22	2	- -	54	4
	Westbound	- -	- -	6	- -	- -	2
	Southwest-bound	100	- -	2	99	1	1

Source: SEWRPC.

Street, from N. 61st Street to N. 60th Street, and from N. 35th Street to N. 34th Street on the south side of the roadway only; and from N. 51st Street to N. 49th Street and N. 34th Street to N. 31st Street on both sides of the roadway.

As shown in Table 134, the problem segment of W. Capitol Drive has 19 signalized intersections. The W. Capitol Drive approaches to these intersections range from 34 to 62 feet in width. As indicated in Table 134, 18 of the eastbound and 14 of the westbound approaches provide separate lanes for the exclusive use of left-turning vehicles, and three of the eastbound and two of the westbound approaches provide separate lanes for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches are also indicated in Table 134.

Traffic Control Measures: The timing plans for each of the 19 traffic signals along W. Capitol Drive between N. 76th Street (STH 181) and the North-South Freeway (IH 43) are set forth in Table 135. Map 136 shows the location and jurisdiction of each of those signals and their relationship to the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Capitol Drive and are directly affected by the timing plans of the traffic signals on W. Capitol Drive. Twelve of the 19 traffic signals on this segment of W. Capitol Drive are located at intersections of W. Capitol Drive with other arterial streets, and six are located at intersections of W. Capitol Drive with nonarterial streets—specifically, N. 68th Street, N. 66th Street, N. 55th Street, N. 51st Street, W. Atkinson Avenue, and N. 15th Street. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Capitol Drive. This segment of W. Capitol Drive is posted for a 35-mile-per-hour (mph) speed limit from N. 76th Street to N. 60th Street, and for a 30-mph speed limit from N. 60th Street to the North-South Freeway (IH 43).

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the 19 signalized inter-

Table 132

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
Wisconsin Avenue (STH 57) and Washington Street (STH 60)	Stop sign-controlled intersection operating at level-of-service E during the evening peak hour (1,394 vehicles per hour)	Recommended Actions Install traffic signals at intersection based on exceeding maximum vehicular volume warrant of Manual on Uniform Traffic Control Devices	$40,000	
		Prohibit trucks on northbound Wisconsin Avenue from Cedar Street to Washington Street, designating and signing 11th Avenue from Cedar Street to Washington Street as the northbound STH 57 truck route, because of the insufficient north-to-eastbound right-turn radius at the corner of Wisconsin Avenue and Washington Street. Sufficient vehicle turning radius is required for the installation of traffic signals at this intersection	$ 200	
		Alternative Action Increase curb radius on southeast corner of the intersection of Wisconsin Avenue and Washington Street (Not recommended, as construction of a larger curb radius would require acquisition and razing of structure on southeast corner of intersection owing to the structure's proximity to existing curbs)		
Total			$40,200	

Source: SEWRPC.

sections along the problem segment of W. Capitol Drive in Figures 44 and 45. The locations along W. Capitol Drive from N. 76th Street to the North-South Freeway (IH 43) where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening peak-hour traffic volumes for each approach to the 19 controlled intersections to the maximum hourly capacity of each approach. Operating characteristics along W. Capitol Drive affecting maximum hourly roadway capacity at its intersection approaches, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 136.

Table 133

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF STH 57 FROM PIONEER ROAD (CTH C) TO THE INTERSECTION OF WASHINGTON STREET (STH 60) AND GRAFTON AVENUE (STH 57)

Phase	Intersection (time in seconds)			
	STH 57		Pioneer Road (CTH C)	
Green	37.0		33.0	
Yellow	4.0		4.0	
Red	39.0		43.0	
Total Cycle[a]	80.0		80.0	
	STH 57		Columbia Road	
	Northbound	Southbound		
Green	22.0	32.8	20.0	
Yellow	3.2	3.2	3.2	
Red	54.8	44.0	56.8	
Green Arrow	20.0[b]	8.4[c]	- -	
Yellow Arrow	3.2	2.4	- -	
Total Cycle	80.0	80.0	80.0	
	Washington Street (STH 60)		Grafton Avenue (STH 57)	
	Westbound		Southwest-bound	Eastbound
Green	40.0		20.0	80.0
Yellow	4.5		4.5	4.5
Red	72.0		92.0	32.0
Green Arrow	- -		40.0[d]	40.0[e]
Yellow Arrow	- -		4.5	4.5
Total Cycle[a]	116.5		116.5	116.5

[a]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[b]*Lagging right-turn arrow concurrent with westbound green phase.*

[c]*Leading left-turn arrow concurrent with southbound green phase.*

[d]*Lagging left-turn green arrow concurrent with eastbound through green phase.*

[e]*Right-turn arrow concurrent with eastbound left-turn arrow.*

Source: SEWRPC.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Capitol Drive, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 44 and 45. Two congested traffic movements were found to occur along this segment of W. Capitol Drive during the morning peak hour, and 13 were found to occur along this segment during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The two morning and 13 evening peak-hour traffic congestion problems identified along W. Capitol Drive are associated with the following 10 intersections: N. 76th

Street (STH 181), W. Appleton Avenue (USH 41), N. 60th Street, W. Fond du Lac Avenue (STH 145), N. Sherman Boulevard, N. 35th Street, N. 31st Street, N. 27th Street, N. 20th Street, and W. Atkinson Avenue.

Table 137 provides a summary of the congestion problems at each intersection, the alternative actions considered for their abatement, the recommended actions, and the associated costs. Table 138 summarizes the changes in traffic signal timing recommended for problem intersections along this segment of W. Capitol Drive. A total of six new actions are recommended to be implemented at the 10 problem intersections, at a capital cost of $17,800 in 1980 dollars.[15] However, the potential need for a new traffic controller at one intersection where a new traffic signal phase is recommended could increase the capital cost of the improvement of this segment to $29,800.

As indicated in Table 137, the actions considered necessary to abate the congestion problem at the intersection of W. Capitol Drive and W. Atkinson Avenue include the retiming of the existing signal timing plan at minimal cost, the addition of a separate signal phase to control the east-to-southeast-bound right-turn movement so that it operates concurrently with the northwest-to-westbound left-turn phasing at a cost of $2,000, and the prohibition of on-street parking on the near side of the eastbound approach and on the near and far sides of the southeast-bound approach during the evening peak hour, at a capital cost of approximately $600. The total cost of implementing all the recommended improvements at this intersection is thus estimated at $2,600. The potential need for a new traffic controller at this intersection could add an additional $12,000 to this total cost.

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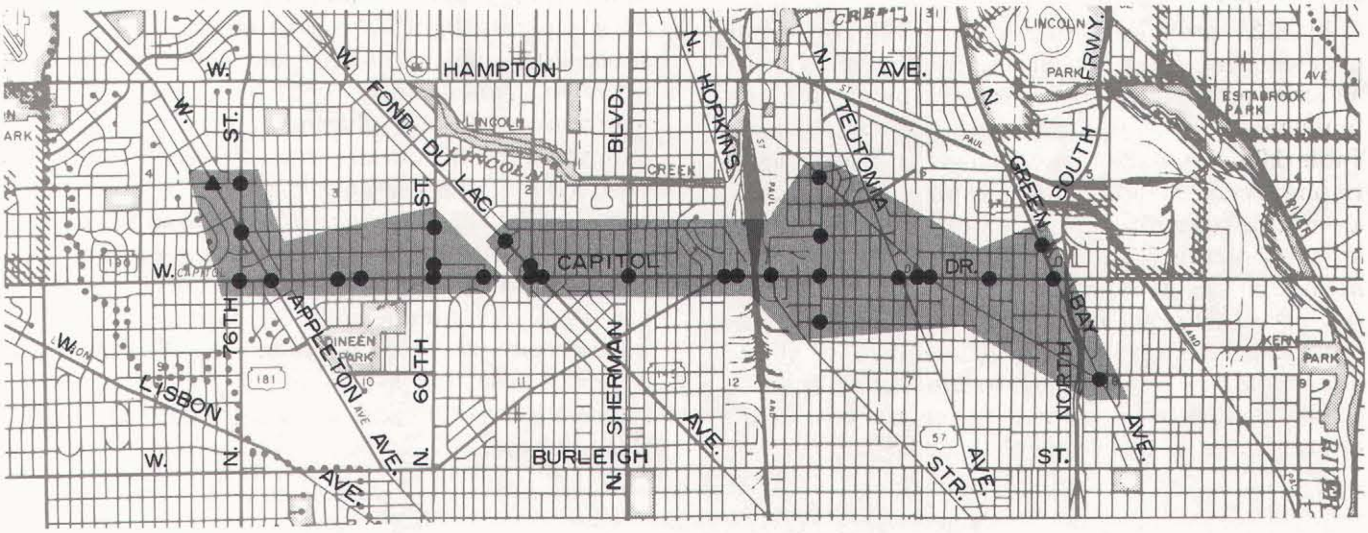
[15] *This cost of short-range improvement of W. Capitol Drive does not include the cost of the improvements recommended at the intersection of W. Capitol Drive at N. 76th Street (STH 181), W. Appleton Avenue (USH 41), N. 60th Street, W. Fond du Lac Avenue (STH 145), N. Sherman Boulevard, N. 35th Street, and N. 27th Street. The improvement of these intersections, and the attendant costs, were considered in this chapter under the analysis of the problem segments of N. 76th Street from W. Harwood Avenue to W. Bradley Road, W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue, N. 60th Street from W. Center Street to W. Capitol Drive, W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street, N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive, N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive, and N. 27th Street from the East-West Freeway (IH 94) to N. Teutonia Avenue. At the intersection of W. Capitol Drive and N. 76th Street, it was recommended that the traffic signals be retimed, and that parking be prohibited on two approaches. The capital cost of improvement of the intersection was estimated at $300. At the intersection of W. Capitol Drive and W. Appleton Avenue it was recommended that two additional signal phases be added, in addition to a new traffic controller, at an estimated capital cost of $16,000. At the intersection of W. Capitol Drive and N. 60th Street, it was recommended that the traffic signals be retimed, that the existing pretimed left-turn arrows be changed to traffic-actuated operation, and that the existing single left-turn lane be enlarged to a double left-turn lane. The capital cost of improvement of this intersection was estimated at $30,000. At the intersection of W. Capitol Drive and W. Fond du Lac Avenue, it was recommended that the traffic signals be retimed and that an existing left-turn lane be lengthened. The capital cost of improvement of this intersection was estimated at $15,000. At the intersection of W. Capitol Drive and W. Sherman Boulevard, it was recommended that an additional signal phase be added, in addition to a new traffic controller, and that parking be prohibited on one approach. The capital cost of improvement of this intersection was estimated at $14,200. At the intersection of W. Capitol Drive and N. 35th Street, it was recommended that the traffic signals be retimed, that a separate signal phase be added, in addition to a new traffic controller, and that an existing left-turn lane be lengthened. The capital cost of improvement of this intersection was estimated at $29,000. At the intersection of W. Capitol Drive and N. 27th Street, it was recommended that the existing signals be retimed, that a separate signal phase be added, in addition to a new traffic controller, that left-turn lanes on two approaches be lengthened, and that parking restrictions be lengthened on one approach. The capital cost of improvement of this intersection was estimated at $44,200.*

Map 136

DETAIL OF THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)—
TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



LEGEND

SIGNAL JURISDICTION

● CITY OF MILWAUKEE

▲ STATE OF WISCONSIN

SIGNAL SUBSYSTEM ASSOCIATED WITH TRAFFIC CONTROL DEVICES LOCATED ON W. CAPITOL DRIVE INCLUDED AS PART OF THE TOTAL PROGRESSION SYSTEM ALONG THE CORRIDOR

GRAPHIC SCALE
0 ½ 1 MILE
0 2000 4000 6000 FEET

Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Capitol Drive (STH 190) from N. 76th Street (STH 181) to the North-South Freeway (IH 43), a distance of 4.4 miles. This map also shows the location and jurisdiction of each of the 19 traffic signals along this arterial segment, including the relationship of these signals to the interconnected progressive signal subsystems which are located within approximately one-half mile of W. Capitol Drive and are directly affected by the timing plans of the traffic signals on W. Capitol Drive.

Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

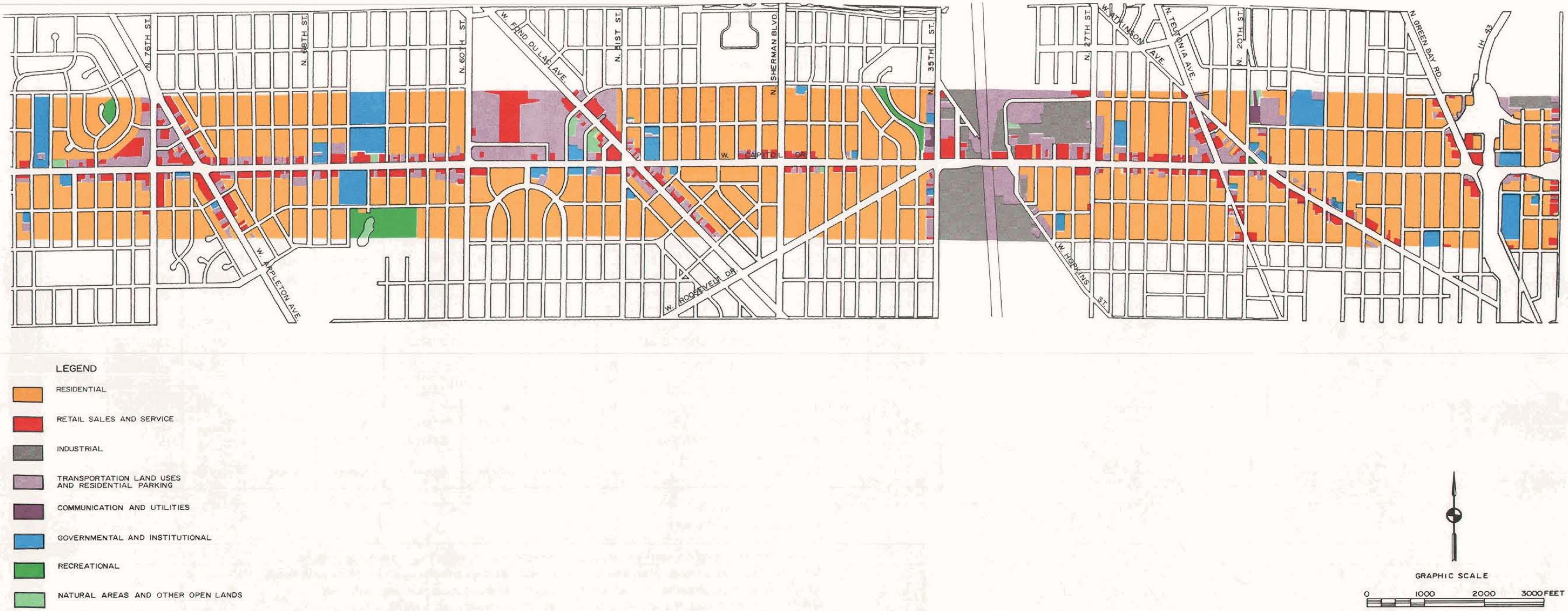
To abate the congestion at the intersection of W. Capitol Drive with N. 20th Street, only the prohibition of on-street parking on the near side of the northbound approach during the evening peak hour is required. The total capital cost of this recommended action is $200.

One intersection that exhibited congestion problems along W. Capitol Drive required some turn-lane construction. At the intersection of W. Capitol Drive and N. 31st Street it is recommended that, in addition to retiming the existing signal timing plan, the east-to-northbound left-turn lane be lengthened from 250 to 330 feet in order to provide for increased vehicle storage capacity. The total capital cost of implementing all the recommended improvements at this intersection is estimated at $15,000.

In addition, the existing offsets between the traffic signal timing plans of the 19 signalized intersections along this segment of W. Capitol Drive should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of W. Capitol Drive by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

Map 137

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Capitol Drive (STH 190). Residential land use comprises the majority of the existing urban development in this corridor, while retail sales and service land uses comprise the majority of the existing urban development immediately adjacent to W. Capitol Drive. Retail sales and service land uses abut this segment of W. Capitol Drive particularly between N. 76th Street (STH 181) and N. 61st Street, at its intersection with N. 60th Street at the Capitol Court Shopping Center, at its intersection with W. Fond du Lac Avenue (STH 145), from N. 45th Street to N. 41st Street, from N. 35th Street to W. Atkinson Avenue, and at its intersection with N. Green Bay Avenue (STH 57). Industrial land use abuts this segment of W. Capitol Drive between N. 35th Street and N. 27th Street. Governmental and institutional land uses, including the John Marshall and Rufus King Senior High Schools and Northwest General Hospital, occur within the corridor at or near the intersections of W. Capitol with N. 65th Street, N. 18th Street, and N. 53rd Street, respectively. Recreational land uses occur along the corridor near N. 65th Street at Dineen Park.

Source: SEWRPC.

Table 134

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound or Northwest-bound		Southbound or Southeast-bound	
W. Capitol Drive and N. *76th Street* (STH 181)	36 ML	NPAM	36 ML	NPPM	36 ML	FS	36 ML	P
W. Capitol Drive and W. Appleton Avenue (USH 41)	36 MLR	NP	36 MLR	NPPM	36 MLR	P	36 MLR	P
W. Capitol Drive and N. 68th Street	36ML	NPAM	36M	NPPM	22	P	22	P
W. Capitol Drive and N. 66th Street	36ML	NPAM	36M	NPPM	- -	- -	17	P
W. Capitol Drive and N. 60th Street	34ML	NPAM	34ML	NPPM	33ML	P	32MLR[a]	FS
W. Capitol Drive and N. 55th Street	34ML	NPAM	34M	NPPM	- -	- -	20	NP
W. Capitol Drive and N. 51st Street	34ML	NPAM	34ML	NPPM	33	P	25M	NS
W. Capitol Drive and W. Fond du Lac Avenue (STH 145)	34ML	NS	34ML	NP	34ML	NPPM	34ML	NPAM
W. Capitol Drive and N. Sherman Boulevard	34ML	NPAM	34ML	NPPM	30ML	P	30ML	P
W. Capitol Drive and W. Roosevelt Drive	40M	NPAM	37L	NPPM	30M	P	- -	- -
W. Capitol Drive and N. 35th Street	36ML	NP	56ML	NPPM	36	NS	28	NP
W. Capitol Drive and N. 34th Street	62ML	NP	45M	NPPM	- -	- -	26	P
W. Capitol Drive and N. 31st Street/ W. Hopkins Street	36MLR	NPAM	34ML	NPPM	37ML[a]	P	30ML[a]	FS
W. Capitol Drive and N. 27th Street	34ML	NPAM	34ML	NPPM	19L	NP	23L	NP
W. Capitol Drive and N. Teutonia Avenue	34ML	NPAM	34ML	NPPM	24LR	NP	22L	NS
W. Capitol Drive and N. 20th Street	34ML	NPAM	34ML	NPPM	18	P	18	P
W. Capitol Drive and W. Atkinson Avenue	34ML	NPAM	34ML	NPPM	30	P	28	NSAM
W. Capitol Drive and N. 15th Street	34ML	NPAM	34ML	NPPM	15	P	15	P
N. Capitol Drive and N. Green Bay Avenue	34MLR	NPAM	36MR	NPPM	33ML	NSPM	33MLR	NP

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a]*Exclusive turn lane included as a part of roadway approach width and delineated with pavement markings.*

Source: SEWRPC.

Table 135

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)

Phase	Intersection (time in seconds)		
	W. Capitol Drive		N. 76th Street (STH 181)
Green	44.1		20.7
Yellow	4.5		4.5
Red	41.4		64.8
Green Arrow	9.0[a]		- -
Yellow Arrow	3.6		- -
Total Cycle[b]	90.0		90.0
	W. Capitol Drive		W. Appleton Avenue (USH 41)
Green	38.7		38.7
Yellow	4.5		4.5
Red	46.8		46.8
Total Cycle	90.0		90.0
	W. Capitol Drive		N. 68th Street
Green	52.2		26.1
Yellow	3.6		3.6
Red	34.2		60.3
Total Cycle[c]	90.0		90.0
	W. Capitol Drive		N. 66th Street
Green	51.3		18.0
Yellow	4.5		3.6
Red	34.2		68.4
Total Cycle[d]	90.0		90.0
	W. Capitol Drive		N. 60th Street
Green	35.1		17.1[f]
Yellow	3.6		3.6
Red	51.3		69.3
Green Arrow	18.0[a]		7.2
Yellow Arrow	3.6		3.6
Total Cycle	90.0		90.0
	W. Capitol Drive		N. 55th Street
Green	53.4		28.6
Yellow	3.5		3.5
Red	33.1		57.9
Total Cycle[b,e]	90.0		90.0
	W. Capitol Drive		N. 51st Street
	Eastbound	Westbound	
Green	36.9	57.6	23.4
Yellow	3.6	3.6	3.6
Red	49.5	28.8	63.0
Green Arrow	- -	17.1[g]	- -
Yellow Arrow	- -	3.6	- -
Total Cycle	90.0	90.0	90.0

Table 135 (continued)

Phase	Intersection (time in seconds)					
	W. Capitol Drive		W. Fond du Lac Avenue (STH 145)			
	Morning	Evening	Morning		Evening	
			Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound
Green.	29.7	33.3	27.9	47.7	30.6	44.1
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red.	55.8	52.2	57.6	37.8	54.9	41.4
Green Arrow.	- -	- -	- -	16.2[g]	- -	9.9[g]
Yellow Arrow	- -	- -	- -	3.6	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. Sherman Boulevard
Green.	43.2	34.2
Yellow	4.5	4.5
Red.	42.3	51.3
Total Cycle	90.0	90.0

Phase	W. Capitol Drive				W. Roosevelt Drive	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green.	37.8	- -	30.6	- -	20.7	21.6
Yellow	3.6	- -	3.6	- -	3.6	3.6
Red.	48.6	45.0	55.8	37.8	65.7	64.8
Green Arrow.	- -	41.4[h]	- -	48.6[h]	- -	- -
Yellow Arrow	- -	3.6	- -	3.6	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. 35th Street
Green.	48.6	21.6
Yellow	3.6	3.6
Red.	37.8	64.8
Green Arrow.	7.2[f]	- -
Yellow Arrow	3.6	- -
Total Cycle[b]	90.0	90.0

Phase	W. Capitol Drive	N. 34th Street
Green.	54.0	24.3
Yellow	4.5	3.6
Red.	31.5	62.1
Green Arrow.	36.0[i]	- -
Yellow Arrow	- -	- -
Total Cycle	90.0	90.0

Phase	W. Capitol Drive				N. 31st Street/W. Hopkins Street			
	Normal		Southbound Actuation		Normal		Southbound Actuation	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound	Northbound	Southbound
Green.	67.6	57.1	52.2	41.7	12.6	- -	12.6	10.5
Yellow	3.5	3.5	3.5	3.5	3.5	- -	3.5	3.5
Red.	18.9	29.4	34.3	44.8	73.9	90.0	73.9	76.0
Green Arrow.	7.7[g]	- -	7.7[g]	- -	12.6[j]	- -	12.6[j]	- -
Yellow Arrow	2.8	- -	2.8	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. 27th Street
Green.	41.4	25.2
Yellow	3.6	4.5
Red.	45.0	60.3
Green Arrow.	9.0[f]	- -
Yellow Arrow	4.5	- -
Total Cycle	90.0	90.0

Table 135 (continued)

Intersection (time in seconds)

Phase	W. Capitol Drive	N. Teutonia Avenue
Green	52.2	25.2
Yellow	4.5	4.5
Red	33.3	60.3
Total Cycle[b]	90.0	90.0

Phase	W. Capitol Drive	N. 20th Street
Green	59.4	19.8
Yellow	3.6	3.6
Red	27.0	66.6
Total Cycle[b]	90.0	90.0

Phase	W. Capitol Drive		W. Atkinson Avenue		
	Morning	Evening	Morning	Evening	
				Northwest-bound	Southeast-bound
Green	52.2	47.7	25.2	29.7	16.2
Yellow	4.5	4.5	4.5	4.5	4.5
Red	33.3	37.8	60.3	55.8	69.3
Green Arrow	--	--	--	9.9[g]	--
Yellow Arrow	--	--	--	3.6	--
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive[k]	N. 15th Street
Green	52.6	27.0
Yellow	3.6	3.6
Red	33.8	59.4
Total Cycle	90.0	90.0

Phase	W. Capitol Drive		N. Green Bay Avenue			
	Morning	Evening	Morning		Evening	
			Northbound	Southbound	Northbound	Southbound
Green	35.1	36.0[d]	16.2	44.1[e]	21.6	43.2[e]
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	50.4	70.2	42.3	64.8	43.2
Green Arrow	--	--	--	22.5[g]	--	16.2[g]
Yellow Arrow	--	--	--	3.6	--	3.6
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

[a] *Leading left-turn arrow.*

[b] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[c] *Signal operates as a flashing beacon, with red indication controlling N. 66th Street and yellow indication controlling W. Capitol Drive except when signal control is actuated by a pedestrian.*

[d] *Westbound through arrow concurrent with eastbound green phase.*

[e] *Through green arrow only.*

[f] *Lagging left-turn arrow.*

[g] *Leading left-turn arrow concurrent with through green phase.*

[h] *Traffic signal controls left turn only; through movement is unimpeded.*

[i] *Lagging right-turn arrow concurrent with N. 34th Street green phase.*

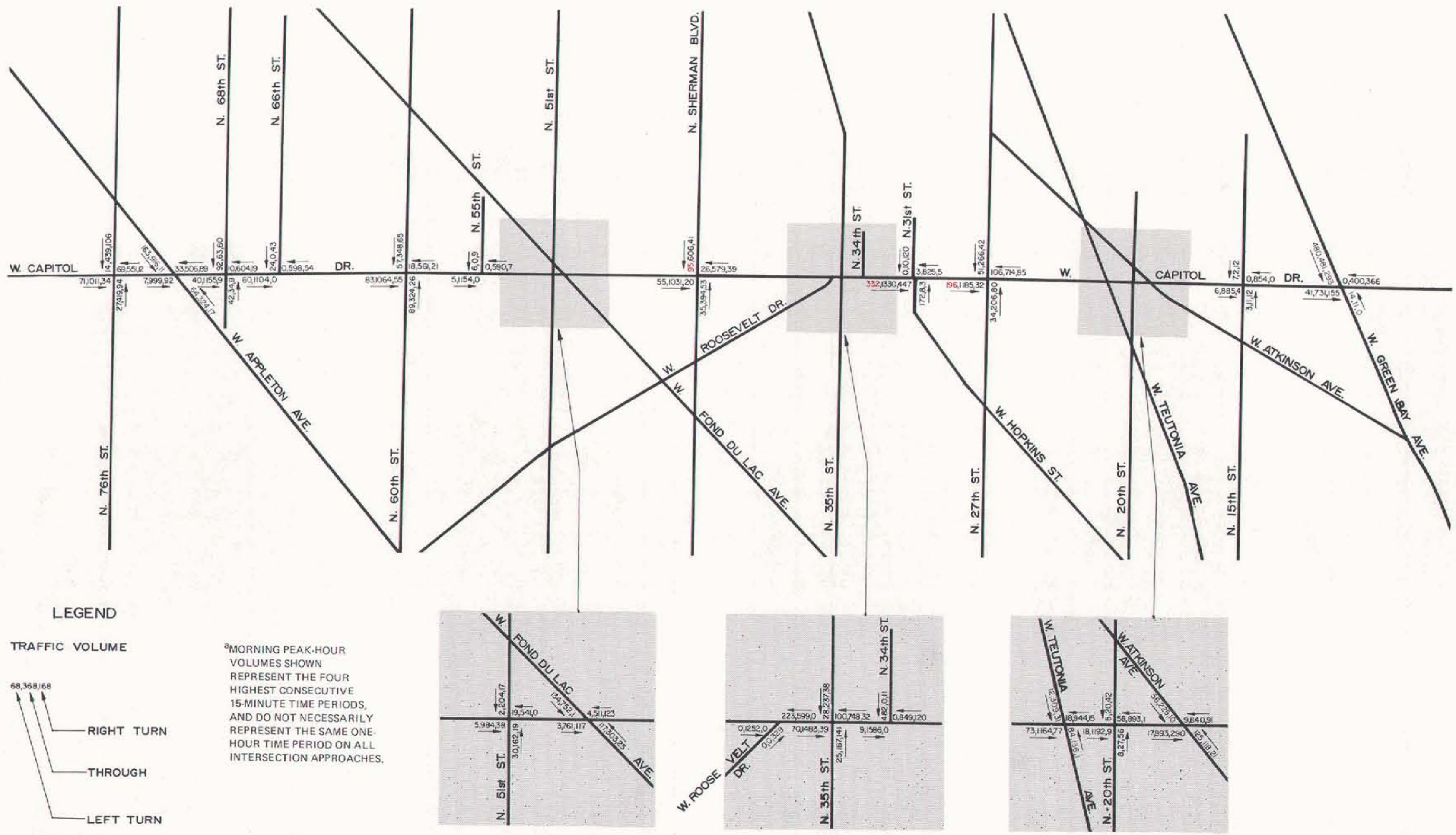
[j] *Left-turn arrow concurrent with through green phase.*

[k] *Vehicular traffic on N. 15th Street actuates signal operation.*

Source: City of Milwaukee and SEWRPC.

Figure 44

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190) DURING THE MORNING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

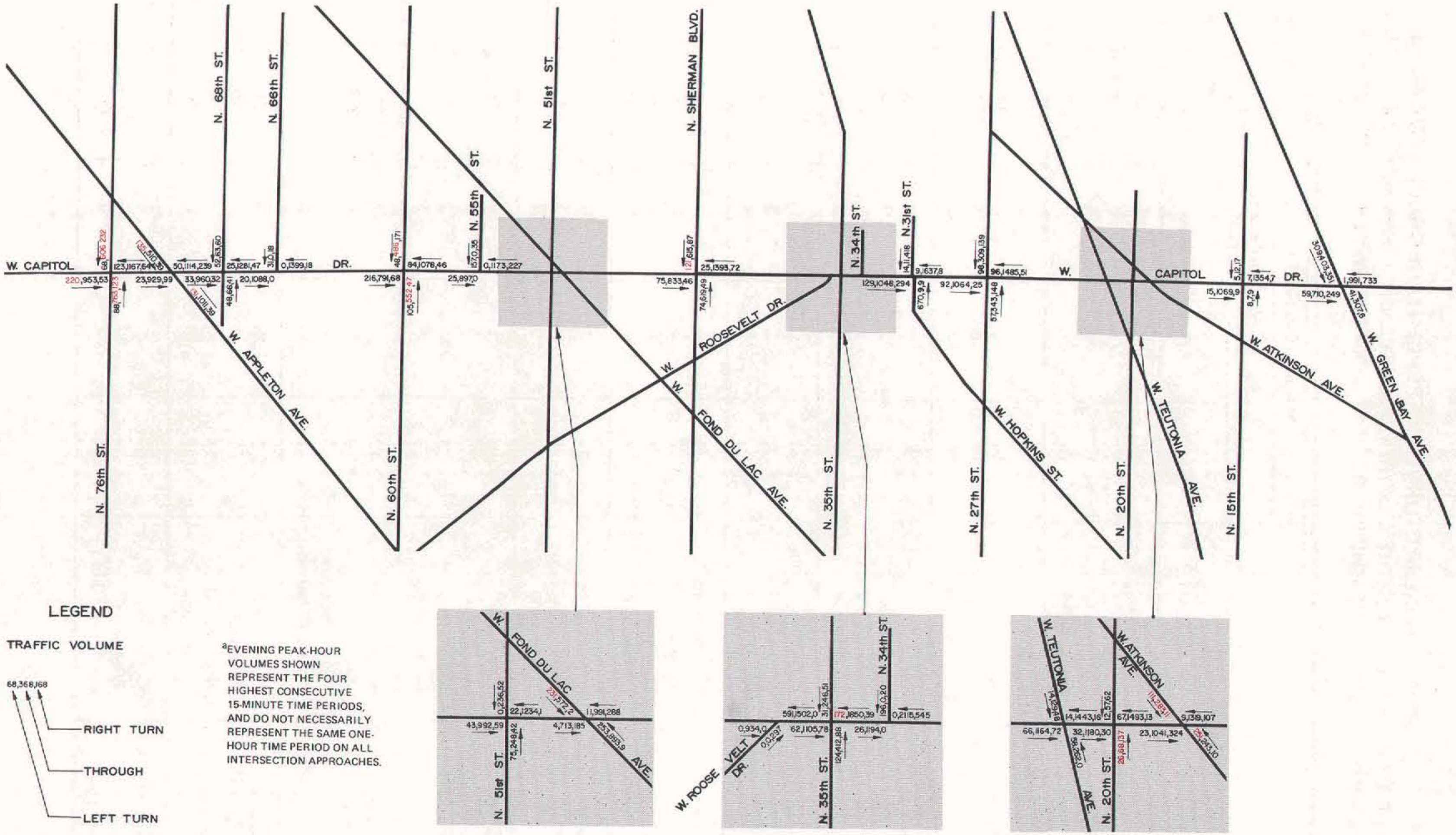
RED NUMBERS INDICATE CONGESTED MOVEMENT

[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 45

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190) DURING THE EVENING PEAK HOUR[a]



LEGEND

TRAFFIC VOLUME

68,368,168

RIGHT TURN

THROUGH

LEFT TURN

RED NUMBERS INDICATE CONGESTED MOVEMENT

[a]EVENING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Table 136

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
W. Capitol Drive and N. 76th Street (STH 181)	Eastbound	3	7	4	4	18	2
	Westbound	2	11	6	5	9	2
	Northbound	17	5	4	13	9	1
	Southbound	19	2	3	26	7	3
W. Capitol Drive and W. Appleton Avenue (USH 41)	Eastbound	8	1	4	10	2	4
	Westbound	14	5	5	17	4	2
	Northwest-bound	4	16	4	3	11	1
	Southeast-bound	1	15	2	6	20	1
W. Capitol Drive and N. 68th Street	Eastbound	1	3	4	3	3	6
	Westbound	3	2	9	3	2	4
	Northbound	11	49	9	26	31	1
	Southbound	28	43	3	34	30	1
W. Capitol Drive and N. 66th Street	Eastbound	- -	5	4	- -	2	4
	Westbound	8	- -	5	1	- -	2
	Southbound	64	36	1	37	63	- -
W. Capitol Drive and N. 60th Street	Eastbound	4	7	4	6	20	4
	Westbound	3	3	6	4	7	2
	Northbound	6	20	3	7	15	2
	Southbound	14	12	5	24	7	4
W. Capitol Drive and N. 55th Street	Eastbound	- -	1	4	- -	3	4
	Westbound	1	- -	8	16	- -	2
	Southbound	40	60	7	18	82	4
W. Capitol Drive and N. 51st Street	Eastbound	3	1	3	5	4	5
	Westbound	- -	3	7	1	1	2
	Northbound	9	14	2	11	21	1
	Southbound	8	1	1	19	- -	1
W. Capitol Drive and W. Fond du Lac Avenue (STH 145)	Eastbound	12	- -	4	21	- -	4
	Westbound	19	1	8	22	1	3
	Northwest-bound	6	26	8	1	22	3
	Southeast-bound	1	15	6	1	28	8
W. Capitol Drive and N. Sherman Boulevard	Eastbound	2	5	4	5	8	5
	Westbound	6	4	11	5	2	3
	Northbound	11	7	4	7	10	4
	Southbound	5	13	4	11	15	4
W. Capitol Drive and W. Roosevelt Drive	Eastbound	- -	- -	2	- -	- -	4
	Westbound	- -	27	7	- -	28	3
	Northeast-bound	100	- -	1	100	- -	5

Table 136 (continued)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Capitol Drive and N. 35th Street	Eastbound	3	4	2	6	5	3
	Westbound	4	11	5	2	8	2
	Northbound	42	8	14	14	20	6
	Southbound	13	9	10	16	9	7
W. Capitol Drive and N. 34th Street	Eastbound	- -	1	2	- -	2	3
	Westbound	12	- -	4	20	- -	2
	Southbound	2	98	2	9	91	4
W. Capitol Drive and N. 31st Street/ W. Hopkins Street	Eastbound	21	16	2	20	9	4
	Westbound	1	1	5	1	1	2
	Northbound	2	94	3	1	98	1
	Southbound	92	- -	3	95	3	1
W. Capitol Drive and N. 27th Street	Eastbound	2	14	4	2	8	6
	Westbound	9	11	8	3	6	3
	Northbound	25	11	4	27	10	8
	Southbound	12	14	11	25	18	4
W. Capitol Drive and N. Teutonia Avenue	Eastbound	6	5	5	6	5	8
	Westbound	1	2	8	2	1	12
	Northwest-bound	1	38	8	0	18	7
	Southeast-bound	9	3	9	25	7	10
W. Capitol Drive and N. 20th Street	Eastbound	1	1	6	2	3	5
	Westbound	1	6	8	1	4	4
	Northbound	61	9	3	60	11	4
	Southbound	63	7	6	47	9	2
W. Capitol Drive and W. Atkinson Avenue	Eastbound	24	2	6	23	2	4
	Westbound	10	1	7	7	1	4
	Northwest-bound	8	47	19	2	50	4
	Southeast-bound	4	19	11	3	27	8
W. Capitol Drive and N. 15th Street	Eastbound	1	1	5	1	1	2
	Westbound	- -	- -	4	1	1	2
	Northbound	46	12	- -	34	33	4
	Southbound	57	33	- -	50	15	- -
W. Capitol Drive and N. Green Bay Avenue	Eastbound	17	4	5	24	6	5
	Westbound	48	- -	10	42	1	3
	Northwest-bound	- -	11	8	1	12	2
	Southeast-bound	24	38	5	33	29	3

Source: SEWRPC.

Table 137

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Capitol Drive and N. 76th Street (STH 181)	Congested east-to-northbound left-turn movement during the evening peak hour (220 vehicles per hour at level-of-service E) and congested right-turn and through movements from northbound and southbound approaches during the evening peak hour (886 and 838 vehicles entering approaches per hour, respectively, both at level-of-service E) Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour. (This storage capacity problem cannot be corrected because of the inadequate space for construction owing to the location of N. 77th Street	Recommended Action Refer to analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road	Cost not included	Cost not included
W. Capitol Drive and W. Appleton Avenue (USH 41)	Congested northwest-to-westbound and southeast-to-eastbound left-turn movements during the evening peak hour (131 and 135 vehicles per hour, respectively, at level-of-service E)	Recommended Action Refer to analysis of W. Appleton Avenue from N. 76th Street to W. Lisbon Avenue	Cost not included	Cost not included
W. Capitol Drive and N. 60th Street	Congested southbound through and northbound right-turn and through movements during the evening peak hour (486 vehicles per hour southbound at level-of-service D and 599 vehicles per hour northbound at level-of-service E) Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of N. 60th Street from W. Center Street to W. Capitol Drive	Cost not included	Cost not included
W. Capitol Drive and W. Fond du Lac Avenue (STH 145)	Congested southeast-to-eastbound left-turn movement during the evening peak hour (231 vehicles per hour at level-of-service E) Insufficient northwest-to-westbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of W. Fond du Lac Avenue from N. 60th Street to W. Walnut Street	Cost not included	Cost not included
W. Capitol Drive and N. Sherman Boulevard	Congested south-to-eastbound left turn during the evening peak hour (121 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive	Cost not included	Cost not included
W. Capitol Drive and N. 35th Street	Congested west-to-southbound left turn during the evening peak hour (172 vehicles per hour at level-of-service E) Insufficient west-to-southbound left-turn-lane storage capacity during the evening peak hour	Recommended Action Refer to analysis of N. 35th Street from East-West Freeway (IH 94) to W. Capitol Drive	Cost not included	Cost not included
W. Capitol Drive and N. 31st Street	Congested east-to-northbound left-turn movement during the morning peak hour (332 vehicles per hour at level-of-service E) Insufficient east-to-northbound left-turn-lane storage capacity during the morning peak hour	Recommended Actions Retime 90-second cycle to increase traffic-actuated east-to-northbound left-turn arrow from 7.7 to 21.0 seconds during the morning peak hour, making necessary signal changes at other approaches Lengthen east-to-northbound left-turn lane from 250 to 330 feet for increased storage capacity	- - $15,000	- - $15,000

Table 137 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Capitol Drive and N. 27th Street	Congested east-to-northbound left-turn movement during the morning peak hour (196 vehicles per hour at level-of-service E) Insufficient east-to-northbound and south-to-eastbound left-turn-lane storage capacity during the morning and evening peak hours, respectively, and insufficient capacity on north-bound approach for right-turn and through movements during the evening peak hour	Recommended Action Refer to analysis of N. 27th Street from East-West Freeway (IH 94) to N. Teutonia Avenue	Cost not included	Cost not included
W. Capitol Drive and N. 20th Street	Congested northbound right-turn, left-turn, and through movements during the evening peak hour (231 vehicles per hour at level-of-service D)	Recommended Action Prohibit on-street parking on near side of northbound approach during the evening peak hour Alternative Action Retime 90-second cycle so that all vehicles can negotiate this problem approach during the evening peak hour (Not recommended because the 90-second cycle could not provide a sufficient percentage of green time to adequately accommodate this traffic volume during the evening peak hour without adversely affecting signal progression on W. Capitol Drive)	$ 200	$ 200
W. Capitol Drive and W. Atkinson Avenue	Congested northwest-to-westbound left-turn movement; and right-turn, left-turn, and through movements on southeast-bound approach during the evening peak hour (251 and 405 vehicles per hour, respectively, at level-of-service E)	Recommended Actions Retime 90-second cycle to increase northwest-to-westbound leading left-turn green arrow from 9.9 to 12.6 seconds during the evening peak hour, making necessary signal timing changes at other approaches Add separate signal phasing to control east-to-southeast-bound right-turn movement so that it operates concurrently with northwest-to-westbound left-turn phasing Prohibit on-street parking on near side of eastbound approach and on near and far sides of southeast-bound approach during the evening peak hour	-- $ 2,000[a] $ 600	$ 2,600[a]
Total				$17,800[a]

[a]*Because the addition of the new signal phase at this intersection may require a new traffic controller, the capital cost of improvement of this intersection may be $12,000 more than that stated in this table—or the approximate cost of a new controller. Consequently, the total capital cost of implementing all of these new recommended improvements along W. Capitol Drive could be increased by $12,000.*

Source: SEWRPC.

Table 138

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. CAPITOL DRIVE (STH 190)

Phase	Intersection (time in seconds)		
	W. Capitol Drive		N. 76th Street (STH 181)
	Morning	Evening	
Green	44.1	38.7	20.7
Yellow	4.5	4.5	4.5
Red	41.4	46.8	64.8
Green Arrow	9.0[a]	14.4[a]	--
Yellow Arrow	3.6	3.6	--
Total Cycle[b]	90.0	90.0	90.0

Phase	W. Capitol Drive		W. Appleton Avenue (USH 41)	
	Morning	Evening	Morning	Evening
Green	38.7	37.8	38.7	28.8
Yellow	4.5	4.5	4.5	4.5
Red	46.8	47.7	46.8	44.1
Green Arrow	--	--	--	7.2[a]
Yellow Arrow	--	--	--	3.6.
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. 68th Street
Green	52.2	26.1
Yellow	3.6	3.6
Red	34.2	60.3
Total Cycle	90.0	90.0

Phase	W. Capitol Drive	N. 66th Street
Green	51.3	18.0
Yellow	4.5	3.6
Red	34.2	68.4
Total Cycle[c]	90.0	90.0

Phase	W. Capitol Drive	N. 60th Street
Green	38.7	20.7
Yellow	3.6	3.6
Red	47.7	65.7
Green Arrow	7.2[a]	7.2[d]
Yellow Arrow	3.6	3.6
Total Cycle[b]	90.0	90.0

Phase	W. Capitol Drive	N. 55th Street
Green	53.4	28.6
Yellow	3.5	3.5
Red	33.1	57.9
Total Cycle	90.0	90.0

Phase	W. Capitol Drive		N. 51st Street
	Eastbound	Westbound	
Green	36.9	57.6	23.4
Yellow	3.6	3.6	3.6
Red	49.5	28.8	63.0
Green Arrow	--	17.1[e]	--
Yellow Arrow	--	3.6	--
Total Cycle	90.0	90.0	90.0

Table 138 (continued)

Phase	Intersection (time in seconds)					
	W. Capitol Drive		W. Fond du Lac Avenue (STH 145)			
	Morning	Evening	Morning		Evening	
			Northwest-bound	Southeast-bound	Northwest-bound	Southeast-bound
Green.	29.7	32.4	27.9	47.7	28.8	45.0
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	55.8	53.1	57.6	37.8	56.7	40.5
Green Arrow.	- -	- -	- -	16.2[e]	- -	12.6[e]
Yellow Arrow	- -	- -	- -	3.6	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. Sherman Boulevard		
		Morning	Evening	
			Northbound	Southbound
Green.	43.2	34.2	23.4	34.2
Yellow	4.5	4.5	4.5	4.5
Red	42.3	51.3	62.1	51.3
Green Arrow.	- -	- -	- -	7.2[e]
Yellow Arrow	- -	- -	- -	3.6
Total Cycle	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive[f]				W. Roosevelt Drive[f]	
	Morning		Evening		Morning	Evening
	Eastbound	Westbound	Eastbound	Westbound		
Green.	37.8	- -	28.8	- -	20.7	19.8
Yellow	3.6	- -	3.6	- -	3.6	3.6
Red	48.6	45.0	57.6	36.0	65.7	66.6
Green Arrow.	- -	41.4[g]	- -	50.4[g]	- -	- -
Yellow Arrow	- -	3.6	- -	3.6	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive			N. 35th Street	
	Morning	Evening		Morning	Evening
		Eastbound	Westbound		
Green.	48.6	44.1	52.2	21.6	18.0
Yellow	3.6	3.6	3.6	3.6	3.6
Red	37.8	42.3	34.2	64.8	68.4
Green Arrow.	7.2[d]	7.2[d]	15.3[d]	- -	- -
Yellow Arrow	3.6	3.6	3.6	- -	- -
Red Indication . . .	- -	47.7	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive	N. 34th Street
Green.	54.0	24.3
Yellow	4.5	3.6
Red	31.5	62.1
Green Arrow.	36.0[h]	- -
Yellow Arrow	- -	- -
Total Cycle	90.0	90.0

Table 138 (continued)

Phase	Intersection (time in seconds)							
	W. Capitol Drive				N. 31st Street/W. Hopkins Street			
	Morning				Morning			
	Normal		Southbound Actuation		Normal		Southbound Actuation	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound	Northbound	Southbound
Green.	67.6	43.8	52.2	28.4	12.6	- -	12.6	10.5
Yellow	3.5	3.5	3.5	3.5	3.5	- -	3.5	3.5
Red.	18.9	42.7	34.3	58.1	73.9	90.0	73.9	76.0
Green Arrow.	21.0[e]	- -	21.0[e]	- -	12.6[g]	- -	12.6[g]	- -
Yellow Arrow	2.8	- -	2.8	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	Evening				Evening			
	Normal		Southbound Actuated		Normal		Southbound Actuation	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound	Northbound	Southbound
Green.	67.6	57.1	52.2	41.7	12.6	- -	12.6	10.5
Yellow	3.5	3.5	3.5	3.5	3.5	- -	3.5	3.5
Red.	18.8	29.4	34.3	44.8	73.9	90.0	73.9	76.0
Green Arrow.	7.7[c]	- -	7.7[c]	- -	12.6[i]	- -	12.6[i]	- -
Yellow Arrow	2.8	- -	2.8	- -	- -	- -	- -	- -
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	W. Capitol Drive				N. 27th Street			
	Morning		Evening		Morning		Evening	
Green.	37.8		41.4		24.3		26.1	
Yellow	3.6		3.6		4.5		4.5	
Red.	48.6		45.0		61.2		57.4	
Green Arrow.	12.6[a]		7.2[a]		- -		- -	
Yellow Arrow	3.6		3.6		- -		- -	
Total Cycle	90.0		90.0		90.0		90.0	
	W. Capitol Drive				N. Teutonia Avenue			
Green.	52.2				25.2			
Yellow	4.5				4.5			
Red.	33.3				60.3			
Total Cycle[b]	90.0				90.0			
	W. Capitol Drive				N. 20th Street			
Green.	59.4				19.8			
Yellow	3.6				3.6			
Red.	27.0				66.6			
Total Cycle[b]	90.0				90.0			
	W. Capitol Drive				N. 20th Street			
Green.	59.4				19.8			
Yellow	3.6				3.6			
Red.	27.0				66.6			
Total Cycle[b]	90.0				90.0			

Table 138 (continued)

Phase	Intersection (time in seconds)					
	W. Capitol Drive			W. Atkinson Avenue		
	Morning	Evening		Morning	Evening	
		Eastbound	Westbound		Northwest-bound	Southeast-bound
Green.	52.2	45.0	45.0	25.2	32.4	16.2
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	33.3	40.5	40.5	60.3	53.1	69.3
Green Arrow.	--	12.6[j]	--	--	12.6[e]	--
Yellow Arrow	--	3.6	--	--	3.6	--
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Capitol Drive[k]	N. 15th Street
Green.	52.6	27.0
Yellow	3.6	3.6
Red	33.8	59.4
Total Cycle	90.0	90.0

Phase	W. Capitol Drive		N. Green Bay Avenue			
	Morning	Evening	Northbound	Southbound	Northbound	Southbound
Green.	35.1	36.0[l]	16.2	44.1[m]	21.6	43.2[m]
Yellow	3.6	3.6	3.6	3.6	3.6	3.6
Red	51.3	50.4	70.2	42.3	64.8	43.2
Green Arrow.	--	--	--	22.5[e]	--	16.2[e]
Yellow Arrow	--	--	--	3.6	--	3.6
Total Cycle[b]	90.0	90.0	90.0	90.0	90.0	90.0

[a]Leading left-turn arrow.

[b]Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.

[c]Signal operates as a flashing beacon, with red indication controlling N. 66th Street and yellow indication controlling W. Capitol Drive except when signal control is actuated by a pedestrian.

[d]Lagging left-turn green arrow.

[e]Leading left-turn arrow concurrent with through green phase.

[f]Recommended traffic signal timing plan at the intersection of W. Capitol Drive and W. Roosevelt Drive reflects signal timing changes made in conjunction with analysis of the intersection of N. 35th Street and W. Capitol Drive. (Refer to analysis of N. 35th Street from the East-West Freeway [IH 94] to W. Capitol Drive.)

[g]Traffic signal controls left turn only; through movement is unimpeded.

[h]Lagging right-turn arrow concurrent with N. 34th Street green phase.

[i]Left-turn green arrow concurrent with through green phase.

[j]Lagging right-turn arrow concurrent with northwest-bound left-turn green arrow.

[k]Vehicular traffic on N. 15th Street actuates signal operation.

[l]Westbound through arrow concurrent with eastbound green phase.

[m]Through green arrow only.

Source: City of Milwaukee and SEWRPC.

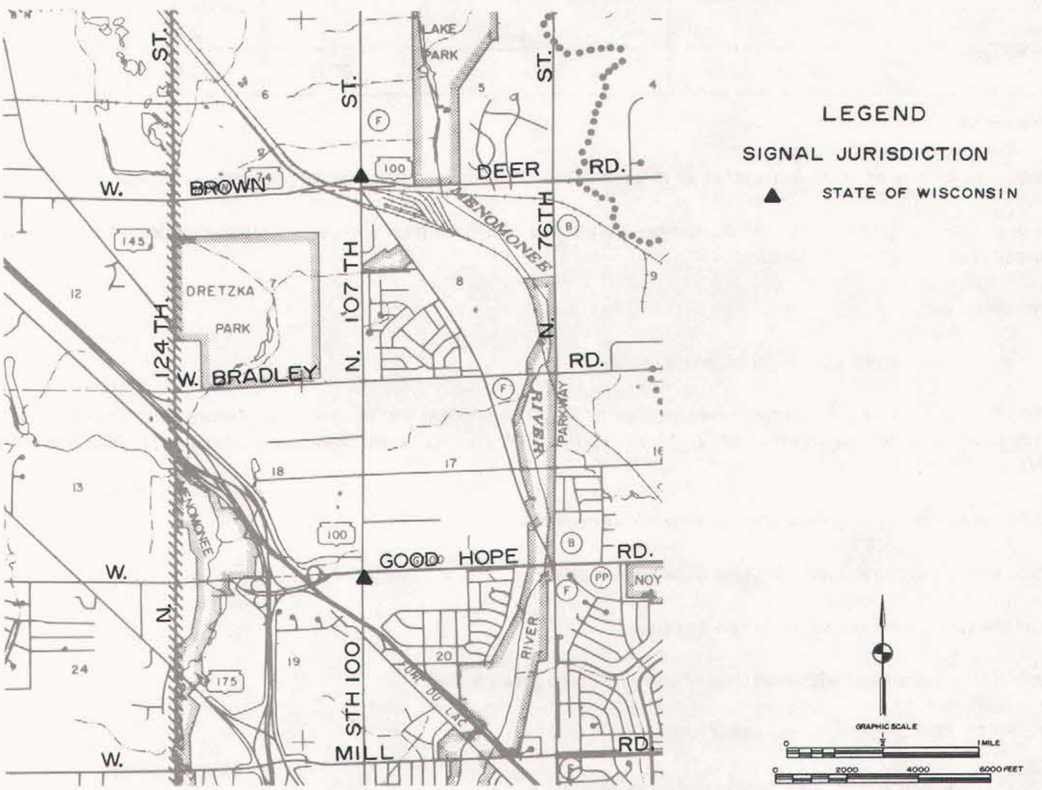
N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road (STH 100)

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range traffic management improvements is, as shown on Map 138, N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road (STH 100), a distance of 2.0 miles. Map 139 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 107th Street. Residential and agricultural land uses comprise the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 107th Street. Retail sales and service land uses abut N. 107th Street at its intersection with W. Villa Street and between W. Heather Street and W. Brown Deer Road. Industrial land uses occur along the corridor on the west side of N. 107th Street between the Milwaukee Road and Chicago & North Western railroad tracks. Recreational land uses abut N. 107th Street along this segment between W. Donna Street and W. Wabash Street at Granville Park. Some areas of open lands also exist within the corridor, particularly between W. Good Hope Road and W. Bradley Road.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. 107th Street. Between W. Good Hope Road and its intersection with the Milwaukee Road railroad tracks, N. 107th Street is not median divided. The curb-to-curb roadway widths along this segment range from 48 to 50 feet from W. Good Hope Road to W. Juniper Street. From W. Juniper Street to the intersection with the Milwaukee Road railroad tracks, there is a rural cross-section that is 28 feet wide between pavement edges. N. 107th Street is divided by a three-foot-wide painted median from its inter-

Map 138

DETAIL OF THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing problems to warrant investigation of short-range improvements—N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road (STH 100), a distance of 2.0 miles. This map also shows the location and jurisdiction of the two traffic signals along this arterial segment.

Source: Wisconsin Department of Transportation.

Map 139

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. 107th Street (STH 100). Residential and agricultural land uses comprise the majority of the existing urban development in the corridor, as well as of the existing urban development immediately adjacent to N. 107th Street. Retail sales and service land uses abut N. 107th Street at its intersection with W. Villa Street and between W. Heather Street and W. Brown Deer Road (STH 100). Industrial land uses occur along the corridor on the west side of N. 107th Street between the Milwaukee Road and Chicago & North Western railroad tracks. Recreational land uses abut N. 107th Street along this segment between W. Donna Street and W. Wabash Street at Granville Park. Also, areas of open lands still exist within the corridor, particularly between W. Good Hope Road and W. Bradley Road.

Source: SEWRPC.

section with the Milwaukee Road tracks to W. Granville Road, a raised median ranging in width from four feet to seven feet from W. Granville Road to the Chicago & North Western tracks, and an 18-foot-wide median from the Chicago & North Western tracks to W. Brown Deer Road. The curb-to-curb widths of the dual roadways along this latter segment of N. 107th Street range from 13 to 19 feet between the Milwaukee Road tracks and W. Brown Deer Road, adequate to provide one lane for moving traffic in each direction with parking permitted, with the exception of the intersection of W. Brown Deer Road with N. 107th Street, where the curb-to-curb widths of the dual roadways range from 30 to 36 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently prohibited along N. 107th Street only between W. Wabash Street and the intersection of N. 107th Street with the Milwaukee Road tracks, where it is prohibited on both sides of the roadway.

As shown in Table 139, the segment of N. 107th Street defined as having traffic problems has two signalized intersections, at which the N. 107th Street approaches range in width from 24 to 36 feet. At the intersection of N. 107th Street and W. Brown Deer Road the northbound and southbound approaches provide separate lanes for the exclusive use of left-turning vehicles. In addition, the northbound approach to the intersection of N. 107th Street and W. Brown Deer Road and the southbound approaches to both of the signalized intersections provide separate lanes for the exclusive use of right-turning vehicles. On-street parking restrictions at each of these signalized intersections are also indicated in Table 139.

Traffic Control Measures: The timing plan for each of the two traffic signals along N. 107th Street between W. Good Hope Road and W. Brown Deer Road is indicated in Table 140. Map 138 shows the location and jurisdiction of each of these signals. Both of the traffic signals are located at intersections of N. 107th Street with other arterial streets. Stop signs are located at all other approaches to collector or local street crossings of this segment of N. 107th Street, as well as at the approaches to the arterial crossing of N. 107th Street at W. Bradley Road. Flashing railroad crossing signals to control traffic are located at the Milwaukee Road at-grade railway crossing of N. 107th Street, as well as at the Chicago & North Western at-grade railway crossing of N. 107th Street north of W. Granville Road. This segment of N. 107th Street is posted for a 45-mile-per-hour (mph) speed limit from W. Good Hope Road to W. Donna Drive and a 30-mph speed limit from W. Donna Drive to W. Brown Deer Road.

Table 139

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

Intersection	Roadway Approach Width (feet)							
	Northbound		Southbound		Eastbound		Westbound	
N. 107th Street and W. Good Hope Road	24	NP	24R	NP	36ML	NS	40ML	NP
N. 107th Street and W. Brown Deer Road (STH 100) . . .	36MLR	P	36MLR	P	40MLR	P	40MLR	P

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

Source: SEWRPC.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the two signalized intersections along the problem segment of N. 107th Street in Figures 46 and 47. The locations along N. 107th Street from W. Good Hope Road to W. Brown Deer Road where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing the morning and evening traffic volumes for each approach to the two controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. 107th Street, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 141.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. 107th Street, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 46 and 47. One congested traffic movement was found to occur along this segment of N. 107th Street during the morning peak hour, and two were found to occur during the evening peak hour. This problem segment of N. 107th

Table 140

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

Phase	Intersection (time in seconds)			
	N. 107th Street		W. Good Hope Road	
	Northbound	Southbound	Eastbound	Westbound
Green.	25.0	25.0	64.0	35.0
Yellow	5.0	5.0	5.0	5.0
Red.	71.0	71.0	32.0	61.0
Green Arrow.	- -	26.0[a]	26.0[b]	- -
Yellow Arrow	- -	3.0	3.0	- -
Red Indication	- -	72.0[c]	- -	- -
Total Cycle	101.0	101.0	101.0	101.0
	N. 107th Street		W. Brown Deer Road (STH 100)	
	Northbound	Southbound	Eastbound	Westbound
Green.	35.0	35.0	40.0	68.2
Yellow	5.0	5.0	5.0	5.0
Red.	75.2	75.2	70.2	42.0
Green Arrow.	25.0[d]	- -	- -	25.0[b]
Yellow Arrow	3.0	- -	- -	3.0
Red Indication	87.2[c]	- -	- -	- -
Total Cycle	115.2	115.2	115.2	115.2

[a] *Right-turn arrow concurrent with eastbound left-turn arrow.*

[b] *Leading left-turn arrow concurrent with through green phase.*

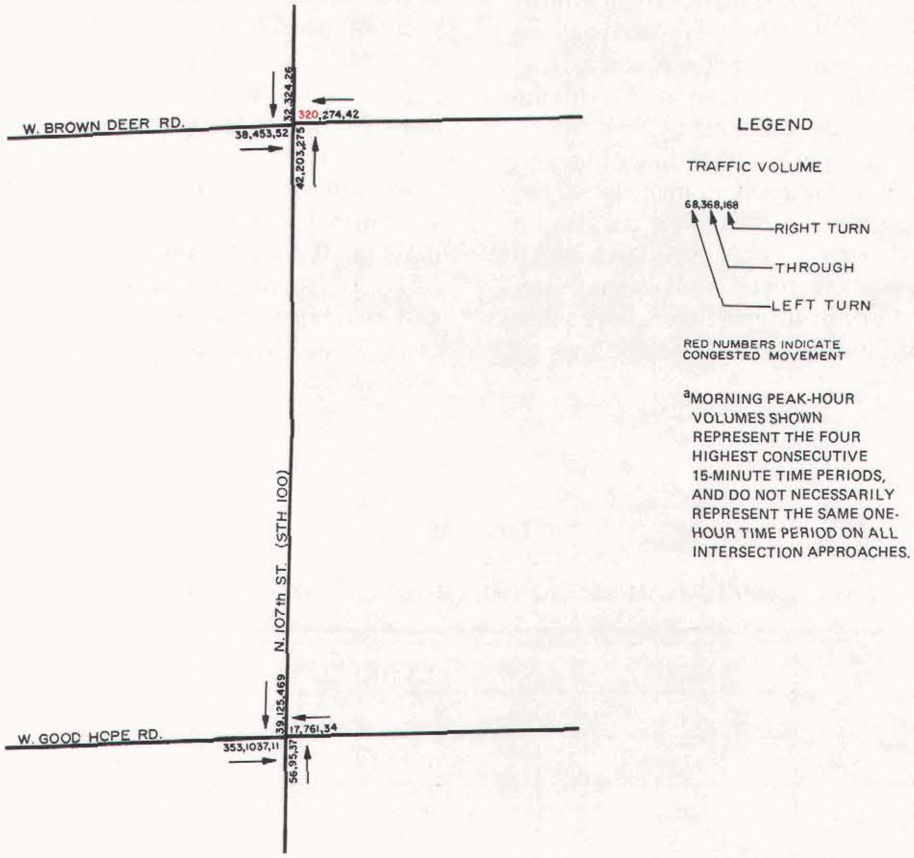
[c] *Flashing red beacon controls right-turn lane during absence of right-turn green arrow indication.*

[d] *Right-turn arrow concurrent with westbound left-turn arrow.*

Source: Wisconsin Department of Transportation and SEWRPC.

Figure 46

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100) DURING THE MORNING PEAK HOUR[a]



Source: SEWRPC.

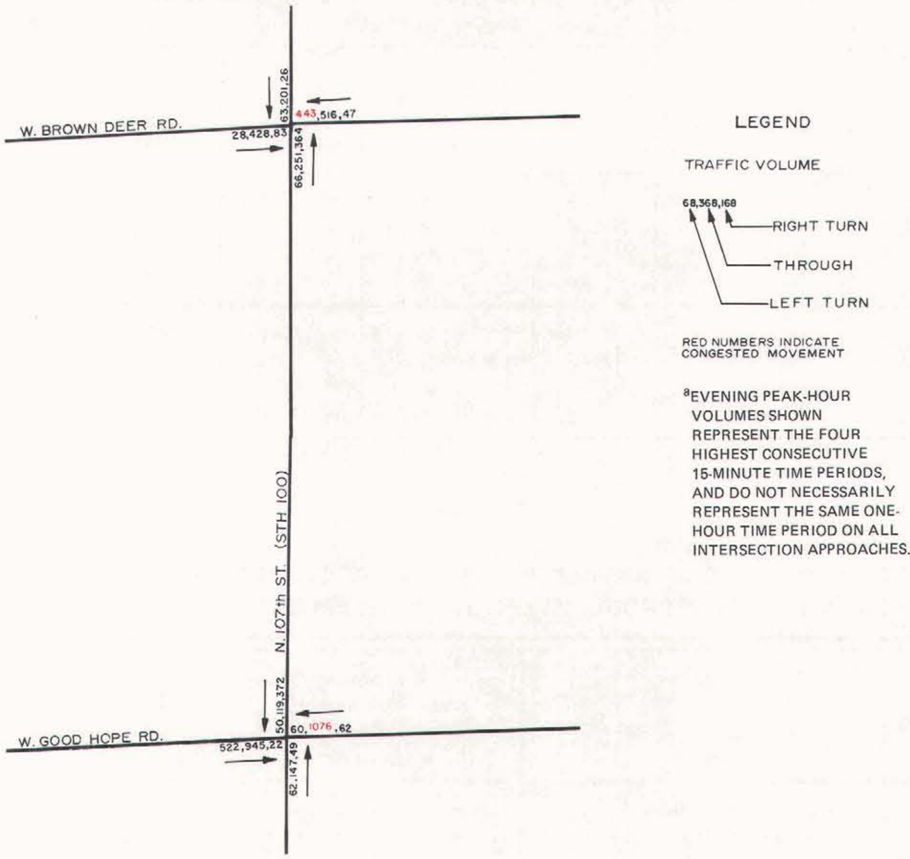
Street was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment in addition to the identified congestion problems.

Alternative and Recommended Transportation Systems Management Actions: The one morning and two evening peak-hour traffic congestion problems identified along N. 107th Street are associated with the signalized intersections of N. 107th Street with W. Good Hope Road and W. Brown Deer Road. Table 142 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 143 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of N. 107th Street. A total of four actions are recommended to be implemented at the two problem intersections at a capital cost of approximately $35,000, in 1980 dollars.

As indicated in Table 142, both congested intersections along this segment of N. 107th Street require some turn-lane construction. To abate the congested westbound through movement during the evening peak hour at the intersection of N. 107th Street and W. Good Hope Road, it is recommended that the total signal cycle length be increased from 101 seconds to 115 seconds in order to provide for increased green time on the westbound approach, as well as for more green arrow time for the east-to-northbound left-turn movement, at minimal cost. It should be noted that, in the calculation of

Figure 47

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100) DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

the needed adjustments in the signal timing plan at this intersection, as in all similar calculations in this analysis, the number of vehicles which could negotiate left-turn movements during the through green and yellow phases, as well as during the exclusive green-arrow phase, was taken into consideration. In order to provide sufficient storage capacity during the evening peak hour at this intersection, it is recommended that the storage length of the existing east-to-northbound double left-turn lane be increased from 186 to 250 feet, at a capital cost of $15,000. The total cost necessary to implement all recommended improvements at this intersection would thus be $15,000. In order to abate the congested west-to-southbound left-turn movements during the morning and evening peak hours at the intersection of N. 107th Street and W. Brown Deer Road, it is recommended that the total signal cycle length be retimed during the morning peak hour at minimal cost. In order to provide sufficient storage capacity at this intersection during the evening peak hour, it is recommended that the exclusive west-to-southbound left-turn lane be reconstructed from a single to a double lane, at a capital cost of $20,000. The total cost necessary to implement all recommended improvements at this intersection would thus be $20,000.

Because of the distance between the two signalized intersections along this segment of N. 107th Street, no adjustments in the offsets between the traffic signal turning plans at these intersections to improve signal progression are recommended.

N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190)

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management

Table 141

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
N. 107th Street and W. Good Hope Road	Eastbound	1	25	7	2	35	5
	Westbound	4	2	5	5	5	4
	Northbound	20	30	3	19	24	2
	Southbound	74	6	5	69	9	7
N. 107th Street and W. Brown Deer Road (STH 100)	Eastbound	10	7	9	15	5	5
	Westbound	7	50	7	5	44	5
	Northbound	53	8	10	53	10	7
	Southbound	7	8	12	9	22	7

Source: SEWRPC.

Table 142

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. 107th Street and W. Good Hope Road	Congested westbound through movement during the evening peak hour (1,076 vehicles per hour at level-of-service D) Insufficient east-to-northbound left-turn-lane storage capacity during the evening peak hour	Recommended Actions Increase 101-second cycle to 115-second cycle to permit an increase in the maximum westbound green phase from 35 to 44 seconds, and in the east-to-northbound left-turn arrow from 26 to 31 seconds Increase storage length of east-to-northbound double left-turn lane from 186 to 250 feet	- - $15,000	$15,000
N. 107th Street and W. Brown Deer Road	Congested west-to-southbound left turn during the morning and evening peak hours (320 and 443 vehicles per hour, respectively, at level-of-service E) Insufficient west-to-southbound left-turn-lane storage capacity during the evening peak hour	Recommended Actions Retime 115.2-second cycle during the morning peak hour to reduce maximum actuated west-to-southbound left-turn arrow from 25.0 to 15.0 seconds, making necessary signal changes at other approaches Reconstruct exclusive west-to-southbound left-turn lane to double lane	- - $20,000	$20,000
Total			$35,000	

Source: SEWRPC.

Table 143

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. 107TH STREET (STH 100)

Phase	Intersection (time in seconds)							
	N. 107th Street				W. Good Hope Road			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	25.0	25.0	25.0	25.0	64.0	35.0	73.0	44.0
Yellow	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Red.	71.0	71.0	85.0	85.0	32.0	61.0	37.0	66.0
Green Arrow. . . .	--	26.0[a]	--	31.0[a]	26.0[a]	--	31.0[b]	--
Yellow Arrow . . .	--	3.0	--	3.0	3.0	--	3.0	--
Red Indication . .	--	72.0	--	81.0	--	--	--	--
Total Cycle	101.0	101.0	115.0	115.0	101.0	101.0	115.0	115.0
	N. 107th Street				W. Brown Deer Road (STH 100)			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green.	35.0	35.0	35.0	35.0	50.0	68.2	40.0	68.2
Yellow	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Red.	75.2	75.2	75.2	75.2	60.2	42.0	70.2	42.0
Green Arrow. . . .	15.0[c]	--	25.0[c]	--	--	15.0[b]	--	25.0[b]
Yellow Arrow . . .	3.0	--	3.0	--	--	3.0	--	3.0
Red Indication . .	97.2[d]	--	87.2[d]	--	--	97.2	--	87.2
Total Cycle	115.2	115.2	115.2	115.2	115.2	115.2	115.2	115.2

[a] *Right-turn arrow concurrent with eastbound left-turn green arrow.*

[b] *Leading left-turn arrow concurrent with through green phase.*

[c] *Right-turn arrow concurrent with westbound left-turn green arrow.*

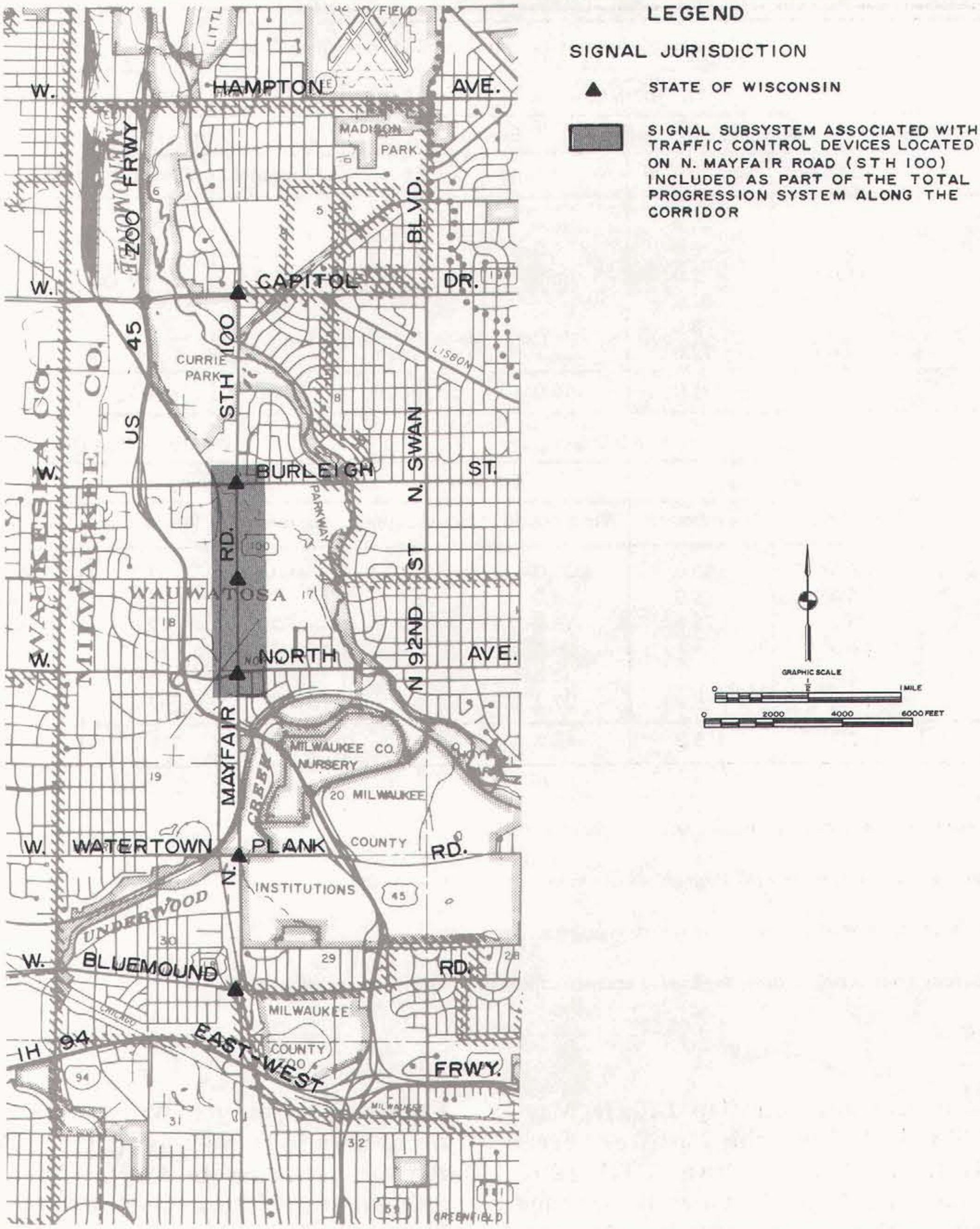
[d] *Flashing red beacon controls right-turn lane during absence of right-turn arrow indication.*

Source: SEWRPC.

improvements is, as shown on Map 140, N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), a distance of 4.3 miles. Map 141 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of N. Mayfair Road (STH 100). Land use within the corridor and immediately adjacent to N. Mayfair Road (STH 100) is comprised of a combination of retail sales and service land uses, off-street parking uses related to retail sales and service centers, residential uses, park and recreational uses, governmental and institutional uses, industrial uses, and areas of open land. Retail sales and service land uses and off-street parking land uses related to retail sales and service centers occur along this corridor from the East-West Freeway to W. Watertown Plank Road; from the Zoo Freeway (USH 45) to W. Auer Avenue, including the Mayfair Mall Shopping Center; and at the intersection of N. Mayfair Road and W. Capitol Drive. Residential land uses occur along this corridor between W. Blue Mound Road and W. Wisconsin Avenue, at or near the intersection of N. Mayfair Road with W. North Avenue, and between W. Burleigh Street and W. Capitol Drive. Industrial land uses occur along N. Mayfair Road at or near the overpass of the Zoo Freeway, and also near its intersection with W. Burleigh Street. Governmental and institutional land uses occur along this corridor between W. Wisconsin Avenue and W. Watertown Plank Road, particularly in the form of the Milwaukee County Institutions. Recrea-

Map 140

DETAIL OF THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)– TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



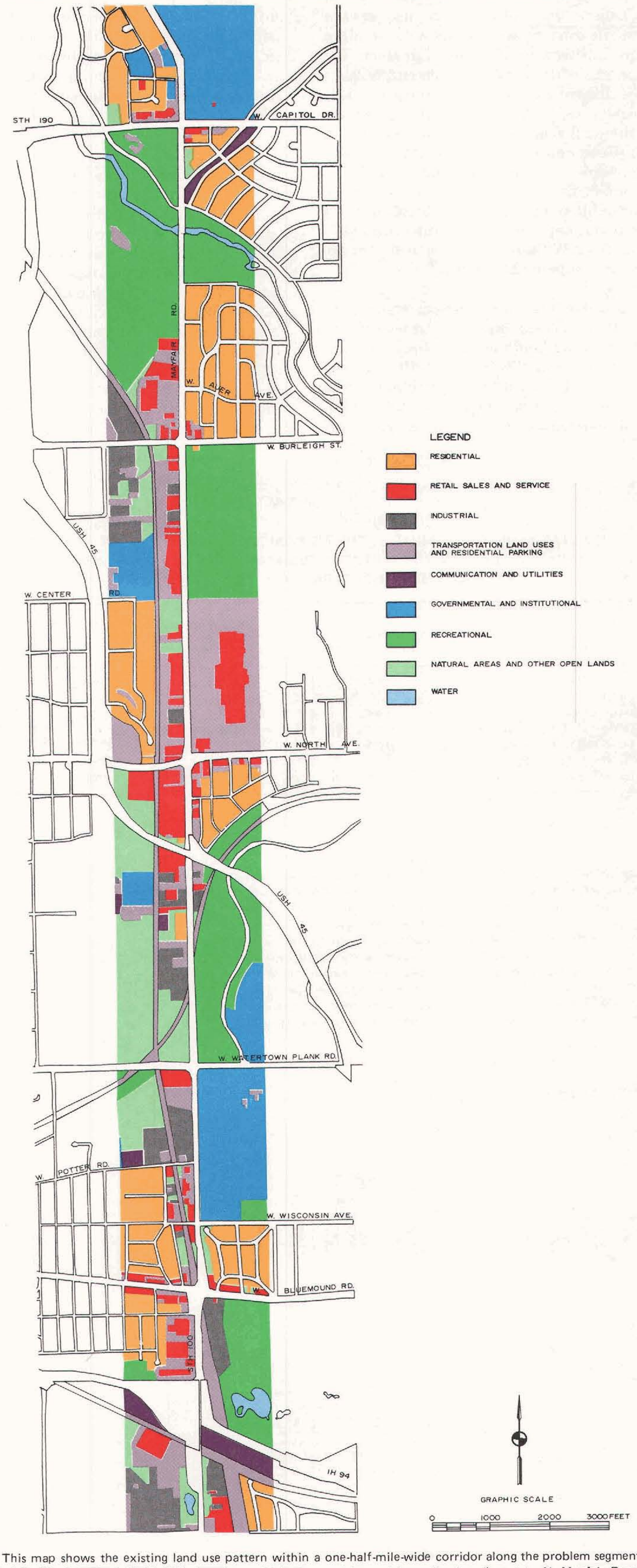
Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements–N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), a distance of 4.3 miles. This map also shows the location and jurisdiction of each of the six traffic signals along this arterial segment, including the interconnection of each of these signals.

Source: Wisconsin Department of Transportation and SEWRPC.

tional land uses occur along this corridor between the East-West Freeway and W. Blue Mound Road at the Milwaukee County Zoo, between W. Watertown Plank Road and the Zoo Freeway at the Underwood Creek Parkway, between W. Center Street and W. Burleigh Street at Blue Mound Golf & Country Club, and between W. Burleigh Street and W. Capitol Drive at Currie Park. There are still some areas of open lands within the corridor, particularly between W. Watertown Plank Road and W. North Avenue on the west side of the roadway.

Map 141

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)



This map shows the existing land use pattern within a one-half-mile-wide corridor along the problem segment of N. Mayfair Road (STH 100). Land use within the corridor and immediately adjacent to N. Mayfair Road (STH 100) is comprised of a combination of retail sales and service land uses, off-street parking uses related to retail sales and service centers, residential uses, park and recreational uses, governmental and institutional uses, industrial uses, and areas of open land. Retail sales and service land uses, and off-street parking land uses related to retail sales and service centers, occur along this corridor from the East-West Freeway (IH 94) to W. Watertown Plank Road, from the Zoo Freeway (USH 45) to W. Auer Avenue—including the Mayfair Mall Shopping Center, and at the intersection of N. Mayfair Road and W. Capitol Drive (STH 190). Residential land uses occur along this corridor between W. Blue Mound Road and W. Wisconsin Avenue, at or near the intersection of N. Mayfair Road (STH 100) with W. North Avenue, and between W. Burleigh Street and W. Capitol Drive. Industrial land uses occur along N. Mayfair Road (STH 100) at or near the overpass of the Zoo Freeway, and near its intersection with W. Burleigh Street. Governmental and institutional land uses occur along this corridor between W. Wisconsin Avenue and W. Watertown Plank Road, particularly in the form of the Milwaukee County Institutions. Recreational land uses occur along this corridor between the East-West Freeway (IH 94) and W. Blue Mound Road at the Milwaukee County Zoo, between W. Watertown Plank Road and the Zoo Freeway at Underwood Creek Parkway, between W. Center Street and W. Burleigh Street at Blue Mound Golf & Country Club, and between W. Burleigh Street and W. Capitol Drive at Currie Park. Also, areas of open lands still exist within the corridor, particularly between W. Watertown Plank Road and W. North Avenue on the west side of the roadway.

Source: SEWRPC.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of N. Mayfair Road. For the entire length of the problem segment, N. Mayfair Road is divided by a median ranging in width from 22 to 30 feet. The curb-to-curb pavement widths of the dual roadways along this segment of N. Mayfair Road range from 32 to 39 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. Parking is currently prohibited along most of this segment of N. Mayfair Road, being permitted only during off-peak periods from W. Burleigh Street to W. Capitol Drive on the east side of the roadway.

As shown in Table 144, the problem segment of N. Mayfair Road has six signalized intersections. The N. Mayfair Road approaches to these intersections range from 32 to 38 feet in width. As indicated in Table 144, each of the northbound and each of the southbound approaches to these intersections provide separate lanes for the exclusive use of left-turning vehicles, and one of the northbound and two of the southbound approaches provide separate lanes for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches are also indicated in Table 144.

Traffic Control Measures: The timing plans for each of the six traffic signals along N. Mayfair Road between the East-West Freeway and W. Capitol Drive are set forth in Table 145. Map 140 shows the location and jurisdiction of each of these signals, and their relationship to the interconnected progressive signal subsystems which are located within approximately one-half mile of N. Mayfair Road and are directly affected by the timing plans of the traffic signals on N. Mayfair Road. Five of the six traffic signals on this segment of N. Mayfair Road are located at intersections of N. Mayfair Road with other arterial streets, and one signal is located at the intersection of N. Mayfair Road with a nonarterial street, W. Center Street.

Table 144

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)

Intersection	Roadway Approach Width (feet)							
	Northbound		Southbound		Eastbound		Westbound	
N. Mayfair Road and W. Blue Mound Road	38MLR	NP	38MLR	NP	38ML	P	38MLR	P
N. Mayfair Road and W. Watertown Plank Road	32ML	NP	34ML	NP	32ML	P	32ML	P
N. Mayfair Road and W. North Avenue	36ML	NP	36MLR	NP	36ML	NS	36ML	NP
N. Mayfair Road and W. Center Street	36ML	NP	36ML	NP	26L[a]	NP	23L[a]	NP
N. Mayfair Road and W. Burleigh Street	36ML	NPPM	36ML	NP	34ML	NS	32ML	FS
N. Mayfair Road and W. Capitol Drive	38ML	NS	36ML	FS	36ML	NP	38ML	NP

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a]*Exclusive turn lane included as part of roadway approach width and identified with pavement markings.*

Source: Wisconsin Department of Transportation and SEWRPC.

Stop signs are located at all other approaches to collector or local street crossings of this segment of N. Mayfair Road. However, a flashing beacon, which displays yellow on the N. Mayfair Road approaches, is located at the intersection of N. Mayfair Road with W. Potter Road. This segment of N. Mayfair Road is posted for a 40-mile-per-hour speed limit for its entire length.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the six signalized intersections along the problem segment of N. Mayfair Road in Figures 48 and 49. The locations along N. Mayfair Road from the East-West Freeway to W. Capitol Drive where traffic management actions are to be considered as a means of reducing con-

Table 145

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)

Phase	Intersection (time in seconds)			
	N. Mayfair Road		W. Blue Mound Road	
	Northbound	Southbound	Eastbound	Westbound
Green	40.0	25.0	25.0	25.0
Yellow	4.5	4.5	4.5	4.5
Red	46.5	61.5	61.5	61.5
Green Left-Turn Arrow	12.0[a]	--	12.0[b]	12.0[b]
Yellow Left-Turn Arrow	3.0	--	3.0	3.0
Green Right-Turn Arrow	--	--	12.0[c]	--
Yellow Right-Turn Arrow	--	--	3.0	--
Red Right-Turn Indication	--	--	46.5	--
Total Cycle	91.0	91.0	91.0	91.0

Phase	N. Mayfair Road	W. Watertown Plank Road
Green	40.0	35.0
Yellow	5.0	5.0
Red	42.0	47.0
Total Cycle	87.0	87.0

Phase	N. Mayfair Road				W. North Avenue	
	Morning		Evening		Morning	Evening
	Northbound	Southbound	Northbound	Southbound		
Green	25.2	25.2	24.3	24.3	24.3	25.2
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red	60.3	60.3	61.2	61.2	61.2	60.3
Green Left-Turn Arrow	9.0[b]	9.0[b]	11.7[b]	11.7[b]	11.7[b]	9.0[b]
Yellow Left-Turn Arrow	3.6	3.6	3.6	3.6	3.6	3.6
Red Left-Turn Indication	77.4	--	74.7	--	--	--
Green Right-Turn Arrow	--	41.4[d]	--	37.8[d]	--	--
Yellow Right-Turn Arrow	--	3.6	--	3.6	--	--
Red Right-Turn Indication	--	45.0	--	48.6	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

Table 145 (continued)

Phase	Intersection (time in seconds)		
	N. Mayfair Road	W. Center Street	
		Eastbound	Westbound
Green	44.1	18.9	18.9
Yellow	4.5	4.5	4.5
Red	41.4	66.6	66.6
Green Arrow	12.6[e]	--	16.2[f]
Yellow Arrow	3.6	--	--
Total Cycle	90.0	90.0	90.0

Phase	N. Mayfair Road	W. Burleigh Street
Green	30.6	23.4
Yellow	4.5	4.5
Red	54.9	62.1
Green Arrow	9.0[e]	9.9[b]
Yellow Arrow	3.6	2.7
Total Cycle	90.0	90.0

Phase	N. Mayfair Road		W. Capitol Drive (STH 190)	
	Northbound	Southbound	Eastbound	Westbound
Green	37.5	25.0	47.0	41.0
Yellow	4.5	4.5	4.5	4.5
Red	84.8	97.3	75.3	81.3
Green Arrow	15.0[a]	--	17.0[b]	22.0[b]
Yellow Arrow	3.0	--	3.0	3.0
Total Cycle	126.8	126.8	126.8	126.8

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Leading left-turn arrow.*

[c] *Right-turn arrow concurrent with through green phase and northbound left-turn arrow.*

[d] *Right-turn arrow concurrent with through green phase and extended as a lagging green arrow.*

[e] *Lagging left-turn arrow.*

[f] *Right-turn green arrow concurrent with leading left-turn arrow.*

Source: Wisconsin Department of Transportation and SEWRPC.

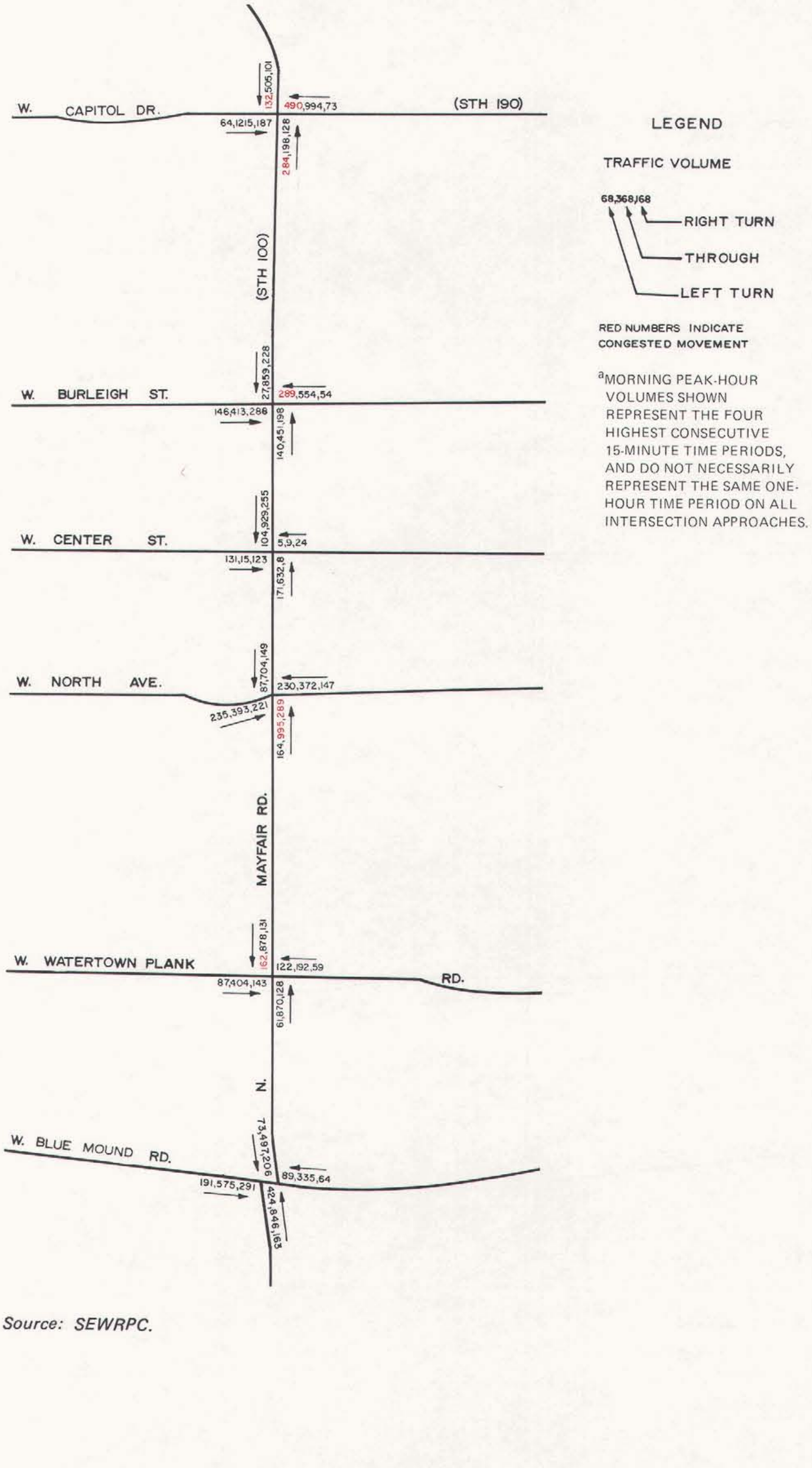
gestion and improving operating conditions were identified by comparing morning and evening peak-hour traffic volumes for each approach to the six controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to N. Mayfair Road, including the percentage of left- and right-turning vehicles and the percentage of trucks of buses in the peak-hour traffic stream, are summarized in Table 146.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of N. Mayfair Road, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 48 and 49. Six congested traffic movements were found to occur along this segment of N. Mayfair Road during the morning peak hour, and 18 were found to occur along this segment during the evening peak hour.

Alternative and Recommended Transportation Systems Management Actions: The six morning and 18 evening peak-hour traffic congestion problems identified along N. Mayfair Road are associated with the following five signalized intersections:

Figure 48

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100) DURING THE MORNING PEAK HOUR[a]

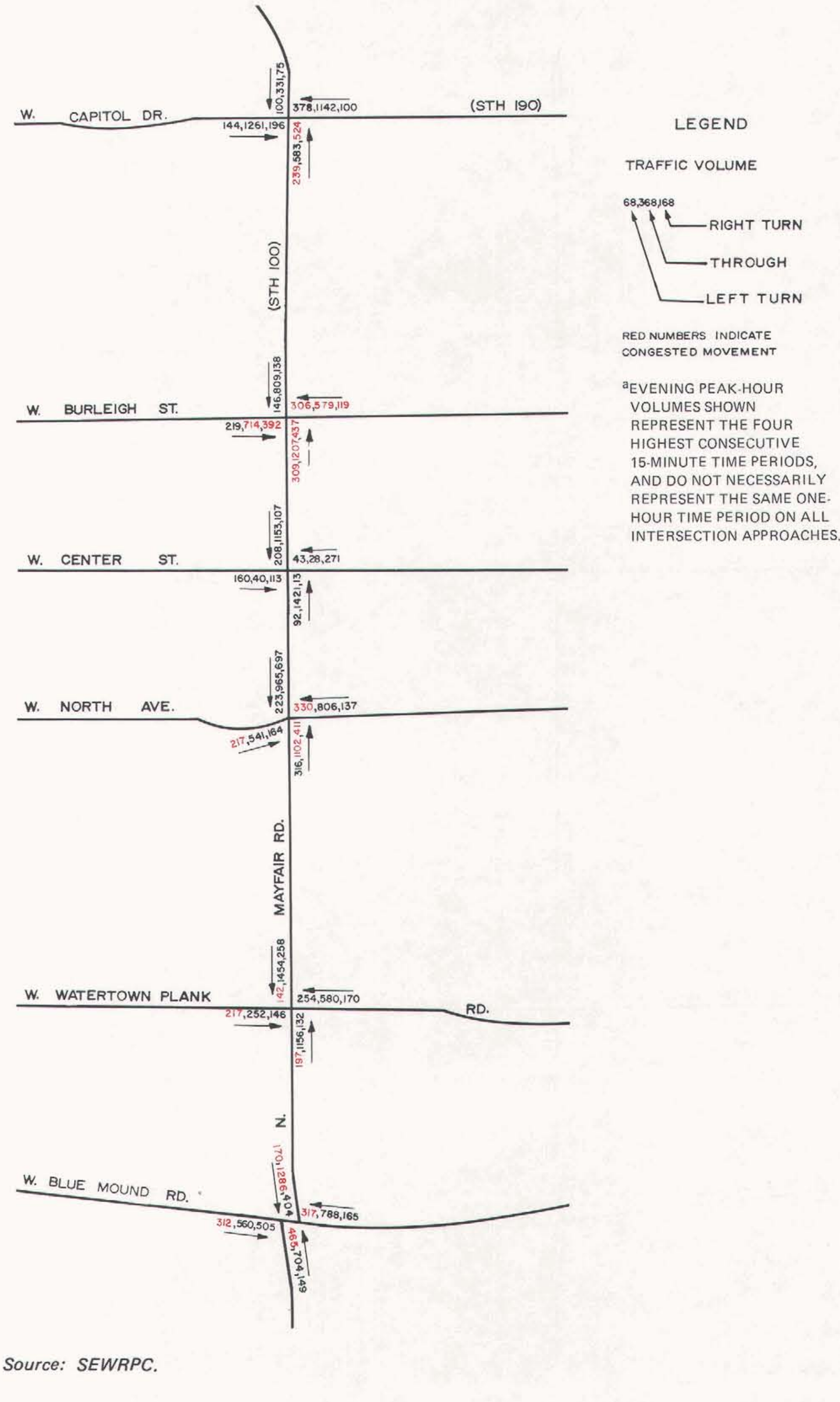


[a]MORNING PEAK-HOUR VOLUMES SHOWN REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: SEWRPC.

Figure 49

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100) DURING THE EVENING PEAK HOUR[a]



Source: SEWRPC.

Table 146

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)

Intersection	Approach Direction	Morning Peak Hour			Evening Peak Hour		
		Turns		Percent Trucks and Buses	Turns		Percent Trucks and Buses
		Percent Right	Percent Left		Percent Right	Percent Left	
N. Mayfair Road and W. Blue Mound Road	Eastbound	28	18	4	36	23	2
	Westbound	13	18	5	12	25	3
	Northbound	11	30	3	11	35	4
	Southbound	27	9	4	22	9	3
N. Mayfair Road and W. Watertown Plank Road	Eastbound	22	14	5	24	35	3
	Westbound	16	33	12	17	25	2
	Northbound	12	6	1	9	13	4
	Southbound	11	14	3	14	8	3
N. Mayfair Road and W. North Avenue	Eastbound	26	28	3	18	23	2
	Westbound	19	31	2	11	26	1
	Northbound	20	11	6	23	17	1
	Southbound	16	9	3	37	12	2
N. Mayfair Road and W. Center Street	Eastbound	46	49	4	36	51	2
	Westbound	63	13	16	79	13	2
	Northbound	1	21	4	1	6	1
	Southbound	20	8	3	8	14	2
N. Mayfair Road and W. Burleigh Street	Eastbound	34	17	4	29	17	2
	Westbound	6	32	2	12	30	2
	Northbound	25	18	4	22	16	2
	Southbound	21	2	2	13	13	3
N. Mayfair Road and W. Capitol Drive (STH 190)	Eastbound	13	4	4	12	9	2
	Westbound	5	31	3	6	23	3
	Northbound	21	47	6	39	18	3
	Southbound	14	18	4	15	20	8

Source: SEWRPC.

W. Blue Mound Road, W. Watertown Plank Road, W. North Avenue, N. Burleigh Street, and W. Capitol Drive (STH 190).

Table 147 provides a summary of the specific congestion problems found at each intersection, the alternative actions considered for the alleviation of these problems, the associated costs, and the recommended actions. Table 148 summarizes the changes in traffic signal timing recommended for the problem intersections along this segment of N. Mayfair Road. A total of 21 new actions are recommended to be implemented at the five problem intersections at a capital cost of approximately $186,800, expressed in 1980 dollars, not including right-of-way and relocation costs.[16] The potential need for new traffic controllers at the four intersections where new traffic signal phases are recommended could increase the capital cost of the improvements to $234,800. Right-of-way and relocation costs would be associated with improvements recommended at the intersections of N. May-

[16] *This cost of short-range improvement of N. Mayfair Road (STH 100) does not include the cost of the improvements recommended at the intersection of N. Mayfair Road and W. North Avenue. The improvements at this intersection, and the attendant cost, were considered in this chapter in the analysis of the problem segment of W. North Avenue from N. 124th Street to N. 76th Street. At the intersection of N. Mayfair Road and W. North Avenue, it was recommended that the existing signal timing plan be retimed, that one additional signal phase be added, that the existing west-to-southbound single left-turn lane be reconstructed to a double left-turn lane, and that an exclusive north-to-eastbound right-turn lane be constructed. All construction recommended at this intersection would be possible within the existing right-of-way with the exception of the construction of the exclusive north-to-eastbound right-turn lane, which would require additional right-of-way at an estimated cost of $80,000. The estimated total cost of improvement of this intersection is thus $153,000.*

Table 147

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. Mayfair Road and W. Blue Mound Road	Congested west-to-southbound left turn during the evening peak hour (317 vehicles per hour at level-of-service E); congested east-to-northbound left turn during the evening peak hour (312 vehicles per hour at level-of-service E); congested north-to-westbound left turn during the evening peak hour (465 vehicles per hour at level-of-service E); and congested southbound through and left-turn movements during the evening peak hour (1,286 and 170 vehicles per hour at levels-of-service D and E, respectively)	Recommended Actions Retime 91-second cycle to increase north-to-westbound leading left-turn green arrow from 12.0 to 15.3 seconds and east-to-northbound and west-to-southbound leading green left-turn arrow from 12.0 seconds to lagging 8.1-second green left-turn arrows, making necessary signal timing changes at other approaches	- -	
		Add separate signal phasing to control south-to-eastbound left-turn movement so that it operates concurrently with north-to-westbound left-turn phasing	$ 2,000[a]	
		Reconstruct exclusive east-to-north-bound and west-to-southbound left-turn lanes to double lanes	$60,000	$62,000[a]
		Alternative Action Retime existing 91.0-second cycle such that all problem movements can be accommodated at an acceptable level of service (Not recommended, as congested movements at this intersection are too extensive, and only significant increases in intersection capacity are seen as solutions)		
N. Mayfair Road and W. Watertown Plank Road	Congested south-to-eastbound left turn during the morning and evening peak hours (162 and 142 vehicles per hour, respectively, at level-of-service E; and congested north-to-westbound and east-to-northbound left turn movements during the evening peak hour (197 and 217 vehicles per hour, respectively, at level-of-service E)	Recommended Actions Add separate signal phasing to control left-turn movements on all approaches to intersection (9.9-second leading green left-turn arrows for west-to-southbound and east-to-northbound movements and 8.1-second lagging green left-turn arrows for north-to-westbound and south-to-eastbound left-turn movements	$12,000[a]	
		Reconstruct south-to-westbound right-turn lane to provide for an exclusive turn lane of 200 feet	$15,000	
		Prohibit on-street parking on near side of east-and-westbound approaches during the evening peak hour	400	$27,400[a]
		Alternative Action Retime existing signal cycle such that all problem movements can be accommodated at an adequate level of service (Not recommended, as congested movements at this intersection are too extensive, and only significant increases in intersection capacity are seen as solutions)		
N. Mayfair Road and W. North Avenue	Congested northbound through and right-turn movements during the morning and evening peak hours (1,284 and 1,513 vehicles per hour, respectively, at level-of-service E); congested westbound left turn during the evening peak hour (330 vehicles per hour at level-of-service E); and congested eastbound left turn during the evening peak hour (217 vehicles per hour at level-of-service E)	Recommended Action Refer to analysis of W. North Avenue from N. 124th Street to N. 76th Street	Cost not included	Cost not included

Table 147 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. Mayfair Road and W. Burleigh Street	Congested westbound left turn during the morning and evening peak hours (289 and 306 vehicles per hour, respectively, at level-of-service E); congested northbound left turn during the evening peak hour (309 vehicles per hour at level-of-service E); congested westbound through and right-turn movements during the evening peak hour (579 and 119 vehicles per hour, respectively, at level-of-service D); and congested eastbound and northbound through and right-turn movements during the evening peak hour (714 and 392 vehicles per hour and 1,207 and 437 vehicles per hour, respectively, at level-of-service E)	Recommended Actions Retime 90-second cycle to decrease the west-to-southbound and east-to-northbound leading left-turn green arrows from 9.9 to 7.2 seconds, and the north-to-westbound and south-to-eastbound lagging left-turn arrows from 9.0 to 7.2 seconds, increasing the east- and westbound green phase time from 23.4 to 27.9 seconds, making necessary signal changes at other approaches	- -	
		Add separate signal phasing to control north-to-eastbound right-turn movement so that it operates concurrently with the east- and westbound left-turn arrows	$ 2,000[a]	
		Reconstruct exclusive west-to-southbound and north-to-westbound left-turn lanes to double lanes	$30,000	
		Construct exclusive north-to-eastbound right-turn lane	$15,000 (Right-of-way cost associated with north-to-eastbound right-turn lane will add between $10,000 and $15,000 to these construction costs)	
		Install pavement markings to delineate north-to-eastbound and south-to-eastbound turn movements	$ 400	$57,400 to $62,400 (Including right-of-way cost associated with north-to-eastbound right-turn lane)
		Alternative Action Retime existing signal cycle such that all problem movements can be accommodated at an adequate level of service (Not recommended, as congested movements at this intersection are too extensive, and only significant increases in intersection capacity are seen as solutions)		
N. Mayfair Road and W. Capitol Drive	Congested west-to-southbound, north-to-westbound, and south-to-eastbound left-turn movements during the morning peak hour (490, 284, and 132 vehicles per hour, respectively, at level-of-service E); congested north-to-westbound left turn during the evening peak hour (239 vehicles per hour at level-of-service E); and congested north-to-eastbound right turn during the evening peak hour (524 vehicles per hour at level-of-service E)	Recommended Actions Retime 126.8-second cycle to increase 17.0-second east-to-northbound and 22.0-second west-to-southbound leading left-turn green arrows to 28.4 seconds during the morning peak hour and to 22.5 seconds during the evening peak hour, respectively, making necessary signal changes at other approaches	- -	
		Add an 11.2- and a 7.5-second south-to-westbound left-turn green arrow during the morning and evening peak hours, respectively, to operate concurrently with the north-to-westbound left-turn arrow, and a separate signal phase to control north-to-eastbound right-turn movement so that it operates concurrently with the east- and westbound left-turn arrows	$ 4,000[a]	
		Reconstruct exclusive north-to-westbound left-turn lane to double lane	$15,000	

Table 147 (continued)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
N. Mayfair Road and W. Capitol Drive (continued)		Construct exclusive north-to-eastbound double right-turn lane	$30,000 (Right-of-way and possible relocation associated with northbound right-turn lane will add between $50,000 and $200,000 to these construction costs, depending upon whether the entire existing retail gasoline station is purchased or whether a strip of right-of-way is purchased from this property)	$99,000 to $249,000[a] (Including right-of-way and possible relocation cost associated with northbound right-turn lane)
		Alternative Action Retime existing signal cycle such that all problem movements can be accommodated at an adequate level of service (Not recommended, as congested movements at this intersection are too extensive, and only significant increases in intersection capacity are seen as solutions)		
Total			$245,700 to $400,700[a]	

[a]*Because the addition of one or more new signal phases at the four intersections above may require a new traffic controller at each intersection, the capital cost of improvement of each of these intersections may be $12,000 more than that stated in this table—or the approximate cost of a new controller. Consequently, the total capital cost of implementing all new recommended improvements along N. Mayfair Road could be increased by $48,000.*

Source: SEWRPC.

fair Road with W. Burleigh Street and W. Capitol Drive (STH 190), and would represent an additional $60,000 to $215,000, as shown in Table 147.

As indicated in Table 147, in order to abate existing congestion during the evening peak hour at the intersection of N. Mayfair Road and W. Blue Mound Road, the retiming of the existing signal timing plan is recommended at minimal cost; the addition of one separate signal phase is recommended at an estimated capital cost of $2,000; and the reconstruction of the exclusive east-to-northbound and west-to-southbound single left-turn lanes to double left-turn lanes is recommended at an estimated capital cost of $60,000. The total capital cost of implementing all recommended improvements at this intersection is thus estimated at $62,000.

In order to abate existing congestion during the morning and evening peak hours at the intersection of N. Mayfair Road and W. Watertown Plank Road, it is recommended that four additional signal phases be added at an estimated capital cost of $12,000; that parking be prohibited on the near side of the east- and westbound approaches during the evening peak hour at an estimated capital cost of $400; and that the existing south-to-westbound right-turn lane be reconstructed to provide for an exclusive turn lane with 200 feet of storage capacity at an estimated capital cost of $15,000. The total capital cost of implementing all recommended improvements at this intersection is thus estimated at $27,400.

As shown in Table 147, to resolve the existing traffic congestion problems during the morning and evening peak hours at the intersection of N. Mayfair Road and W. Burleigh Street, it is recommended that the existing signal timing plan be retimed at minimal cost; that one additional signal phase be added at an estimated capital cost of $2,000; that pavement markings be installed to delineate the north-to-eastbound and south-to-

Table 148

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF N. MAYFAIR ROAD (STH 100)

Phase	Intersection (time in seconds)		
	N. Mayfair Road	W. Blue Mound Road	
		Eastbound	Westbound
Green.	27.9	23.4	23.4
Yellow	4.5	4.5	4.5
Red.	57.6	62.1	62.1
Green Left-Turn Arrow	15.3[a]	8.1[b]	8.1[b]
Yellow Left-Turn Arrow	2.7	2.7	2.7
Green Right-Turn Arrow	--	15.3[c]	--
Yellow Right-Turn Arrow	--	2.7	--
Red Right-Turn Indication	--	44.1	--
Total Cycle	90.0	90.0	90.0

	N. Mayfair Road	W. Watertown Plank Road
Green.	35.1	23.4
Yellow	4.5	4.5
Red.	50.4	62.1
Green Arrow.	8.1[a]	7.2[b]
Yellow Arrow	2.7	2.7
Total Cycle	90.0	90.0

	N. Mayfair Road		W. North Avenue			
	Morning	Evening	Morning		Evening	
			Eastbound	Westbound	Eastbound	Westbound
Green.	25.2	25.2	22.5	22.5	22.5	22.5
Yellow	4.5	4.5	4.5	4.5	4.5	4.5
Red.	60.3	60.3	63.0	63.0	63.0	63.0
Green Left-Turn Arrow	8.1[a]	11.7[a]	14.4[a]	14.4[a]	10.8[a]	10.8[a]
Yellow Left-Turn Arrow	3.6	3.6	3.6	3.6	3.6	3.6
Red Left-Turn Indication	78.3	74.7	--	72.0	--	75.6
Green Right-Turn Arrow	44.1[d]	40.5[d]	--	--	--	--
Yellow Right-Turn Arrow	3.6	3.6	--	--	--	--
Red Right-Turn Indication	42.3	45.9	--	--	--	--
Total Cycle	90.0	90.0	90.0	90.0	90.0	90.0

	N. Mayfair Road	W. Center Street	
		Eastbound	Westbound
Green.	44.1	18.9	18.9
Yellow	4.5	4.5	4.5
Red.	41.4	66.6	66.6
Green Arrow.	12.6[b]	--	16.2[e]
Yellow Arrow	3.6	--	--
Total Cycle	90.0	90.0	90.0

Table 148 (continued)

Phase	N. Mayfair Road Northbound	N. Mayfair Road Southbound	W. Burleigh Street
	Intersection (time in seconds)		
Green	30.6	30.6	27.9
Yellow	4.5	4.5	4.5
Red	54.9	54.9	57.6
Green Left-Turn Arrow	7.2[b]	7.2[b]	7.2[a]
Yellow Left-Turn Arrow	3.6	3.6	2.7
Red Left-Turn Indication	79.2	--	79.2
Green Right-Turn Arrow	53.1[d]	--	--
Yellow Right-Turn Arrow	2.7	--	--
Red Right-Turn Indication	34.2	--	--
Total Cycle	90.0	90.0	90.0

	N. Mayfair Road				W. Capitol Drive (STH 190)			
	Morning		Evening		Morning		Evening	
	Northbound	Southbound	Northbound	Southbound	Eastbound	Westbound	Eastbound	Westbound
Green	22.5	22.5	26.8	26.8	42.5	42.5	50.2	50.2
Yellow	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Red	98.0	98.0	93.7	93.7	78.0	78.0	70.3	70.3
Green Left-Turn Arrow	11.2[a]	11.2[a]	7.5[a]	7.5[a]	28.8[a]	28.8[a]	22.5[a]	22.5[a]
Yellow Left-Turn Arrow	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Left-Turn Indication	110.8	--	114.5	--	--	93.2	--	99.5
Green Right-Turn Arrow	57.3[d]	--	55.3[d]	--	--	--	--	--
Yellow Right-Turn Arrow	3.0	--	3.0	--	--	--	--	--
Red Right-Turn Indication	64.7	--	66.7	--	--	--	--	--
Total Cycle	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0

[a] *Leading left-turn arrow.*

[b] *Lagging left-turn arrow.*

[c] *Right-turn arrow concurrent with through green phase and north- and southbound left-turn arrows.*

[d] *Right-turn arrow concurrent with through green phase and extended as a lagging green arrow.*

[e] *Right-turn arrow concurrent with leading left-turn arrows.*

Source: SEWRPC.

eastbound turn movements at an estimated capital cost of $400; that the existing single, exclusive west-to-southbound and north-to-westbound left-turn lanes be enlarged to double left-turn lanes at an estimated capital cost of $30,000; and that an exclusive north-to-eastbound right-turn lane be constructed at an estimated capital cost of $15,000. The total capital cost of implementing all recommended improvements at this intersection is thus estimated at $47,400. All turn-lane construction recommended for this intersection is possible within the existing right-of-way with the exception of the construction of the exclusive north-to-eastbound right-turn lane. A minimum of 10 feet of additional right-of-way would have to be acquired for the length of this turn lane from Blue Mound Golf & Country Club on the southeast corner of the intersection. The cost of obtaining this additional right-of-way is estimated at between $10,000 and $15,000. The total cost of implementing all recommended improvements at this intersection, including right-of-way costs, is thus estimated at between $57,400 and $62,400.

As also shown in Table 147, in order to abate existing congestion problems during the morning and evening peak hours at the intersection of N. Mayfair Road and W. Capitol Drive (STH 190), it is recommended that the existing traffic signal timing plan be retimed at minimal cost; the two additional signal phases be added at an estimated cost of $4,000; that an exclusive north-to-westbound single left-turn lane be reconstructed to a double left-turn lane at an estimated capital cost of $15,000; and that an exclusive north-to-eastbound double right-turn lane be constructed at an estimated capital cost of $30,000. The total capital cost of the recommended improvements at this intersection is thus estimated at $49,000. All turn-lane construction recommended for this intersection is possible within the existing right-of-way with the exception of the construction of the exclusive north-to-eastbound double right-turn lane. A minimum of 20 feet of additional right-of-way would have to be acquired for the length of this turn lane from a retail gasoline station now located on the southeast corner of the intersection. The cost of obtaining an additional 20-foot-wide strip of right-of-way from this service station is estimated at $50,000, while the cost of obtaining the station in its entirety is estimated at $200,000. The total cost of implementing all recommended improvements at this intersection, including the right-of-way costs, is thus estimated at between $99,000 and $249,000, depending on the extent of right-of-way required.

In addition, the existing offsets between the traffic signal timing plans of the three interconnected signalized intersections along this segment of N. Mayfair Road—the intersection of N. Mayfair Road with W. North Avenue, W. Center Street, and W. Burleigh Street—should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management actions and to assure efficient signal progression. Interconnection should also be extended to the intersections of N. Mayfair Road with W. Blue Mound Road and W. Watertown Plank Road in order to provide signal progression along most of this problem segment. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of N. Mayfair Road by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

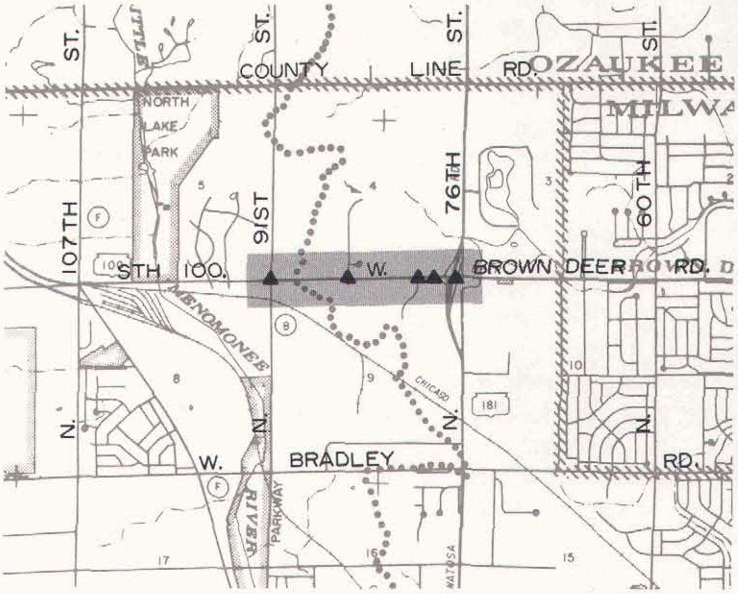
W. Brown Deer Road (STH 100) from N. 91st Street to N. 76th Street (STH 181)

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 142, W. Brown Deer Road (STH 100) from N. 91st Street to N. 76th Street (STH 181), a distance of about 1.0 mile. Map 143 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Brown Deer Road. Retail sales and service uses and related off-street parking uses comprise the majority of the existing urban development in this corridor, as well as the majority of urban development immediately adjacent to W. Brown Deer Road. Retail sales and service uses and related off-street parking uses abut W. Brown Deer Road between N. 91st Street and N. 85th Street on the south side of the roadway, and between N. 85th Street and N. 76th Street on the north side of the roadway at the Northridge Shopping Center. Residential land uses occur along this segment of W. Brown Deer Road at or near its intersection with N. 85th Street. Agricultural land uses occur in this corridor between N.91st Street and N. 85th Street on the north side of the roadway.

Physical Characteristics: There are no physical restrictions between intersections along the length of this segment of W. Brown Deer Road. For the entire length of the problem segment, W. Brown Deer Road is divided by a 30-foot-wide median. The curb-to-curb pavement widths of the dual

Map 142

DETAIL OF THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)— TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT

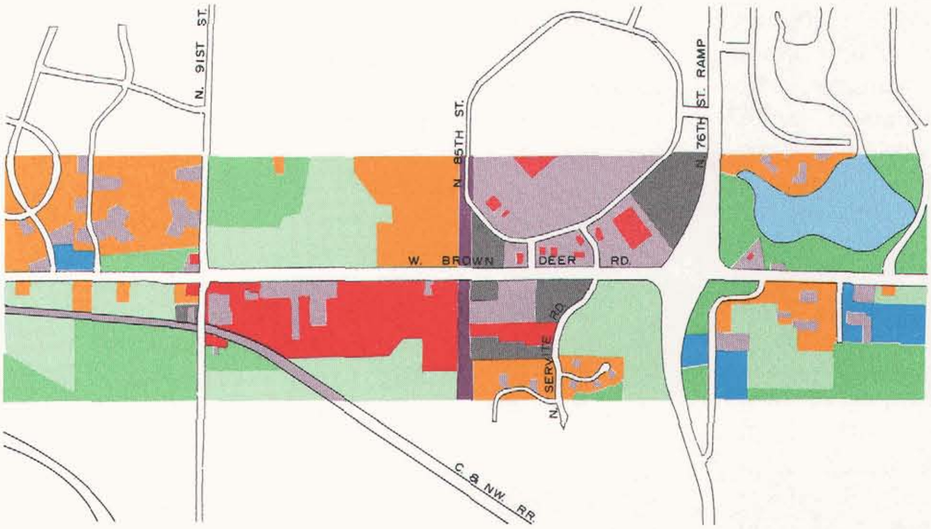


Shown on this map is another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Brown Deer Road (STH 100) from N. 91st Street to N. 76th Street (STH 181), a distance of about 1.0 mile. This map also shows the location and jurisdiction of each of the five traffic signals along this arterial segment, including the interconnection of each of these signals.

Source: Wisconsin Department of Transportation and SEWRPC.

Map 143

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Brown Deer Road (STH 100). Retail sales and service uses and off-street parking uses related to retail and service centers comprise the majority of the existing urban development in this corridor, as well as the majority of urban development immediately adjacent to W. Brown Deer Road. Retail sales and service uses and off-street parking uses related to retail sales and service centers abut W. Brown Deer Road in particular between N. 91st Street and N. 85th Street on the south side of the roadway, and between N. 85th Street and N. 76th Street (STH 181) on the north side of the roadway at the Northridge Shopping Center. Residential land uses occur along this segment of W. Brown Deer Road at or near its intersection with N. 85th Street. Agricultural land uses occur in this corridor between N. 91st Street and N. 85th Street on the north side of the roadway.

Source: SEWRPC.

roadways along this segment of W. Brown Deer Road range from 40 to 42 feet, adequate to provide three lanes for moving traffic in each direction with parking permitted. Parking is currently prohibited on both sides of the roadway along this entire segment of W. Brown Deer Road. As shown in Table 149, the problem segment of W. Brown Deer Road has five signalized intersections. Four of the eastbound and four of the westbound approaches to these intersections provide separate lanes for the exclusive use of left-turning vehicles, and one of the eastbound and one of the westbound approaches provide separate lanes for the exclusive use of right-turning vehicles. On-street parking restrictions at each of the signalized intersection approaches are also indicated in Table 149.

Traffic Control Measures: The timing plans for each of the five traffic signals along W. Brown Deer Road between N. 91st Street and N. 76th Street are set forth in Table 150. Map 142 shows the location, jurisdiction, and extent of interconnection of each of these signals. Three of the five traffic signals on this segment of W. Brown Deer Road are located at intersections of W. Brown Deer Road with other arterial streets, and two are located at intersections of W. Brown Deer Road with nonarterial streets—specifically, N. 85th Street and W. Servite Road. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Brown Deer Road. This entire segment of W. Brown Deer Road is posted for a 40-mile-per-hour speed limit.

Table 149

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
W. Brown Deer Road and N. 91st Street	40ML	NP	40ML	NP	38M	P	38M	P
W. Brown Deer Road and N. 85th Street	40ML	NP	40ML	NP	17	NS	24R	NP
W. Brown Deer Road and N. Servite Drive	40ML	NP	40ML	NP	24M	NP	38ML[c]R[c]	NP
W. Brown Deer Road and N. 76th Street (STH 181) Ramp (west)[a]	40MR	NP	40ML	NP	--	--	26L[c]R	NP
W. Brown Deer Road and N. 76th Street (STH 181) Ramp (east)[b]	40ML	NS	40MR	NP	26L[c]R	NP	--	--

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a] *One-way street southbound.*

[b] *One-way street northbound.*

[c] *Exclusive turn lane included as part of roadway width.*

Source: SEWRPC.

Table 150

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)

Phase	Intersection (time in seconds)	
	W. Brown Deer Road	N. 91st Street
Green.	37.8	21.0
Yellow	4.2	4.2
Red.	28.0	44.8
Total Cycle	70.0	70.0

Phase	W. Brown Deer Road			N. 85th Street	
	Morning[a]	Evening		Morning[a]	Evening
		Westbound	Eastbound		
Green.	--	30.8	43.4	--	15.4
Yellow	--	4.2	4.2	--	4.2
Red.	--	35.0	22.4	--	50.4
Green Arrow. . . .	--	--	9.1[b]	--	--
Yellow Arrow . . .	--	--	3.5	--	--
Total Cycle	--	70.0	70.0	--	70.0

Phase	W. Brown Deer Road	W. Servite Road			
		Morning		Evening	
		Northbound	Southbound	Northbound	Southbound
Green.	29.4	15.4	8.4	8.4	15.4
Yellow	4.2	4.2	4.2	4.2	4.2
Red.	36.4	50.4	57.4	57.4	50.4
Green Arrow. . . .	--	15.4[c]	8.4[c]	8.4[c]	15.4[c]
Yellow Arrow . . .	--	--	--	--	--
Total Cycle	70.0	70.0[d]	70.0	70.0[d]	70.0

Phase	W. Brown Deer Road		N. 76th Street Ramp (STH 181) (west)
	Westbound	Eastbound	Southbound
Green.	46.9	32.9	11.9
Yellow	4.2	4.2	4.2
Red.	18.9	32.9	53.9
Green Arrow. . . .	10.5[b]	--	--
Yellow Arrow . . .	3.5	--	--
Total Cycle	70.0	70.0	70.0[d]

Phase	W. Brown Deer Road		N. 76th Street Ramp (STH 181) (east)
	Westbound	Eastbound	Northbound
Green.	29.4	42.0	16.8
Yellow	4.2	4.2	4.2
Red.	36.4	23.8	49.0
Green Arrow. . . .	--	7.0[e]	--
Yellow Arrow . . .	--	--	--
Total Cycle	70.0	70.0	70.0

[a] *Signal operates during morning peak hour as flashing beacon, with red indication controlling N. 85th Street and green indication controlling W. Brown Deer Road.*

[b] *Leading left-turn arrow concurrent with through green phase.*

[c] *Left-turn arrow concurrent with through green phase.*

[d] *Traffic-actuated signal normally set for red.*

[e] *Lagging left-turn arrow concurrent with through green phase.*

Source: Wisconsin Department of Transportation and SEWRPC.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the five signalized intersections along the problem segment of W. Brown Deer Road in Figures 50 and 51. The locations along W. Brown Deer Road from N. 91st Street to N. 76th Street where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening peak-hour traffic volumes for each approach to the five controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Brown Deer Road, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 151.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Brown Deer Road, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at a level-of-service D or E—were identified and are shown in Figures 50 and 51. While no congested traffic movements were found to occur along this segment of W. Brown Deer Road during the morning peak hour, one congested movement was found to occur during the evening peak hour.

This problem segment of W. Brown Deer Road was included in this study of the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment in addition to the identified congestion problem.

Alternative and Recommended Transportation Systems Management Actions: The one evening peak-hour traffic congestion problem identified along W. Brown Deer Road is associated with the intersection of W. Brown Deer Road and N. 91st Street. Table 152 provides a summary of the congestion problem found at this intersection, the alternative actions considered for the alleviation of this problem, the associated costs, and the recommended action. Table 153 summarizes the changes in traffic signal timing recommended for the problem intersection along this segment of W. Brown Deer Road. The one action recommended to be implemented along this problem segment would entail a capital cost of approximately $2,000 in 1980 dollars. The potential need for a new traffic controller at the one intersection where new traffic signal phases are recommended could increase the capital cost of the improvements to $14,000.

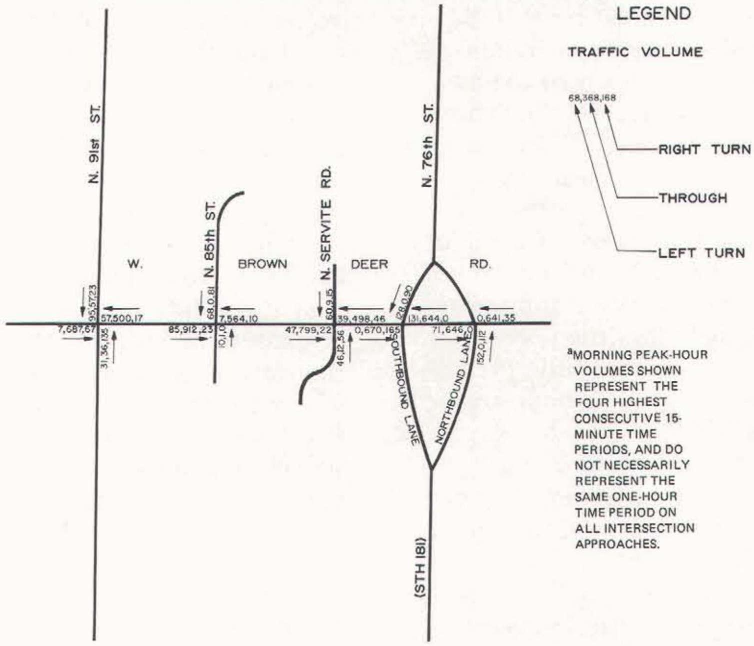
As indicated in Table 152, to abate the congested west-to-southbound left-turn movement during the evening peak hour at the intersection of W. Brown Deer Road and N. 91st Street, it is recommended that one signal phase be added to the signal timing plan at this intersection at an estimated capital cost of $2,000. In addition, the existing offsets between the traffic signal timing plans of the five signalized intersections along this segment of W. Brown Deer Road should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic management action and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delays at the signalized intersections along this segment of W. Brown Deer Road by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

W. Good Hope Road from N. 76th Street (STH 181) to N. Teutonia Avenue

Another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range traffic management improvements is, as shown on Map 144, W. Good Hope Road from N. 76th Street (STH 181), to N. Teutonia Avenue, a distance of 2.4 miles. Map 145 shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Good Hope Road. Land use within the corridor and immediately adjacent to W. Good Hope Road is comprised of a combination of residential, retail sales and service, industrial, park and recreational, and agricultural uses, and areas of open unused lands. Residential uses occur along this corridor between N. 51st Street and N. 43rd Street on the south side of the roadway and between N. 43rd Street and N. Teutonia Avenue on both sides of the roadway. Retail sales and service uses occur along W. Good Hope Road at its intersection with N. 76th Street, between N. 60th Street and N. 51st Street, at N. 43rd Street, and at N. Teutonia Avenue. Industrial uses occur along this corridor between N. 60th Street and N. 51st

Figure 50

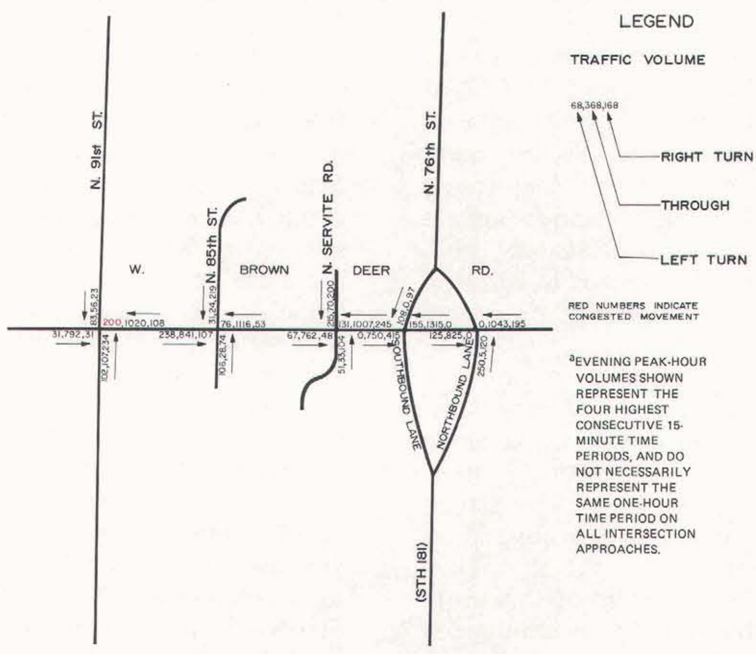
EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100) DURING THE MORNING PEAK HOUR[a]



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 51

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100) DURING THE EVENING PEAK HOUR[a]



Source: Wisconsin Department of Transportation and SEWRPC.

Table 151

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Brown Deer Road and N. 91st Street	Eastbound	9	1	7	3	4	3
	Westbound	3	10	7	8	15	3
	Northbound	67	15	5	53	23	1
	Southbound	13	54	3	14	51	4
W. Brown Deer Road and N. 85th Street	Eastbound	2	8	6	9	20	3
	Westbound	2	1	6	4	6	4
	Northbound	- -	91	- -	36	51	1
	Southbound	54	46	7	80	11	1
W. Brown Deer Road and N. Servite Road	Eastbound	3	5	8	5	8	5
	Westbound	8	7	6	18	9	4
	Northbound	49	40	2	55	27	1
	Southbound	18	71	7	42	44	1
W. Brown Deer Road and N. 76th Street Ramp (STH 181) (west)	Eastbound	20	- -	7	36	- -	2
	Westbound	- -	17	2	- -	11	3
	Southbound	41	59	5	47	53	2
W. Brown Deer Road and N. 76th Street Ramp (STH 181) (east)	Eastbound	- -	10	8	- -	13	3
	Westbound	5	- -	3	16	- -	2
	Northbound	42	58	5	32	67	5

Source: Wisconsin Department of Transportation and SEWRPC.

Street on the north side of the roadway. Recreational uses occur east of N. 76th Street on the south side of the roadway at Uihlein Polo Field, west of N. 60th Street on the north side of the roadway at Brynwood Country Club, and between N. 51st Street and N. 43rd Street on the north side of the roadway at Tripoli Country Club. Agricultural uses occur along this corridor between N. 76th Street and N. 60th Street. In addition, there are still some areas of unused open lands within the corridor, particularly between N. 60th Street and N. 51st Street on the south side of the roadway.

Physical Characteristics: There are no physical roadway restrictions between intersections along the length of this segment of W. Good Hope Road. For the entire length of the problem segment, W. Good Hope Road is divided by a median ranging in width from 26 to 40 feet. The curb-to-curb pavement widths of the dual roadways along this segment of W. Good Hope Road range from 40 to 42 feet, adequate to provide three lanes for moving traffic in each direction with parking prohibited. Parking is currently prohibited only between N. 76th Street and N. 60th Street on the south side of the roadway.

As shown in Table 154, the problem segment of W. Good Hope Road in the study area has four signalized intersections. The W. Good Hope Road approaches to these signalized intersections are all 40 feet in width. Each of the eastbound and westbound approaches to these intersections provides separate lanes for the exclusive use of left-turning vehicles, and three of the eastbound and one of the westbound approaches provide separate lanes for the exclusive use of right-turning vehicles, the right-turn lane on the westbound approach to the intersection of W. Good Hope Road and N. 76th Street being provided by regulatory pavement

Table 152

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost
W. Brown Deer Road and N. 91st Street	Congested west-to-southbound left turn during the evening peak hour (200 vehicles per hour at level-of-service E)	Recommended Action Add actuated 7.0-second west-to-southbound leading green left-turn arrow operating concurrently with westbound green phase, making necessary signal changes at other approaches Alternative Action Retime 7.0-second cycle so that all vehicles can negotiate this problem left-turn movement on through green phase during the evening peak hour (Not recommended because the controlling capacity factor for left-turn movements considered is the opposing through traffic volume during the evening peak hour)	$2,000[a]	$2,000[a]
Total			$2,000[a]	

[a]*Because the addition of the new signal phases at this intersection may require a new traffic controller, the capital cost of improvement of this intersection may be $12,000 more than that stated in this table—or the approximate cost of a new controller. Consequently, the total capital cost of implementing all recommended improvements along W. Brown Deer Road could be increased by $12,000.*

Source: SEWRPC.

marking rather than channelization. On-street parking restrictions at each of the signalized intersection approaches are also indicated in Table 154.

Traffic Control Measures: The timing plans for each of the four traffic signals along W. Good Hope Road between N. 76th Street and N. Teutonia Avenue are set forth in Table 155. Map 144 shows the location and jurisdiction and extent of interconnection of each of these signals. All four of the traffic signals on this segment of W. Good Hope Road are located at intersections of W. Good Hope Road with other arterial streets. Stop signs are located at all other approaches to collector or local street crossings of this segment of W. Good Hope Road. This segment of W. Good Hope Road is posted for a 40-mile-per-hour speed limit for its entire length.

Existing Traffic Conditions and Problems: Current morning and evening peak-hour traffic volumes are shown for all approaches to the four signalized intersections along the problem segment of W. Good Hope Road in Figures 52 and 53. The locations along W. Good Hope Road from N. 76th Street to N. Teutonia Avenue where traffic management actions are to be considered as a means of reducing congestion and improving operating conditions were identified by comparing morning and evening peak-hour traffic volumes for each

Table 153

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. BROWN DEER ROAD (STH 100)

Intersection (time in seconds)

Phase	W. Brown Deer Road			N. 91st Street
	Morning	Evening		
		Westbound	Eastbound	
Green.	39.2	39.2	28.7	19.6
Yellow	4.2	4.2	4.2	4.2
Red	26.6	26.6	37.1	46.2
Green Arrow. . . .	--	7.0[a]	--	--
Yellow Arrow . . .	--	3.5	--	--
Total Cycle	70.0	70.0	70.0	70.0

Phase	W. Brown Deer Road			N. 85th Street	
	Morning[b]	Evening		Morning[b]	Evening
		Westbound	Eastbound		
Green.	--	30.8	43.4	--	15.4
Yellow	--	4.2	4.2	--	4.2
Red	--	35.0	22.4	--	50.4
Green Arrow. . . .	--	--	9.1[a]	--	--
Yellow Arrow . . .	--	--	3.5	--	--
Total Cycle	--	70.0	70.0	--	70.0

Phase	W. Brown Deer Road	W. Servite Road			
		Morning		Evening	
		Northbound	Southbound	Northbound	Southbound
Green.	29.4	15.4	8.4	8.4	15.4
Yellow	4.2	4.2	4.2	4.2	4.2
Red	36.4	50.4	57.4	57.4	50.4
Green Arrow. . . .	--	15.4[c]	8.4[c]	8.4[c]	15.4[c]
Yellow Arrow . . .	--	--	--	--	--
Total Cycle	70.0	70.0[d]	70.0	70.0[d]	70.0

Phase	W. Brown Deer Road		N. 76th Street Ramp (STH 181) (west)
	Westbound	Eastbound	Southbound
Green.	46.9	32.9	11.9
Yellow	4.2	4.2	4.2
Red	18.9	32.9	53.9
Green Arrow. . . .	10.5[a]	--	--
Yellow Arrow . . .	3.5	--	--
Total Cycle	70.0	70.0	70.0[d]

Phase	W. Brown Deer Road		N. 76th Street Ramp (STH 181) (east)
	Westbound	Eastbound	Northbound
Green.	29.4	42.0	16.8
Yellow	4.2	4.2	4.2
Red	36.4	23.8	49.0
Green Arrow. . . .	--	7.0[e]	--
Yellow Arrow . . .	--	--	--
Total Cycle	70.0	70.0	70.0

[a] *Leading left-turn arrow concurrent with through green phase.*

[b] *Signal operates during morning peak hour as flashing beacon, with red indication controlling N. 85th Street and yellow indication controlling W. Brown Deer Road.*

[c] *Left-turn arrow concurrent with through green phase.*

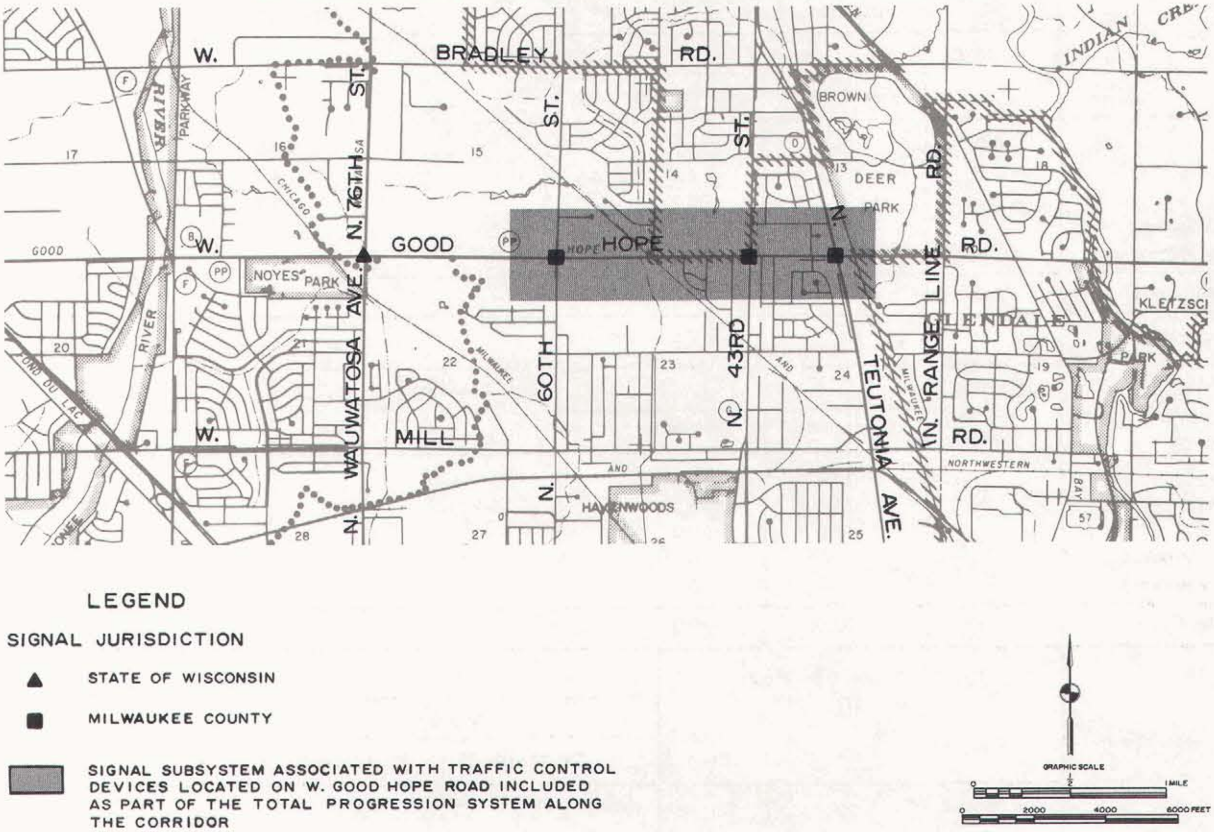
[d] *Traffic-actuated signal normally set for red.*

[e] *Lagging left-turn arrow concurrent with through green phase.*

Source: SEWRPC.

Map 144

DETAIL OF THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD—TRAFFIC SIGNAL JURISDICTION AND SUBSYSTEM ALIGNMENT



This map shows another of the 20 arterial street segments in the northwest side study area determined to have sufficiently severe existing traffic problems to warrant investigation of short-range improvements—W. Good Hope Road from N. 76th Street (STH 181) to N. Teutonia Avenue, a distance of 2.4 miles. This map also shows the location and jurisdiction of each of the four traffic signals along this arterial segment, including the interconnection of each of these signals.

Source: Wisconsin Department of Transportation, Milwaukee County, and SEWRPC.

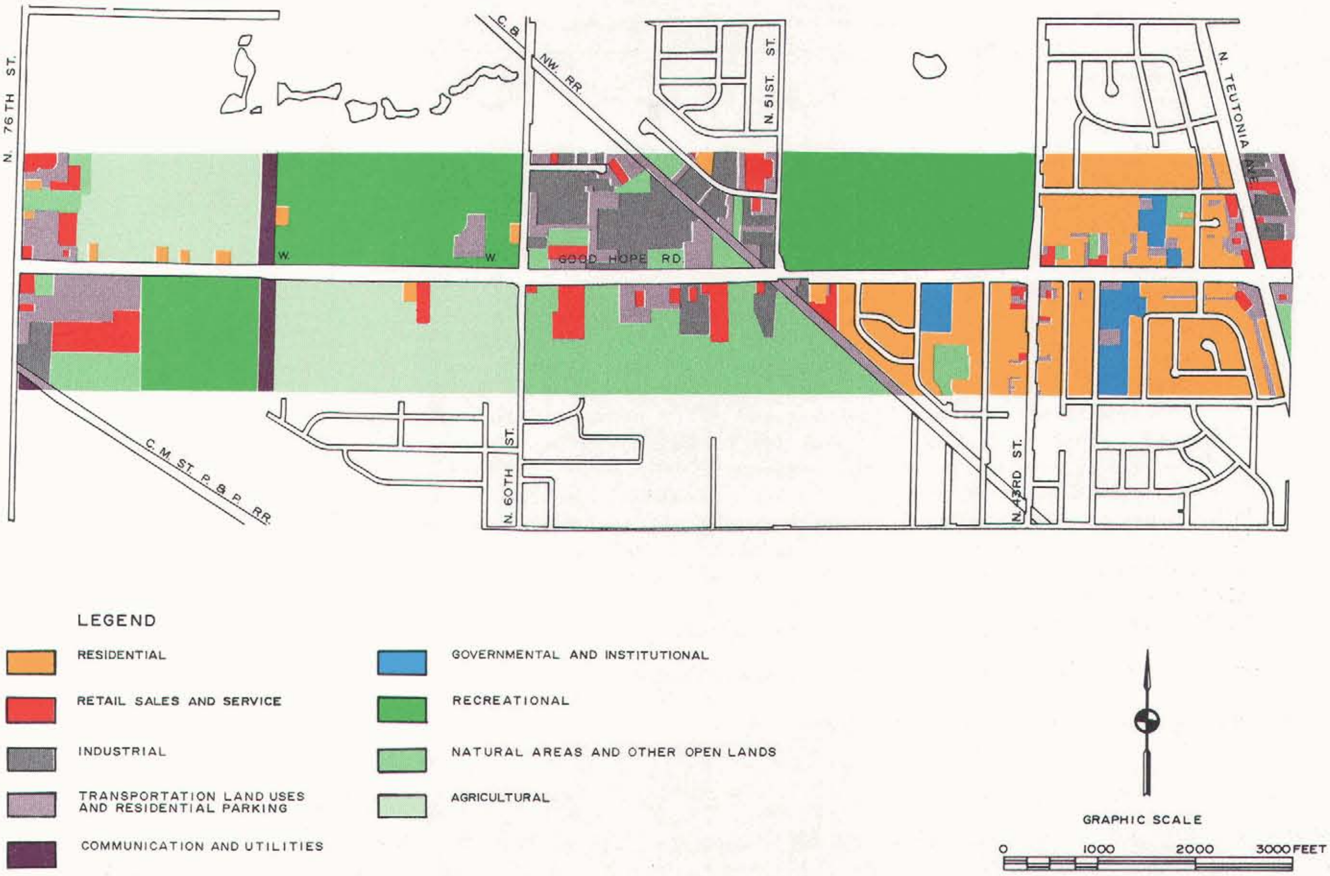
approach to the four controlled intersections to the maximum hourly capacity of each approach. The major operating characteristics affecting the maximum hourly roadway capacity of intersection approaches to W. Good Hope Road, including the percentage of left- and right-turning vehicles and the percentage of trucks or buses in the peak-hour traffic stream, are summarized in Table 156.

Based upon the ratios of existing morning and evening peak-hour traffic volumes and the maximum traffic-carrying capacities of each intersection approach along this segment of W. Good Hope Road, those vehicular traffic movements currently experiencing traffic congestion—that is, operating at level-of-service D or E—were identified and are shown in Figures 52 and 53. Four congested traffic movements were found to occur along this segment of W. Good Hope Road during the morning peak hour, and nine were found to occur during the evening peak hour.

This segment of W. Good Hope Road was included in this study at the request of the City of Milwaukee, as it was identified as having high accident rates and frequencies. In this regard, additional studies of accident rates and frequencies will be necessary to further identify and formulate recommendations to relieve the traffic safety problems which may exist on this segment in addition to the identified congestion problems.

Map 145

LAND USE ADJACENT TO THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD



This map shows the existing land use pattern within a one-half-mile-wide corridor along this problem segment of W. Good Hope Road. Land use within the corridor and immediately adjacent to W. Good Hope Road is comprised of a combination of residential, retail sales and service, industrial, park and recreational, and agricultural uses, and areas of open unused lands. Residential uses occur along this corridor between N. 51st Street and N. 43rd Street on the south side of the roadway, and between N. 43rd Street and N. Teutonia Avenue on both sides of the roadway. Retail sales and service uses occur along W. Good Hope Road at its intersection with N. 76th Street (STH 181), between N. 60th Street and N. 51st Street, at N. 43rd Street, and at N. Teutonia Avenue. Industrial uses occur along this corridor between N. 60th Street and N. 51st Street on the north side of the roadway. Recreational uses occur along this segment of W. Good Hope Road east of N. 76th Street on the south side of the roadway at Uihlein Polo Field, west of N. 60th Street on the north side of the roadway at Brynwood Country Club, and between N. 51st Street and N. 43rd Street on the north side of the roadway at Tripoli Country Club. Agricultural uses occur along this corridor between N. 76th Street and N. 60th Street. Also, areas of unused open lands still exist within the corridor, particularly between N. 60th Street and N. 81st Street on the south side of the roadway.

Source: SEWRPC.

Alternative and Recommended Transportation Systems Management Actions: The four morning and nine evening peak-hour traffic congestion problems identified along W. Good Hope Road are associated with the intersections of W. Good Hope Road with N. 76th Street (STH 181) and N. Teutonia Avenue. Table 157 provides a summary of the congestion problems at each of these intersections, the alternative actions considered for their abatement, the recommended actions, and the associated costs. Table 158 summarizes the changes in traffic signal timing recommended for the problem intersections

Table 154

ROADWAY APPROACH WIDTHS, THE PROVISION OF EXCLUSIVE TURNING LANES, AND ON-STREET PARKING RESTRICTIONS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD

Intersection	Roadway Approach Width (feet)							
	Eastbound		Westbound		Northbound		Southbound	
W. Good Hope Road and N. 76th Street (STH 181) . .	40ML	NS	40MLR[a]	NS	36ML	P	36ML	P
W. Good Hope Road and N. 60th Street	40MLR	P	40ML	P	26ML	NS	26ML	FS
W. Good Hope Road and N. 43rd Street	40MLR	P	40ML	P	36ML	P	36MLR	P
W. Good Hope Road and N. Teutonia Avenue.	40MLR	NP	40ML	NS	36ML	NP	36ML	P

NOTE: M = median provided
L = exclusive left-turn lane
R = exclusive right-turn lane (does not include minor right-turn channelizations)
P = parking permitted on near- and far-side approaches during morning and evening peak hours
NP = parking prohibited on near- and far-side approaches during morning and evening peak hours
NPAM = parking prohibited on near- and far-side approaches during morning peak hour
NPPM = parking prohibited on near- and far-side approaches during evening peak hour
FS = parking prohibited on far-side approach during morning and evening peak hours
FSAM = parking prohibited on far-side approach during morning peak hour
FSPM = parking prohibited on far-side approach during evening peak hour
NS = parking prohibited on near-side approach during morning and evening peak hours
NSAM = parking prohibited on near-side approach during morning peak hour
NSPM = parking prohibited on near-side approach during evening peak hour

[a]*Exclusive turn-lane width included as part of intersection approach width.*

Source: Wisconsin Department of Transportation and SEWRPC.

along this segment of W. Good Hope Road. A total of four new actions are recommended to be implemented at the two problem intersections, at a capital cost of $34,000 in 1980 dollars.[17] However, the need for a new traffic controller at the intersection where a new traffic signal phase is recommended may increase the cost of the improvement of this segment to $46,000.

As shown in Table 157, at the intersection of W. Good Hope Road with N. Teutonia Avenue the retiming of the existing signal timing plan is necessary to abate congestion, at minimal cost. Changing the existing 75-second total signal cycle length to a 65-second length is necessary at this intersection in order to provide signal progression along W. Good Hope Road from N. 60th Street

[17] *This cost of short-range improvement of W. Good Hope Road does not include the cost of the improvements recommended at the intersection of W. Good Hope Road at N. 76th Street. The improvements at this intersection, and the attendant cost, were considered in this chapter in the analysis of the problem segment of N. 76th Street from W. Harwood Avenue to W. Bradley Road. At the intersection of N. 76th Street and W. Good Hope Road, it was recommended that the existing signal timing plan be retimed and that the total signal cycle length be changed, that six additional signal phases be added as well as the addition of a separate red indication on three approaches, that parking be restricted on all approaches during the evening peak hour and on the southbound approach during the morning peak hour, and that exclusive right-turn lanes be constructed on the north- and southbound approaches, that the existing right-turn lane be reconstructed on the westbound approach, and that double left-turn lanes be constructed on the southbound, eastbound, and westbound approaches. All construction recommended at this intersection would be possible within the existing right-of-way with the exception of the construction of the exclusive southbound right-turn lane, which would require additional right-of-way at an estimated cost of between $35,000 and $150,000. The cost of improvement of this intersection was thus estimated at between $157,500 and $272,500, including right-of-way costs.*

Table 155

EXISTING TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD

Phase	Intersection (time in seconds)			
	W. Good Hope Road		N. 76th Street (STH 181)	
			Northbound	Southbound
Green	37.0		40.0	58.0
Yellow	4.5		4.5	4.5
Red	83.0		80.5	57.5
Green Arrow	16.0[a]		--	15.0[b]
Yellow Arrow	3.0		--	3.0
Total Cycle	125.0		125.0	125.0
	W. Good Hope Road		N. 60th Street	
Green	36.5		16.9	
Yellow	4.5		4.5	
Red	24.0		43.6	
Total Cycle	65.0		65.0	
	W. Good Hope Road		N. 43rd Street	
Green	28.6		25.4	
Yellow	3.9		4.5	
Red	32.5		35.1	
Total Cycle[c]	65.0		65.0	
	W. Good Hope Road		N. Teutonia Avenue	
	Morning	Evening	Morning	Evening
Green	24.1	29.2	16.9	21.8
Yellow	3.9	3.8	3.9	3.8
Red	37.0	42.0	44.2	49.4
Green Arrow	--	--	10.4[a]	10.5[a]
Yellow Arrow	--	--	3.2	3.0
Total Cycle[c]	65.0	75.0	65.0	75.0

[a] *Leading left-turn arrow.*

[b] *Leading left-turn arrow concurrent with through green phase.*

[c] *Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

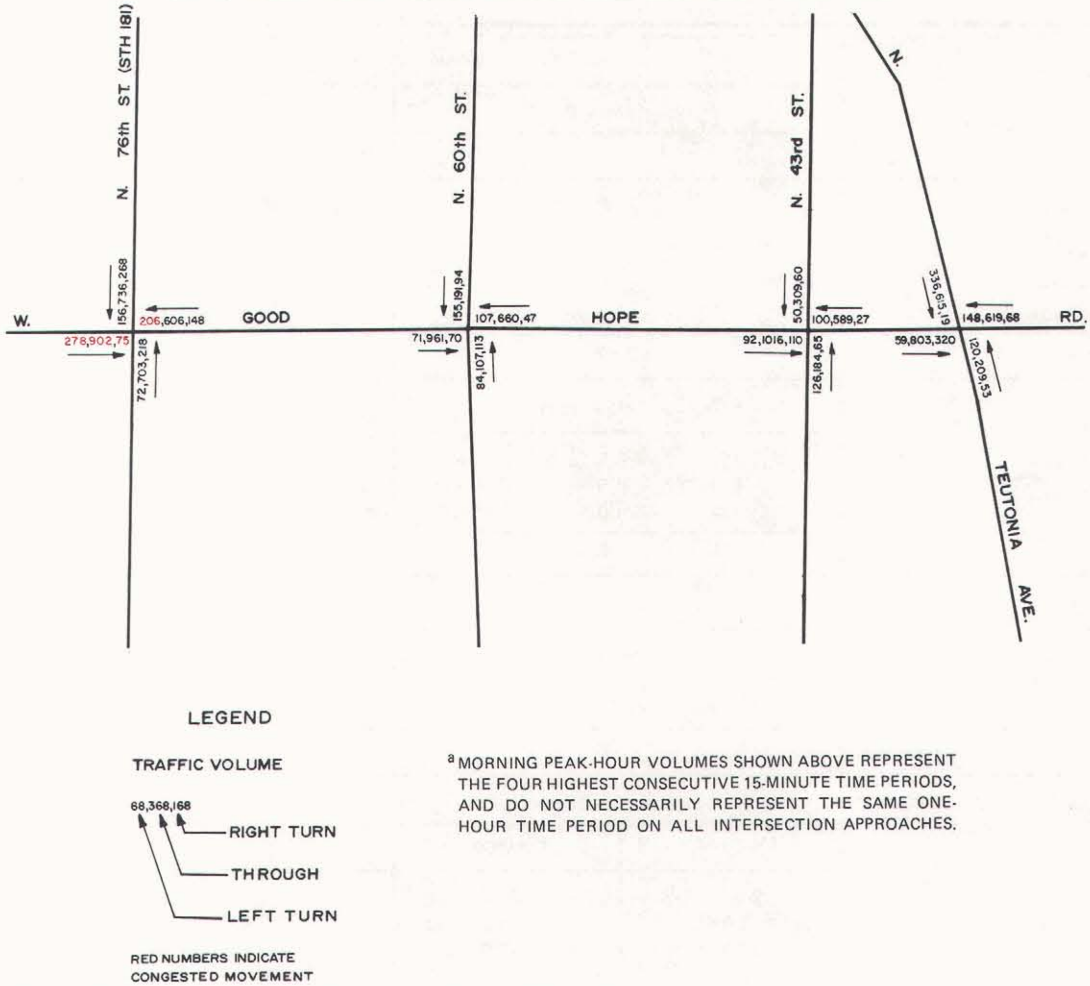
Source: Wisconsin Department of Transportation, Milwaukee County, and SEWRPC.

to N. Teutonia Avenue. Also, it is recommended that two signal phases be added to abate congestion at this intersection at an estimated capital cost of $4,000; that the existing north-to-westbound single left-turn lane be reconstructed to a double left-turn lane at a cost of $15,000; and that the storage length of the existing south-to-eastbound left-turn lane be increased from 130 to 300 feet, at an estimated capital cost of $15,000. The total cost of implementing all of the recommended improvements at this intersection is thus estimated at $34,000.

In addition, the existing offsets between the traffic signal timing plans of the four signalized intersections along this segment should be reviewed by the implementing agency and altered as necessary to accommodate the recommended traffic manage-

Figure 52

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD DURING THE MORNING PEAK HOUR[a]



Source: Wisconsin Department of Transportation and SEWRPC.

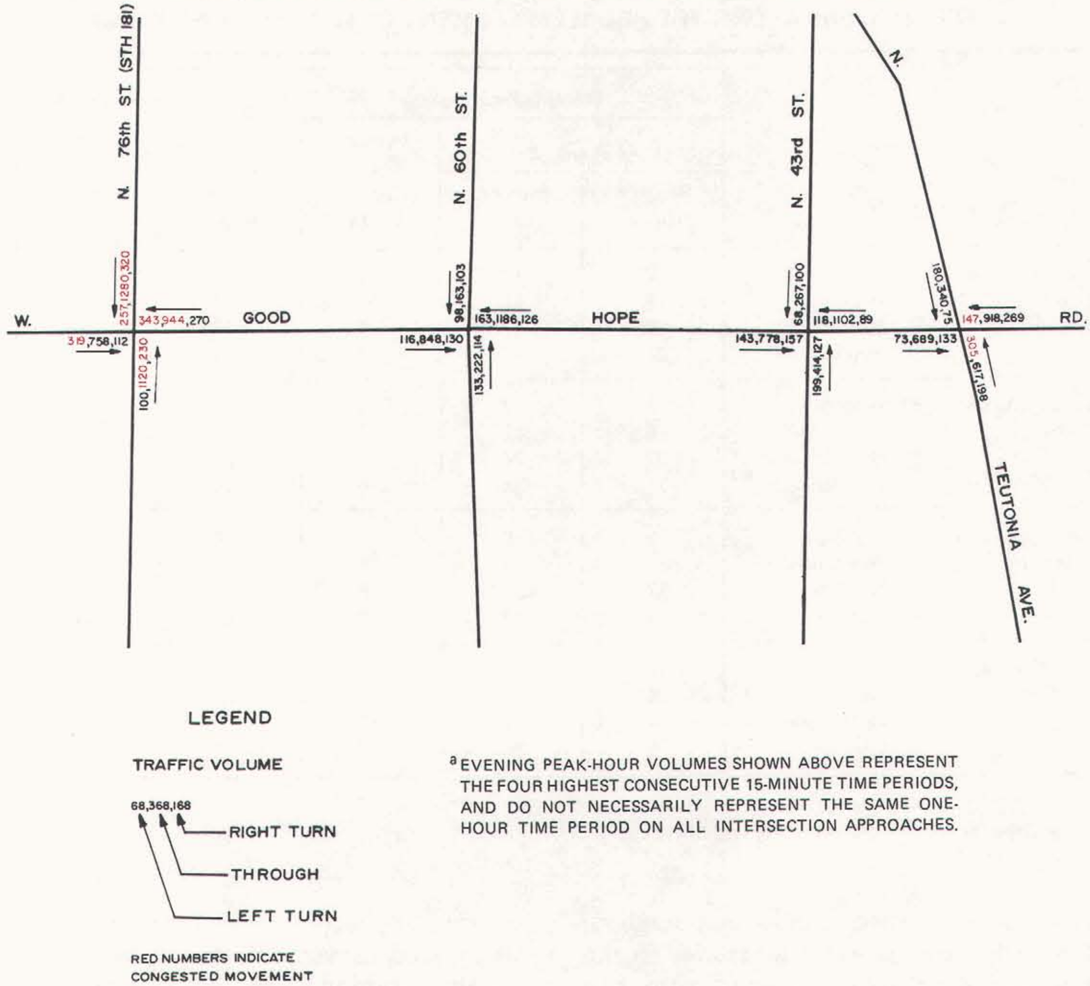
ment actions at the problem intersections and to assure efficient signal progression. Efficient progression is intended to yield increased average vehicle operating speeds and reduced vehicular delay at the signalized intersections along this segment of W. Good Hope Road by permitting traffic to travel along the arterial segment with a minimum number of stops at traffic signals.

Summary

This Milwaukee Northwest Side/Ozaukee County transportation improvement study has identified a total of 20 arterial street segments as having sufficiently severe traffic problems to warrant the development of a short-range plan for their improvement. Accordingly, a traffic engineering analysis was performed for each of the 210 intersections along these 20 problem segments at which the problem arterial facility was controlled by either a traffic signal or a stop sign. Alternative traffic management actions were developed and evaluated, and recommended actions were set forth for each of 63 of these 210 intersections determined to have traffic congestion problems. Alternative actions were also investigated, and recommended actions set forth, for another 21 intersections which, while not exhibiting traffic congestion problems, were determined to have inadequate turn-lane storage capacity and/or an inefficient signal timing plan. In the planning process, the least costly and least disruptive traffic management actions were considered first for each

Figure 53

EXISTING TRAFFIC VOLUMES ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD DURING THE EVENING PEAK HOUR[a]



[a] EVENING PEAK-HOUR VOLUMES SHOWN ABOVE REPRESENT THE FOUR HIGHEST CONSECUTIVE 15-MINUTE TIME PERIODS, AND DO NOT NECESSARILY REPRESENT THE SAME ONE-HOUR TIME PERIOD ON ALL INTERSECTION APPROACHES.

Source: Wisconsin Department of Transportation and SEWRPC.

congested intersection, and recommended where appropriate. Traffic management actions were considered in the following order: first, the revision of signal timing; second, the addition of a separate signal phase; third, the modification of the traffic signal cycle; fourth, the prohibition of on-street parking; and fifth, the construction of new or additional through or exclusive turn lanes. The installation of pavement markings and various other signal modifications were also considered in conjunction with other actions as appropriate and, in the case of nonsignalized intersections, the installation of new traffic signals was considered as well.

The traffic engineering analyses of each intersection were based on current traffic volume counts and traffic-carrying capacities. In the analyses, traffic congestion was considered to be present when the traffic volume-to-capacity ratio exceeded that attendant to a level-of-service C, or design capacity, as defined in the Highway Capacity Manual. Traffic management actions were recommended for congested intersections with the objective of reaching design capacity or level-of-service C. It must be recognized that, prior to implementation, these recommended actions will require final engineering and design studies by the implementing agencies,

Table 156

PERCENTAGE RIGHT AND LEFT TURNS AND PERCENTAGE TRUCKS AND BUSES IN THE TRAFFIC STREAM DURING THE MORNING AND EVENING PEAK HOURS AT SIGNALIZED INTERSECTIONS ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD

Intersection	Approach Direction	Morning Peak Hour: Turns: Percent Right	Morning Peak Hour: Turns: Percent Left	Morning Peak Hour: Percent Trucks and Buses	Evening Peak Hour: Turns: Percent Right	Evening Peak Hour: Turns: Percent Left	Evening Peak Hour: Percent Trucks and Buses
W. Good Hope Road and N. 76th Street (STH 181)	Eastbound	6	22	5	9	27	5
	Westbound	15	22	6	17	22	3
	Northbound	22	7	5	16	7	3
	Southbound	23	14	3	17	14	3
W. Good Hope Road and N. 60th Street	Eastbound	6	7	4	12	11	3
	Westbound	6	13	5	9	11	2
	Northbound	37	28	2	24	29	1
	Southbound	21	35	5	28	27	4
W. Good Hope Road and N. 43rd Street	Eastbound	9	8	4	15	13	3
	Westbound	4	14	6	7	9	2
	Northbound	17	34	3	17	27	1
	Southbound	14	12	2	23	16	2
W. Good Hope Road and N. Teutonia Avenue	Eastbound	27	5	4	15	8	4
	Westbound	8	18	3	20	11	2
	Northbound	14	31	15	18	27	1
	Southbound	2	35	3	13	30	3

Source: Wisconsin Department of Transportation and SEWRPC.

and that these more detailed studies may in some cases identify additional, better alternatives to the recommended actions or desirable modifications to the recommended actions.

Existing Problems Along the 20 Arterial Street Problem Segments: Of the 210 intersections analyzed in the conduct of this study, 63 were found to exhibit traffic congestion on one or more of their approaches during the morning or evening peak hours. As shown on Map 146, 30 intersections were found to exhibit traffic congestion on one or more of their approaches during the morning peak hour; and, as shown on Map 147, 57 intersections were shown to exhibit congestion on one or more of their approaches during the evening peak hour. Forty-two separate congested right-turn, left-turn, or through traffic movements were identified on these approaches during the morning peak hour, and 107 separate congested traffic movements were identified on these approaches during the evening peak hour. Six types of traffic management actions were investigated and, as warranted, recommended for abating the identified congested movements found on these approaches: 1) the retiming of the existing traffic signal timing plan so as to increase the green time and capacity of a problem intersection approach, and abate its congestion; 2) the addition of a separate signal phase, such as an exclusive turn arrow, to provide for increased traffic capacity on a problem intersection approach; 3) the modification of the traffic signal cycle, the increase or decrease of the total cycle length so as to increase the green time and capacity allotted to a problem intersection approach, or other signal modifications; 4) the prohibition of on-street parking within 250 feet of the near and far sides of an intersection approach to provide for increased traffic capacity; 5) the construction of new or additional through or exclusive turn lanes to increase the capacity of the congested intersection; and 6) the installation of new traffic signals at an intersection where traffic volumes warrant such an action. The installation of pavement markings was also considered, usually in conjunction with the creation of an exclusive turn

Table 157

SUMMARY OF ALTERNATIVE AND RECOMMENDED TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS TO ABATE THE TRAFFIC CONGESTION PROBLEMS ON THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD

Location	Problem	Alternative and Recommended Transportation Systems Management Actions	Capital Cost of Recommended Action	Total Capital Cost per Intersection
W. Good Hope Road and N. 76th Street	Congested west-to-southbound left-turn movement (206 vehicles per hour at level-of-service E); congested eastbound through and right-turn movements (902 and 75 vehicles per hour at level-of-service D); and congested east-to-northbound left-turn movement (278 vehicles per hour at level-of-service E) during the morning peak hour. Congested westbound through movement (944 vehicles per hour at level-of-service D); congested west-to-southbound left-turn movement (343 vehicles per hour at level-of-service E); congested east-to-northbound left-turn movement (319 vehicles per hour at level-of-service E); congested northbound through and right-turn movements (1,120 and 230 vehicles per hour at level-of-service E); congested southbound right-turn and through movements (320 and 1,280 vehicles per hour at level-of-service E); and congested south-to-eastbound left-turn movement (257 vehicles per hour at level-of-service E) during the evening peak hour Insufficient east-to-northbound left-turn-lane storage capacity during the morning and evening peak hours	Recommended Action Refer to analysis of N. 76th Street from W. Harwood Avenue to W. Bradley Road	Cost not included	Cost not included
W. Good Hope Road and N. Teutonia Avenue	Congested west-to-southbound left turn during the evening peak hour (147 vehicles per hour at level-of-service E); and congested north-to-westbound left turn during the evening peak hour (305 vehicles per hour at level-of-service E) Insufficient south-to-eastbound left-turn-lane storage capacity during the morning peak hour	Recommended Actions Change 75-second cycle to 65-second cycle during the evening peak hour, and reduce north- and southbound leading green left-turn arrows from 10.5 to 7.2 seconds, making necessary changes at other approaches	- -	
		Add a 7.2-second west-to-southbound lagging green left-turn arrow to traffic signal sequence to operate concurrently with westbound green phase, and a 7.2-second north-to-eastbound right-turn green arrow to traffic signal sequence to operate concurrently with west-to-southbound left-turn green arrow	\$ 4,000[a]	
		Reconstruct exclusive north-to-westbound left-turn lane to double lane	\$15,000	
		Increase storage length of south-to-eastbound left-turn lane from 130 to 300 feet	\$15,000	\$34,000[a]
Total			\$34,000[a]	

[a]*Because the addition of the new signal phases at this intersection may require a new traffic controller, the capital cost of improvement of this intersection may be \$12,000 more than that stated in this table—or the approximate cost of a new controller. Consequently, the total cost of implementing all new recommended improvements along W. Good Hope Road could be increased by \$12,000.*

Source: SEWRPC.

Table 158

RECOMMENDED TRAFFIC SIGNAL OPERATION ALONG THE PROBLEM SEGMENT OF W. GOOD HOPE ROAD

Phase	Intersection (time in seconds)							
	Morning	Evening	Morning	Evening	Morning		Evening	
	Westbound		Eastbound		Northbound	Southbound	Northbound	Southbound
Green	30.6	23.4	30.6	23.4	27.0	37.8	30.6	49.4
Yellow	3.6	4.5	3.6	4.5	3.6	3.6	4.5	4.5
Red	55.8	62.1	55.8	62.1	59.4	48.6	54.9	44.1
Green Right-Turn Arrow	43.2[a]	36.0[a]	--	--	39.6[a]	39.6[a]	46.8[a]	46.8[a]
Yellow Right-Turn Arrow	3.6	3.6	--	--	3.6	3.6	3.6	3.6
Green Left-Turn Arrow	7.2[b]	10.8[b]	7.2[b]	10.8[b]	--	7.2[b]	--	7.2[b]
Yellow Left-Turn Arrow	3.6	3.6	3.6	3.6	--	3.6	--	3.6
Red Left-Turn Indication	79.2	75.6	79.2	75.6	--	79.2	--	79.2
Total Cycle[c]	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Phase	W. Good Hope Road	N. 60th Street
Green	36.5	16.9
Yellow	4.5	4.5
Red	24.0	43.6
Total Cycle	65.0	65.0

Phase	W. Good Hope Road	N. 43rd Street
Green	28.6	25.4
Yellow	3.9	4.5
Red	32.5	35.1
Total Cycle[c]	65.0	65.0

Phase	W. Good Hope Road			N. Teutonia Avenue		
	Morning	Evening		Morning	Evening	
		Westbound	Eastbound		Northbound	Southbound
Green	24.1	29.6	18.2	16.9	16.9	16.9
Yellow	3.9	3.9	3.9	3.9	3.9	3.9
Red	37.0	31.5	42.9	44.2	44.2	44.2
Green Left-Turn Arrow	--	7.2[d]	--	10.4[e]	7.2[e]	7.2[e]
Yellow Left-Turn Arrow	--	3.9	--	3.2	3.2	3.2
Green Right-Turn Arrow	--	--	--	--	7.2[f]	--
Yellow Right-Turn Arrow	--	--	--	--	3.9	--
Red Right-Turn Indication	--	--	--	--	33.2	--
Total Cycle[c]	65.0	65.0	65.0	65.0	65.0	65.0

[a]*Right-turn arrow concurrent with through green phase and then lagging.*

[b]*Actuated leading left-turn arrow.*

[c]*Signal timing sequence on one or more approaches to this intersection is subject to change by pedestrian-actuated control.*

[d]*Lagging left-turn arrow concurrent with through green phase.*

[e]*Leading left-turn arrow.*

[f]*Right-turn arrow concurrent with westbound green left-turn arrow.*

Source: SEWRPC.

Map 146

INTERSECTIONS WITHIN THE STUDY AREA EXHIBITING TRAFFIC PROBLEMS DURING THE MORNING PEAK HOUR: 1980

LEGEND

INTERSECTIONS EXHIBITING CONGESTED TRAFFIC MOVEMENT

- WHICH COULD BE ABATED
- WHICH COULD NOT BE ABATED
- INTERSECTION AT WHICH CONGESTION PROBLEMS COULD BE ABATED, BUT TURN-LANE STORAGE PROBLEMS COULD NOT BE ABATED

INTERSECTION EXHIBITING INADEQUATE TURN-LANE STORAGE CAPACITY AND/OR INEFFICIENT TRAFFIC SIGNAL TIMING PLAN

- WHICH COULD BE ABATED
- WHICH COULD NOT BE ABATED

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

As shown on this map, during the morning peak hour in 1980, 30 intersections were found to exhibit traffic congestion on one or more of their approaches. All of these intersections were located in *the Milwaukee County portion of the study area. As also shown on* this map, during the morning peak hour, 18 intersections within the study area were found to exhibit problems relating to turn-lane storage inadequacies or inefficient signal timing plans. Of these intersections, 15 were located in the Milwaukee County portion of the study area. During the development of the short-range plan for the arterial street and highway system of the study area, it was found that problems on all but two of the 30 intersections exhibiting traffic congestion—the intersection of W. Appleton Avenue with N. 60th Street and the intersection of W. Lisbon Avenue with W. North Avenue—and that problems on all but one of the 18 intersections exhibiting noncongestion-related problems—the intersection of W. Harwood Avenue with N. 76th Street—could be abated through relatively low-cost transportation systems management measures. It was also determined that a turn-lane storage problem at one congested intersection—the intersection of N. 76th Street with W. Silver Spring Drive—could not be abated through such low-cost measures.

Source: SEWRPC.

Map 147

INTERSECTIONS WITHIN THE STUDY AREA EXHIBITING TRAFFIC PROBLEMS DURING THE EVENING PEAK HOUR: 1980

LEGEND

INTERSECTIONS EXHIBITING CONGESTED TRAFFIC MOVEMENT

- ● WHICH COULD BE ABATED
- ▲ WHICH COULD NOT BE ABATED
- INTERSECTION AT WHICH CONGESTION PROBLEMS COULD BE ABATED, BUT TURN-LANE STORAGE PROBLEMS COULD NOT BE ABATED

INTERSECTION EXHIBITING INADEQUATE TURN-LANE STORAGE CAPACITY AND/OR INEFFICIENT TRAFFIC SIGNAL TIMING PLAN

- ● WHICH COULD BE ABATED
- ▲ WHICH COULD NOT BE ABATED

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

As shown on this map, during the evening peak hour in 1980, 57 intersections were found to exhibit traffic congestion on one or more of their approaches. All but one of these intersections were located in the Milwaukee County portion of the study area. As also shown on this map, during the evening peak hour, 20 intersections within the study area were found to exhibit problems relating to turn-lane storage inadequacies or inefficient signal timing plans. Of these intersections, 17 were located in the Milwaukee County portion of the study area. During the development of the short-range plan for the arterial street and highway system of the study area, it was found that problems on all but two of the 57 intersections exhibiting traffic congestion—the intersection of W. Lisbon Avenue with W. North Avenue and the intersection of STH 60 (Washington Street) with STH 57 (Wisconsin Avenue)—and that problems on all but one of the 20 intersections exhibiting non-congestion-related problems—the intersection of W. Harwood Avenue with N. 76th Street—could be abated through relatively low-cost transportation systems management measures. It was also determined that turn-lane storage problems at two congested intersections—the intersection of N. 76th Street with W. Capitol Drive and the intersection of N. 76th Street with W. Silver Spring Drive—could not be abated through such low-cost measures.

Source: SEWRPC.

lane, and recommended where necessary. Also, in certain cases where the addition of a separate signal phase was recommended, new traffic controllers were also recommended for installation.

At certain of the 63 intersections shown to exhibit congestion, problems of inadequate turn-lane storage capacity were found to exist in addition to the congestion problems. Such additional turn-lane storage problems were found to exist at nine congested intersections during the morning peak hour and at 18 congested intersections during the evening peak hour. Two types of traffic management actions were recommended to alleviate these storage problems: 1) the prohibition of on-street parking within 250 feet of the intersection to create an exclusive turn lane or to provide for additional capacity in an existing exclusive turn lane, or 2) the addition of an exclusive turn lane, or the lengthening or widening of an existing exclusive turn lane, to provide for increased storage capacity in the turn lane.

In addition to the traffic management actions recommended to solve the problems at each congested intersection along the 20 problem arterial street segments, traffic management actions were recommended to solve problems at other intersections along the problem arterial segments which, while not exhibiting congestion problems, were shown to have either inadequate storage capacity in one or more of their exclusive turn lanes or an inefficient signal timing plan, both of which had the potential to affect efficient operation of the intersection. As shown on Maps 146 and 147, 21 intersections were found to exhibit such problems; 18 of these 20 intersections were found to exhibit such problems during the morning peak hour, and 20 intersections were found to exhibit such problems during the evening peak hour. Seven of the 21 intersections were found to have vehicle storage problems in an exclusive turn lane, and 14 were found to have inefficient signal timing plans. Two types of actions were considered to abate the storage-capacity problems at these intersections: 1) the prohibition of on-street parking within 250 feet of the intersection to create an exclusive turn lane or to provide for additional capacity in an existing exclusive turn lane, and 2) the addition of an exclusive turn lane or the lengthening or widening of an existing exclusive turn lane to provide for increased storage capacity. At each of the 14 intersections displaying an inefficient timing plan, one type of traffic management action, the retiming of the existing signal timing plan, was recommended to alleviate this problem.

Recommended Traffic Management Actions: A total of 209 traffic management actions, at a total estimated capital cost of between $1,637,000 and $1,972,000 in 1980 dollars, are recommended for the 84 intersections determined to have traffic problems along the 20 problem arterial street segments. The capital cost is expressed as a range because, for certain of the recommended actions, additional right-of-way would have to be acquired, and the precise right-of-way needs and costs cannot be determined without more detailed engineering studies. Right-of-way costs attendant to the recommended traffic management actions are estimated to range between $190,000 and $410,000 depending upon the extent of additional land required at six intersections where such additional rights-of-way have been determined necessary.

A total of 192 of the 209 traffic management actions, having an estimated capital cost of between $1,485,000 and $1,820,000 in 1980 dollars, are recommended to abate the traffic congestion problems identified at 63 of the 210 intersections studied. As already noted, of this total cost, between $190,000 and $410,000 would be required for additional right-of-way, the only new right-of-way recommended to be acquired under the short-range plan. To abate traffic congestion and related turn-lane storage problems at these 63 congested intersections, it is recommended that the traffic signal timing plans be retimed at 38 intersections; that 55 new signal phases be added; that the total traffic signal cycle be modified at five intersections; that on-street parking be prohibited on nine intersection approaches during the morning peak hour and on 23 approaches during the evening peak hour; that pavement markings be installed at five intersections; that new traffic signals be installed at one intersection; and that new signal heads be installed at one intersection. New roadway construction recommended at these 63 congested intersections includes the lengthening of three single right-turn lanes and 10 single left-turn lanes, the addition of five single right-turn lanes and two single left-turn lanes, the lengthening of one double left-turn lane, the addition of four double left-turn lanes and one double right-turn lane, and the expansion of 13 single left-turn lanes to double left-turn lanes. Besides the implementation of these recommended traffic management actions, it is recommended that 22 to 29 traffic signal controllers be installed at these intersections in order to accommodate the recommended changes in signal phasing.

The analyses indicated that implementation of the 192 recommended traffic management actions would abate existing traffic congestion at all but two of the 30 intersections in the study area that are congested during the morning peak hour and all but two of the 57 intersections that are congested during the evening peak hour. As indicated on Maps 146 and 147, the only congestion problems that could not be abated during both the morning and evening peak hours, are those at the intersection of W. Lisbon Avenue with W. North Avenue. The traffic movements which would remain congested at this intersection are the southeast-bound through movement and eastbound right-turn and through movements during the morning peak hour, and the northwest-bound through movement, eastbound right-turn and through movements, and westbound right-turn and through movements during the evening peak hour. An unconventional traffic management action—the implementation of a reversible lane—also was investigated as a low-cost action to abate the traffic congestion problems at the intersection of W. Lisbon Avenue and W. North Avenue. This action would provide a third lane of traffic in the peak-traffic-flow direction on W. Lisbon Avenue between W. Appleton Avenue and N. 46th Street and thus increase the traffic-carrying capacity of W. Lisbon Avenue during the peak periods of traffic demand. Although this action could be expected to abate the traffic congestion at the intersection of W. Lisbon Avenue and W. North Avenue, it was not recommended for implementation—principally because of the potential safety, breakdown, and turn prohibition problems attendant to the single-lane operation in the nonpeak direction during the peak period. The other intersection at which a congestion problem could not be abated during the morning peak hour was the intersection of W. Appleton Avenue and N. 60th Street. At this intersection, the south- to southeastbound left-turn movement could not be abated. The other intersection at which a congestion problem could not be abated during the evening peak hour was the intersection of STH 57 (Wisconsin Avenue) and STH 60 (Washington Street) in the Village of Grafton. All traffic movements at this intersection could not be abated during the evening peak hour. It was also determined that all but one of the related turn-lane storage capacity problems during the morning peak hour, and all but two of such storage problems during the evening peak hour, could be abated—the only storage problems not able to be abated being associated with the southbound left-turn lane at the intersection of N. 76th Street (STH 181) and W. Silver Spring Drive during the morning and evening peak hours, and with the eastbound left-turn lane at the intersection of N. 76th Street (STH 181) and W. Capitol Drive during the evening peak hour.

In addition to the actions recommended to solve the congestion and storage problems at each congested intersection, a total of 27 traffic management actions, at an estimated capital cost of $152,200 in 1980 dollars, are recommended to be implemented at those 21 intersections which, while not exhibiting congestion, were shown either to have inadequate turn-lane storage capacity during the morning and/or evening peak hours, or to have an inefficient signal timing plan. To alleviate the inadequate storage problems at these intersections, it was recommended that five single left-turn lanes and two double left-turn lanes be lengthened, and that on-street parking be prohibited on one intersection approach during the evening peak hour. To remove the inefficiencies of the signal timing systems at these intersections, it was recommended that the signal timing systems at all 14 intersections be retimed, that the signal systems at three of the problem intersections be interconnected, and that two signal phases be added. Through implementation of the above 27 traffic management actions, it was determined that traffic problems could be abated on all but one of the 20 intersections concerned—the intersection of N. 76th Street (STH 181) with W. Harwood Avenue. At this intersection, the insufficient-storage-capacity problem associated with the east-to-northbound left-turn lane during the morning and evening peak hours cannot be abated; it is believed, however, that the storage problems at this intersection could be abated with the opening of the new Harwood Avenue bridge in Wauwatosa.

The analyses indicated that seven intersections will require particularly heavy capital expenditure in order to abate their existing traffic congestion problems. These are the intersections of N. Mayfair Road (STH 100) with W. Blue Mound Road, W. North Avenue, W. Burleigh Street, and W. Capitol Drive (STH 190); the intersection of N. 76th Street (STH 181) with W. Good Hope Road; the intersection of W. Cornell Street with N. Teutonia Avenue; and the intersection of W. Milwaukee Avenue with N. 68th Street. Improvements to abate the existing congestion along N. Mayfair Road were estimated to have a capital cost of

$62,000 at its intersection with W. Blue Mound Road; $73,000, not including $80,000 for additional right-of-way, at its intersection with W. North Avenue; $47,400, not including $15,000 for additional right-of-way, at its intersection with W. Burleigh Street; and $49,000, not including from $50,000 to $200,000 for additional right-of-way, at its intersection with W. Capitol Drive (STH 190). Improvements to abate the existing congestion at the intersection of N. 76th Street and W. Good Hope Road were estimated to have a capital cost of $122,500, not including from $35,000 to $150,000 for additional right-of-way.

Improvements at the intersection of W. Cornell Street and N. Teutonia Avenue were estimated to have a capital cost of $20,200, not including from $15,000 to $80,000 for additional right-of-way. Improvements to abate the existing congestion at the intersection of W. Milwaukee Avenue and N. 68th Street were estimated to have a capital cost of $205,000, not including $35,000 for additional right-of-way. The total cost of implementing the necessary improvements at these seven intersections, including right-of-way costs, would constitute over one-half of the total cost necessary to implement all of the recommended actions on the 20 arterial street segments.

CONSIDERATION OF TRAFFIC PROBLEMS BETWEEN SIGNALIZED INTERSECTIONS

In urban areas, traffic congestion and motor vehicle accident problems are typically concentrated at signalized intersections along arterial streets. However, congestion and accident problems can also occur between signalized intersections. Principally, these problems are located at median openings along divided portions of arterial streets, but they also can occur in areas of high-volume driveways, areas of high on-street parking turnover, and areas of pedestrian crossings, and at nonsignalized local street intersections. Table 159 identifies the median-divided portions of the 20 problem arterial street segments determined to have traffic problems under the short-range plan for the northwest side study area. Of these 76 miles of arterial streets, about 41 miles, or 54 percent, are median divided.

As part of the development of the short-range plan for the study area, a prototype traffic management plan for the abatement of problems between signalized intersections has been prepared for a median-divided portion of the identified problem segment of N. 76th Street (STH 181). N. 76th Street was the only arterial in the study area identified at public informational meetings and advisory committee meetings to the study as having severe problems between signalized intersections because of median and driveway openings. Since this analysis of midblock problems was intended to serve as a prototype analysis, it is recommended that the levels and units of government identified in Table 159 as having jurisdictional responsibility for the remaining median-divided portions of the 20 problem arterial segments consider preparing traffic management plans similar to this prototype for N. 76th Street. This traffic management plan was prepared by the District 2 office of the Wisconsin Department of Transportation (WisDOT) as part of a comprehensive study of the performance of N. 76th Street within the State's jurisdictional limits in Milwaukee County.[18]

The limits of WisDOT's problem analysis of N. 76th Street which are relevant to this northwest side study are W. Grantosa Drive on the south and W. Bradley Road on the north, a distance of 3.6 miles. These limits embrace the median-divided portion of the identified problem segment of N. 76th Street within the study area. Hereafter, the severe problems being experienced between signalized intersections along this portion of N. 76th Street are referred to as midblock problems. This segment of N. 76th Street is abutted primarily by commercial and multiple-family residential land uses which have driveway openings on N. 76th Street. In addition, this segment has median openings between street intersections to serve those land uses, at intersections with local streets for land access, and prior to signalized street intersections for U-turns. Many of these median openings are not treated with exclusive turn lanes. The median-divided portion of the problem segment of N. 76th Street does extend 2.9 miles south of W. Grantosa Drive to W. Center Street. However, this portion of N. 76th Street does not experience severe midblock problems as it is abutted primarily by residential land uses which have limited driveway openings and generate low driveway volumes on N. 76th Street. In addition, its median openings are generally located either at street intersections or prior to signalized street intersections, and are

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[18] *See State Trunk Highway 181—N. 76th Street—Transportation Systems Management Study Report, prepared by the Wisconsin Department of Transportation, District 2.*

Table 159

LIMITS AND JURISDICTION OF MEDIAN-DIVIDED PORTIONS OF THE 20 IDENTIFIED PROBLEM ARTERIAL STREET SEGMENTS

Arterial Segment	Distance (miles)	Jurisdiction
N. 76th Street (STH 181) from W. Center Street to W. Bradley Road	6.5	State of Wisconsin from W. Grantosa Drive to W. Bradley Road; City of Milwaukee from W. Center Street to W. Grantosa Drive
W. Hampton Avenue from N. 92nd Street to W. Green Bay Road (STH 57)	4.9	Milwaukee County/City of Milwaukee from N. 92nd Street to N. 60th Street; City of Milwaukee east of N. 60th Street
N. Sherman Boulevard from W. Lisbon Avenue to W. Silver Spring Drive	4.2	City of Milwaukee
W. Vliet Street from N. 47th Street to N. 40th Street	0.4	City of Milwaukee
W. Fond du Lac Avenue (STH 145) from N. 60th Street to N. 35th Street	2.2	City of Milwaukee
N. 27th Street from W. State Street to W. Lisbon Avenue; and N. 27th Street/W. Cornell Street from W. Glendale Avenue to N. Teutonia Avenue	0.9	City of Milwaukee
W. Silver Spring Drive from W. Appleton Avenue (USH 41) to N. Teutonia Avenue	4.2	Milwaukee County/City of Milwaukee from W. Appleton Avenue to N. 68th Street; City of Milwaukee east of N. 68th Street
W. Lisbon Avenue from N. 30th Street to W. Walnut Street; and W. Appleton Avenue (USH 41) from N. 76th Street (STH 181) to W. Burleigh Street	1.9	City of Milwaukee
W. North Avenue from N. 124th Street to W. Menomonee River Parkway	1.7	City of Wauwatosa
W. North Avenue from N. 9th Street to N. 7th Street	0.1	City of Milwaukee
W. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190)	2.3	State of Wisconsin
W. Capitol Drive (STH 190) from N. 76th Street (STH 181) to the North-South Freeway (IH 43)	4.3	City of Milwaukee
W. Wisconsin Avenue from N. 35th Street to N. 16th Street	1.3	City of Milwaukee
W. Brown Deer Road (STH 100) from N. 91st Street to N. 76th Street (STH 181)	0.9	State of Wisconsin
N. Good Hope Road from N. 76th Street (STH 181) to N. Teutonia Avenue	2.4	Milwaukee County
N. 107th Street (STH 100) from N. Granville Road to W. Brown Deer Road (STH 100)	0.2	State of Wisconsin
STH 57 from Oak Street to 7th Avenue in the Village of Grafton	0.4	State of Wisconsin

Source: SEWRPC.

generally treated with exclusive turn lanes. Also, the posted speed limits along this portion of N. 76th Street are lower than those on the median-divided segment of N. 76th Street from W. Grantosa Drive to W. Bradley Road, which experiences severe midblock problems, and the peak-hour and average weekday traffic volumes are less than those from W. Grantosa Drive to Bradley Road.

Methodology of Midblock Problem Analysis

In the preparation of a traffic management plan for the abatement of midblock traffic problems within the northwest side study area, it is recommended that, as in the parts of WisDOT's analysis of N. 76th Street which address midblock problems, the analysis of each median-divided problem arterial street segment consist of three steps: 1) data collection; 2) identification of problems; and 3) development and recommendation of problem abatement actions. This three-step procedure is summarized below.

Data Collection: The first step in the analysis of the midblock traffic problems of an arterial street segment is data collection. The following four types of traffic data should be collected: arterial travel time and delay; intersection stopped-time delay; accident frequency at intersections, driveways, and median openings; and traffic counts at intersections, driveways, and median openings.

The first of these data types, arterial travel time and delay, provides a measure of the overall performance of the arterial during different time periods throughout the day. It also identifies the location and average length of time that vehicles traveling along an arterial street segment experience stops and delays. Through this type of data, the extent and severity of interference at median openings or driveways can be determined, and can be compared to such interference at signalized intersections. Such travel time and delay data are obtained by test vehicles driven along the arterial street segment at the average speed of the traffic stream. Elapsed travel times are recorded at predetermined control points and at the location of each stopped delay along the problem segment. This information should be obtained for each direction of traffic flow during all weekday peak travel periods and during at least one off-peak period. Sufficient test vehicle runs must be made for each time period so that representative data are obtained. In the analysis of N. 76th Street, between 23 and 29 test runs were made in the northbound and southbound directions during each time period. The analysis of this travel time and delay data should include for each direction of travel and each time period: 1) the overall average running speed (the average speed of the car while moving—that is, not including any stops); 2) the overall average stopped-time delay at each point where such delay was experienced; 3) the total accumulated stopped-time delay for each travel time run; 4) the total number of travel time runs which were delayed at each point; and 5) the percentage of all travel time runs which were delayed at each point.

The second type of data collected in the arterial street midblock analysis, intersection stopped-time delay, measures the type of stopped time delay experienced by vehicles negotiating intersection approaches, the number of vehicles experiencing such delay, and the length of time that those vehicles are stopped at each intersection. This information is obtained manually by field personnel recording information on stopped and left-turning vehicles at intersections, and should be obtained during peak hours. Stopped-time delay data need be collected only at nonsignalized intersections for midblock problem analysis, but collection of such data at both signalized and nonsignalized intersections permits the extent and severity of interference at nonsignalized intersections to be compared to that at signalized intersections. In this study of N. 76th Street, stopped-time delay data were available for both signalized and nonsignalized intersections because the study was intended to address the overall performance of N. 76th Street. The stopped-time delay data gathered were used to indicate for each direction of travel and each time period: 1) the total amount of stopped-time delay observed at each intersection (in vehicle hours); 2) the average delay observed for each vehicle approaching the intersection on all approaches (in seconds per approaching vehicle); 3) the total amount of stopped-time delay observed at each separate intersection approach (in vehicle hours); and 4) as needed, the average delay and stopped-time delay for through and right-turning vehicles only and for left-turning vehicles only at each intersection approach.

The third type of data collected in the arterial street midblock analysis, accident frequency, indicates: 1) the number of accidents per year which occurred at intersections; and 2) the number of accidents which occurred annually along midblock segments between intersections. Accident information of this type for each accident location along the arterial segment is obtained from municipal accident record systems, which provide detailed information on the location and type of each accident. It is recommended that this information be obtained for at least a three-year time period to provide a sound data base for the identification and analysis of high accident locations and the determination of predominant collision patterns at those locations.

The fourth type of data collected in the arterial street midblock analysis, traffic counts, measures the average annual weekday traffic volume entering the intersection approaches, and the average annual weekday traffic volume traversing the arterial street at midblock segments. These traffic count data are considered together with the accident frequency data to calculate accident rates for both intersections and midblock segments. These accident rates are expressed as accidents per million vehicles entering the intersection for nonsignalized intersections, and as accidents per million vehicle miles traveled for midblock segments. Through this type of data, the extent and severity of accident problems at nonsignalized intersections and median openings and driveways can be determined. In this analysis of N. 76th Street, these accident data were compiled for signalized intersections as well.

Identification of Problems: The second step in the analysis of the midblock traffic problems of an arterial street segment is problem identification. The purpose of this step is to utilize the compiled midblock travel time and delay data, the intersection stopped-time delay data, and the accident frequency and rate data to identify midblock problem areas and their relative severity.

Midblock segments which are experiencing travel time and delay problems at median openings or driveways are identified by examination of the midblock travel time and delay summary tables. This examination not only should illustrate which midblock segments are experiencing the worst delays, but also should illustrate the relative magnitude of that delay. It should be noted that, in this analysis of N. 76th Street, no delays were experienced during any of the test vehicle runs at any median openings or driveways. This is because N. 76th Street operates with two through traffic lanes and one parking lane in each direction of traffic flow from W. Center Street to W. Bradley Road. Even though there were numerous instances of vehicles slowing at median openings or driveways to negotiate turning movements, no test vehicles had to stop, as through traffic performed lane-change maneuvers in order to bypass the stopped vehicles and thereby avoid any stopped-time delays. Arterial segments which have only one through lane and one parking lane, or two through lanes, may, however, experience delays at median openings and driveways due to increased constraints on lane-changing maneuverability.

Nonsignalized intersections which are experiencing problems in terms of stopped-time delay are also identified by examining stopped-time-delay summary tables. It should be noted, however, that it was found in this analysis of N. 76th Street that only slight delay was experienced at nonsignalized intersections. The only significant delay at nonsignalized intersections along N. 76th Street was, as expected, found to be experienced by traffic on crossing streets that was required to stop before entering N. 76th Street, and by left-turning traffic from N. 76th Street to local streets. Through traffic on N. 76th Street was not required to stop at any nonsignalized intersection and, as a result, total delay at nonsignalized intersections was much less than that at signalized intersections.

Midblock segments and nonsignalized intersections which are experiencing accident problems are identified by analyzing the collected accident data. Because the proximity of a midblock segment to a signalized intersection influences its accident characteristics, midblock segments along the problem arterial street are separated into two groups: those located one block or less from a signalized intersection, and those located more than one block from a signalized intersection. The mean accident rates and frequencies are calculated for all nonsignalized intersections and for each of the two groups of midblock segments. Nonsignalized intersections and midblock segments are identified as experiencing high accident rates and frequencies when the accident rate or frequency is two or more times greater than the group mean. At the same time, they are identified as experiencing less severe accident rate and frequency problems when the accident rate or frequency is between one and one-half and two times greater than the group mean. Based on the problem identification process described above, a summary table is then prepared which categorizes each severe problem location by problem type, and ranks each location by problem severity.

Development of Actions for Problem Abatement: The third step in the analysis of the midblock problems of an arterial street segment is the development of actions for problem abatement. This step first requires the preparation of detailed traffic flow and collision diagrams for each midblock problem area identified in the second step of the analysis process. In order to prepare these diagrams, manual traffic counts must be taken of all vehicular movements to and from driveways and median openings within identified midblock problem segments, as well as of all vehicular movements at each identified problem nonsignalized intersection. In addition, three-year accident histories must be collected of all collisions occurring at each problem location. In this analysis of N. 76th Street, these detailed traffic flow and collision diagrams were prepared not only for those problem areas specifically identified in the second phase of the analysis, but for each portion of the arterial segment located adjacent to high commercial activity along N. 76th Street as well. The detailed traffic flow and collision diagrams are then analyzed to identify alternative traffic management strategies for the abatement of specific problems at these areas.

Based upon the prepared traffic volume and accident collision diagrams, alternative traffic management actions to abate the midblock problems are developed. These problems may require various median opening or driveway treatments, the prohibition of on-street parking, the installation of new traffic signals at nonsignalized intersections, or—as recommended in one instance for N. 76th Street—the removal of traffic signals at signalized intersections.[19] Although the types of traffic management actions to be considered at identified problem locations can vary widely and need to be designed expressly to meet the needs of the individual problem location, certain types of alternative traffic management treatments were considered in this study of N. 76th Street. These treatments constitute a representative set of traffic management actions which can be considered in analyses of midblock problems on the remainder of the arterial street segments under the northwest side study. The alternative actions with the potential to reduce vehicular delay and/or traffic accident problems at midblock median openings or nonsignalized intersections are discussed below, along with their attendant advantages and disadvantages.

1. One alternative traffic management action involves the construction of an exclusive left-turn lane at the approach to the midblock median opening or to the nonsignalized intersection. The lane must be of sufficient length to accommodate left-turning vehicles. The principal advantage of this alternative is that a deceleration and refuge area would be provided for left-turning vehicles so that they will not obstruct the through traffic lanes, thereby reducing delays or lane-changing of through traffic as well as the potential for rear-end collisions. Depending on the volume of traffic making left turns, a shorter left-turn taper with no storage may be sufficient at the approach to the median opening to provide refuge area for one or two vehicles. There are no inherent disadvantages to this alternative action.

2. A second alternative traffic management action involves the limited widening of the existing median opening. The advantages of this alternative are that it may supply more area for separating conflicting traffic movements through the opening and for some storage of left-turning vehicles, thereby reducing delays for through traffic and reducing the potential for sideswipe and rear-end collisions. Depending on site-specific conditions, it may also improve the median opening alignment with driveway entrances or intersecting roadways, thereby reducing potential wrong-way movements. The disadvantage of this alternative is that it may result in driver confusion by creating a large, undefined median opening area.

3. A third alternative traffic management action involves the channelization of the median opening in order to restrict the turning movements which can be made. This alternative involves the channelization and redirection of the median opening to create one-way operation to facilitate only specific movements through the opening. The advantages of this alternative are that some vehicle movements through the median opening will

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[19] *As a result of the Wisconsin Department of Transportation's Comprehensive Analysis of N. 76th Street, from which this midblock analysis is taken, the removal of traffic signals was recommended at the intersection of N. 76th Street and W. Acacia Street. This recommendation is presented in the section of this chapter on traffic management recommendations to abate problems at signalized intersections along the problem segment of N. 76th Street from W. Harwood Avenue to W. Bradley Road.*

be separated or eliminated, thereby reducing the potential for sideswipe or right-angle accidents. The disadvantages of this alternative are that many of the traffic movements which would have been negotiated at the median opening will be diverted to the next nearest median opening or intersection, thereby increasing the U-turn movements and accident potential and delay at that opening, and possibly resulting in circuitous access to some adjacent development.

4. A fourth alternative traffic management action involves closing the existing median opening. The advantage of this alternative is that it totally eliminates all traffic conflicts, thereby eliminating any vehicular delay and/or traffic accident problems at the median opening. The disadvantages of this alternative are, first, that traffic movements that would have been negotiated at the median opening would be diverted to the next nearest median opening, thereby increasing U-turn movements and the accident potential and delay at that median opening; and, second, that circuitous access to adjacent development may result.

5. A fifth alternative traffic management action involves the creation of a new median opening. The advantages of this alternative are, first, that it serves to reduce circuitous access to adjacent development; and, second, that U-turn movements at other adjacent problem median openings will be reduced, thereby reducing the accident potential and delay at those openings. The disadvantages of this alternative are, first, that some problem traffic movements may simply be relocated; and, second, that an additional area of traffic conflict with through traffic is created. Generally, median openings should be spaced at intervals of 500 feet or more to avoid these disadvantages.

6. A sixth alternative traffic management action involves the consolidation of existing driveway entrances into a single entrance. The advantages of this alternative are, first, that it removes circuitous traffic flow from the arterial street by routing it onto off-street parking areas or frontage roadways; second, that it concentrates vehicle conflicts with through traffic at one location, and; third, that it may reduce the potential for wrong-way movements. Under this alternative, the consolidated driveway entrance would align directly with a median opening, which may require relocation or consolidation of the existing median openings as well. The disadvantage of this alternative is that circuitous access to adjacent development may result.

7. A seventh alternative traffic management action is the prohibition of on-street parking. The advantages of this action are, first, that delays and rear-end collision problems resulting from vehicles exiting the main arterial to driveways and nonsignalized intersections could be abated by this action; second, that it increases the capacity of the roadway; third, that it eliminates traffic stream conflicts resulting from vehicles entering and leaving curb parking spaces; fourth, that transit vehicles are able to travel in the curb lane without having to pull out into the through lanes after making a curb stop; fifth, that vehicles turning in and out of driveways and nonsignalized intersections are able to use the curb lane rather than through lanes for acceleration and deceleration; and, sixth, that sight conditions and visibility are improved for motorists and pedestrians attempting to cross the arterial street. The major disadvantage of this alternative is that direct vehicular access to abutting property may be reduced.

8. A final alternative traffic management action is the installation of traffic signals. The advantages of this alternative are that specific traffic conflicts are separated and controlled, delays can be reduced for vehicles attempting to enter or cross a major arterial facility, and pedestrian movements can be more safely provided across the major arterial street. The disadvantages of this alternative are that total delays can be significantly increased and accidents can be increased because of the installation of the traffic signal. Consequently, established and accepted minimum intersection traffic volume warrants, under which the advantages of traffic signal installation outweigh its disadvantages, should be followed in traffic signal installation.[20]

[20] *Manual on Uniform Traffic Control Devices, U. S. Department of Transportation, Federal Highway Administration, 1978.*

In consideration of the alternative traffic management actions listed above, it must be recognized that the list is not all-inclusive. Neither are the actions listed above mutually exclusive, as they can be used in combination with one another.

Midblock Problem Analysis of N. 76th Street (STH 181) from W. Grantosa Drive to W. Bradley Road

The one median-divided portion of the 20 identified problem arterial street segments in the northwest side study area examined for resolution of existing problems between signalized intersections was N. 76th Street (STH 181) from W. Grantosa Drive to W. Bradley Road, a distance of 3.6 miles. The analysis of these midblock problems was conducted by the District 2 Office of the Wisconsin Department of Transportation, as part of a study of the overall performance of N. 76th Street. The purpose of this analysis was to collect traffic data along the facility to aid in the identification of congestion and accident problems at median openings, driveway entrances, and signalized and nonsignalized intersections; to determine the relative significance of these problem locations; and to develop and recommend actions to abate these problems. This section presents a summary of the analysis of midblock problems along N. 76th Street.

Data Collection and Midblock Problem Identification and Prioritization: Four types of data were collected in this analysis of N. 76th Street: travel time and delay data, signalized and nonsignalized intersection stopped-time delay data, accident frequency data, and traffic count data. This information was analyzed and, based on this analysis, existing midblock problems were identified and prioritized. The results of each of these analyses are summarized below.

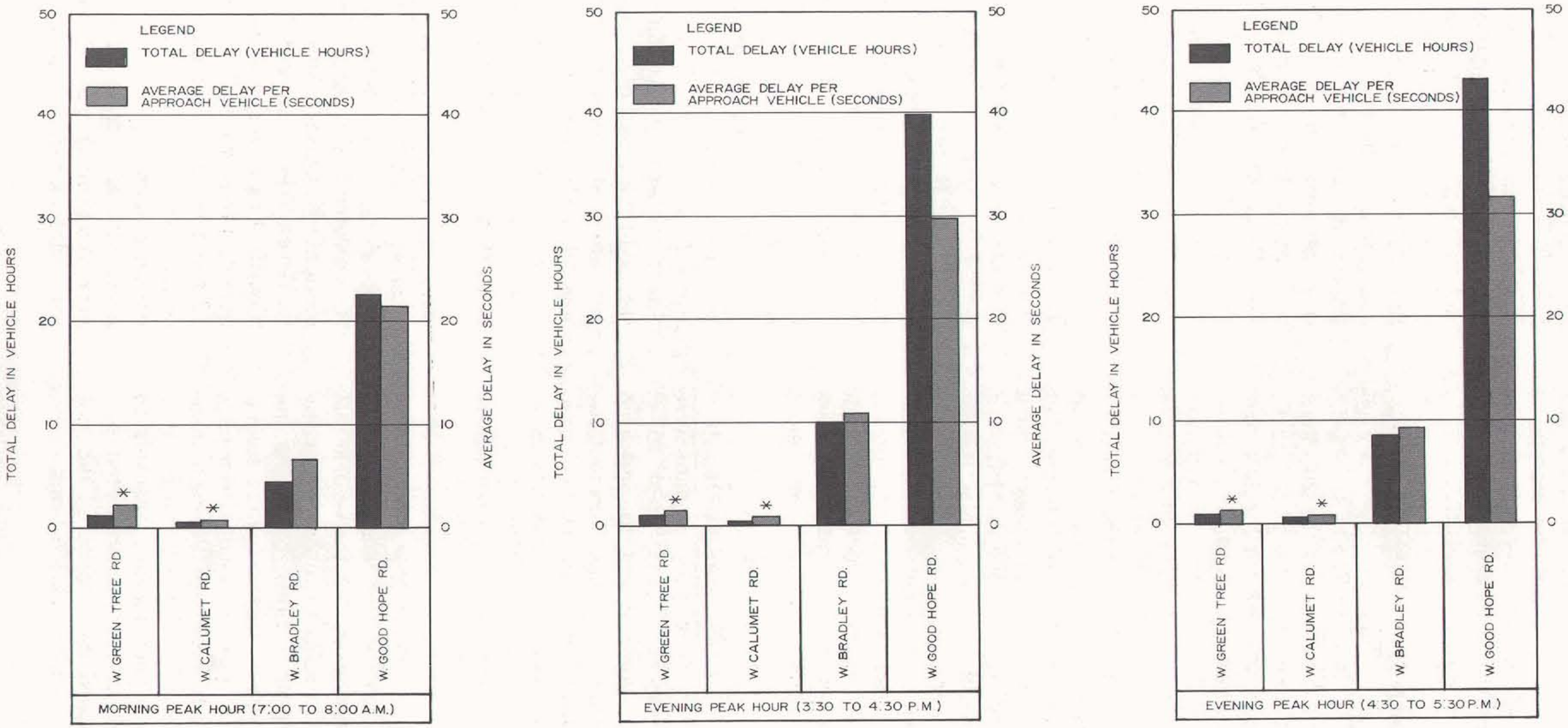
Travel Time and Delay Data: No stopped-time delays were experienced by test vehicles at any midblock locations during any of the vehicle test runs taken along N. 76th Street during either the morning or evening peak periods, or during the midday period. Numerous instances were found, however, of vehicles stopped at median openings and driveways waiting to negotiate turning maneuvers. These vehicles served to force through traffic on N. 76th Street into lane-change maneuvers to avoid travel time delays. Also, as indicated previously, the travel speed data collected did not identify any problems at midblock locations.

Nonsignalized Intersection Stopped-Time Delay Data: The only delay recorded by observers at nonsignalized intersections along N. 76th Street occurred on crossing street approaches to N. 76th Street and in conjunction with left turns from N. 76th Street to the intersecting roadways. No stopped-time delays were recorded for through traffic at nonsignalized intersections along N. 76th Street, since that traffic was not required to stop in any case. Stopped-time delay data for two nonsignalized intersections along N. 76th Street—W. Green Tree Road and W. Calumet Road—are shown in Figures 54 and 55. These two intersections exhibited the highest incidence of stopped-time delay along N. 76th Street, and the stopped-time delay data for these two intersections are representative of such data collected for the nonsignalized intersections along this segment of N. 76th Street. The data in Figure 54 indicate the total intersection delay, expressed in vehicle hours, during the morning peak period and two-hour evening peak period for each of the two intersections, and the average delay per approaching vehicle, expressed in seconds per approach vehicle, during the morning and evening peak periods for each of the two intersections. Figure 55 shows the total intersection delay, expressed in vehicle hours, for each approach to the two intersections during each of the three peak hours. For purposes of comparison, these data elements are also indicated for each time period for the signalized intersection of W. Good Hope Road and W. Bradley Road with N. 76th Street. As seen by this comparison, the amount of stopped-time delay data experienced at these two nonsignalized intersections along N. 76th Street was relatively insignificant, ranging from 0.2 hour to 1.1 vehicle hours of delay during the morning peak hour and from 0.3 to 0.9 vehicle hour of delay during the evening peak hours.

Accident Frequency and Traffic Count Data: Accident frequencies for nonsignalized intersections along N. 76th Street are shown in Figure 56. As indicated in this figure, four nonsignalized intersections—W. Carmen Avenue, W. Bobolink Avenue, W. Green Tree Road, and W. Denver Avenue—were identified as having the most severe accident frequency problems, with averages of between 6 and 10 accidents per year; and one nonsignalized intersection—W. Sheridan Avenue—was identified as having moderately severe accident frequency problems, with an average of about five accidents per year. Accident frequencies are shown in Figure 57 for midblock segments along N. 76th Street accord-

Figure 54

TOTAL INTERSECTION DELAY IN VEHICLE HOURS AND AVERAGE DELAY PER APPROACH VEHICLE IN SECONDS FOR ALL APPROACHES TO TWO NONSIGNALIZED INTERSECTIONS ALONG N. 76TH STREET AND THE INTERSECTIONS OF N. 76TH STREET WITH W. GOOD HOPE ROAD AND W. BRADLEY ROAD



* COMPUTED VALUE INCLUDES ESTIMATED THROUGH VOLUME AT NONSIGNALIZED INTERSECTIONS.

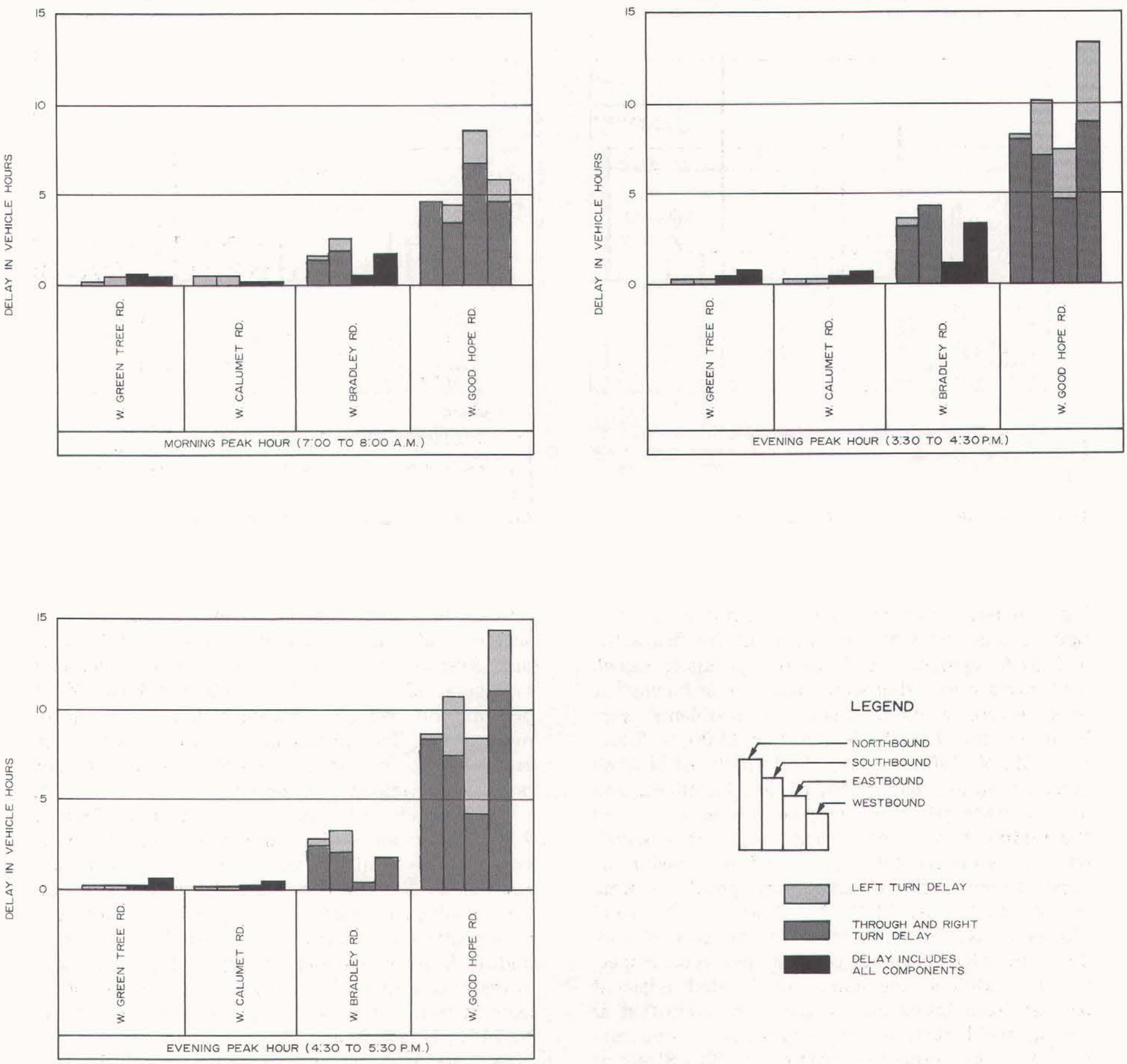
* COMPUTED VALUE INCLUDES ESTIMATED THROUGH VOLUME AT NONSIGNALIZED INTERSECTIONS.

* COMPUTED VALUE INCLUDES ESTIMATED THROUGH VOLUME AT NONSIGNALIZED INTERSECTIONS.

Source: Wisconsin Department of Transportation.

Figure 55

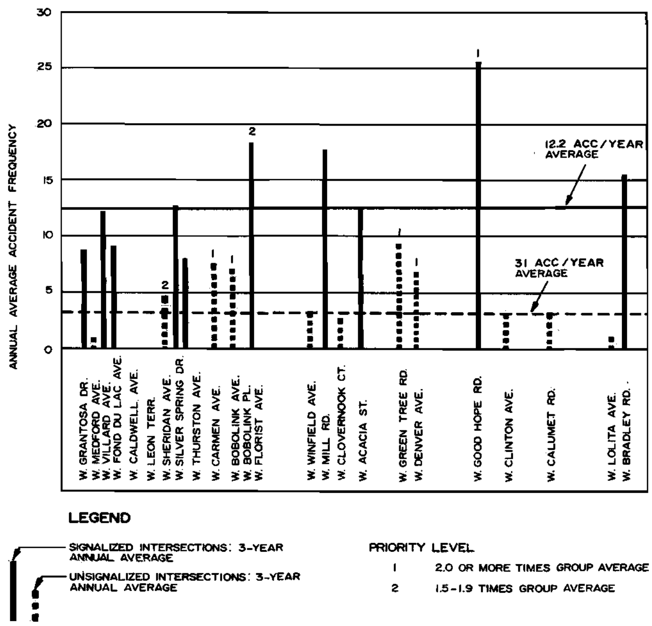
INTERSECTION DELAY PER APPROACH AND DIRECTIONAL MOVEMENTS IN VEHICLE HOURS FOR TWO NONSIGNALIZED INTERSECTIONS ALONG N. 76TH STREET AND THE INTERSECTIONS OF N. 76TH STREET WITH W. GOOD HOPE ROAD AND W. BRADLEY ROAD



Source: Wisconsin Department of Transportation.

Figure 56

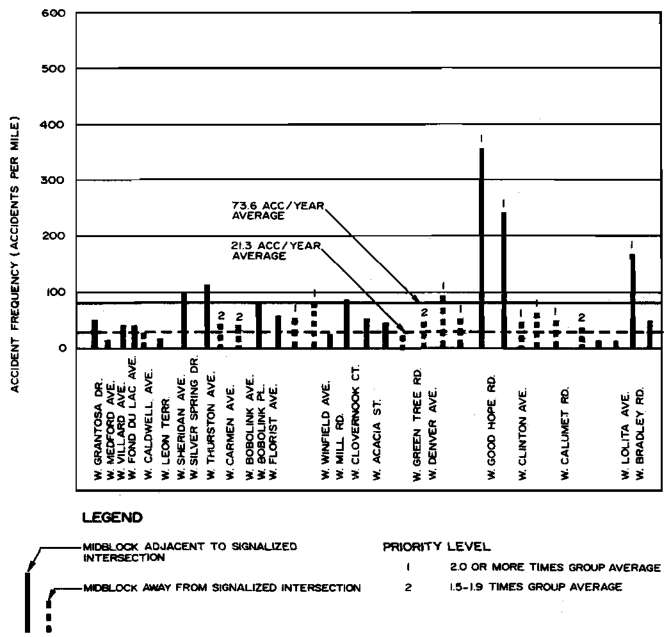
AVERAGE ANNUAL INTERSECTION ACCIDENT FREQUENCY FOR N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD: 1978-1980



Source: Wisconsin Department of Transportation.

Figure 57

AVERAGE ANNUAL MIDBLOCK ACCIDENT FREQUENCY FOR N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD: 1978-1980



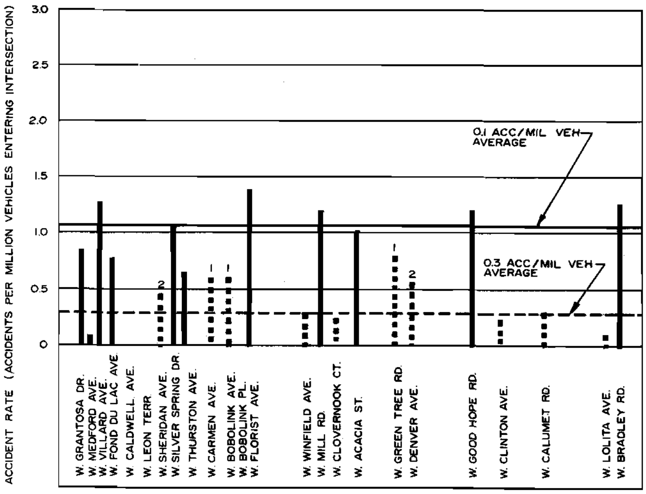
Source: Wisconsin Department of Transportation.

ing to whether they are adjacent or not adjacent to signalized intersections. As shown in this figure, the midblock segments not located adjacent to signalized intersections that were identified as having the most severe accident frequency problems were located at the N. 6100, N. 6200, N. 6900, N. 7000, N. 7300, N. 7400, and N. 7500 blocks of N. 76th Street, with averages of 45, 70, 92, 45, 46, 62, and 44 accidents per mile per year, respectively; and the midblock segments located adjacent to signalized intersections that were identified as having the most severe accident frequency problems were located at the N. 7100, N. 7200, and N. 7900 blocks of N. 76th Street, with averages of 353, 236, and 167 accidents per mile per year, respectively. Midblock segments not located adjacent to signalized intersections that were identified as having accident frequency problems of moderate severity were those segments of N. 76th Street at the N. 5700, N. 5800, N. 6800, and N. 7600 blocks, which had averages of 33, 39, 42, and 38 accidents per mile per year, respectively.

The results of the intersection accident rate analysis of N. 76th Street are shown in Figure 58. As indicated in this figure, the three nonsignalized intersections identified as having the most severe accident rates were W. Green Tree Road, W. Carmen Avenue, and W. Bobolink Avenue, which had average accident rates of 0.8, 0.6, and 0.6 accident per million vehicles entering the intersection, respectively. Two nonsignalized intersections were identified as having moderately severe accident rates: W. Sheridan Avenue and W. Denver Street, both of which had average accident rates of about 0.5 accident per million vehicles entering the intersection. The results of the midblock accident rate analysis of N. 76th Street are shown in Figure 59 for midblock segments not adjacent and adjacent to signalized intersections. As seen in this figure, midblock segments located adjacent to signalized intersections identified as having the worst problems in terms of accident rate were located at the N. 7100, N. 7200, and N. 7900 blocks of N. 76th Street, and had accident rates of about 29, 19, and 15 accidents per million vehicle miles traveled, respectively. Midblock segments not located adjacent to a signalized intersection identified as having the worst problems in terms of accident rate were located at the N. 6200 and N. 6900 blocks of N. 76th Street, and had accident rates of 6.5 and 7.5 accidents per million vehicle miles traveled,

Figure 58

AVERAGE ANNUAL INTERSECTION ACCIDENT RATE FOR N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD: 1978-1980



LEGEND

3-YEAR RATE - SIGNALIZED INTERSECTION

3-YEAR RATE - NONSIGNALIZED INTERSECTION

PRIORITY LEVEL

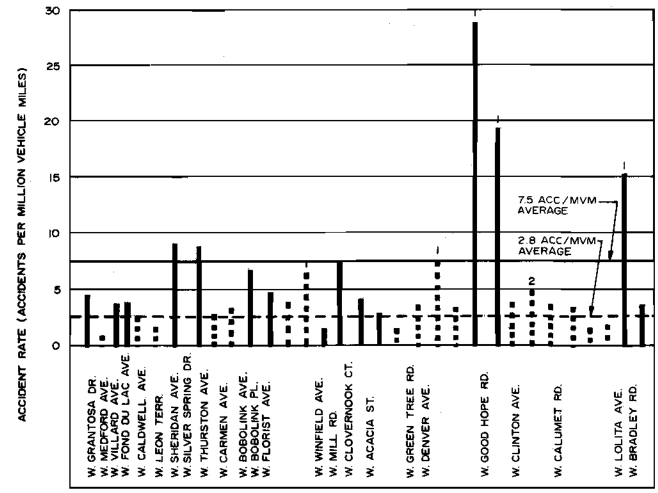
1 2.0 OR MORE TIMES GROUP RATE

2 1.5-1.9 TIMES GROUP RATE

Source: Wisconsin Department of Transportation.

Figure 59

AVERAGE ANNUAL MIDBLOCK ACCIDENT RATE FOR N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD: 1978-1980



LEGEND

MIDBLOCK ADJACENT TO SIGNALIZED INTERSECTIONS: RATE

MIDBLOCK AWAY FROM SIGNALIZED INTERSECTIONS: RATE

PRIORITY LEVEL

1 2.0 TIMES GROUP RATE

2 1.5-2.0 TIMES GROUP RATE

Source: Wisconsin Department of Transportation.

respectively. Only one midblock segment which was not located adjacent to a signalized intersection—the N. 7400 block of N. 76th Street—was identified as having problems of moderate severity in terms of accident rate, and it had an accident rate of about 5.0 accidents per million vehicle miles traveled.

Table 160 provides a summary of the problems identified at nonsignalized intersections and midblock locations along N. 76th Street using each of the four types of data collected, and prioritizes each of these locations according to their relative problem severity. As shown in this table, of the nonsignalized intersections located along N. 76th Street between W. Grantosa Drive and W. Bradley Road, W. Green Tree Road displayed the most severe problems in terms of the three types of data which were found to be relevant to the analysis—nonsignalized intersection stopped-time delay (measured in total vehicle hours of delay), accident frequency (measured in accidents per year), and accident rate (measured in accidents per million vehicle miles entering the intersection). Four nonsignalized intersections—W. Carmen Avenue, W. Bobolink Avenue, W. Denver Avenue, and W. Calumet Avenue—were found to have severe problems in terms of one or two of these three types of data. Three midblock segments along N. 76th Street located adjacent to a signalized intersection—the N. 7100 and N. 7200 blocks immediately north and south of W. Good Hope Road, and the N. 7900 block located immediately south of W. Bradley Road—were found to have severe problems in terms of both accident frequency and accident rate. Finally, three midblock segments along N. 76th Street not located adjacent to a signalized intersection—in order of problem severity, the N. 6900 block between W. Green Tree Road and W. Good Hope Road, the N. 6200 block between W. Florist Avenue and W. Mill Road, and the N. 7400 block between W. Good Hope Road and W. Calumet Road—were found to have severe problems in terms of both accident frequency and accident rate; and three other midblock segments along N. 76th Street not located adjacent to a signalized intersection were found to have severe accident frequency problems only, as shown in Table 160.

Development of Actions to Abate Identified Problems: Based on traffic movement and accident collision diagrams prepared for each problem location and for all stretches of N. 76th Street

Table 160

SUMMARY OF PROBLEMS IDENTIFIED AT NONSIGNALIZED INTERSECTIONS AND MIDBLOCK LOCATIONS DURING THE ANALYSIS OF N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD

Problem Locations (in order of problem severity) Identified in Terms of:								
Arterial Travel and Delay Data	Observed Nonsignalized Intersection Stopped-Time Delay Data (total vehicle hours of delay)		Compiled Average Annual Accident Frequency Data (accidents per year)			Compiled Average Annual Accident Rate Data		
No Problems	Morning Peak	Evening Peak	Nonsignalized Intersection (accidents per year)	Midblock Segment Not Adjacent to a Signalized Intersection (accidents per mile per year)	Midblock Segment Adjacent to a Signalized Intersection (accidents per mile per year)	Nonsignalized Intersection (accidents per million vehicles entering intersection)	Midblock Segment Not Adjacent to a Signalized Intersection (accidents per million vehicle miles)	Midblock Segment Adjacent to a Signalized Intersection (accidents per million vehicle miles)
	1. W. Green Tree Road (1.1) 2. W. Calumet Road (0.2)	1. W. Green Tree Road (0.9-0.9) 2. W. Calumet Road (0.6-0.3)	1. W. Green Tree Road (9.7) 2. W. Carmen Avenue (7.3) 3. W. Bobolink Drive (7.0) 4. W. Denver Avenue (6.7) 5. W. Sherman Avenue (4.7)	1. N. 6900 (91.7) 2. N. 6200 (75.0) 3. N. 7400 (61.5) 4. N. 7300 (46.2) 5. N. 6100 (44.4) 6. N. 7000 (44.4) 7. N. 7500 (43.6) 8. N. 6800 (41.7) 9. N. 5800 (38.5) 10. N. 7600 (38.1) 11. N. 5700 (33.3)	1. N. 7100 (352.8) 2. N. 7200 (236.1) 3. N. 7900 (166.7)	1. W. Green Tree Road (0.79) 2. W. Carmen Avenue (0.60) 3. W. Bobolink Drive (0.59) 4. W. Denver Avenue (0.54) 5. W. Sheridan Avenue (0.46)	1. N. 6900 (7.5) 2. N. 6200 (6.5) 3. N. 7400 (5.10)	1. N. 7100 (28.8) 2. N. 7200 (19.4) 3. N. 7900 (15.1)

Source: Wisconsin Department of Transportation.

adjacent to commercial land uses, it was determined that, with the exception of the segment of N. 76th Street adjacent to its intersection with W. Good Hope Road, most of the safety and operational problems at median openings and nonsignalized intersections along this stretch of N. 76th Street could be resolved through the provision of exclusive left-turn lanes and on-street parking prohibition.

The safety problems were determined to consist of rear-end or sideswipe collisions which occurred as vehicles slowed to negotiate right, left, and U-turns at median openings, driveway openings, and nonsignalized intersections. The left-turn and U-turn conflicts could be relieved by the provision of exclusive left-turn lanes within the median area, which would provide a deceleration and refuge area for left- and U-turning vehicles so that they would not obstruct the through traffic lanes on N. 76th Street. Right-turn problems from vehicles exiting N. 76th Street to driveways and to nonsignalized intersections, as well as problems from vehicles exiting driveways and nonsignalized intersections onto N. 76th Street, could be abated by the restriction of on-street parking at these problem areas. Consequently, a number of exclusive left-turn lanes within the existing median were recommended for construction, and on-street parking was recommended to be prohibited along the entire length of N. 76th Street from W. Grantosa Drive to W. Bradley Road, as shown in Table 161. The priority of these new left-turn lanes was determined based upon the severity of the delay and accident problems at each midblock problem location and nonsignalized intersection, as presented in Table 160.

In addition, at the nonsignalized intersection that was identified as having the most severe problems, W. Green Tree Road, the installation of traffic signals was recommended at an estimated capital cost of $30,000 in 1980 dollars. The estimated capital cost of the parking restrictions is $8,600 and of the left-turn lanes is $254,000. The estimated capital cost of the lanes with high priority is $100,000, of the lanes with medium priority is $99,000, and of the lanes with low priority is $55,000.

That segment of N. 76th Street located immediately north and south of W. Good Hope Road was identified as having the worst problems in terms of both stopped-time delay and accident frequency and rate, and as requiring more than parking restrictions and turn lanes to resolve its problems. Traffic volumes along N. 76th Street were found to be highest in the area of the intersection of W. Good Hope Road with N. 76th Street, and the abutting commercial development was found to generate the most traffic. Figures 60 through 63 provide detailed information about the traffic flow and accident characteristics of this area for the three-year period 1978 through 1980. The numerous rear-end collision and turning-movement accidents at the median openings along this segment are evident in these figures.

Table 161

RECOMMENDATION AND PRIORITIZATION OF LEFT-TURN LANE CONSTRUCTION ALONG N. 76TH STREET FROM W. GRANTOSA DRIVE TO W. BRADLEY ROAD

Location	Direction	
	Northbound	Southbound
High Priority		
First Median Opening South of Good Hope Road (to Manning's Restaurant and Arthur Treacher's Fish and Chips Restaurant—7100 North)	X	--
Second Median Opening North of Good Hope Road (Good Hope Plaza-North Drive—7200 North)	--	X
First Median Opening North of Good Hope Road (Good Hope Plaza-South Drive—7200 North)	X	X
Medium Priority		
Carmen Avenue	X	X
Thurston Circle	X	X
Second Median Opening North of Good Hope Road (Good Hope Plaza-North Drive—7200 North)	X	--
First Median Opening North of Clinton Avenue (between W. Good Hope Road and W. Calumet Road) (Northtown Cinema—7400 North)	--	X
Second Median Opening North of Calumet Road (Phil Tolkan Pontiac—7600 North)	--	X
Denver Avenue	--	X
Clinton Avenue (first nonsignalized intersection north of W. Good Hope Road)	--	X
Low Priority		
Frontage Road Northbound Opening at 7800 North (median opening on south end of frontage road)	X	--
Median Opening North of Denver Avenue (7200 North)	X	--
Villard Avenue	--	X
Medford Avenue	--	X
Grantosa Drive	--	X
Future		
Frontage Road Southbound Opening at 7800 North	--	X

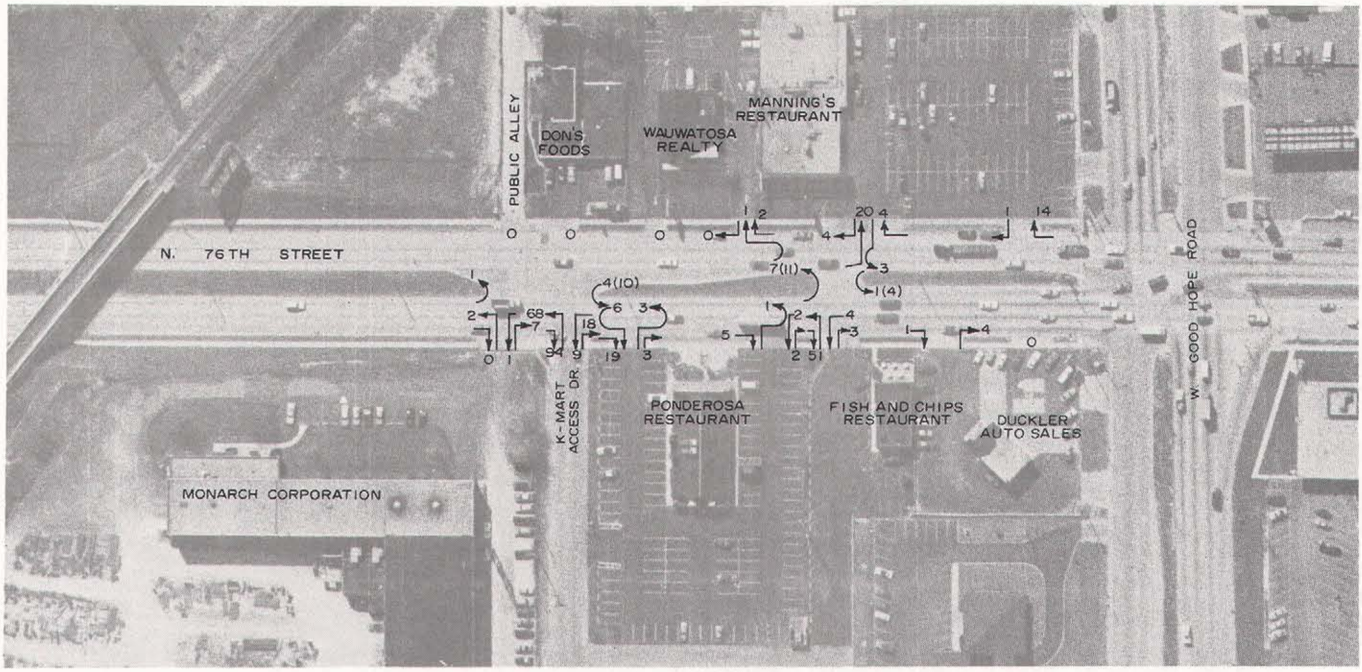
Source: Wisconsin Department of Transportation.

Figure 60 shows the traffic volumes at driveway and median openings along the segment of N. 76th Street south of W. Good Hope Road. The major traffic generator along the west side of this segment of N. 76th Street is Manning's Restaurant. Traffic generators on the east side of this segment of N. 76th Street include the K-Mart Shopping Center, Ponderosa Restaurant, and Arthur Treacher's Fish and Chips Restaurant. As shown in Figure 61, a concentration of rear-end collision and turning movement accidents occurs at the first median opening south of W. Good Hope Road on N. 76th Street. Manning's Restaurant, located on the west side of N. 76th Street, is the major traffic generator affecting this median opening. The accidents at the median opening are a result of movements in and out of the driveways on both sides of N. 76th Street at the median opening.

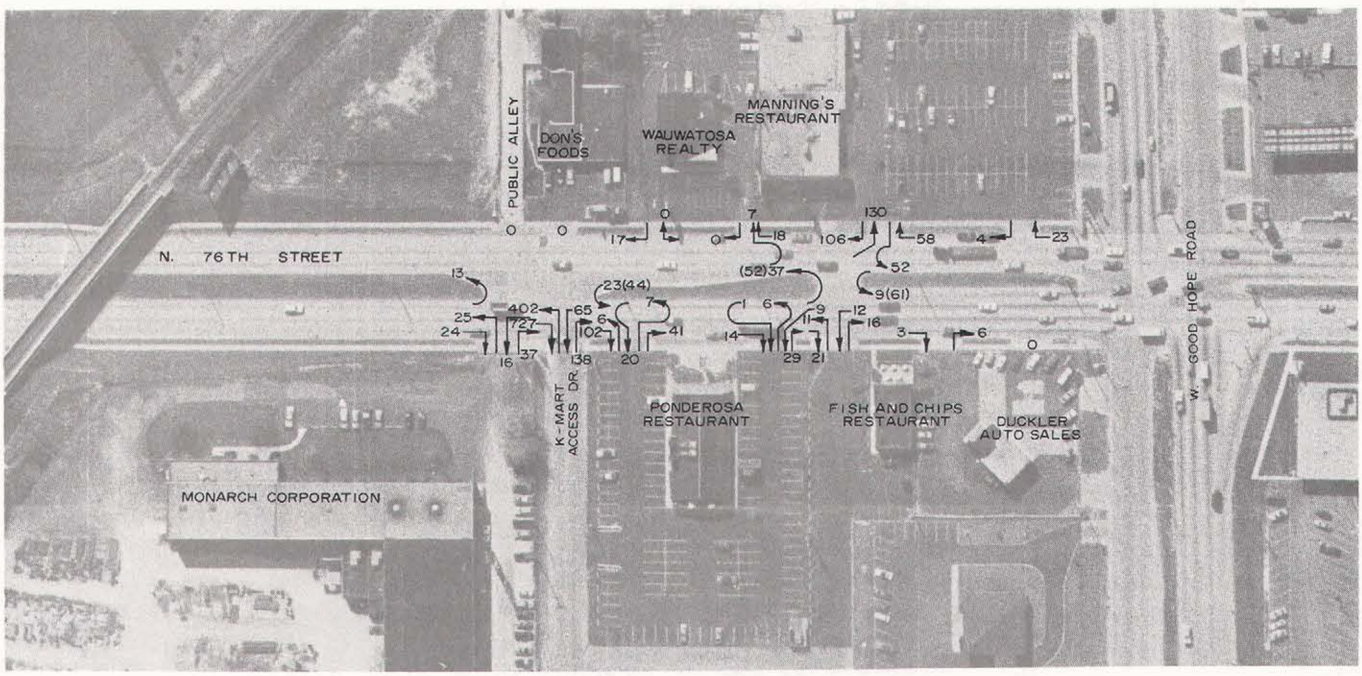
The alternative traffic management actions considered to treat this problem median opening are shown in Figure 64, along with a summary of the advantages and disadvantages of each. The recommended action, Alternative 3, calls for an exclusive northbound left-turn lane at the problem median opening in order to provide refuge for vehicles accessing the restaurant from the south. In addition, Alternative 3 would eliminate the major conflict at the median opening by prohibiting left turns from the restaurant driveway through the

Figure 60

DETAILED TRAFFIC MOVEMENTS AT DRIVEWAYS AND MEDIAN OPENINGS ALONG N. 76TH STREET IMMEDIATELY SOUTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD



CRITICAL HOUR COUNT (11:15 A.M. TO 12:15 P.M.)
(XX)=SUM OF ALL U-TURNS AT MEDIAN OPENING

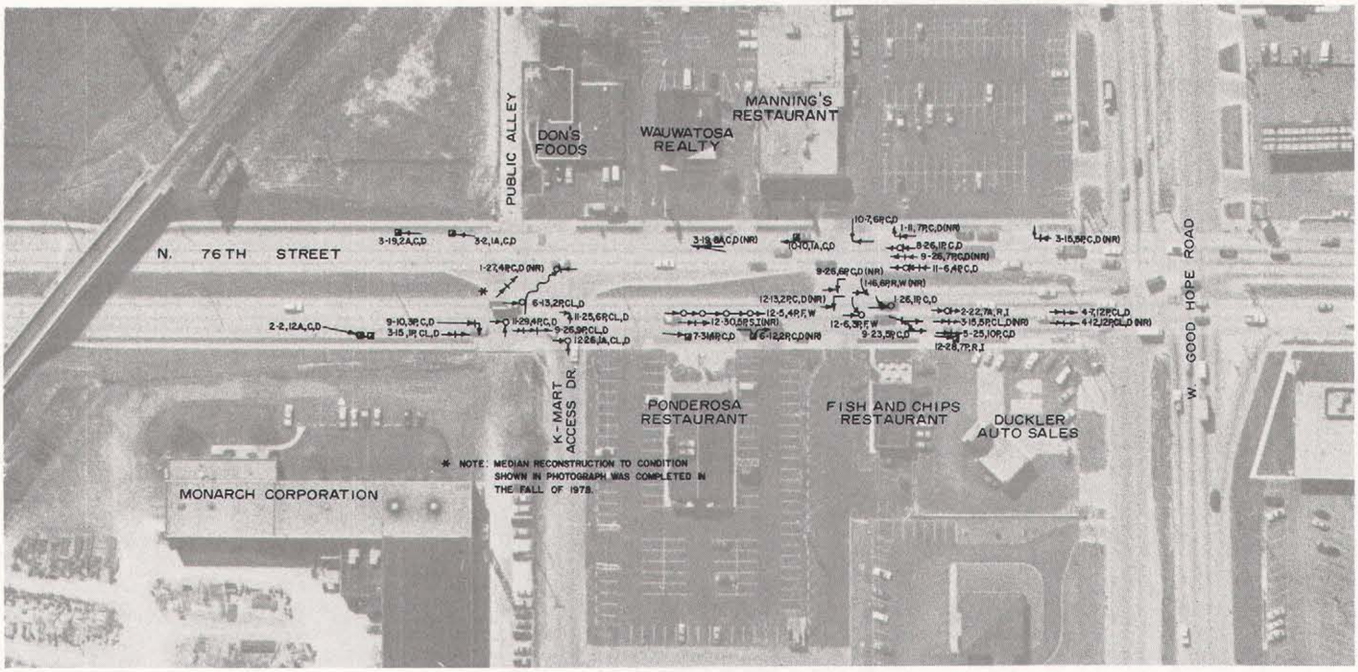


10 HOUR COUNT (11-13-80, 11:00 A.M. TO 9:00 P.M.)

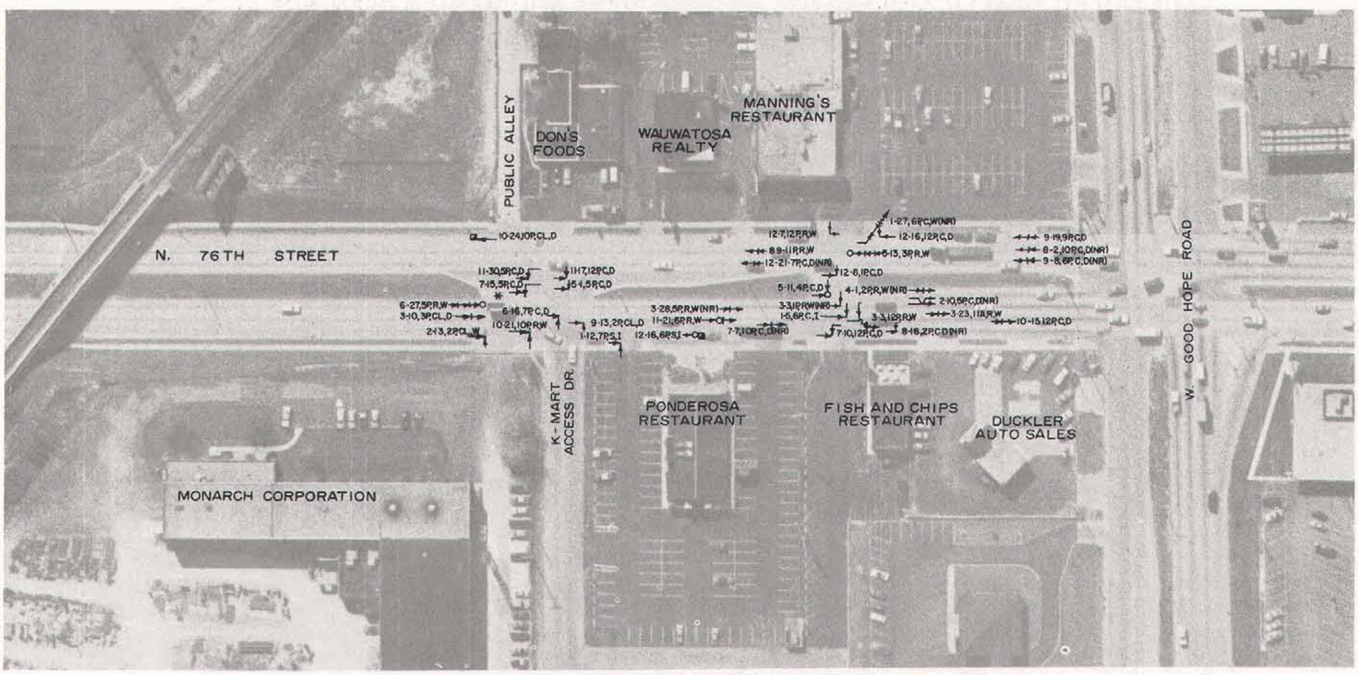
Source: Wisconsin Department of Transportation.

Figure 61

DETAILED COLLISION DIAGRAM FOR THAT SEGMENT OF N. 76TH STREET IMMEDIATELY SOUTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD

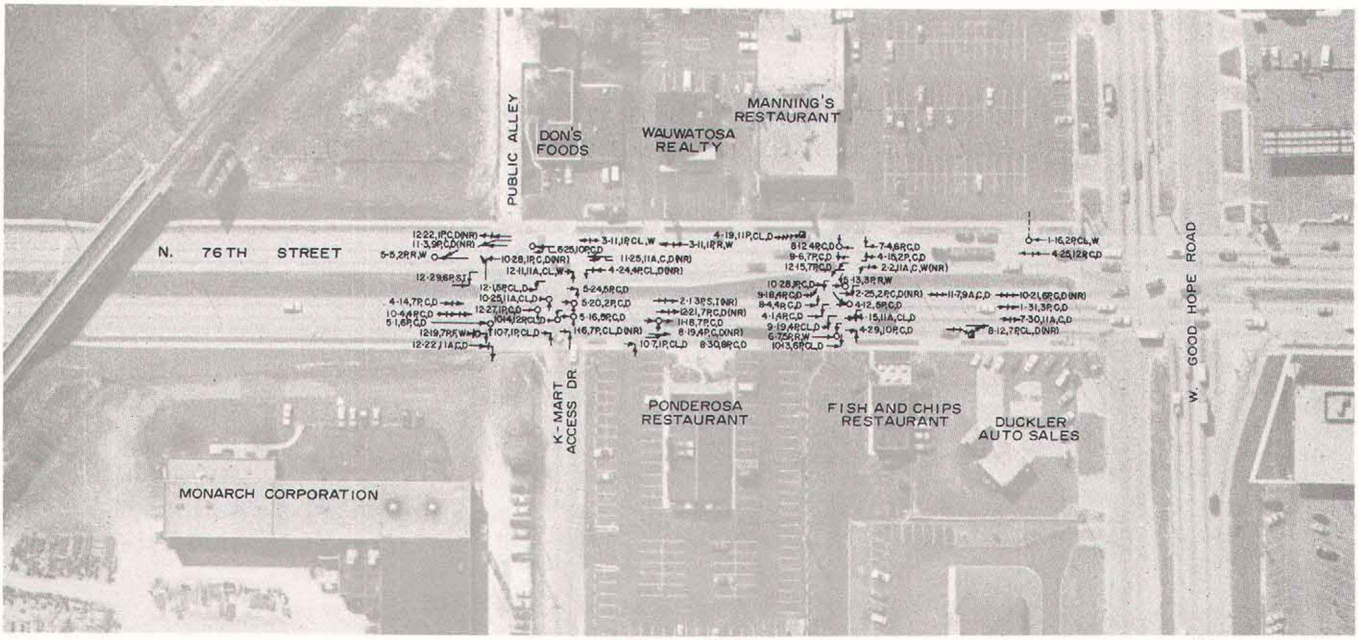


1980 35 ACCIDENTS



1979 36 ACCIDENTS

Figure 61 (continued)



1978 59 ACCIDENTS

COLLISION DIAGRAM
LEGEND

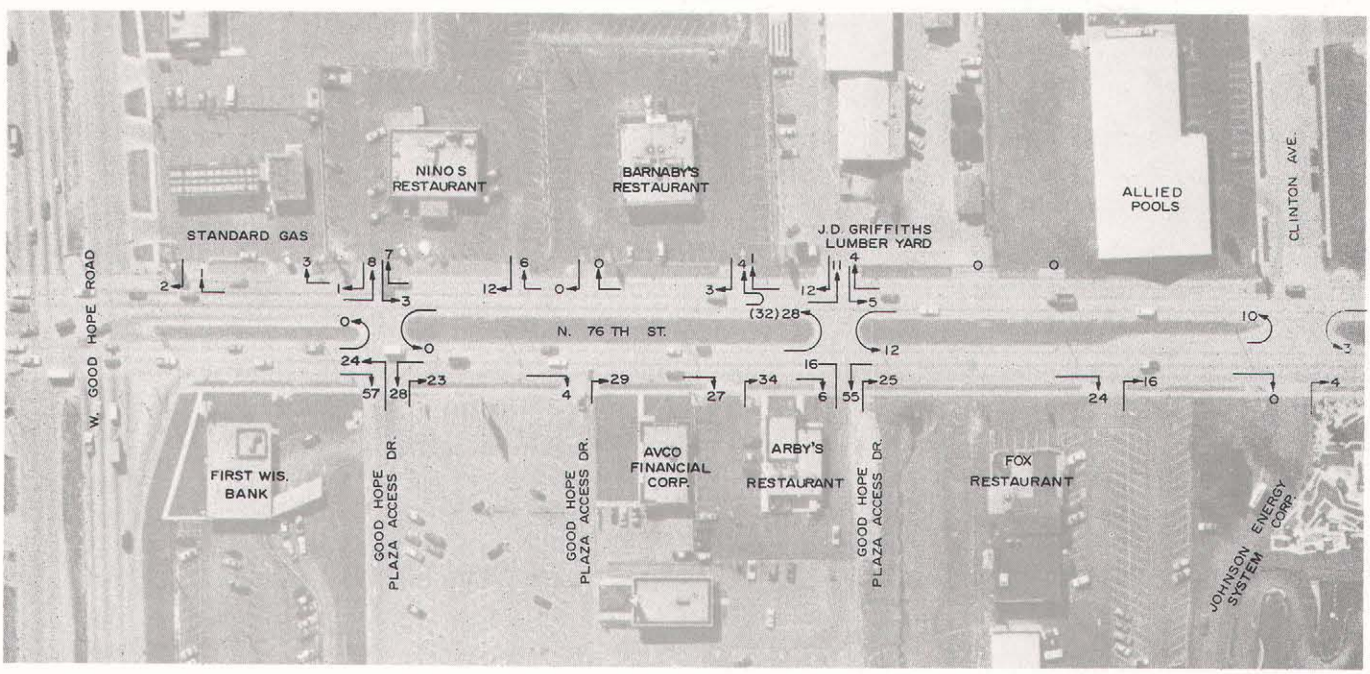
PATH OF MOVING MOTOR VEHICLES
PEDESTRIAN PATH
FATAL
NON-FATAL
REAR-END COLLISION
OVER TURNED
PARKED VEHICLE
FIXED OBJECT

OUT OF CONTROL
MOTORCYCLE
BICYCLE
SIDESWIPE
TIME ... A = AM P = PM
PAVEMENT ... D = DRY I = ICY W = WET
WEATHER ... C = CLEAR CL = CLOUDY F = FOG
R = RAIN SL = SLEET S = SNOW
M = MIST
TYPE ... (NR) = NON- REPORTABLE

Source: Wisconsin Department of Transportation.

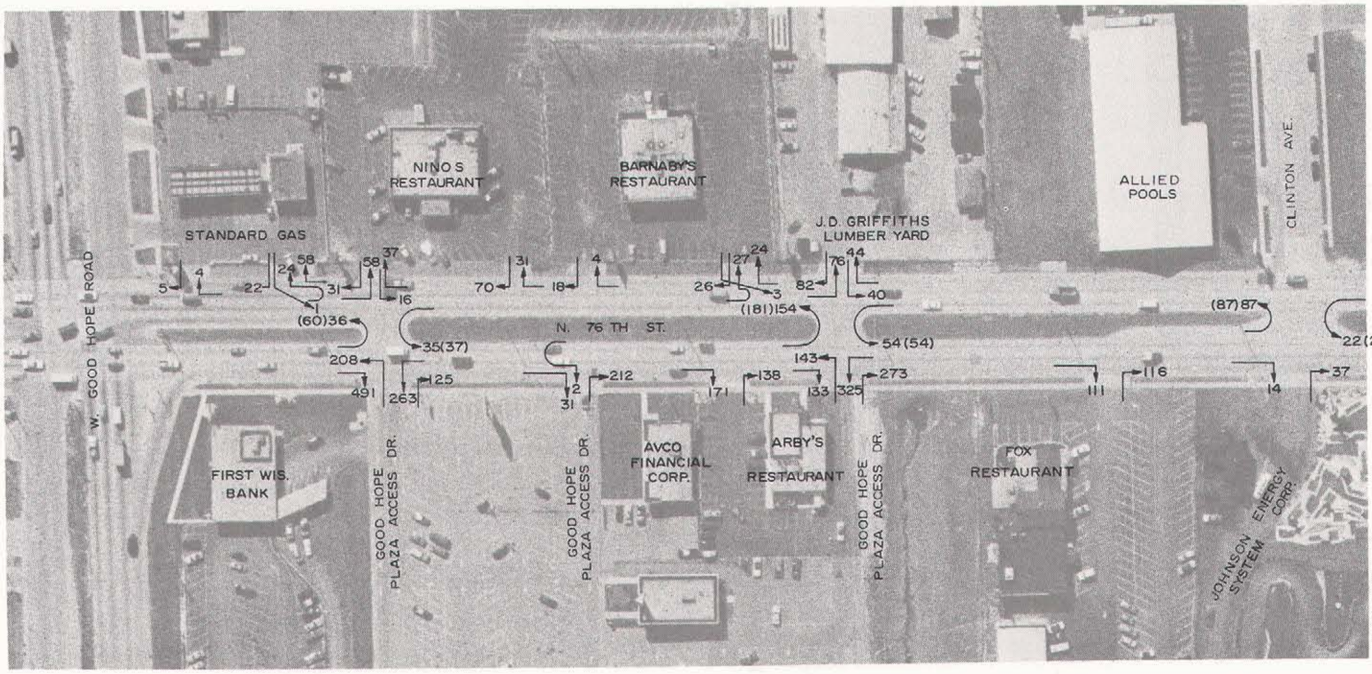
Figure 62

DETAILED TRAFFIC MOVEMENTS AT DRIVEWAYS AND MEDIAN OPENINGS ALONG N. 76TH STREET IMMEDIATELY NORTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD



CRITICAL HOUR COUNT (12:00 PM TO 1:00 PM) (XX) = SUM OF ALL U-TURNS AT MEDIAN OPENING

Figure 62 (continued)

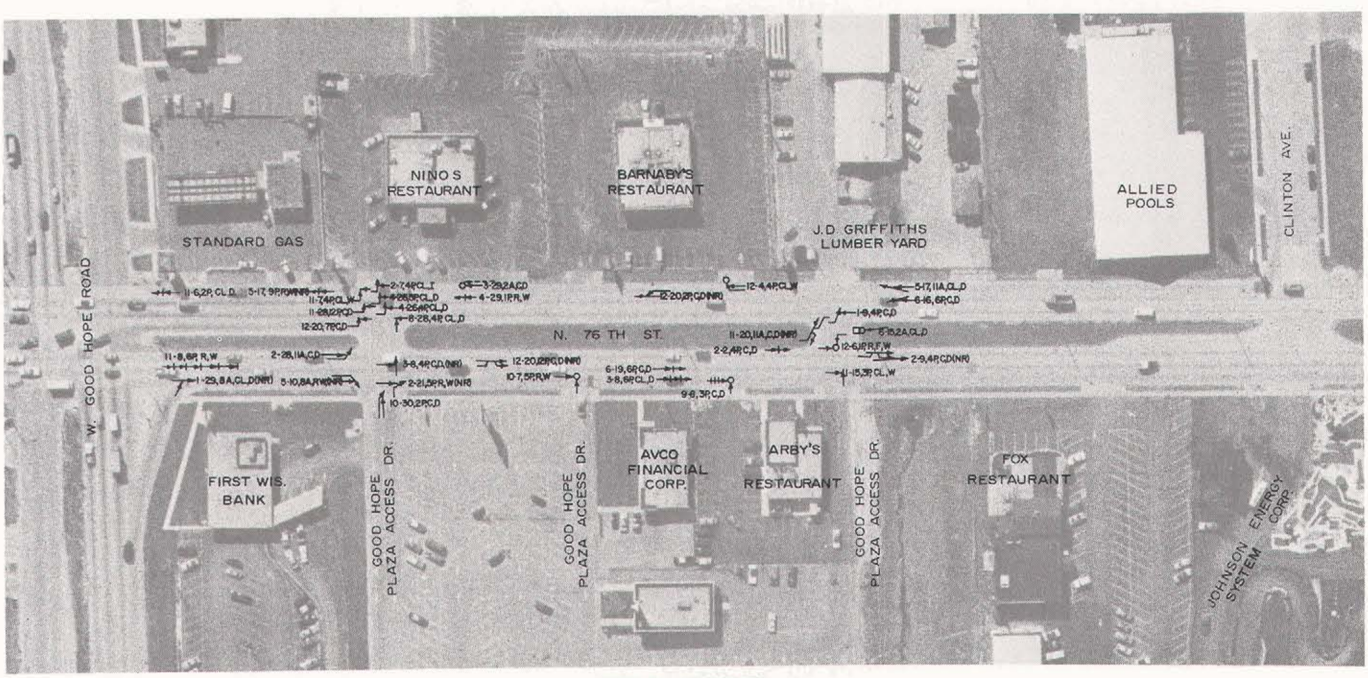


10 HOUR (11-19-80 11:00AM TO 9:00 PM)

Source: Wisconsin Department of Transportation.

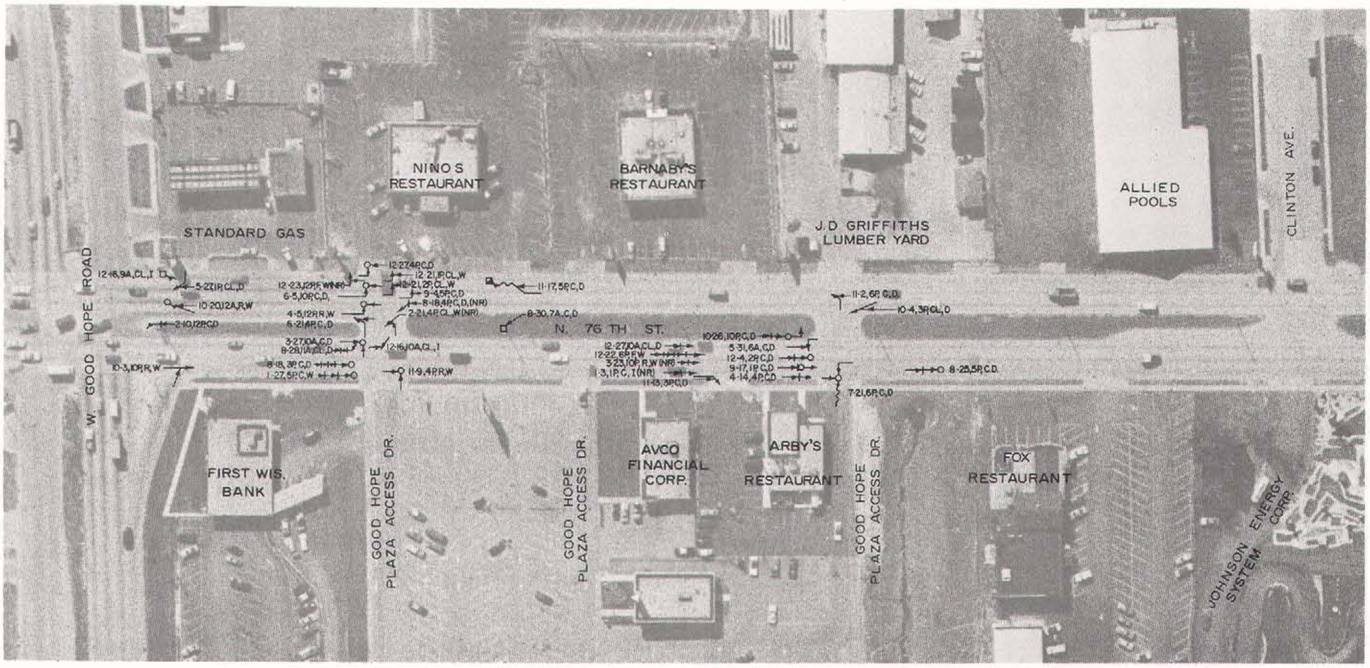
Figure 63

DETAILED COLLISION DIAGRAM FOR THAT SEGMENT OF N. 76TH STREET IMMEDIATELY NORTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD

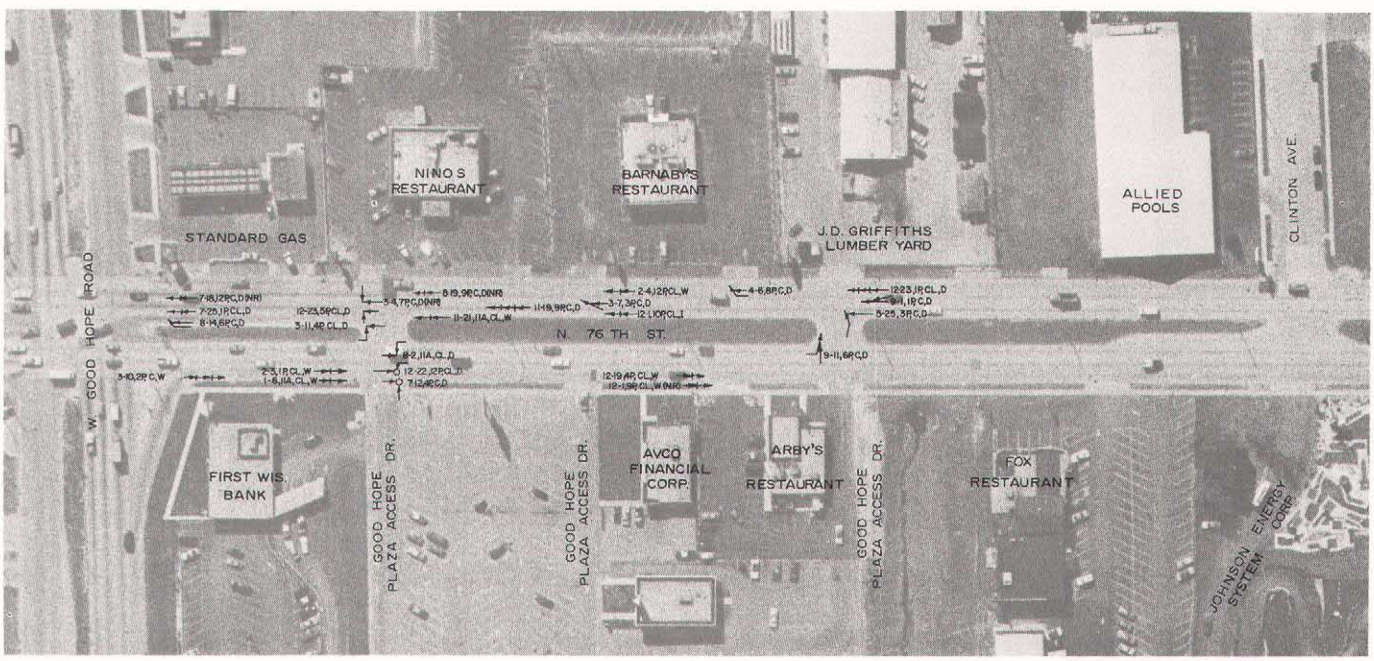


1980 34 ACCIDENTS

Figure 63 (continued)



1979 37 ACCIDENTS



1978 25 ACCIDENTS

COLLISION DIAGRAM
LEGEND

PATH OF MOVING MOTOR VEHICLES
PEDESTRIAN PATH
FATAL
NON-FATAL
REAR-END COLLISION
OVER TURNED
PARKED VEHICLE
FIXED OBJECT
OUT OF CONTROL

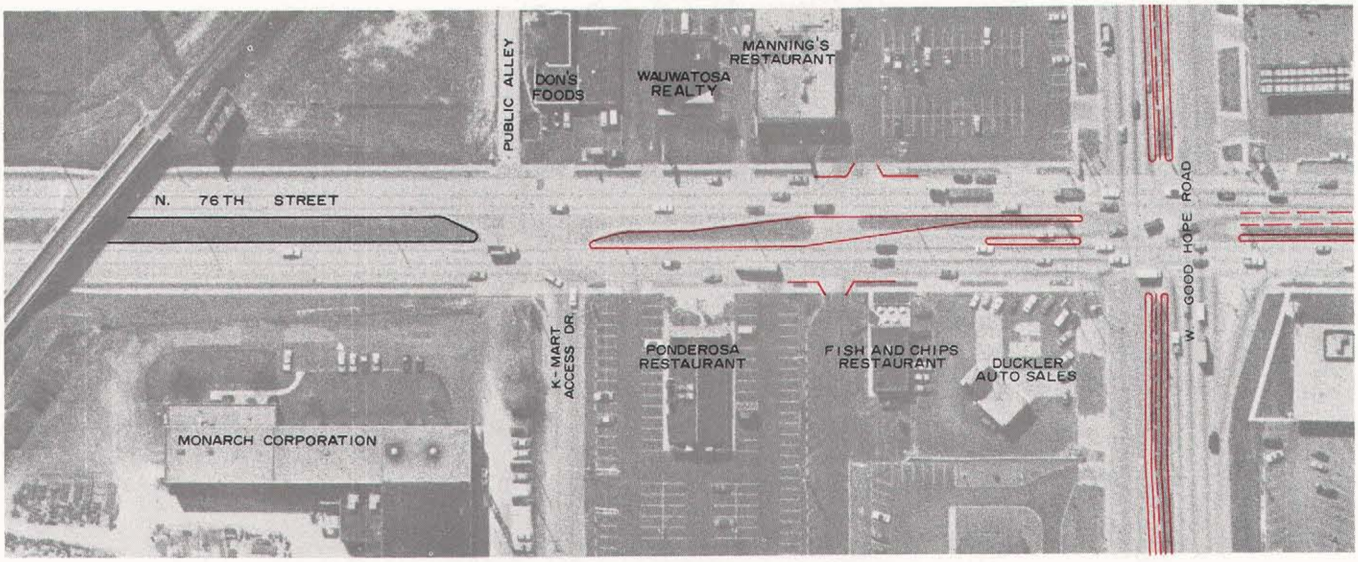
MOTORCYCLE
BICYCLE
SIDESWIPE
TIME ... A = AM P = PM
PAVEMENT ... D = DRY I = ICY W = WET
WEATHER ... C = CLEAR CL = CLOUDY F = FOG
R = RAIN SL = SLEET S = SNOW
M = MIST
TYPE ... (NR) = NON-REPORTABLE

Source: Wisconsin Department of Transportation.

Figure 64

ALTERNATIVE TRAFFIC MANAGEMENT ACTIONS TO ABATE TRAFFIC PROBLEMS AT MEDIAN OPENINGS AND DRIVEWAYS ALONG N. 76TH STREET IMMEDIATELY SOUTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD

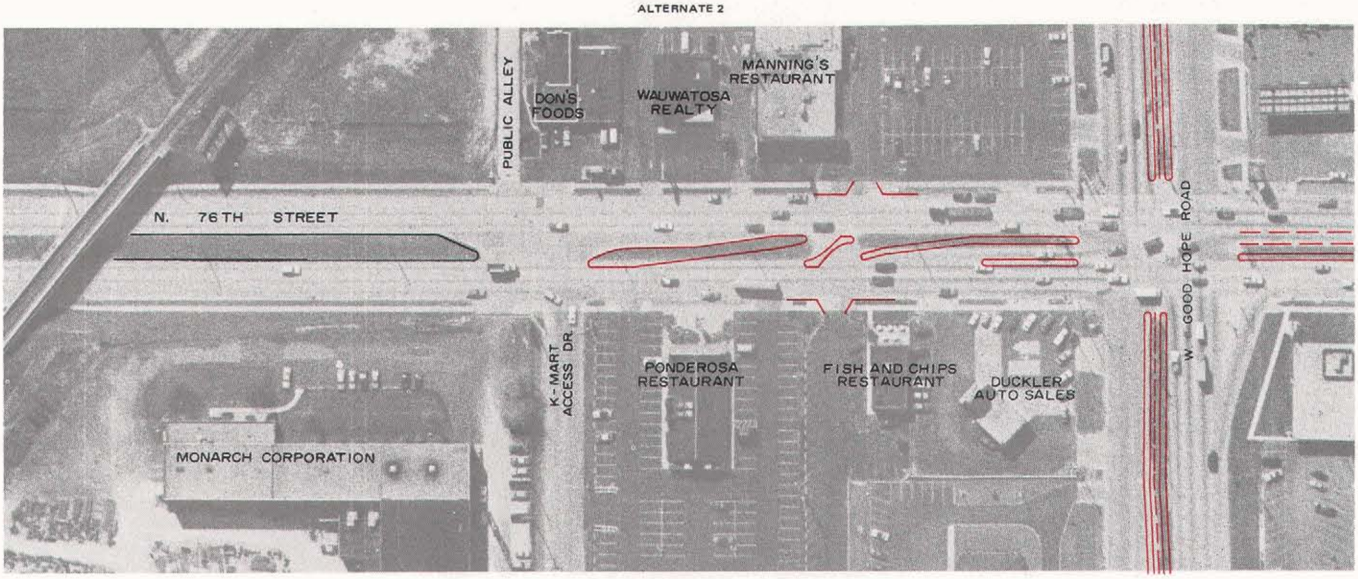
ALTERNATE 1



ADVANTAGES
1. TOTALLY ELIMINATES CONFLICTS AT MEDIAN OPENING BETWEEN K-MART DRIVE AND GOOD HOPE ROAD
2. ELIMINATES ALL RIGHT ANGLE-TYPE ACCIDENTS AT EXISTING MEDIAN OPENING

DISADVANTAGES
1. FORCES INDIRECT INGRESS FOR NORTHBOUND TRAFFIC PATRONIZING WAUWATOSA REALTY & MANNING'S RESTAURANT, AND FOR SOUTHBOUND TRAFFIC PATRONIZING TREACHER'S FISH & CHIPS, PONDEROSA, AND DUCKLER'S
2. FORCES INDIRECT EGRESS FOR TRAFFIC LEAVING TREACHER'S, MANNING'S, AND PONDEROSA
3. INCREASES U-TURN ACTIVITY AT THE FIRST AVAILABLE MEDIAN OPENING SOUTH OF GOOD HOPE ROAD, AND ALSO AT MEDIAN ON GOOD HOPE ROAD WEST OF 76TH STREET
4. TRAFFIC MAKING U-TURNS AT THE OPENING WEST OF 76TH STREET WILL INCREASE INTERSECTION TRAFFIC VOLUMES

ALTERNATE 2

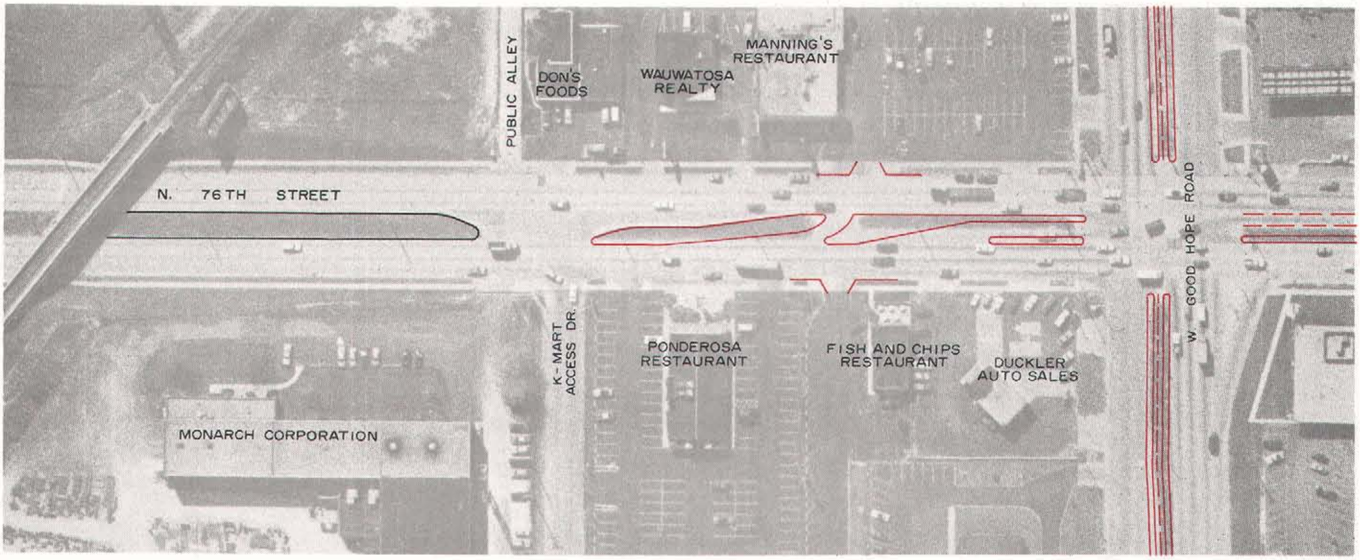


ADVANTAGES
1. PROVIDES DIRECT INGRESS FOR COMMERCIAL ESTABLISHMENTS ON BOTH SIDES OF 76TH STREET
2. PROVIDES STORAGE AND CHANNELIZATION FOR TURNING VEHICLES
3. PARTIALLY ELIMINATES CONFLICTS AT MEDIAN OPENING
4. TRAFFIC ISLAND DISCOURAGES UNWANTED VEHICLE MOVEMENTS

DISADVANTAGES
1. INDIRECT EGRESS FOR NORTHBOUND VEHICLES LEAVING MANNING'S, AND FOR SOUTHBOUND VEHICLES LEAVING TREACHER'S
2. SOUTHBOUND U-TURNS AT K-MART DRIVE CAN BE EXPECTED TO INCREASE
3. SHORTENED TAPER IS USED FOR GOOD HOPE ROAD LEFT-TURN LANE

Figure 64 (continued)

ALTERNATE 3



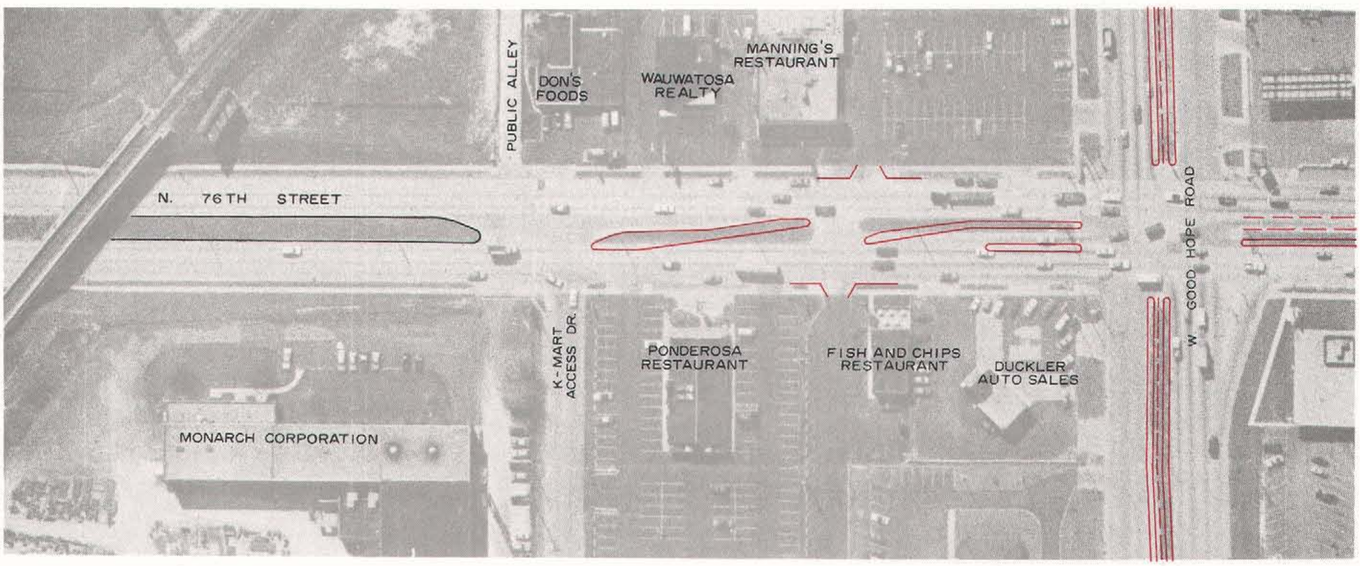
ADVANTAGES

1. PROVIDES DIRECT INGRESS TO MANNING'S RESTAURANT AND NORTHBOUND U-TURN OPPORTUNITIES
2. PROVIDES STORAGE AND CHANNELIZATION TO ACCOMMODATE THE LARGEST MIDBLOCK TRAFFIC MOVEMENT
3. ELIMINATES MANY OF THE EXISTING CONFLICTS AT THE MEDIAN OPENING

DISADVANTAGES

1. PREVENTS DIRECT SOUTHBOUND INGRESS TO TREACHER'S FISH & CHIPS AND TO DUCKLER'S
2. INDIRECT EGRESS FOR VEHICLES SOUTHBOUND FROM TREACHER'S AND NORTHBOUND FROM MANNING'S
3. U-TURN ACTIVITY AT K-MART DRIVE CAN BE EXPECTED TO INCREASE. ADDITIONAL NORTHBOUND U-TURN MAY ALSO OCCUR AT THE FIRST MEDIAN OPENING NORTH OF GOOD HOPE, THEREBY INCREASING INTERSECTION VOLUMES

ALTERNATE 4



ADVANTAGES

1. MEDIAN OPENING ACCOMMODATES THE SAME VEHICULAR MOVEMENTS AS DOES THE EXISTING OPENING
2. LEFT-TURN LANE STORAGE THAT IS PROVIDED AT MEDIAN OPENING WILL TEND TO SOMEWHAT REDUCE ACCIDENT POTENTIAL AND DELAYS FOR THROUGH TRAFFIC
3. NO TRAFFIC MOVEMENTS ARE DIVERTED TO OTHER LOCATIONS

DISADVANTAGES

1. CONFLICTS OCCURRING AT MEDIAN OPENING ARE NOT RELIEVED
2. FEWER ACCIDENT REDUCTIONS CAN BE EXPECTED
3. SHORTENED TAPER IS USED FOR LEFT-TURN LANE TO GOOD HOPE ROAD

Source: Wisconsin Department of Transportation.

median opening to northbound N. 76th Street. Alternative 3 would, however, likely cause some traffic to exit Manning's Restaurant to northbound N. 76th Street at the next median opening south of the intersection of W. Good Hope Road and N. 76th Street, resulting in circuity of travel. Nevertheless, using this median opening would be safer than using the problem median opening because this median opening would be expected to have fewer potential traffic conflicts, a limited number of other turns would be made there, and it would be further removed from the intersection of N. 76th Street with Good Hope Road. Alternative 3 may also cause some traffic exiting Manning's Restaurant to northbound N. 76th Street to use an existing driveway to W. Good Hope Road, and then to turn left to northbound N. 76th Street with no indirection. The capital cost of Alternative 3 is estimated at $36,000.

Figure 62 shows traffic volumes at driveways and median openings along N. 76th Street north of W. Good Hope Road. The major traffic movements along this segment are generally on the east side of N. 76th Street to and from the Good Hope Plaza Shopping Center and, to a lesser extent, to and from the First Wisconsin National Bank, the AVCO Financial Corporation, and Arby's Restaurant. On the west side of N. 76th Street there are fewer traffic movements, mainly occurring to and from Nino's and Bally's Tomfollery Restaurants. As shown in Figure 62, a concentration of rear-end accidents occurs as a result of northbound traffic making right turns into the shopping center. In addition, there is a concentration of accidents as a result of north- and southbound traffic making left-turn and U-turn movements through the first and second median openings north of W. Good Hope Road.

Figure 65 shows two alternative traffic management actions to abate the conflicts at these problem median openings, along with a summary of their advantages and disadvantages. The recommended action, Alternative 2, would provide for left-turn lanes on both sides of the second median opening north of W. Good Hope Road in order to provide refuge areas for vehicles using this median opening from the north and south. Also, this alternative would provide for the relocation of the first median opening north of W. Good Hope Road slightly to the north. This new median opening would align with new driveway entrances on each side of N. 76th Street, requiring an existing driveway entrance to the Good Hope Plaza Shopping Center on the east side of N. 76th Street to be relocated slightly to the south, and a new consolidated driveway entrance on the west side of N. 76th Street to be constructed on a common property line to serve both Bally's Tomfollery and Nino's Restaurants. Left-turn lanes would also be provided on each side of this new median opening. Besides providing necessary storage area for vehicles accessing the Good Hope Plaza Shopping Center, this alternative would eliminate much of the circuitous traffic movements along this segment, as median openings would better align with driveway openings. The estimated capital cost of this alternative is $75,000.

SPECIAL SHORT-RANGE TRANSPORTATION SYSTEMS MANAGEMENT ACTIONS: RESOLUTION OF FREEWAY "STUB ENDS"

Two particularly important elements of the short-range transportation system plan for the northwestern quadrant of the Milwaukee area are the proposals for the integration of the "stub ends" of two freeways into the existing surface arterial street system. The "stub ends" concerned are those of the Park Freeway-West and Park Freeway spur at the uncompleted Hillside Interchange on the North-South Freeway (IH 43), and those of the Stadium Freeway-North at W. Lloyd Street. These "stub ends" exist because two proposed freeways—the Park Freeway-West/Park Spur and the Stadium Freeway-North "gap closure" were removed from the adopted long-range regional transportation system plan in 1978.

HILLSIDE INTERCHANGE AND SPUR "STUB ENDS"

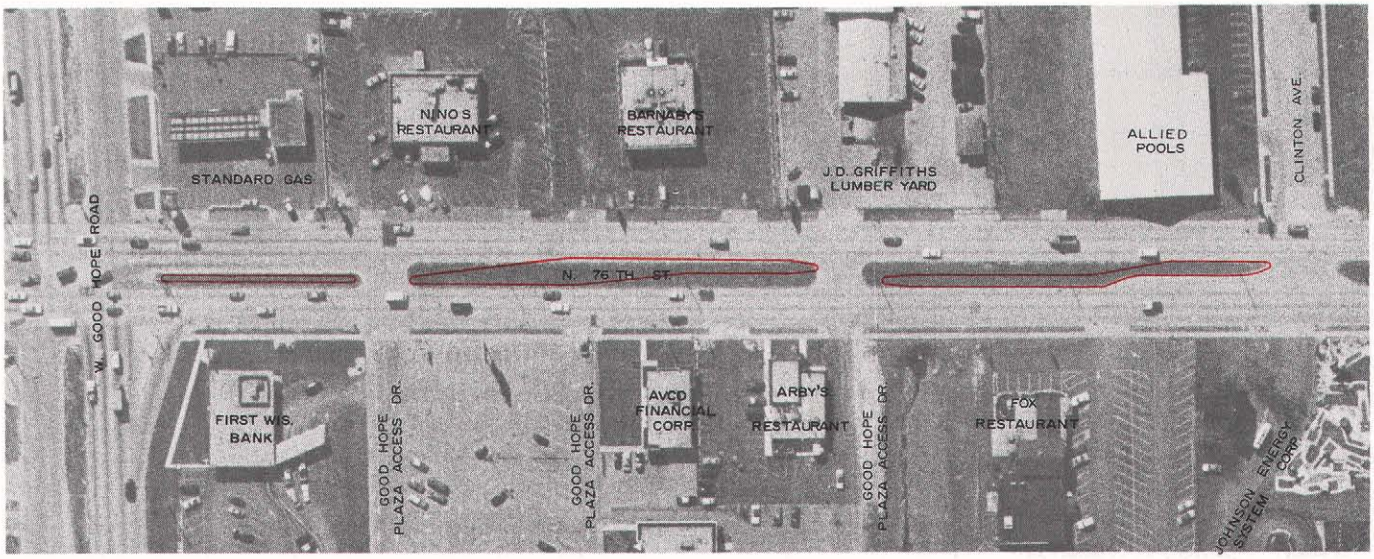
As originally proposed, the Hillside Interchange and spur, as shown on Map 148, would have provided the connections between the Park Freeway-East and the Park Freeway-West, between the Park Freeway-East and the North-South Freeway (IH 43), and between the Park Freeway-West and the North-South Freeway. As a result of the removal of the Park Freeway-West and Park Freeway spur from the regional and, subsequently, state and local transportation system plans, the Hillside Interchange and spur was left with seven "stub ends."

Four "stub ends" are at the Hillside Interchange proper: 1) the north- to northwest-bound ramp from the North-South Freeway (IH 43) to the no longer-recommended Park Freeway-West; 2) the southeast- to southbound ramp from the no longer-

Figure 65

ALTERNATIVE TRAFFIC MANAGEMENT ACTIONS TO ABATE TRAFFIC PROBLEMS AT MEDIAN OPENINGS AND DRIVEWAYS ALONG N. 76TH STREET IMMEDIATELY NORTH OF ITS INTERSECTION WITH W. GOOD HOPE ROAD

ALTERNATE 1



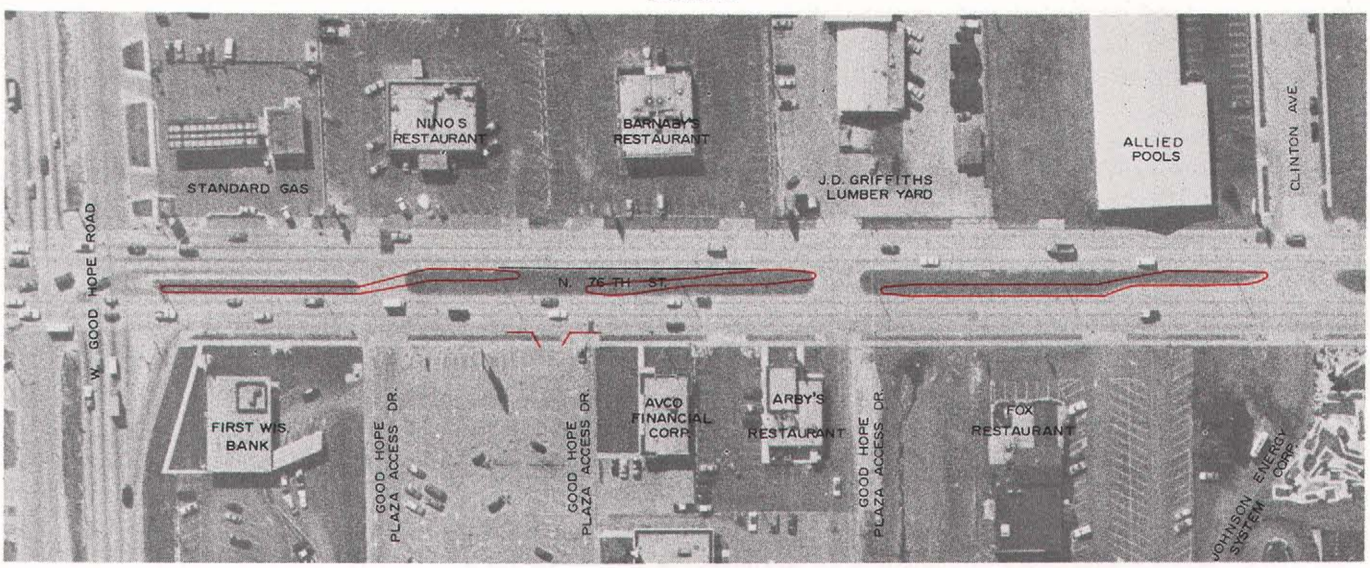
ADVANTAGES

1. PROVIDES STORAGE FOR HEAVY LEFT-TURN MOVEMENT INTO GOOD HOPE PLAZA AT NORTH ACCESS DRIVEWAY
2. PROVIDES STORAGE FOR NORTHBOUND MIDBLOCK U-TURNS TO NINO'S, BARNABY'S, AND J. D. GRIFFITH'S
3. PROVIDES ADEQUATE TAPER FOR DOUBLE LEFT TURN AT GOOD HOPE ROAD
4. ADDED STORAGE WILL TEND TO REDUCE LOCALIZED ACCIDENT POTENTIAL AND IMPROVE TRAVEL TIMES FOR THROUGH VEHICLES
5. RETAINS ALL EXISTING TRAFFIC MOVEMENTS
6. PROVIDES STORAGE FOR LEFT-TURN MOVEMENT INTO GOOD HOPE PLAZA AT SOUTH ACCESS DRIVEWAY

DISADVANTAGES

1. VEHICLES STORED FOR TURNS AT SOUTH MEDIAN OPENING BOULD DIMINISH THE EFFECTIVENESS OF THE DOUBLE LEFT-TURN LANE
2. CONFLICTS ARE NOT RELIEVED IN THE VICINITY OF THE SOUTH MEDIAN OPENING
3. SAFETY AREA, FOR TRANSVERSE MEDIAN TRAFFIC, HAS BEEN ELIMINATED AT SOUTH MEDIAN OPENING

ALTERNATE 2



ADVANTAGES

1. PROVIDES STORAGE FOR HEAVY LEFT-TURN MOVEMENT INTO GOOD HOPE PLAZA AT NORTH ACCESS DRIVEWAY
2. PROVIDES STORAGE FOR NORTHBOUND MIDBLOCK U-TURNS TO NINO'S, BALLY'S TOM FOOLERY, AND J. D. GRIFFITH'S
3. PROVIDES ADEQUATE TAPER FOR DOUBLE LEFT TURN AT GOOD HOPE ROAD
4. ADDED STORAGE WILL TEND TO REDUCE LOCALIZED ACCIDENT POTENTIAL AND IMPROVE TRAVEL TIMES FOR THROUGH VEHICLES
5. ELIMINATES TRAFFIC CONFLICTS AT SOUTH MEDIAN OPENING
6. RELOCATES SOUTH MEDIAN OPENING FOR ACCESS TO SHOPPING CENTER AND ALSO TO RESTAURANTS ON THE WEST; PROVIDES SAME CIRCULATION AS AT ORIGINAL OPENING, WITH STORAGE PROVIDED

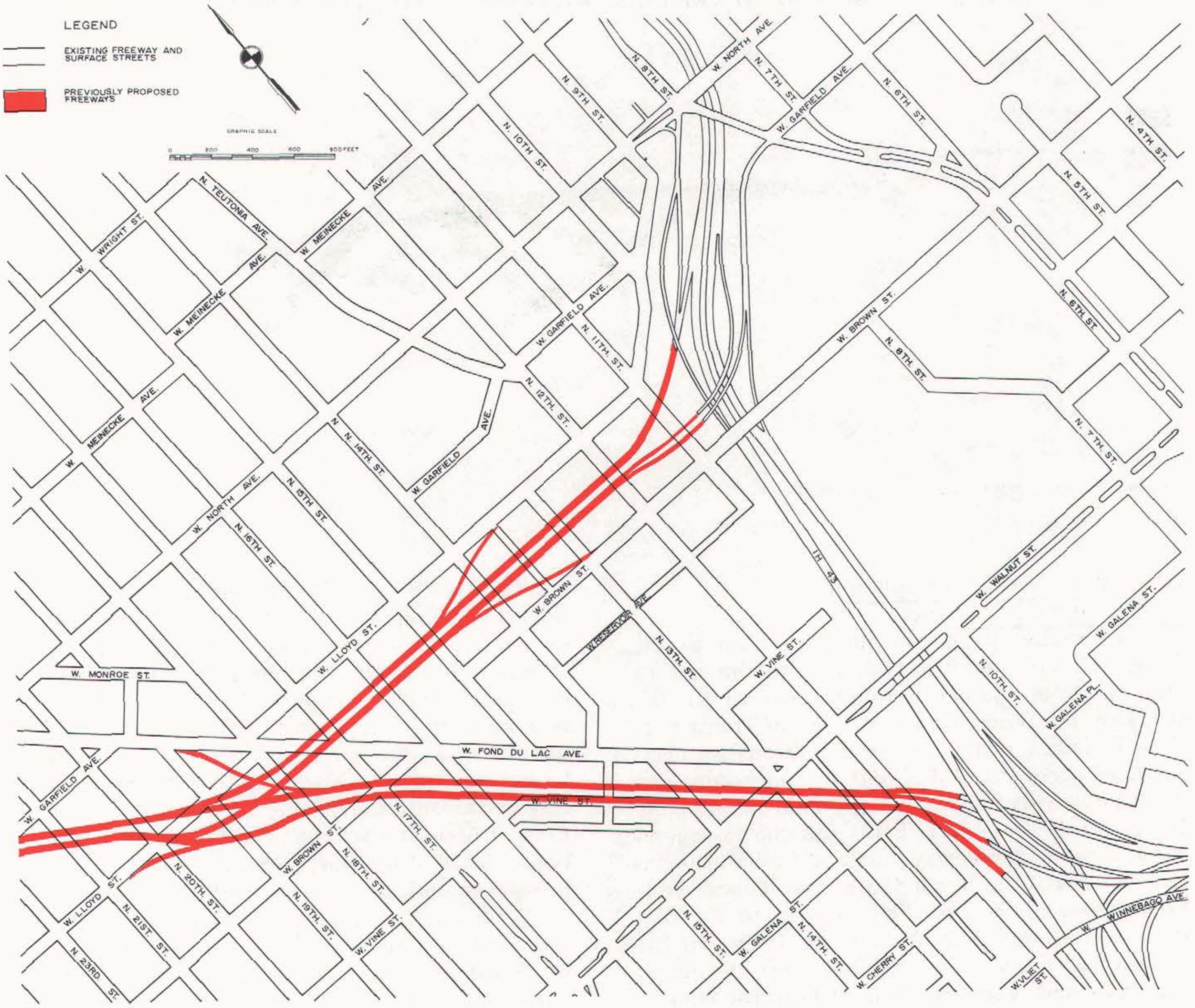
DISADVANTAGES

1. INDIRECT INGRESS TO BANK THROUGH SHOPPING CENTER'S PARKING LOT
2. REQUIRES A DRIVEWAY RELOCATION AT THE SHOPPING CENTER AND CONSTRUCTION OF A COMMON DRIVEWAY BETWEEN THE RESTAURANTS ON THE WEST

Source: Wisconsin Department of Transportation.

Map 148

THE HILLSIDE INTERCHANGE AND PARK FREEWAY-WEST AND PARK FREEWAY SPUR AS ORIGINALLY PROPOSED SHOWING "STUB ENDS"



As shown on this map, as originally proposed, the Hillside Interchange and spur was to have provided the connections between the Park Freeways-East and West and the North-South Freeway (IH 43). As a result of the removal of the Park Freeway-West and Park Freeway spur from the regional and, subsequently, the state and local transportation system plans, the Hillside Interchange and spur were left with seven "stub ends."

Source: SEWRPC.

recommended Park Freeway-West to the North-South Freeway; 3) the west- to northwest-bound through lanes from the Park Freeway-East to the no longer-recommended Park Freeway-West; and 4) the east- to southeast-bound through lanes from the no longer-recommended Park Freeway-West to the Park Freeway-East. As shown on Map 148, approximately 17.5 acres of land were cleared to accommodate the connections to these four "stub ends."

Average weekday traffic volumes in 1979 in the vicinity of the Hillside Interchange were approximately 9,000 vehicles on W. Fond du Lac Avenue in the vicinity of N. 14th Street, approximately 13,500 vehicles on W. Walnut Street east of N. 12th Street, approximately 7,500 vehicles on W. Walnut Street east of N. 20th Street, and approximately 109,000 vehicles on the North-South Freeway (IH 43) north of the Hillside Interchange.

Figure 66

ALTERNATIVE NO. 1 FOR THE HILLSIDE INTERCHANGE "STUB END" CONNECTION

Source: Wisconsin Department of Transportation.

Alternative Plans for Completion of the Hillside Interchange

Five alternative plans for the integration of the Hillside Interchange "stub end" into the surface arterial street system were prepared under the study by the Wisconsin Department of Transportation, District 2 staff. Each of the alternative plans provided access from W. Fond du Lac Avenue and W. Walnut Street to the southbound lanes of the North-South Freeway (IH 43) and the eastbound lanes of the Park Freeway-East, and from the northbound lanes of the North-South Freeway and westbound lanes of the Park Freeway-East to W. Fond du Lac Avenue and W. Walnut Street. Two of the alternative plans met desirable freeway design standards and would result in little traffic congestion at the connection; however, these plans were costly, and their development would require the acquisition of additional right-of-way. Another two alternatives were of lower cost and involved little or no disruption, but did not meet desirable design standards and were expected to result in some traffic congestion at the connection. The fifth alternative, which was recommended by the Commission staff and adopted by the study Advisory Committee on January 30, 1980, was a modification of one of the two lower cost alternatives. This modified alternative met desirable design standards at a minimum cost and required no new right-of-way, but could be expected to involve some traffic congestion. A description of each of the five alternative designs developed by the Wisconsin Department of Transportation, along with the estimated costs, traffic volumes, and disruption, is presented below.

Alternative Plan 1: The first alternative plan considered for completion of the Hillside Interchange, one of the two higher cost alternatives, is shown in Figure 66. Under this alternative plan, freeway on-ramps would be provided from W. Fond du Lac Avenue at about N. 15th Street and from W. Walnut Street at about N. 13th Street to the southbound lanes of the North-South Freeway (IH 43) and to the eastbound lanes of the Park Freeway-East. Off-ramps would be provided from the northbound lanes of the North-South Freeway and from the westbound lanes of the Park Freeway-East to W. Fond du Lac Avenue at about N. 14th Street and to W. Walnut Street at about N. 15th Street. W. Fond du Lac Avenue would be extended northwest-bound from W. Walnut Street at N. 12th Lane to N. 15th Street and southeast-bound from N. 15th Street to the intersection of N. 13th Street and W. Cherry Street. W. Walnut Street would have no street intersections between N. 15th Street and N. 12th Street. All of the new ramps would have grades of less than 4 percent, the desired design standard for such ramps.

Four structures would be required to provide the necessary grade separation of traffic movements. One structure would be required on N. 12th Street over the new freeway on- and off-ramps in the vicinity of W. Galena Street. Two more would be required on W. Walnut Street at N. 13th Street and N. 14th Street. Another would be required for the freeway off-ramp from W. Walnut Street over the freeway on-ramp from W. Fond du Lac Avenue.

Table 162

IMPACTS OF THE IMPLEMENTATION OF THE ALTERNATIVE AND RECOMMENDED DESIGNS FOR COMPLETION OF THE HILLSIDE INTERCHANGE

Impact Variable	Hillside Interchange Design Alternatives				
	1	2	3	4	Adopted 5
Cost					
Right-of-Way	$1,500,000	$ 320,000	$ --	$ 460,000	$ --
Construction	5,300,000	1,600,000	3,000,000	6,600,000	3,020,000
Engineering and Contingencies	800,000	200,000	500,000	1,000,000	500,000
Total Cost[a] (in 1980 dollars)	$7,600,000	$2,120,000	$3,500,000	$8,060,000	$3,520,000
Right-of-Way Taken (acres)					
New Right-of-Way Required	5.3	0.3	--	3.4	--
Existing Right-of-Way Not Used	5.6	12.8	10.3	3.7	10.3
Total Right-of-Way Required	17.2	5.0	7.2	17.2	7.2
Structures Displaced					
Residential	35	--	--	2	--
Commercial	6	2	--	2	--
Other	--	--	--	1	--

[a]*Does not include utility costs.*

Source: Wisconsin Department of Transportation and SEWRPC.

During peak travel hours in the plan design year 2000, the new freeway off-ramp to the surface street system could be expected to operate at level-of-service C, but the combined freeway on-ramp from W. Fond du Lac Avenue and W. Walnut Street would operate at level-of-service D. All surface arterial street intersections in the vicinity of the completed interchange could be expected to operate at level-of-service C.

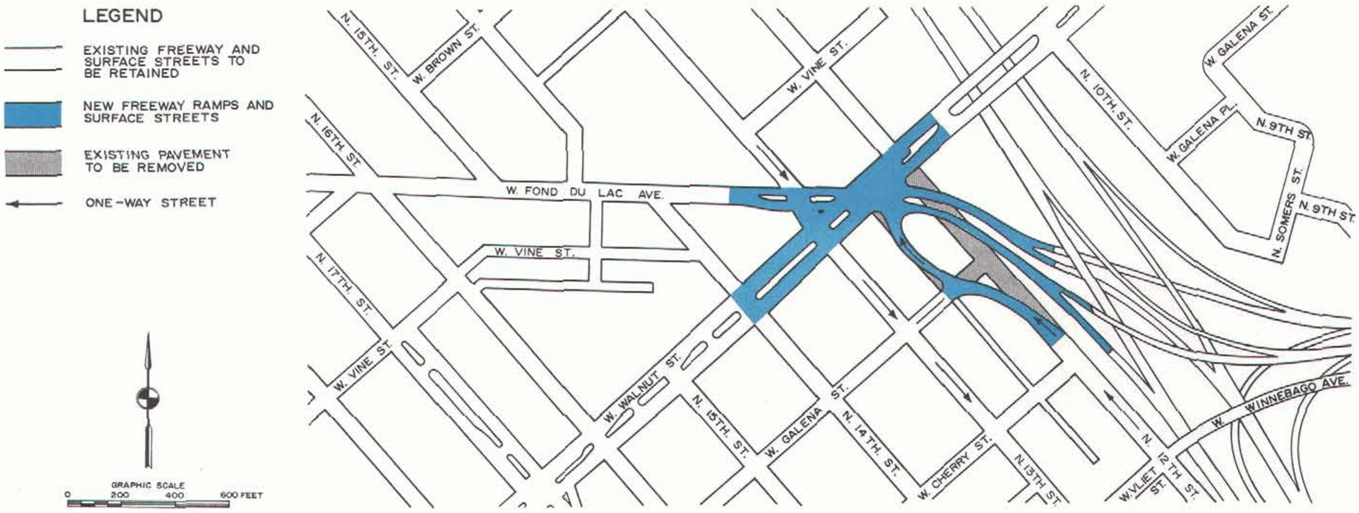
As shown in Table 162, the total cost of this alternative "stub end" connection is estimated at $7,600,000, expressed in 1980 dollars, of which $1,500,000 would be required for the acquisition of additional right-of-way. About 5.3 acres of new right-of-way would be required under this alternative, and about 5.6 acres of existing right-of-way would not be used. In total, this connection would require about 17.2 acres of right-of-way. The connection would require the displacement of 35 residential and six commercial structures.

Alternative Plan 2: The second alternative plan considered for the completion of the Hillside Interchange is shown in Figure 67, and is one of the two lower cost alternatives. This alternative would provide for connections between the intersection of W. Fond du Lac Avenue, W. Walnut Street, and N. 12th Street, relocated about one-half block westerly, and ramps to and from the Park Freeway-East; and northbound from, and southbound to, the North-South Freeway. Under this alternative plan, N. 12th Street would operate one way northbound.

No new grade-separation structures would be required under this alternative. However, because of the relatively short length of the ramps under this alternative plan, a 7 percent grade would be necessary on the freeway on- and off-ramps in order to negotiate the incline from the "stub ends" to the arterial street system. This grade exceeds the desirable design standard for freeway ramp grades, and could affect the safe and efficient operation of the ramps, particularly during severe winter weather. The ramps would, however, meet minimum acceptable freeway design standards. The steep grade of the off-ramp to the signalized intersection of W. Fond du Lac Avenue, W. Walnut Street, and N. 12th Street could also affect the safe and efficient operation of the intersection during severe winter weather.

Figure 67

ALTERNATIVE NO. 2 FOR THE HILLSIDE INTERCHANGE "STUB END" CONNECTION



Source: Wisconsin Department of Transportation.

Because of its short length, steep grade, and termination the signalized intersection, the freeway off-ramp approaching the five-legged intersection of W. Fond du Lac Avenue, W. Walnut Street, and N. 12th Street may be expected to operate at level-of-service E during the evening peak travel hour in the plan design year 2000. The surface street approaches to the five-legged intersection may be expected to operate at level-of-service D during the morning peak travel hour and at level-of-service E during the evening peak travel hour.

The total cost of this plan is estimated at $2,120,000, expressed in 1980 dollars, of which $320,000 would be required for the acquisition of additional right-of-way. About 0.3 acre of new right-of-way would be required, and about 12.8 acres of existing right-of-way would not be used. In total, this connection would require about 5.0 acres of right-of-way. It would also require the displacement of two commercial structures.

Alternative Plan 3: The third alternative plan considered for completion of the Hillside Interchange, like Alternative 2, would provide for the connection of the North-South Freeway (IH 43) and the Park Freeway-East to the surface street system at the intersection of W. Fond du Lac Avenue and W. Walnut Street, as shown in Figure 68. The connection at this intersection would be provided at about N. 13th Street. East of N. 14th Street, W. Fond du Lac Avenue would need to be curved to the south to meet this intersection. N. 13th Street would have its northern terminus at this intersection, and would be one way southbound from W. Walnut Street.

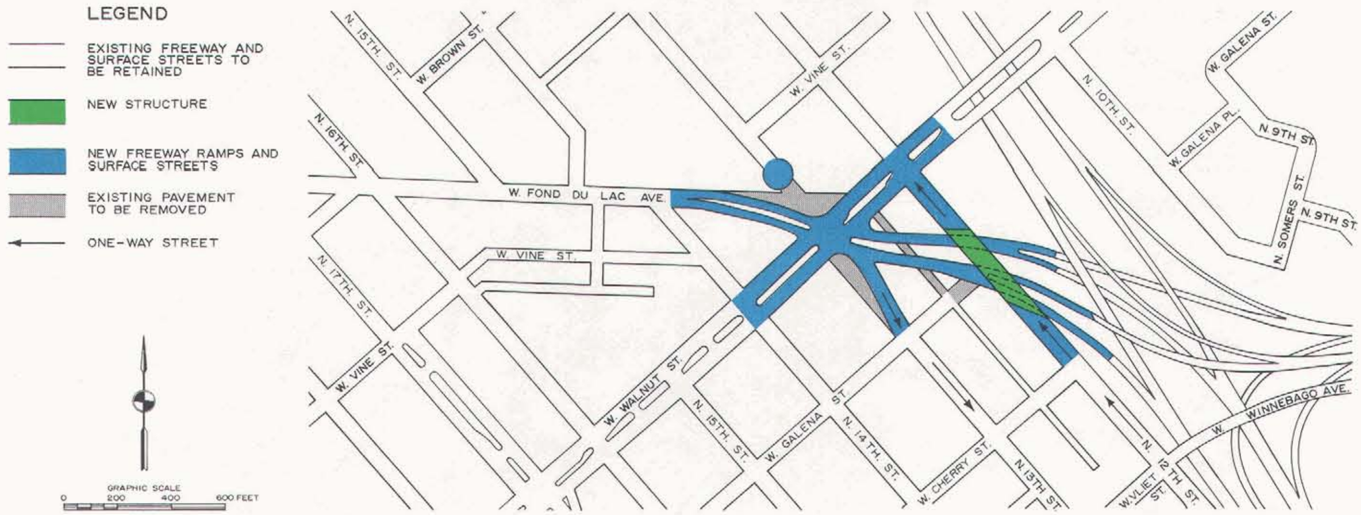
Under this alternative connection, one new grade-separation structure would be provided to carry N. 12th Street over the new freeway on- and off-ramps in the vicinity of W. Galena Street. A 5 percent grade would be necessary on each of the ramps, exceeding the desirable design standard for freeway ramp grades.

Because of its relatively short length, steep grade, and termination in the signalized intersection, the off-ramp approaching the intersection of W. Fond du Lac Avenue and W. Walnut Street could be expected to operate at level-of-service D during both peak travel hours in the plan design year 2000. The intersection of W. Fond du Lac Avenue, W. Walnut Street, and the freeway on- and off-ramps could be expected to operate at level-of-service D during both peak travel hours.

The total cost of this alternative is estimated at $3,500,000, expressed in 1980 dollars. No additional right-of-way or disruption would be entailed, as all construction would be confined to the existing right-of-way. About 10.3 acres of the existing right-of-way would not be used under this alternative.

Figure 68

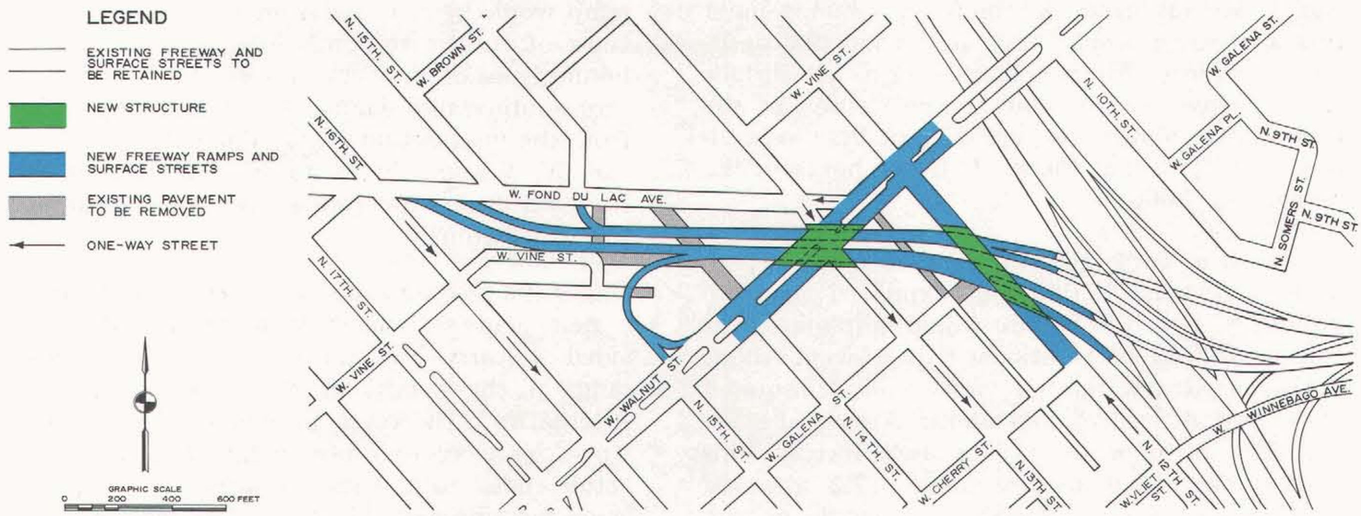
ALTERNATIVE NO. 3 FOR THE HILLSIDE INTERCHANGE "STUB END" CONNECTION



Source: Wisconsin Department of Transportation.

Figure 69

ALTERNATIVE NO. 4 FOR THE HILLSIDE INTERCHANGE "STUB END" CONNECTION



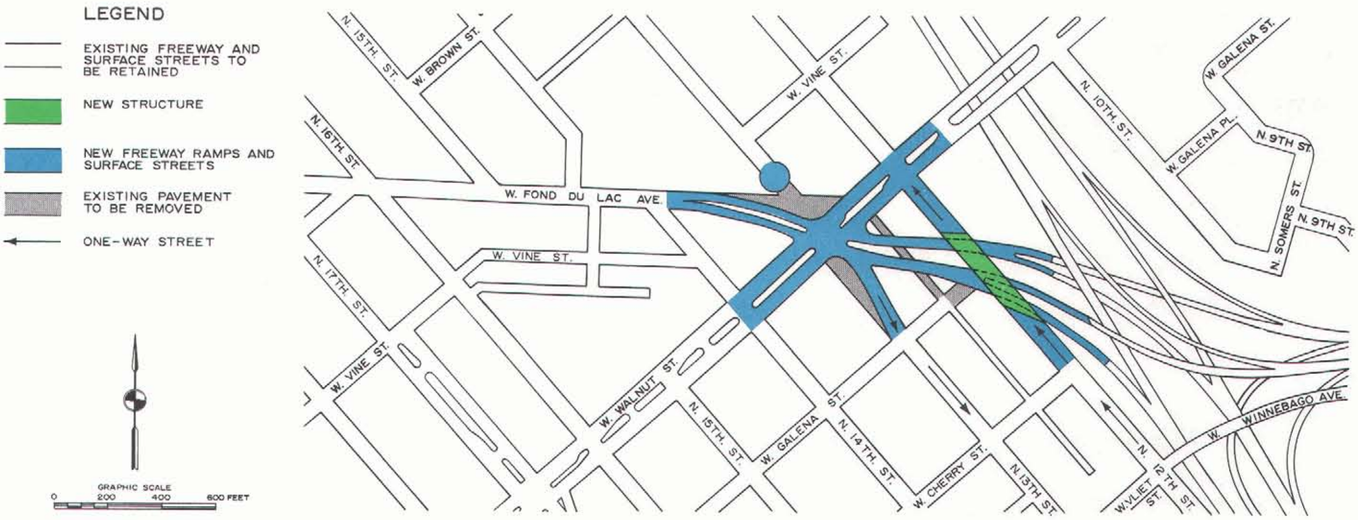
Source: Wisconsin Department of Transportation.

Alternative Plan 4: The fourth alternative plan for completion of the Hillside Interchange was the most costly considered. This alternative would provide a freeway on-ramp to the Park Freeway-East and to the southbound lanes of the North-South Freeway (IH 43) from W. Fond du Lac Avenue at about N. 16th Street and from W. Walnut Street via a loop ramp at about N. 15th Street, as shown in Figure 69. The off-ramp from the northbound lanes of the North-South Freeway and westbound lanes of the Park Freeway-East would be connected to the northbound lanes of W. Fond du Lac Avenue at N. 16th Street and to the south- and northbound lanes of W. Fond du Lac Avenue between N. 14th Street and N. 15th Street.

Two new grade-separation structures would be required under this alternative. One structure would be required to carry N. 12th Street over the freeway ramps in the vicinity of W. Galena

Figure 70

ALTERNATIVE NO. 5 FOR THE HILLSIDE INTERCHANGE "STUB END" CONNECTION



Source: Wisconsin Department of Transportation.

Street, and another would be required to carry the ramps over the intersection of N. 13th Street and W. Walnut Street. All the freeway ramps under this alternative would have grades meeting desirable standards. All ramps, as well as all surface arterial street intersections in the vicinity of the interchange, may be expected to operate at level-of-service C during the peak travel hours in the design year 2000.

As shown in Table 162, the total cost of this plan is estimated at $8,060,000, expressed in 1980 dollars, of which $460,000 would be required for the acquisition of additional right-of-way. About 3.4 acres of new right-of-way would be required under this alternative, and about 3.7 acres of existing right-of-way would not be used. In total, this connection would require about 17.2 acres of right-of-way. This alternative plan would require the displacement of two residential and two commercial structures and one church.

Alternative Plan 5—The Adopted Plan: The fifth alternative plan considered for the completion of the Hillside Interchange was the plan adopted by the study Advisory Committee on January 30, 1980. This design, as shown in Figure 70, is a modification of Alternative 3, as requested by the Committee. From the intersection of W. Fond du Lac Avenue and W. Walnut Street at about N. 13th Street, a freeway on-ramp would be provided under this alternative to both the southbound lanes of the North-South Freeway (IH 43) and the eastbound lanes of the Park Freeway-East. An off-ramp would be provided from both the northbound lanes of the North-South Freeway and the westbound lanes of the Park Freeway-East. Also, a one-way southbound connection would be provided from the intersection of W. Fond du Lac Avenue and W. Walnut Street to N. 13th Street, with N. 13th Street operating one way southbound from that point.

Under the recommended plan, as in Alternative 3, a new grade-separation structure would be provided to carry N. 12th Street over the freeway ramps in the vicinity of W. Galena Street. Unlike Alternative 3, however, in which 5 percent grades would be necessary on the ramps from the freeway "stub ends" to the surface arterials, a 4 percent grade meeting desirable design standards would be provided under the recommended plan by lowering the grade of W. Walnut Street about seven feet between N. 12th Street and N. 14th Street. The lowering of W. Walnut Street would require the construction of a 130-foot-long, approximately 3.5-foot-high retaining wall east of N. 14th Street along the south side of W. Walnut Street.

Under the recommended plan, it is estimated that the intersection of W. Fond du Lac Avenue, W. Walnut Street, and the freeway ramps would operate at level-of-service D during both peak travel hours in the plan design year 2000.

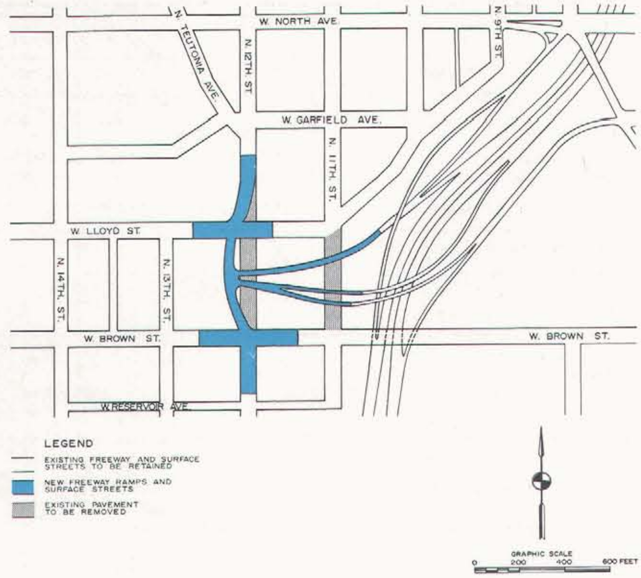
The total cost of this adopted alternative is estimated at $3,520,000, expressed in 1980 dollars. No additional right-of-way would be required and no disruption would be entailed, as all construction would be limited to the existing right-of-way. About 10.3 acres of existing right-of-way would not be required under this plan and could be made available for development following project completion. In total, this connection would require about 7.2 acres of right-of-way.

Alternative Plans for Completion of the Hillside Interchange Northern Spur

Eight alternative plans for the integration of the Hillside Interchange northern spur "stub end" into the surface arterial street system were prepared under the study by the Wisconsin Department of Transportation, District 2 staff. Three alternative plans, each of which provided full access between the North-South Freeway (IH 43) and the arterial street system, were originally presented. Each of these three alternative plans provided both on- and off-ramp connections between the freeway and the arterial street system at the northern spur, in addition to an eastbound one-way ramp from the arterial street system west of the freeway to the arterial street system east of the freeway. Following review of these three alternative plans, the study Advisory Committee requested the design of lower cost-connection alternative plans, and asked that the alternative plans treat separately the potential connections between the North-South Freeway and the arterial street system at the northern spur. One of the four alternative plans developed in response included an on-ramp to the northbound lanes of the freeway and the one-way ramp over the freeway connecting the arterial street system. The other three alternative plans separately treated each of the three elements of potential connections at the Hillside Interchange northern spur—the on-ramp connection to the northbound lanes of the North-South Freeway (IH 43), the off-ramp connection from the southbound lanes of the North-South Freeway, and the one-way ramp over the freeway. These three plans were designed so that they could be combined or implemented separately. An eighth alternative plan, considered by the Committee at the request of the Park West Redevelopment Task Force, was a modification of the design previously prepared for the on-ramp to the northbound lanes of the freeway. After consideration of these eight alternatives, the Advisory Committee, acting on the recommendation of the Park West Redevelopment Task Force, chose to adopt a "status quo" plan for the Hillside Interchange northern spur, whereby no action would be recommended to either connect or remove the existing "stub end" ramps. A description of each of the eight alternative designs developed by the Wisconsin Department of Transportation, including a discussion of estimated costs and traffic volumes, is presented in the following paragraphs.

Figure 71

ALTERNATIVE NO. 1 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

Alternative Plan 1: Under the first alternative plan for completion of the Hillside Interchange northern spur, a northbound on-ramp to the freeway would be provided from N. 12th Street between W. Brown and W. Lloyd Streets to the northbound lanes of the North-South Freeway (IH 43), as shown in Figure 71. From this on-ramp, access would also be provided over the North-South Freeway to the arterial street system east of the freeway at the intersection of N. Halyard Street and E. Garfield Avenue. An off-ramp would be provided from the southbound lanes of the North-South Freeway to N. 12th Street, also between W. Brown and W. Lloyd Streets. Under this alternative plan, N. 12th Street would be relocated westerly and would be depressed seven feet between W. Brown and W. Lloyd Streets. N. 11th Street would be completely closed between W. Brown and W. Lloyd Streets. All of the new ramps would meet the desired design standard for freeway ramps except

Table 163

IMPACTS OF THE IMPLEMENTATION OF THE ALTERNATIVE AND RECOMMENDED DESIGNS FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR

Impact Variable	Hillside Interchange Northern Spur Design Alternatives								Proposed Ramp Removal
	1	2	3	4	5	6	7	8	
Cost									
Right-of-Way	$ 10,000	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
Construction	800,000	1,000,000	1,200,000	174,000	87,000	104,000	870,000	200,000	430,000
Engineering and Contingencies	100,000	200,000	200,000	26,000	13,000	16,000	130,000	30,000	70,000
Total Cost[a] (in 1980 dollars)	$910,000	$1,200,000	$1,400,000	$200,000	$100,000	$120,000	$1,000,000	$230,000	$500,000
Right-of-Way Taken (acres)									
New Right-of-Way Required	0.1	--	--	--	--	--	--	--	--
Existing Right-of-Way Not Used	12.2	12.2	11.0	15.3	15.5	15.3	12.4	14.8	16.2
Total Right-of-Way Required	4.0	4.0	5.2	0.9	0.7	0.9	3.8	1.4	--
Structures Displaced									
Residential	--	--	--	--	--	--	--	--	--
Commercial	--	--	--	--	--	--	--	--	--
Other	--	--	--	--	--	--	--	--	--

[a]*Does not include utility costs.*

Source: Wisconsin Department of Transportation and SEWRPC.

the off-ramp from the North-South Freeway (IH 43) to N. 12th Street, which would have a grade of 6 percent.

The new freeway off-ramp to N. 12th Street, the ramp from N. 12th Street to the freeway and to the surface arterial street system east of the freeway, and all surface arterial street intersections in the vicinity of the completed connection could be expected to operate at level-of-service C or better in the plan design year 2000.

As shown in Table 163, the total cost of this alternative connection is estimated at $910,000, expressed in 1980 dollars, of which $10,000 would be required for the acquisition of additional right-of-way. About 0.1 acre of new right-of-way would be required under this alternative, and 12.2 acres of the available right-of-way for this connection would not be used. In total, about 4.0 acres of right-of-way would be required.

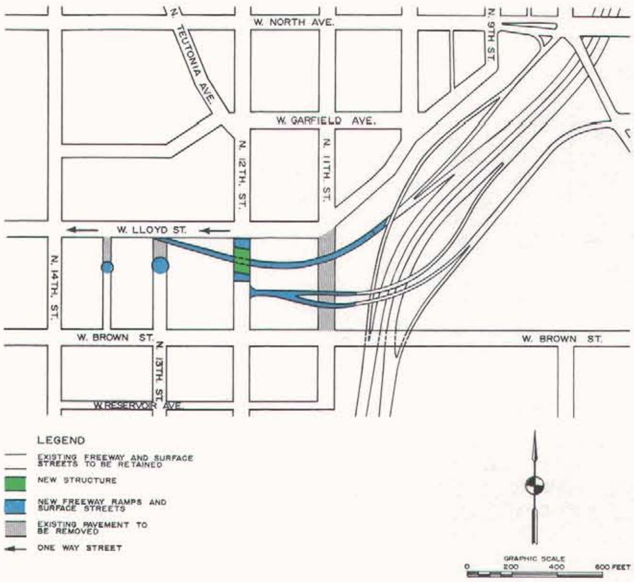
Alternative Plan 2: The second alternative plan considered for the completion of the Hillside Interchange northern spur is shown in Figure 72. This alternative plan, like the first alternative plan, would provide for a freeway on-ramp from N. 12th Street between W. Brown and W. Lloyd Streets to the northbound lanes of the North-South Freeway (IH 43), and access would be provided via a one-way eastbound ramp over the North-South Freeway to the arterial street system east of the freeway at the intersection of N. Halyard Street and E. Garfield Avenue. The off-ramp from the southbound North-South Freeway (IH 43), however, would be connected to W. Lloyd Street at N. 13th Lane. Under this alternative, N. 13th Street and N. 13th Lane would both be closed in cul-de-sacs midway between W. Brown Street and W. Lloyd Street, and N. 11th Street would be completely closed between W. Brown and W. Lloyd Streets. All of the new ramps would have grades which would meet the desired design standard for such ramps.

One structure would be required on N. 12th Street over the new freeway off-ramp at a point between W. Brown and W. Lloyd Streets in order to provide the necessary grade separation of traffic movements.

The new freeway off-ramp to W. Lloyd Street, the ramp from N. 12th Street to the freeway and to the surface arterial street system east of the freeway, and all surface arterial street intersections in the vicinity of the completed connection could be expected to operate at level-of-service C or better in the plan design year 2000.

Figure 72

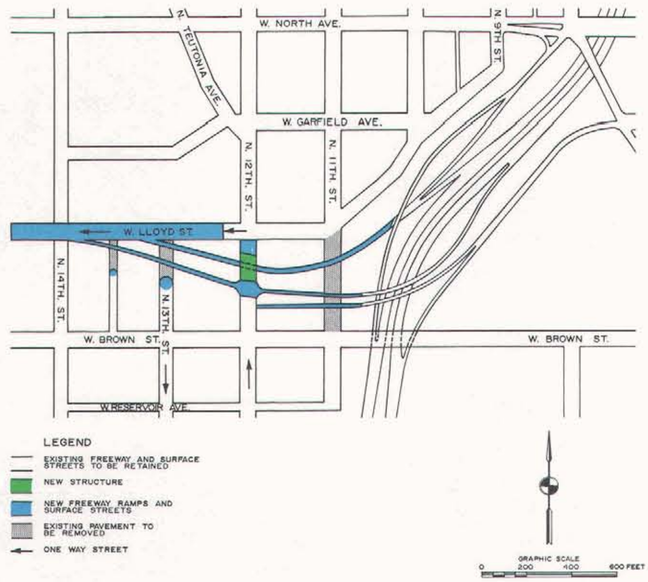
ALTERNATIVE NO. 2 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 73

ALTERNATIVE NO. 3 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

As shown in Table 163, the total cost of this alternative connection is estimated at $1,200,000, in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the available right-of-way. About 12.2 acres of the available right-of-way would not be used under this alternative. In total, this connection would require about 4.0 acres of right-of-way.

Alternative Plan 3: The third alternative plan considered for the completion of the Hillside Interchange northern spur is shown in Figure 73. Under this alternative plan, a freeway on-ramp from N. 12th Street between W. Brown Street and W. Lloyd Street would be provided to the northbound lanes of the North-South Freeway (IH 43). The ramp under this alternative plan, however, would be extended to the intersection of N. 14th Street and W. Lloyd Street. Also, unlike the first two alternative plans, a separate ramp from N. 12th Street from a point between W. Brown and W. Lloyd Streets would be provided over the North-South Freeway to the surface arterial street system east of the freeway at N. Halyard Street and E. Garfield Avenue. As in the second alternative, an off-ramp would be provided from the southbound lanes of the North-South Freeway to W. Lloyd Street at about N. 13th Lane.

Under this alternative, N. 13th Street and N. 13th Lane would both be closed in cul-de-sacs at a point midway between W. Brown Street and W. Lloyd Street, and N. 11th Street would be completely closed between W. Brown and W. Lloyd Streets. All of the new ramps would have grades which would meet the desired design standard for such ramps.

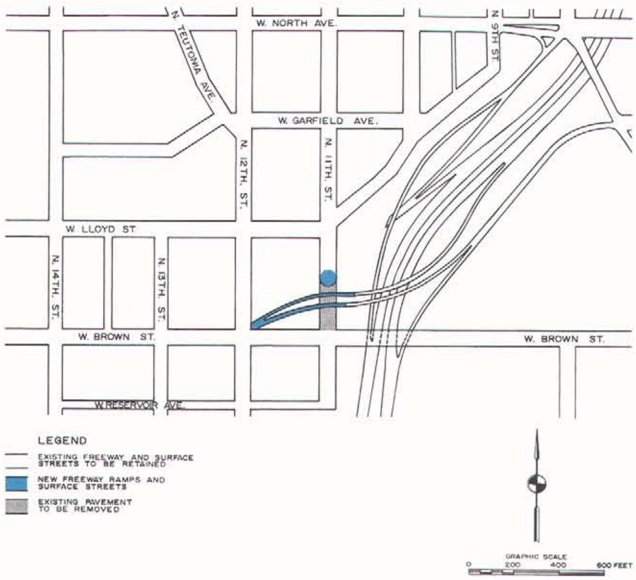
As in the second alternative, one structure would be required on N. 12th Street over the new freeway off-ramp at a point between W. Brown and W. Lloyd Streets in order to provide the necessary grade separation of traffic movements.

The new freeway off-ramp to W. Lloyd Street, the on-ramp to the freeway and the ramp to the surface arterial street system east of the freeway, the surface arterial street connection between eastbound W. Lloyd Street and N. 12th Street, and all surface arterial street intersections in the vicinity of the completed connection could be expected to operate at level-of-service C or better in the plan design year 2000.

As shown in Table 163, the total cost of this alternative connection is estimated at $1,400,000, in 1980 dollars. No additional right-of-way would be required under this alternative as all construction

Figure 74

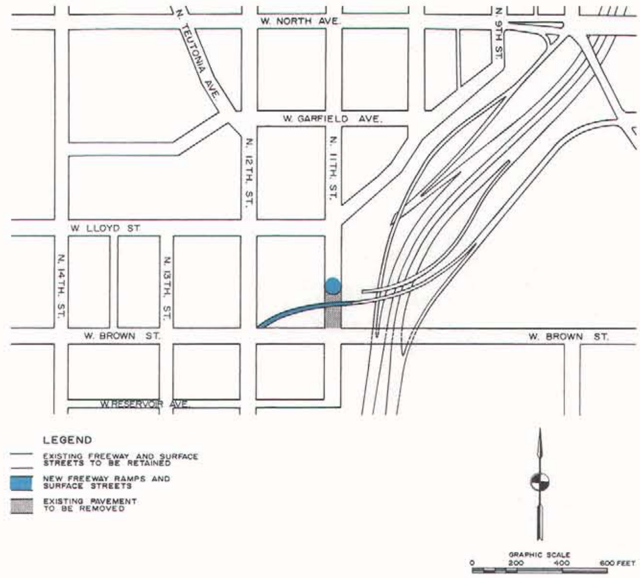
ALTERNATIVE NO. 4 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 75

ALTERNATIVE NO. 5 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

would be confined to the available right-of-way. About 11.0 acres of the available right-of-way would not be used under this alternative. In total, this connection would require about 5.2 acres of right-of-way.

Alternative Plan 4: The fourth alternative plan considered for completion of the Hillside Interchange northern spur is shown in Figure 74, and is the first of the second group of alternatives which were designed to be less costly and less disruptive than the three previous alternative plans. Under this alternative, a freeway on-ramp would be provided from the intersection of N. 12th Street and W. Brown Street to the northbound lanes of the North-South Freeway (IH 43). Also, from this ramp access would be provided over the North-South Freeway to the arterial street system east of the freeway at the intersection of N. Halyard Street and E. Garfield Avenue. Under this alternative, N. 11th Street would be closed in a cul-de-sac midway between W. Brown and W. Lloyd Streets. All the new ramps would have grades which would meet the desired design standard for such ramps.

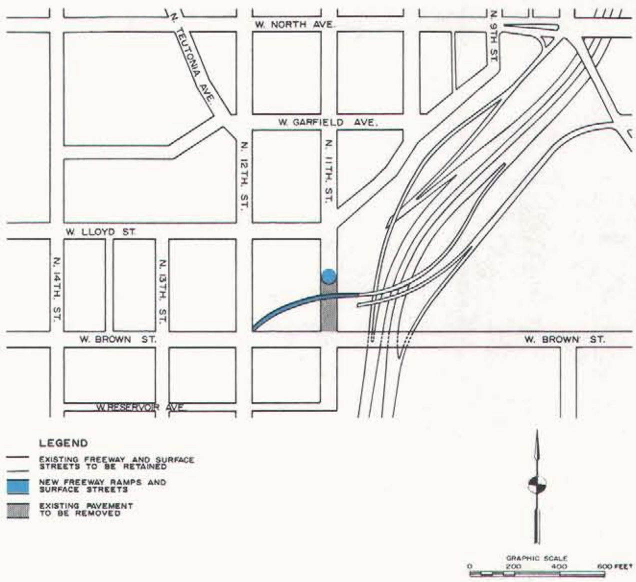
In the plan design year 2000 the ramp from the intersection of N. 12th Street and W. Brown Street to the North-South Freeway (IH 43) and to the arterial street system east of the freeway, as well as the intersection of N. 12th Street and W. Brown Street, would operate at level-of-service C or better.

As shown in Table 163, the total cost of this alternative connection is estimated at $200,000, expressed in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the existing right-of-way. About 15.3 acres of the available right-of-way would not be used under this alternative. In total, this connection would require about 0.9 acre of right-of-way.

Alternative Plan 5: The fifth alternative plan considered for completion of the Hillside Interchange northern spur, as shown in Figure 75, is another of the low-cost alternatives, and is the first of the three alternatives designed to be implemented separately or in combination with each other. Under this alternative, a ramp would be provided from the intersection of N. 12th Street and W. Brown Street only to the arterial street system east of the North-South Freeway (IH 43) at the intersection of N. Halyard Street and E. Garfield Avenue. N. 11th Street would be closed in a cul-de-sac midway between W. Brown and W. Lloyd

Figure 76

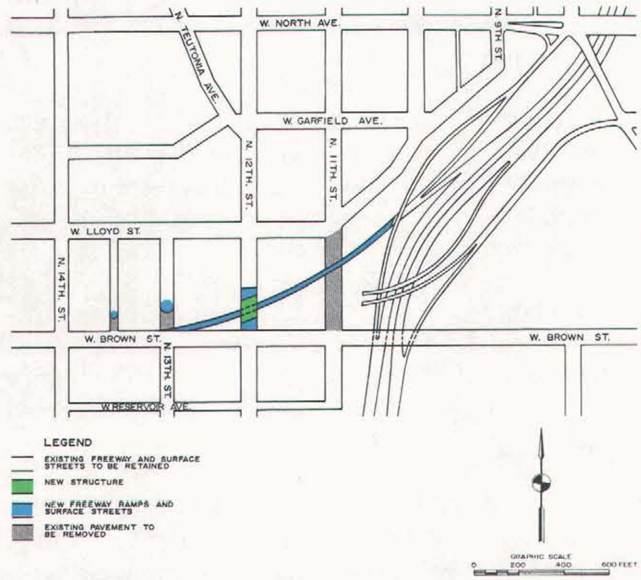
ALTERNATIVE NO. 6 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

Figure 77

ALTERNATIVE NO. 7 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation and SEWRPC.

Streets under this alternative. The new ramp would have a grade which would meet the desired design standard for such ramps.

In the plan design year 2000 the new ramp and the intersection of N. 12th Street and W. Brown Street could be expected to operate at level-of-service C or better.

As shown in Table 163, the total cost of this alternative connection is estimated at $100,000, expressed in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the available right-of-way. About 15.5 acres of the available right-of-way would not be used under this alternative. In total, this alternative would require about 0.7 acre of right-of-way.

Alternative Plan 6: The sixth alternative plan considered for completion of the Hillside Interchange northern spur, as shown in Figure 76, is the second of the three alternatives designed to be implemented separately or in combination with other alternative plans. Under this alternative, a freeway on-ramp would be provided from the intersection of N. 12th Street and W. Brown Street to the northbound lanes of the North-South Freeway (IH 43). Under this alternative, N. 11th Street would be closed in a cul-de-sac between W. Brown and W. Lloyd Streets. The new ramp would have a grade which would meet the desired design standard for such ramps.

In the plan design year 2000 the new ramp, as well as the intersection of N. 12th Street and W. Brown Street, could be expected to operate at level-of-service C or better.

As shown in Table 163, the total cost of this alternative connection is estimated at $120,000, expressed in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the available right-of-way. About 15.3 acres of the available right-of-way would not be used under this alternative. In total, this alternative would require about 0.9 acre of right-of-way.

Alternative Plan 7: The seventh alternative plan considered for completion of the Hillside Interchange northern spur is shown in Figure 77, and is the last of the three alternative plans which were designed to be implemented separately or in combination. Under this alternative, a freeway off-ramp would be provided from the southbound lanes of the North-South Freeway (IH 43) to W. Brown Street at about N. 13th Street, N. 11th

Street would be completely closed between W. Brown and W. Lloyd Streets, and N. 13th Street and N. 13th Lane would be closed in cul-de-sacs between W. Brown and W. Lloyd Streets. The new off-ramp would have a grade of about 5 percent, which would exceed the desired design standard for such ramps.

One structure would be required on N. 12th Street over the new freeway off-ramp at a point between W. Brown and W. Lloyd Streets in order to provide the necessary grade separation of traffic movements.

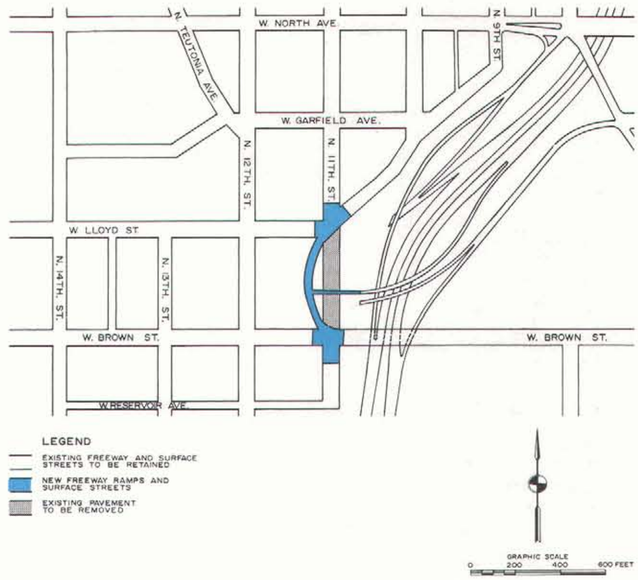
In the plan design year 2000 the new freeway off-ramp to the surface street system, as well as all surface arterial street intersections in the vicinity of the completed connection, could be expected to operate at level-of-service C or better.

As shown in Table 163, the total cost of this alternative connection is estimated at $1,000,000, expressed in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the available right-of-way. About 12.4 acres of the available right-of-way would not be used under this alternative. In total, this connection would require about 3.8 acres of right-of-way.

Alternative Plan No. 8: The next alternative plan considered is a modification of the design prepared for the freeway on-ramp at the northern spur and was requested by the Park West Redevelopment Task Force. In an attempt to provide the lowest cost alternative at least disruption to potential development in the Park West neighborhood immediately west of N. 11th Street, the requested plan was designed to directly connect the on-ramp to N. 11th Street between W. Brown and W. Lloyd Streets to the northbound lanes of the North-South Freeway (IH 43). However, analyses by the Wisconsin Department of Transportation (WisDOT) staff indicated that, because of the 10-foot difference in elevation between the existing "stub end" of the on-ramp structure and N. 11th Street, a connecting on-ramp would require a 13 percent grade, which would be too steep for safe operation. The WisDOT staff also determined that lowering N. 11th Street between W. Brown and W. Lloyd Streets in order to provide a grade on the on-ramp which would meet design standards would result in a grade of about 8 percent on N. 11th Street from its intersection with W. Brown Street to the freeway on-ramp, also considered to be too steep for safe operation.

Figure 78

ALTERNATIVE NO. 8 FOR COMPLETION OF THE HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation.

The WisDOT staff determined that the only way the on-ramp design requested by the Park West Redevelopment Task Force could be accomplished within design standards would be to lower N. 11th Street approximately three feet and relocate it approximately 100 feet to the west, as shown in Figure 78.

In the plan design year 2000 the new freeway on-ramp, as well as all surface arterial street intersections in the vicinity of the completed connection, could be expected to operate at level-of-service C or better.

As shown in Table 163, the total cost of this alternative connection is estimated at $230,000, in 1980 dollars. No additional right-of-way would be required under this alternative, as all construction would be confined to the existing right-of-way. About 14.8 acres of the existing right-of-way would not be used under this alternative. In total, this connection would require about 1.4 acres of right-of-way.

The "Status Quo" Plan—The Adopted Alternative: On December 11, 1980, the Milwaukee Northwest Side/Ozaukee County Transportation Improvement Study Citizens Intergovernmental and Technical Coordinating and Advisory Committee, acting on the recommendation of the Park West Redevelopment Task Force, recommended that no action be taken to either connect or remove the three existing "stub end" ramps at the Hillside Interchange northern spur. This "status quo" action was taken because of the belief that the costs and disruption involved in any of the alternative connections outweighed the benefits to the immediate community at the connection. No action was recommended to remove the ramp "stub ends" in order that the option for their connection could remain, should the development in the area now envisioned by the Park West Redevelopment Task Force not take place, and should the potential benefits of connection at the northern spur outweigh the costs. The Committee did recommend that the "stub end" ramps be removed if the envisioned development takes place in the area, which would foreclose the construction of the ramps, or if the ramps deteriorate to the point where substantial maintenance would be required for their use.

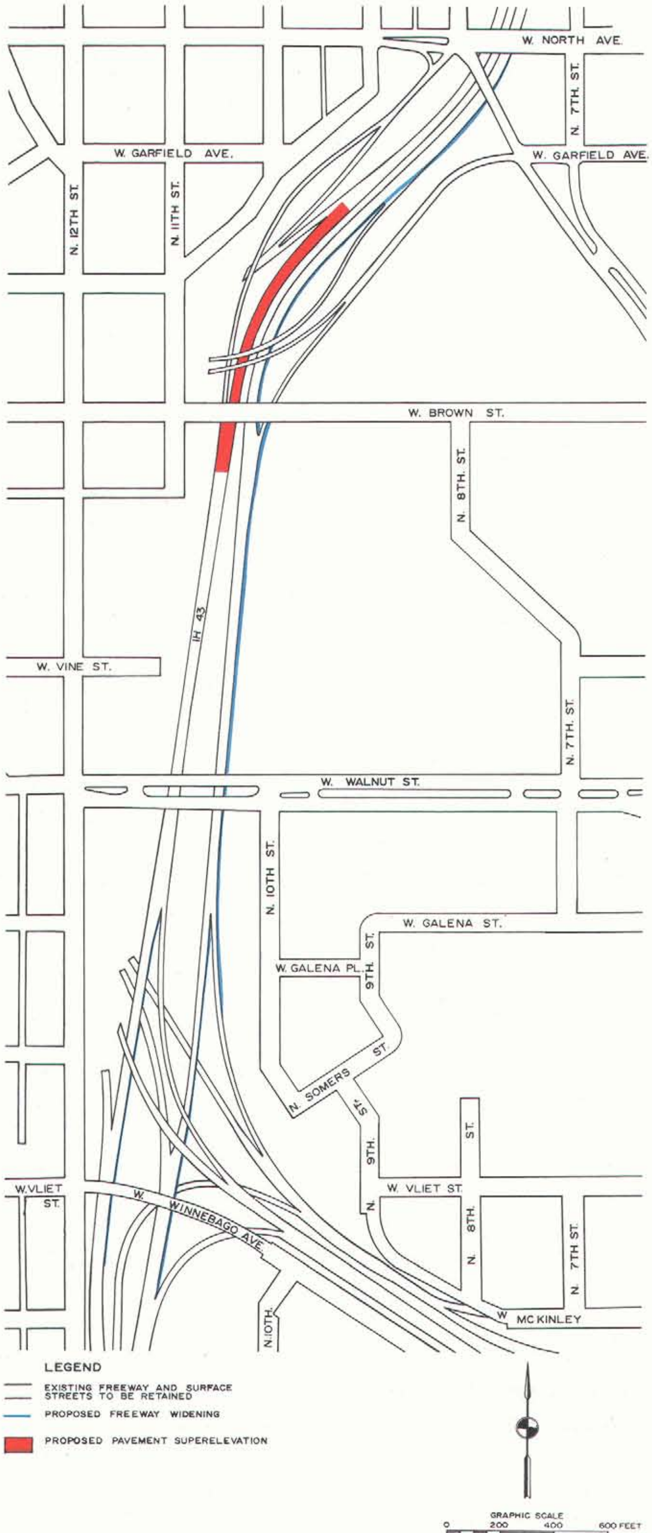
During the conduct of the preliminary engineering attendant to implementation of the adopted plan for completion of the Hillside Interchange proper early in 1981, it became necessary for the northwest side study Advisory Committee to reconsider the recommended "status quo" plan for the Hillside Interchange northern spur. This reconsideration was based on the conclusion of Wisconsin Department of Transportation that, in order to best provide for the completion of the Hillside Interchange, as recommended by the study Advisory Committee in January 1980, changes would be necessary to the recommended plan for the Hillside Interchange northern spur.

At the February 27, 1981 meeting of the northwest side study Advisory Committee, the Wisconsin Department of Transportation indicated to the Committee that, in order to effect the completion of the Hillside Interchange "stub end" connection, and its proper operation through the abatement of peak-hour traffic congestion on the North-South Freeway in the vicinity of the Interchange, three continuous lanes for through traffic should be provided northbound on the North-South Freeway through the Hillside Interchange and northern spur by the addition of a single outside lane to the pavement for northbound traffic on the North-South Freeway from a point immediately south of W. Winnebago Street to a point south of W. North Avenue, a distance of about 0.95 mile; and three continuous lanes for through traffic should be provided southbound on the North-South Freeway by the addition of a single inside lane from the freeway ramp entrance to the Park Freeway-East to a point immediately south of W. Winnebago Street, a distance of about 0.25 mile (see Figure 79). It was also recommended by the Department that, to improve travel safety, the existing southbound curve through the ramp bridges at the Hillside Interchange northern spur be superelevated between W. Garfield Avenue and W. Reservoir Avenue, a distance of about 0.21 mile.

It was concluded by the Wisconsin Department of Transportation that both ramp bridges at the Hillside Interchange northern spur would have to be removed to accommodate the needed widening of the North-South Freeway at the Interchange. Analyses by the Department indicated that neither the existing Hillside Interchange northern spur bridge for the eastbound-to-northbound ramp from the previously proposed Park Freeway-West to the North-South Freeway nor the existing Hillside Interchange northern spur bridge for the eastbound ramp from the Park Freeway-West to the arterial street system east of the North-South Freeway at N. Halyard Street and W. Garfield Avenue have sufficient horizontal clearance to accommodate the necessary widening of the northbound lanes of the North-South Freeway. The analyses further indicated that neither of these two ramp bridges have sufficient vertical clearance to accommodate the necessary superelevation of the southbound lanes of the North-South Freeway. Figure 80 illustrates the extent of pavement and structure removal and reconstruction recommended in the vicinity of the Hillside Interchange northern spur. It should be noted that, in addition to the removal of the existing Hillside Interchange northern spur ramp bridges over the North-South Freeway being recommended, it was recommended that the ramps leading to these bridges be removed and that the southbound-to-eastbound uncompleted "stub end" ramps from the North-South Freeway and from W. North Avenue to the previously proposed Park Freeway-West, another part of the Hillside Interchange northern spur, also be removed. The removal of these additional ramps was recommended because the southbound on-ramp from W. North Avenue to the North-South Freeway is carried by an elevated structure with a deteriorating deck over these "stub end" ramps. Removal of these ramps would permit this elevated structure to be removed and replaced by a fill.

Figure 79

ROAD IMPROVEMENTS PROPOSED FOR THE NORTH-SOUTH FREEWAY (IH 43) IN THE VICINITY OF THE HILLSIDE INTERCHANGE AND HILLSIDE INTERCHANGE NORTHERN SPUR



Source: Wisconsin Department of Transportation.

The total cost of the removal of these three ramp bridges at the Hillside Interchange northern spur, as well as the removal of all connecting ramp roadways and the construction necessary to provide the widened roadways and attendant landscaping, is estimated at $500,000 in 1980 dollars (see Table 163). These bridge and ramp removals would not require the acquisition of any new right-of-way.

Alternative Plans for Completion of the Stadium Freeway-North "Stub End"

The Stadium Freeway-North and its "stub end" at N. 47th Street and W. Lloyd Street, as constructed in 1962, was envisioned in the 1960's as the first segment of a freeway which would eventually extend from the East-West Freeway (IH 94) through northern Milwaukee County and Ozaukee County in the Southeastern Wisconsin Region to the City of Green Bay. With the removal of the Stadium Freeway-North through northern Milwaukee County and Ozaukee County early in the long-range regional transportation plan reevaluation conducted by the Regional Planning Commission in the middle and late 1970's, it was proposed that the existing Stadium Freeway-North (USH 41) "stub end" be extended about 0.35 mile north of its present terminus to the proposed Stadium Freeway-North/Park Freeway-West Inter-

Figure 80

DETAIL OF PROPOSED ROADWAY AND STRUCTURE RECONSTRUCTION AND REMOVAL IN THE VICINITY OF THE HILLSIDE INTERCHANGE NORTHERN SPUR

Source: Wisconsin Department of Transportation.

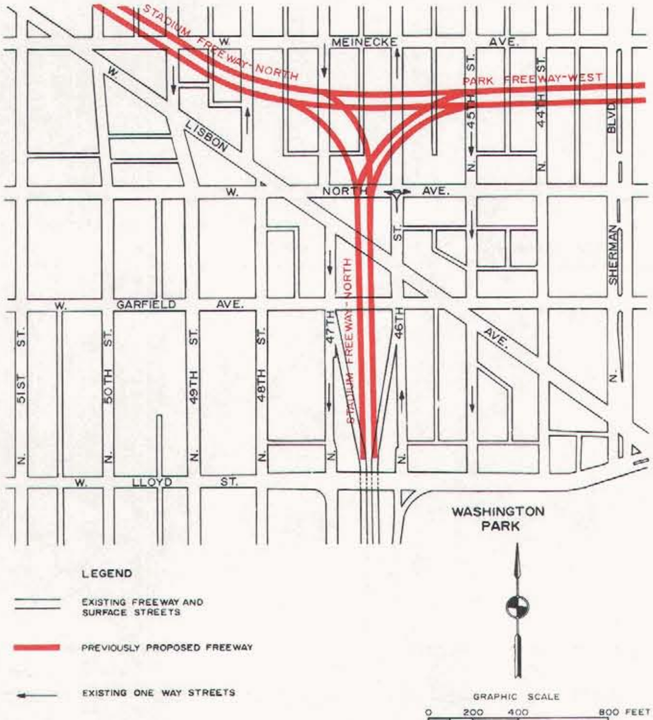
change. At this interchange, the "stub end" would have connected to the Fond du Lac Freeway via the proposed Stadium Freeway-North "gap closure" and to the proposed Park Freeway-West. However, with the removal of the Park Freeway-West and Stadium Freeway-North "gap closure" from the regional transportation system plan in 1978 following public hearings on the preliminary plan, the Stadium Freeway-North was left with a "stub end" having an entrance ramp at N. 47th Street between W. Lloyd Street and W. Garfield Avenue, and an exit ramp merging with N. 46th Street between W. Lloyd Street and W. Garfield Avenue, as shown on Map 149.

Average weekday traffic volumes in 1980 in the vicinity of the Stadium Freeway-North "stub end" were approximately 45,000 vehicles on the Stadium Freeway-North south of W. Lloyd Street, about 13,000 vehicles on the Stadium Freeway-North exit ramp to N. 46th Street, and about 14,000 vehicles on N. 47th Street immediately north of the Stadium Freeway-North entrance ramp, as shown on Map 150. Average weekday traffic volumes in the vicinity of the intersection of W. Lisbon Avenue and W. North Avenue were about 31,000 vehicles on W. Lisbon Avenue immediately northwest of the intersection, about 32,000 vehicles on W. Lisbon Avenue immediately southeast of the intersection, about 8,600 vehicles on W. North Avenue east of the intersection, and about 9,400 vehicles on W. North Avenue west of the intersection.

Both the W. Lisbon Avenue and W. North Avenue approaches to the intersection of W. Lisbon and W. North Avenues operate with traffic congestion during the morning and evening peak hours, and left turns are prohibited from W. Lisbon Avenue at all times. The predominant traffic flow at the intersection is southeast-bound on W. Lisbon Avenue through the intersection to southbound on the Stadium Freeway in the morning peak hour, and northbound on the Stadium Freeway-North to northwest-bound through the intersection on W. Lisbon Avenue during the evening peak hour. No feasible combination of traffic management actions appears to have the potential to resolve the traffic congestion or turn-movement problems at this intersection, as demonstrated in the traffic management element of the short-range plan of this study.[21]

Map 149

THE STADIUM FREEWAY-NORTH INTERCHANGE AS ORIGINALLY PROPOSED SHOWING EXISTING "STUB ENDS"



As shown on this map, as originally proposed, the Stadium Freeway-North (USH 41) was to have been extended about 0.35 mile north of its present terminus to the proposed Stadium Freeway-North/Park Freeway-West interchange. At this interchange, the Stadium Freeway-North would have connected to the Fond du Lac Freeway via the proposed Stadium Freeway-North "gap closure" and to the proposed Park Freeway-West. However, with the removal of the Park Freeway-West and the Stadium Freeway-North "gap closure" from the regional transportation system plan in 1978, following public hearings on a preliminary second generation system plan, the Stadium Freeway-North was left with a "stub end" having an entrance ramp at N. 47th Street between W. Lloyd Street and W. Garfield Street, and an exit ramp merging with N. 46th Street between W. Lloyd Street and W. Garfield Avenue.

Source: SEWRPC, Tour Guide of Proposed Freeway Routes in Milwaukee County, Wisconsin, 1977.

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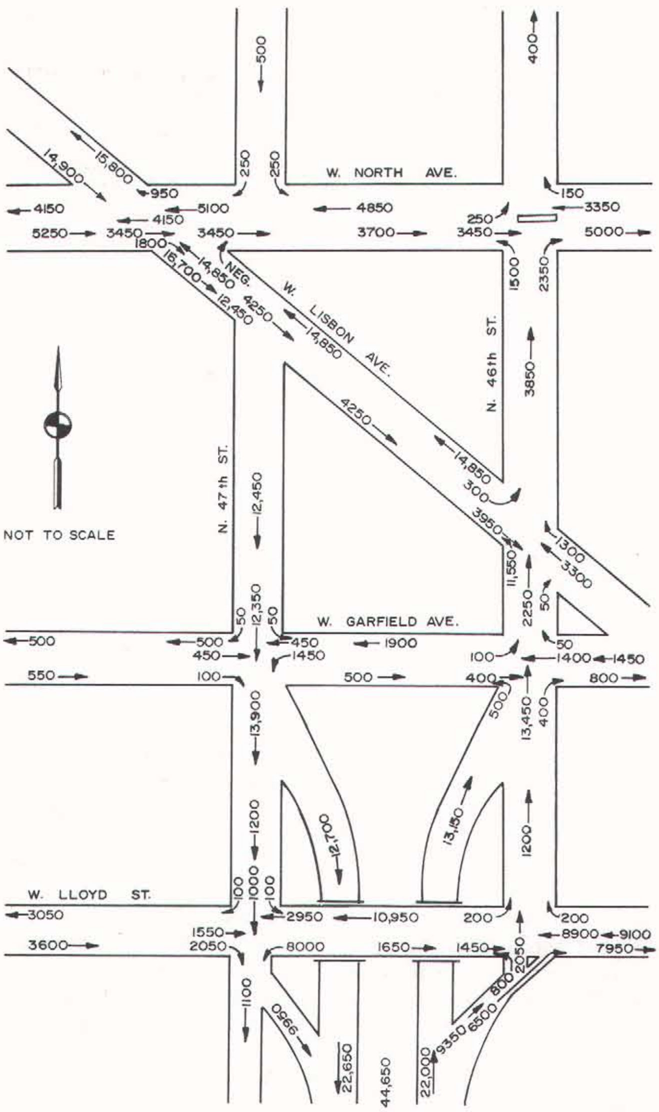
[21] *See the section of this chapter entitled, "Related Street Segments Proceeding from the Terminus of the Stadium Freeway-North (USH 41) "Stub End" and its subsection, "W. Lisbon Avenue from N. 60th Street to W. Walnut Street."*

Map 150

AVERAGE 1980 WEEKDAY TRAFFIC VOLUMES IN THE VICINITY OF THE STADIUM FREEWAY-NORTH "STUB ENDS"



As shown on this map, average weekday traffic volumes in the vicinity of the Stadium Freeway-North "stub end" were approximately 45,000 vehicles on the Stadium Freeway-North south of W. Lloyd Street, about 13,000 vehicles on the Stadium Freeway-North exit ramp to N. 46th Street, and about 14,000 vehicles on N. 47th Street immediately south of the Stadium Freeway-North entrance ramp. Average weekday traffic volumes in the vicinity of the intersection of W. Lisbon Avenue and W. North Avenue were about 31,000 vehicles on W. Lisbon Avenue immediately northwest of the intersection, about 32,000 vehicles on W. Lisbon Avenue immediately southeast of the intersection, about 8,600 vehicles on W. Lisbon Avenue east of the intersection, and about 9,400 vehicles on W. North Avenue west of the intersection.

Source: Wisconsin Department of Transportation.

For this reason, and because the "stub end" of the Stadium Freeway-North is now proposed in adopted state, regional, and local long-range plans to remain without further connections to other freeways, the design of alternatives to further integrate the "stub end" of the Stadium Freeway-North into the surface arterial street system was undertaken as part of the short-range element of this study. Particular concern was expressed by the northwest side study Advisory Committee that the design of these alternatives should not result in the funneling of traffic along W. Lisbon Avenue, and should provide equal access to W. North Avenue by the provision of left-turn movements during the peak hours at the intersection of W. Lisbon Avenue and W. North Avenue. Consequently, the principal objectives of each alternative design for the completion of the Stadium Freeway-North "stub end" were: to efficiently integrate the Stadium Freeway-North ramps with the surface arterial street system; to abate the existing traffic congestion at the intersection of W. Lisbon Avenue and W. North Avenue; and, if practicable, to provide for left-turn movements at that intersection.

Alternative Plans for Completion of the Stadium Freeway-North Interchange

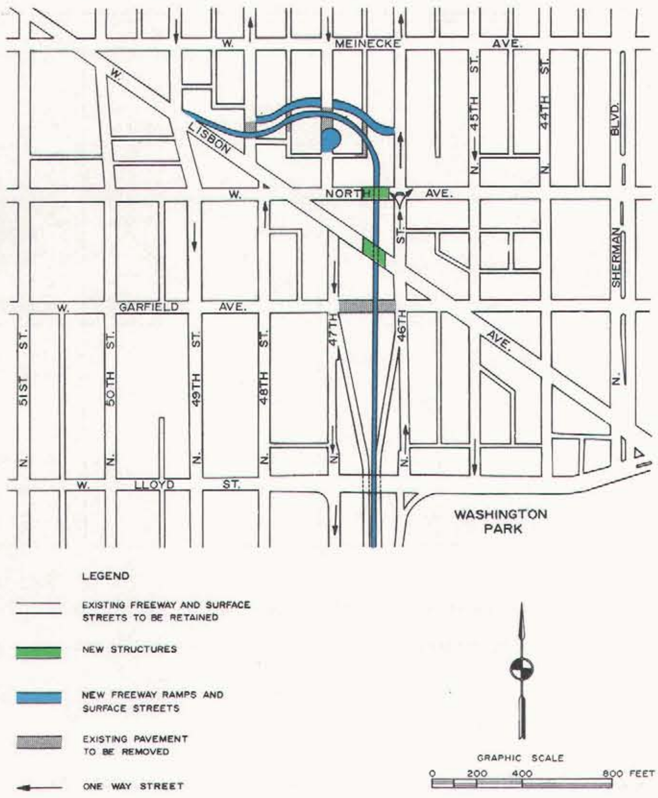
Ten alternative plans for the connection of the Stadium Freeway-North (USH 41) "stub end" to the surface arterial street system were prepared under the northwest side study. The first six of these plans were prepared by the Wisconsin Department of Transportation (WisDOT), District 2, and the last four were prepared by the City of Milwaukee. The first two alternative plans prepared by the WisDOT provide alternative designs for the construction of new off-ramps from the Stadium Freeway-North (USH 41) only. One of these off-ramps would have to be used in conjunction with the design of the third alternative plan prepared by the WisDOT, which provides for an on-ramp to the freeway, in order to provide sufficient integration of the Stadium Freeway-North "stub end" ramps with the surface arterial street system, as well as to abate the congestion and left-turn problems at the intersection of W. Lisbon Avenue and W. North Avenue. The fourth, fifth, and sixth alternative plans prepared by the WisDOT include both off- and on-ramps, and the fifth and sixth alternatives were specifically requested as modifications of the original four alternative plans by the study Advisory Committee. Each of these latter three alternatives would also serve to resolve all of the concerns expressed by the Advisory Committee regarding the "stub end" problem, and thus would meet the three principal design objectives for completion of the Stadium Freeway-North "stub end." The first four of the alternative plans prepared by the WisDOT are moderate-cost alternatives, and each would involve some urban disruption; the other two plans designed by the State are high-cost alternatives which were designed to minimize such disruption.

The four alternative plans prepared by the City of Milwaukee provide only partial integration of the freeway "stub ends" with the surface arterial street system, and three of the four plans are intended, more importantly, to treat the left-turn movement problem at the intersection of W. Lisbon Avenue and W. North Avenue. Only one of these four plans provides any additional capacity at the intersection. As such, these four plans are the least costly of any of the alternatives. Two of these plans, however, involve moderate disruption. Eight of the 10 alternatives involve the taking of some new right-of-way.

A description of each of the 10 alternative designs developed by the WisDOT and the City of Milwaukee, along with the estimated cost of and disruption entailed by each, is presented below.

Figure 81

ALTERNATIVE NO. 1 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"



Source: Wisconsin Department of Transportation.

Alternative Plan 1: The first alternative plan considered for completion of the Stadium Freeway-North Interchange, and the first of the six plans prepared by the WisDOT, is one of the four moderate-cost alternatives and provides a design for an off-ramp only (see Figure 81). This alternative design provides for a northbound freeway off-ramp which would loop north of the intersection of W. Lisbon Avenue and W. North Avenue and merge with northwest-bound W. Lisbon Avenue at a point northwest of the intersection of W. Lisbon and W. North Avenues at about N. 49th Street. This northbound loop is designed to take as few of the businesses along W. Lisbon Avenue as practicable, and to take instead several residential structures north of W. Lisbon Avenue. This new ramp would maintain a grade of less than 4 percent along its entire length, the desired design standard for such ramps. Access to the freeway southbound would be provided by the existing on-ramp at N. 47th Street without modification. The existing off-ramp which merges with N. 46th Street northbound would also remain. Under this plan, W. Garfield Avenue would be closed between N. 46th and N. 47th Streets. N. 47th Street would be closed in a cul-de-sac north of W. North Avenue, and N. 46th Street north of W. North Avenue would remain as currently channelized by the City of Milwaukee, inaccessible to traffic from the south, but accessible to traffic from the east on W. North Avenue. Under this plan, N. 48th Street would no longer connect with W. Lisbon Avenue. To provide neighborhood street continuity, however, N. 48th Street would join with a connector road between N. 48th and N. 46th Streets. A traffic signal would be necessary under this alternative at N. 49th Street at the end of the off-ramp.

Two structures would be required to provide the necessary grade separation of traffic movements under this alternative. One structure would be required on W. Lisbon Avenue over the new freeway off-ramp between N. 46th and N. 47th Streets, and the other would be required on W. North Avenue over the new freeway off-ramp between N. 46th and N. 47th Streets. As shown in Table 164, the total cost of this alternative plan is estimated at $3,000,000, expressed in 1980 dollars, of which

Table 164

IMPACTS OF THE IMPLEMENTATION OF THE ALTERNATIVE AND RECOMMENDED DESIGNS FOR COMPLETION OF THE STADIUM FREEWAY-NORTH INTERCHANGE

Impact Variable	Stadium Freeway-North "Stub End" Completion Design Alternatives									
	1 (off-ramp only)	2 (off-ramp only)	3 (on-ramp only)	4	5	6	7 (on-ramp only)	8 (on-ramp and provision for left-turn movements at intersection of W. Lisbon Avenue and W. North Avenue only)	9	10
Cost										
Right-of-Way	$2,000,000	$1,265,000	$ 875,000	$1,800,000	$ 221,000	$ 524,000	$	$	$ 640,000	$ 860,000
Utilities	115,000	165,000	230,000	380,000	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Construction	775,000	1,025,000	1,500,000	2,350,000	7,400,000	11,100,000	420,000	450,000	600,000	650,000
Engineering and Contingencies	110,000	155,000	220,000	350,000	1,100,000	1,700,000	63,000	68,000	90,000	98,000
Total Cost (in 1980 dollars)	$3,000,000	$2,610,000	$2,825,000	$4,880,000	$8,721,000	$13,324,000	$483,000	$518,000	$1,330,000	$1,608,000
Structures Displaced										
Single Family	20	--	--	--	--	--	--	--	--	--
Multiple Family	5	--	--	--	--	--	--	--	--	--
Business	5	9	4	12	5 (partial)	8 (partial)	--	--	5 (2 partial)	1
Business/ Residential	1	1	2	1	--	--	--	--	1	3
Parking Lot (strip taking)	--	2	1	3	--	--	--	1	3	1
Vacant Lot (strip taking)	--	1	--	2	--	--	--	1	1	--

[a]*Alternative does not include estimates of utility adjustment work.*

Source: Wisconsin Department of Transportation and City of Milwaukee.

$2,000,000 would be required for new right-of-way and about $1,000,000 would be required for construction costs. In total, this alternative design would require the taking of 20 single-family homes, five multiple-family homes, five businesses, and one business establishment with an apartment attached.

Alternative Plan 2: The second alternative plan considered for completion of the Stadium Freeway-North Interchange, and the second of the six plans prepared by the WisDOT, provides a design for a freeway off-ramp only, and is interchangeable with the first alternative plan (see Figure 82). This alternative plan provides for a northbound freeway off-ramp which would merge with northwest-bound W. Lisbon Avenue at a point northwest of the intersection of W. Lisbon Avenue and W. North Avenue at about N. 49th Street. Unlike the off-ramp called for in the first alternative plan, this off-ramp is designed to be adjacent to the north right-of-way line of W. Lisbon Avenue and, as a result, would require the acquisition of the businesses located along the north side of W. Lisbon Avenue rather than of residential units. The new ramp would maintain a grade of less than 4 percent, the desired design standard for such ramps, with the exception of that segment between W. North Avenue and N. 49th Street, which would have a grade of 4.4 percent, slightly above the design standard. As under the first alternative plan, access to the freeway southbound under this alternative would be provided by the existing on-ramp at N. 47th Street without modification. The existing off-ramp which merges with N. 46th Street northbound would also remain. Under this plan, W. Garfield Avenue would be closed between N. 46th and N. 47th Streets, and N. 48th Street would no longer connect with W. Lisbon Avenue but would join with a new connecting roadway between N. 47th and N. 48th Streets. A retaining wall in excess of 700 feet long would be required between W. Lisbon Avenue and the off-ramp under this alternative. As in the first alternative, a traffic signal would be necessary under this alternative at N. 49th Street at the end of the off-ramp.

Two structures would be required to provide the necessary grade separation of traffic movements under this alternative: one on W. Lisbon Avenue over the new freeway off-ramp between N. 46th and N. 47th Streets, and the other on W. North Avenue over the new freeway off-ramp at about N. 47th Street. As shown in Table 164, the total

Figure 82

ALTERNATIVE NO. 2 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"

Source: Wisconsin Department of Transportation.

Figure 83

ALTERNATIVE NO. 3 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"

Source: Wisconsin Department of Transportation.

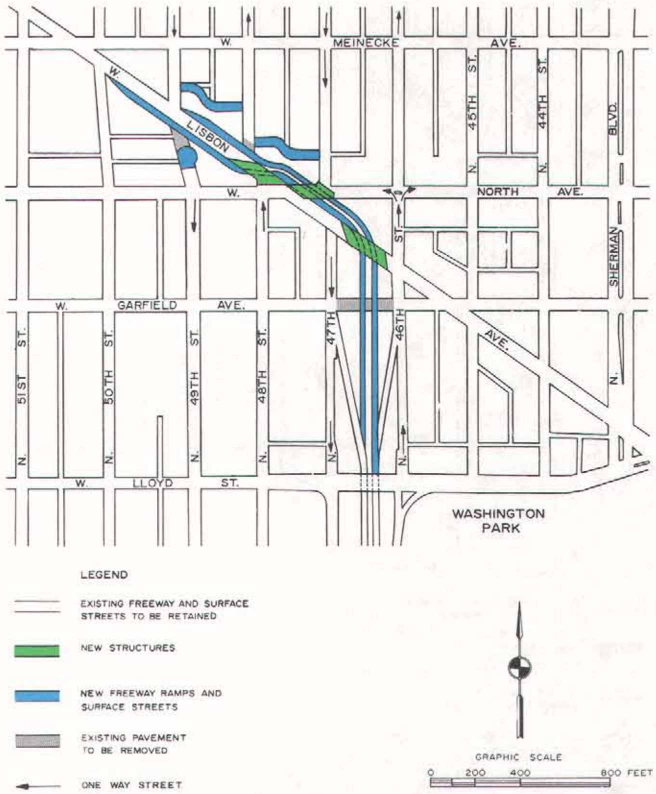
cost of this alternative is estimated at $2,610,000, expressed in 1980 dollars, of which $1,265,000 would be required for new right-of-way and $1,345,000 would be required for construction costs. A total of nine businesses, two parking lots, one business establishment with an apartment attached, and one vacant lot would have to be acquired to implement this alternative plan.

Alternative Plan 3: The third alternative plan considered for completion of the Stadium Freeway-North Interchange, and the third of the six plans prepared by the Wisconsin Department of Transportation, provides a design for a freeway on-ramp only, and is to be used in combination with one of the first two alternative plans (see Figure 83). Under this alternative plan, a southbound freeway on-ramp would be provided which would have an entrance from W. Lisbon Avenue at about N. 49th Street northwest of the intersection of W. Lisbon Avenue and W. North Avenue. This ramp would be designed to be adjacent to the south right-of-way line of W. Lisbon Avenue and to take businesses rather than residences. This new ramp would maintain a grade of less than 4 percent, the desired design standard for such ramps, with the exception of that segment between W. North Avenue and N. 49th Street, which would have a grade of about 5.2 percent. As under the first two alternatives, access to the freeway would be provided by the existing southbound on-ramp from N. 47th Street and the existing off-ramp to N. 46th Street. In addition, under this alternative W. Garfield Avenue would be closed between N. 46th and N. 47th Streets; N. 49th Street would be closed in a cul-de-sac south of W. Lisbon Avenue; and N. 46th Street north of W. North Avenue would remain as currently channelized by the City of Milwaukee—that is, inaccessible to traffic from the south, but accessible to traffic from the east on W. North Avenue. A retaining wall approximately 700 feet in length would be required along the south side of W. Lisbon Avenue between W. Lisbon Avenue and the new on-ramp under this alternative.

Two structures would be required under this alternative to provide the necessary grade separation of traffic movements: one on N. 47th Street over the new freeway on-ramp south of its intersection with W. Lisbon Avenue, and the other on W. North Avenue over the new freeway on-ramp south of its intersection with W. Lisbon Avenue. As shown in Table 164, the total cost of this alternative is estimated at $2,825,000, expressed in 1980 dollars, of which $875,000 would be required for new right-of-way and $1,950,000 would be required for construction. This alternative design would require the taking of four businesses, two business establishments with attached apartments, and one parking lot.

Figure 84

ALTERNATIVE NO. 4 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"



Source: Wisconsin Department of Transportation.

Alternative Plan 4: The fourth alternative plan considered for completion of the Stadium Freeway-North Interchange, and the fourth of the six plans prepared by the Wisconsin Department of Transportation, is the last of the four moderate-cost alternatives (see Figure 84). Under this alternative plan, a northbound freeway off-ramp would be provided which would merge with W. Lisbon Avenue at about N. 49th Street, and a southbound freeway on-ramp would be provided which would have an entrance from W. Lisbon Avenue at about N. 50th Street. This alternative plan is a modification of a combination of the second and third alternative plans, as both new ramps are designed to be adjacent to the W. Lisbon Avenue right-of-way line, thus taking businesses rather than residential units. The new on-ramp would maintain a grade of less than 4 percent, the desired design standard for such ramps, throughout its entire length. The new off-ramp would also maintain a grade of less than 4 percent with the exception of that portion between N. 47th Street and N. 49th Street, which would have a grade of about 4.5 percent, slightly above the desirable standard. As under the first three alternatives, both the existing southbound on-ramp from N. 47th Street and the existing off-ramp to N. 46th Street would again remain without modification. Under this alternative, W. Garfield Avenue would again be closed between N. 46th Street and N. 47th Streets; N. 49th Street would be closed in a cul-de-sac south of W. Lisbon Avenue; N. 48th Street would no longer connect with W. Lisbon Avenue, but would join with a new connecting roadway between N. 47th and N. 48th Streets; another new connecting roadway would be provided between N. 48th and N. 49th Streets to provide neighborhood continuity; and N. 46th Street north of W. North Avenue would again remain as currently channelized by the City of Milwaukee—that is, inaccessible to traffic from the south, but accessible to traffic from the east on W. North Avenue. As in the first two alternatives, a traffic signal would be necessary at N. 49th Street at the end of the off-ramp under this alternative.

Three structures would be necessary under this alternative to provide the necessary grade separation of traffic movements: one on W. Lisbon Avenue between N. 46th and N. 47th Streets over the new ramps; another on W. North Avenue at about N. 47th Street over the new ramps; and the third on W. Lisbon Avenue at about N. 48th Street over the southbound freeway on-ramp. As shown in Table 164, the total cost of this alternative is estimated at $4,880,000, expressed in 1980 dollars, of which $1,800,000 would be required for new right-of-way and $3,080,000 would be required for construction. A total of 12 businesses, three parking lots, one business establishment with an attached apartment, and two vacant lots would be taken under this alternative.

Alternative Plan 5: Upon review of the initial four alternatives discussed above, the Advisory Committee expressed concern over the disruption to the W. Lisbon Avenue business community which would result from implementation of the second, third, and fourth alternatives, as well as the disruption to the residential community north of W. Lisbon Avenue which would result from implementation of the first alternative. The Committee requested that the Wisconsin Department of Transportation design additional alternatives which would provide for the necessary on- and off-ramps between the Stadium Freeway-North (USH 41) and the surface arterial street system in a tunnel under the W. Lisbon Avenue business community. This tunnel would reconnect to the surface arterial street system well northwest of the intersection of W. Lisbon and W. North Avenues, where any disruption caused by the reconnection would be minimal.

Two alternatives were designed to accomplish this purpose. The first of these alternatives, and the fifth alternative designed by the Wisconsin Department of Transportation, was one of the two most costly alternative plans designed for completion of the Stadium Freeway-North Interchange (see Figure 85). Under this plan, a dual on- and off-ramp composed of three 12-foot lanes would be provided within a tunnel directly underneath W. Lisbon Avenue between N. 47th Street and N. 50th Street. The three-lane ramp is designed so that the center lane would be used as a reversible lane to meet peak-hour traffic conditions and provide two lanes in the direction of heaviest flow through the tunnel segment. The southbound on-ramp entrance onto the freeway from W. Lisbon Avenue, as well as the point at which the northbound off-ramp would merge with W. Lisbon Avenue, would be located in the median area of W. Lisbon Avenue immediately southeast of N. 50th Street. An open roadway cut, necessary to accommodate the roadway descent, would extend from a point immediately northwest of N. 48th Street to a point immediately southeast of N. 50th Street. The actual tunnel would extend from a point between N. 46th and N. 47th Streets to about N. 48th Street. South of the southeastern tunnel portal, the three-lane roadway would split into separate one-lane on- and off-ramps. W. Lisbon Avenue would be unchanged directly above the tunnel, but would be necessarily split into one-

Figure 85

ALTERNATIVE NO. 5 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"

Source: Wisconsin Department of Transportation.

way arterial pairs from about N. 48th Street to N. 50th Street to accommodate the open roadway cut. The tunnel would maintain a vertical clearance of 15.25 feet throughout. While the profile grade within the tunnel itself would approximate that of the existing W. Lisbon Avenue grade, the descending roadways at the northwest tunnel portal within the roadway cut would have grades of about 5 percent, slightly in excess of the desirable ramp grade standard. As under the other four alternatives, both the existing southbound on-ramp from N. 47th Street and the existing off-ramp onto N. 46th Street would remain without modification under this alternative. Under this alternative, W. Garfield Avenue would again be closed between N. 46th Street and N. 47th Streets; right turns only would be possible from N. 48th and N. 49th Streets onto W. Lisbon Avenue; and the at-grade W. Lisbon Avenue roadways on either side of the tunnel

Figure 86

ALTERNATIVE NO. 6 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"

Source: Wisconsin Department of Transportation.

entrance and exit retaining walls would not provide for passing a disabled vehicle—therefore, no parking, stopping, or standing could be allowed in this area. No structures other than the tunnel would be required under this alternative.

As shown in Table 164, the total cost of this alternative is estimated at $8,721,000, expressed in 1980 dollars, of which $221,000 would be required for new right-of-way and $8,500,000 would be required for construction. Although the cost of providing utility reconstruction as a result of the tunnel cut is not available, during committee discussion it was estimated to potentially add in excess of $380,000 to this total cost. Under this alternative, the tunnel and approaches would be located in irregular alignment to avoid the taking of any buildings. Portions of five business establishments would be taken under this alternative. It was concluded during committee discussion, however, that sufficient disruption would occur during the construction phase of this alternative to possibly require the closing of some businesses during that period.

Alternative Plan 6: The second of the two tunnel alternatives, and the last alternative designed by the Wisconsin Department of Transportation, was the most costly alternative designed for completion of the Stadium Freeway-North Interchange (see Figure 86). Under this plan, a four-lane roadway accommodating an on- and off-ramp, each two lanes wide, would be provided directly beneath W. Lisbon Avenue between approximately N. 47th and N. 50th Streets within a tunnel configuration similar to that described for the fifth alternative. Under this alternative, the open roadway cut would extend about one block farther to the northwest along W. Lisbon Avenue than the roadway cut described for Alternative Plan 5. The southbound on-ramp entrance to the freeway from W. Lisbon Avenue, as well as the point at which the northbound off-ramp would merge with W. Lisbon Avenue, would be located in this alternative, as in the fifth alternative, in the median area of W. Lisbon Avenue immediately northwest of N. 50th Street. An open roadway cut, necessary to accommodate the roadways, would extend from a point immediately southeast of N. 49th Street to a point immediately northwest of N. 50th Street. The actual tunnel would extend from a point between N. 46th and N. 47th Streets to a point northwest of N. 48th Street. As in the fifth alternative, the ramps would split into two separate roadways south of the southeastern tunnel portal. W. Lisbon Avenue again would remain unchanged directly above the tunnel area, but would necessarily be separated into two one-way arterial pairs from about N. 49th Street to a point northwest of N. 50th Street to accommodate the open roadway cut. The tunnel would maintain a vertical clearance of about 15.25 feet throughout. As in the fifth alternative, only those portions of the ramp roadways at the north tunnel portal within the roadway cut would have grades slightly exceeding the minimum design ramp grade standard—having grades of about 5 percent. Also as in the fifth alternative, both the existing northbound off-ramp onto N. 46th Street and the existing southbound on-ramp from N. 47th Street would remain without modification. Under this alternative plan, W. Garfield Avenue would again be closed between N. 46th and N. 47th Street; right turns only would be permitted from N. 49th and N. 50th Streets onto W. Lisbon Avenue; and the at-grade W. Lisbon

Avenue roadways on either side of the tunnel entrance and exit retaining walls would not provide for passing a disabled vehicle—therefore, no parking, stopping, or standing could be allowed in these areas. No structures other than the tunnel would be required under this alternative.

As shown in Table 164, the total cost of this alternative is estimated at $13,324,000, expressed in 1980 dollars, of which $524,000 would be required for new right-of-way and $12,800,000 would be required for construction. As in the fifth alternative, the cost of providing utility reconstruction as a result of the tunnel cut would add in excess of $380,000 to this total cost. Also as in the fifth alternative, the tunnel and approaches would be located in irregular alignment to avoid the taking of any buildings. Although only portions of eight business establishments would be taken under this alternative, it was concluded that the construction of this alternative would result in sufficient disruption to force the closing of some business establishments during that period.

Alternative Plan 7: The seventh alternative plan considered for completion of the Stadium Freeway-North Interchange, and the first of the four lesser cost plans prepared by the City of Milwaukee staff, is shown in Figure 87. This alternative design provides for a southbound freeway on-ramp which would have an entrance from W. Lisbon Avenue at a point between N. 46th and N. 47th Streets. This new ramp would maintain a grade of less than 4 percent, the desired maximum for such ramps. Under this plan, the existing off-ramp to N. 46th Street would be retained, but the existing on-ramp from N. 47th Street would be closed. Also, W. Garfield Avenue would be closed between N. 46th and N. 47th Streets; N. 47th Street would become a two-way street north of W. Garfield Avenue, and be closed in a cul-de-sac south of W. Lisbon Avenue; and N. 46th Street north of W. North Avenue would remain as currently channelized by the City of Milwaukee—that is, inaccessible to traffic from the south, but accessible to traffic from the east on W. North Avenue.

One structure would be required under this alternative to provide pedestrian access over the new freeway on-ramp between the intersections of N. 46th Street and W. Lisbon Avenue, and N. 47th Street and W. Garfield Avenue. This alternative would provide no specific treatment for the intersection of W. Lisbon Avenue and W. North Avenue and, as such, no left turns would be permitted at the intersection and the capacity of the intersection would not be changed.

Figure 87

ALTERNATIVE NO. 7 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"

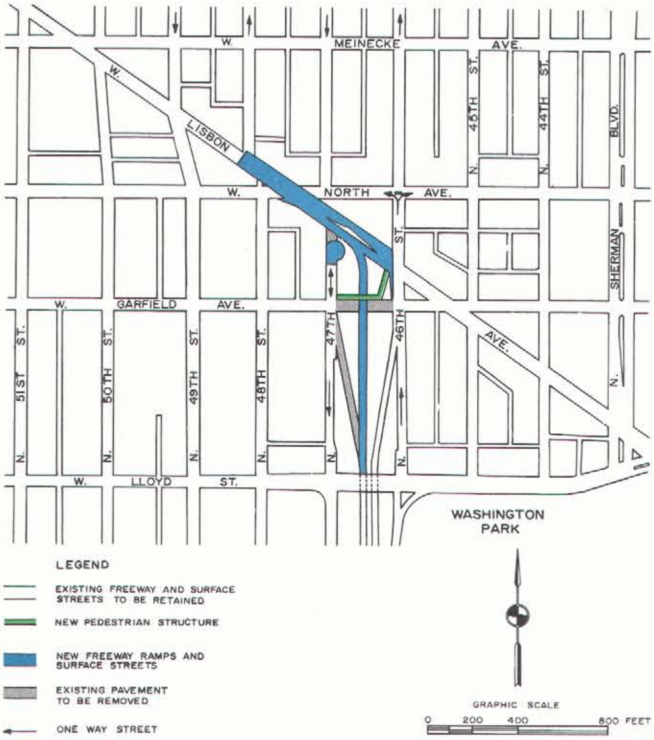
Source: City of Milwaukee.

As shown in Table 164, the total cost of this alternative is estimated at $483,000, expressed in 1980 dollars, all of which would be required for construction. No new right-of-way, businesses, or residential structures would be taken under this alternative.

Alternative Plan 8: The eighth alternative plan considered for completion of the Stadium Freeway-North Interchange, and the second of the four lesser cost plans prepared by the City of Milwaukee, is shown in Figure 88. This alternative design is similar to the seventh alternative design, and provides for a southbound freeway on-ramp which would have an entrance from W. Lisbon Avenue at a point between N. 46th and N. 47th Streets. This new ramp would maintain a grade of less than 4 percent, the desired maximum for such ramps. Like the seventh alternative plan, this alternative plan would retain the existing off-ramp to

Figure 88

ALTERNATIVE NO. 8 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"



Source: City of Milwaukee.

N. 46th Street, but would provide for the closure of the on-ramp from N. 47th Street. Under this alternative, W. Garfield Avenue would be closed between N. 46th and N. 47th Streets; N. 47th Street would become a two-way street north of W. Garfield Avenue and be closed in a cul-de-sac south of W. Lisbon Avenue; and N. 46th Street north of W. North Avenue would remain as currently channelized by the City of Milwaukee.

As under the seventh alternative plan, one structure would be required under this alternative plan to provide pedestrian access over the new freeway on-ramp between the intersections of N. 46th Street and W. Lisbon Avenue, and N. 47th Street and W. Garfield Avenue.

This alternative plan would provide for specific treatments to the intersection of W. Lisbon Avenue and W. North Avenue. Under this alternative, the north curb line of W. Lisbon Avenue would be set back a maximum of 15.5 feet between W. North Avenue and N. 46th Street in order to accommodate the addition of a segment of median and an exclusive left-turn lane on the northwest-bound approach to W. Lisbon Avenue. This left-turn lane would be exclusively phased to permit northwest-to-westbound turn movements from W. Lisbon Avenue to W. North Avenue, which would be the only left-turn movements permitted under this alternative. As shown in Figure 88, accommodation of this exclusive left-turn lane would cause northwest-bound movements through the intersection of W. Lisbon Avenue and W. North Avenue to be negotiated at an extreme seven-to-one angle. It is important to note that the capacity of the intersection would decrease under this alternative because of the provision of the separate turn phase.

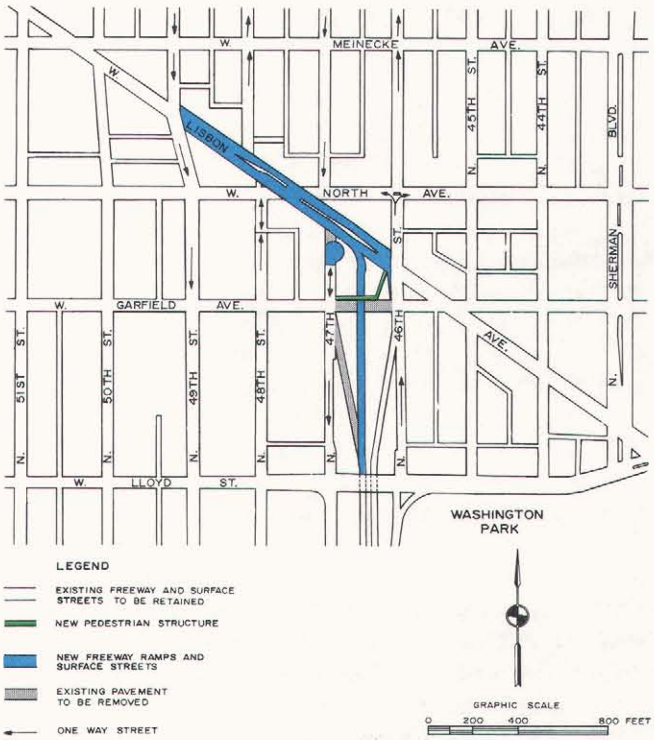
As shown in Table 164, the total cost of this alternative is estimated at $518,000, expressed in 1980 dollars, all of which would be required for construction. Strips of land from an existing parking lot and a vacant lot, currently owned by the City of Milwaukee and Milwaukee County, respectively, would be taken under this plan. No businesses or residential structures, however, would be taken under this plan.

Alternative Plan 9: The ninth alternative plan considered for completion of the Stadium Freeway-North Interchange, and the third of the four lesser cost plans prepared by the City of Milwaukee, is shown in Figure 89. This alternative would also provide for the construction of a southbound freeway on-ramp which would have an entrance from W. Lisbon Avenue at a point between N. 46th and N. 47th Streets, and which would maintain a grade of less than 4 percent, the desired maximum for such ramps. This plan is similar to the seventh and eighth alternatives in that it would provide for the closure of W. Garfield Avenue between N. 46th and N. 47th Streets, the retention of the existing off-ramp to N. 46th Street, and the closure of the existing on-ramp from N. 47th Street. Also under this alternative, N. 47th Street would become a two-way street north of W. Garfield Avenue and would be closed in a cul-de-sac south of W. Lisbon Avenue; and the existing channelization of N. 46th Street north of W. North Avenue would be retained.

Like Alternative Plans 7 and 8, this alternative would provide for a structure for pedestrian access over the new on-ramp between the intersections of N. 46th Street and W. Lisbon Avenue, and N. 47th Street and W. Garfield Avenue.

Figure 89

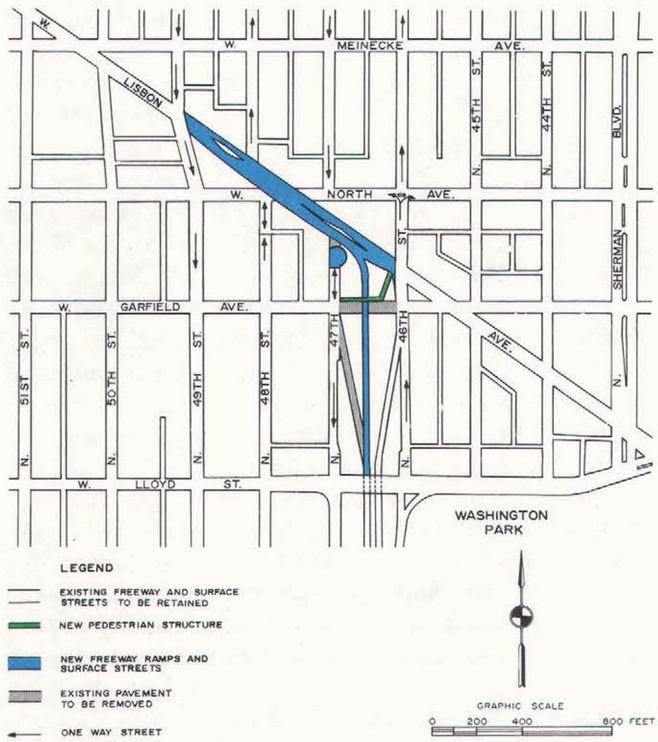
ALTERNATIVE NO. 9 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END"



Source: City of Milwaukee.

Figure 90

ALTERNATIVE NO. 10 FOR COMPLETION OF THE STADIUM FREEWAY-NORTH "STUB END



Source: City of Milwaukee.

Like Alternative Plan 8, this alternative would provide for specific treatments to the intersection of W. Lisbon Avenue and W. North Avenue. Under this plan, the north curb line of W. Lisbon Avenue would be set back a maximum of 32 feet between N. 48th Street and W. North Avenue and a maximum of 27.5 feet between W. North Avenue and N. 46th Street in order to accommodate the addition of segments of median and channelization for exclusive left-turn lanes on both the northwest-bound and southeast-bound approaches to W. Lisbon Avenue. Northwest-to-westbound and southeast-to-eastbound left turns would be permitted under this alternative, and the capacity of the intersection would not be changed.

As shown in Table 164, the total cost of this alternative is estimated at $1,330,000, expressed in 1980 dollars, of which $690,000 would be required for construction and $640,000 would be required for additional right-of-way. A total of three entire businesses and strips of land from two other businesses, one business establishment with an attached apartment, and strips of land from three existing parking lots and one vacant lot would be taken under this plan.

Alternative Plan 10: The last alternative plan considered for completion of the Stadium Freeway-North Interchange, and the fourth of the lesser cost plans prepared by the City of Milwaukee, is shown in Figure 90. Being similar to the other three alternatives prepared by the City of Milwaukee, this alternative would provide for the construction of a southbound freeway on-ramp which would have an entrance from W. Lisbon Avenue at a point between N. 46th and N. 47th Streets and which would maintain a grade of less than 4 percent, the desired standard for such ramps; would provide for the closure of W. Garfield Avenue between N. 46th and N. 47th Streets; would retain the existing off-ramp to N. 46th Street and provide for the closure of the existing on-ramp from N. 47th Street; would provide for the changing of N. 47th Street to two-way operation north of W. Garfield Avenue, and its closure in a cul-de-sac south of W. Lisbon Avenue; and would provide for the retention of the existing channelization of N. 46th Street north of W. North Avenue.

Like the other three City of Milwaukee alternatives, this alternative would provide for a structure to provide pedestrian access over the new on-ramp between the intersections of N. 46th Street and W. Lisbon Avenue, and N. 47th Street and W. Garfield Avenue. This alternative also would provide for specific treatments to the intersection of W. Lisbon Avenue and W. North Avenue. Under this plan, the south curb line of W. Lisbon Avenue would be set back a maximum of 28 feet between W. North Avenue and N. 46th Street, and a maximum of 32 feet between N. 49th Street and W. North Avenue, in order to accommodate the addition of segments of median and exclusive left-turn lanes on both the northwest-bound and southeast-bound approaches to W. Lisbon Avenue. Also under this alternative, an additional lane would be provided for southbound traffic through the intersection of W. Lisbon Avenue and W. North Avenue. Northwest-to-westbound and southeast-to-eastbound left turns would be permitted under this alternative, and the capacity of the southeast-bound approach to the intersection of W. Lisbon Avenue and W. North Avenue would be increased.

As shown in Table 164, the total cost of this alternative is estimated at $1,608,000, expressed in 1980 dollars, of which $748,000 would be required for construction and $860,000 would be required for new right-of-way. A total of one business, three business establishments with apartments attached, and one strip of land from a parking lot would be taken under this plan.

Alternative Plan 7—The Adopted Plan: The seventh alternative plan considered for the completion of the Stadium Freeway-North "stub end" was the plan adopted by the study Advisory Committee in 1982. This plan was adopted in conjunction with the adoption in the long-range element of the northwest side study of an improvement proposal for W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue under which no physical improvement would be made to the existing segments of W. Appleton Avenue and W. Lisbon Avenue, but under which all on-street parking would be prohibited during both the morning and evening peak periods in the direction of peak traffic flow and all left-turn movements from both W. Appleton Avenue and W. Lisbon Avenue over these segments would be prohibited during both peak periods. Under this alternative, as in the recommended plan for the improvement of W. Appleton Avenue and W. Lisbon Avenue, minimal urban disruption would be incurred, and no businesses or residential structures would be taken. The intersection of W. Lisbon Avenue and W. North Avenue would not be improved and left turns would be prohibited.

A TRANSPORTATION SYSTEMS MANAGEMENT PLAN FOR THE PUBLIC TRANSIT SYSTEM OF THE NORTHWEST SIDE STUDY AREA

Alternative short-range plans for public transit system development in the northwest side study area were designed, tested, and evaluated as part of the concurrent Milwaukee County transit system service improvement study for the entire public transit system of Milwaukee County. The alternative transit system plans prepared for Milwaukee County were developed to include as alternatives those improvements necessary to address the existing major public transit problems of the study area as identified in Chapter IV of this report. Those problems principally relate to the lack of "Freeway Flyer" or express transit service in the most intensively developed parts of the study area. The Regional Planning Commission staff, having a technical representative on the task force guiding the countywide study, ensured that these problems and their potential resolution were adequately addressed in that study. Other agencies represented on the northwest side study Advisory Committee also participating as members of the task force—thus ensuring that the major short-range concerns for the study area were addressed in the countywide study—were the City of Milwaukee Departments of City Development and Public Works, the Milwaukee County Department of Public Works, the Milwaukee County Transit System, the Wisconsin Department of Transportation, and the Federal Urban Mass Transportation Administration.

In order to be implemented over the next three to five years, it was essential that the short-range transit planning for the northwest side study area be conducted within the context of the Milwaukee County Transit System short-range transit planning for all of Milwaukee County. Routes and service-level improvements for the northwest side study area had to be carefully fitted to the routes and service levels and their proposed changes for the remainder of Milwaukee County. And, importantly, the resources available to Milwaukee County to make service improvements and extensions in the study area in the next three to five years had to be balanced against the need to preserve service, and to improve and extend service in the remainder of the Milwaukee County public transit service area. Without this systemwide approach, it would be extremely difficult, if not impossible, to implement the short-range public transit recommendations of the northwest side study.

Four alternative short-range plans were developed for the public transit system of Milwaukee County and the study area under Milwaukee County's short-range transit planning effort. Of these, two plans were intended to serve as "benchmark" plans against which alternative plans developed to address the existing problems and needs of Milwaukee County and the study area could be compared. One of these benchmark plans was a "status quo" system plan, which would maintain the routes and service levels of the transit system as it existed in 1980. The second benchmark plan, termed an "augmented" system plan, also would retain the existing route structure of the Milwaukee County Transit System, but would provide for increased service levels.

The third alternative plan developed, and the first designed to specifically address the identified transit deficiencies within the Milwaukee area and the northwest side study area, was termed a "timed-transfer" system plan, and was based upon establishing transit, or transfer, centers at which a number of routes would meet at common arrival times in order to facilitate transfers between routes. Local routes of short length and with short headways would meet at the center serving collection and distribution functions in the surrounding area, and express or Freeway Flyer routes would provide line-haul service connecting the centers. A total of eight transit centers were proposed to be developed in Milwaukee County under this alternative, including three in the northwest side study area and one center on the border of the study area, as shown on Map 151. The plan also recommended within the northwest side study area the provision of one additional Freeway Flyer route, five additional express routes, and some extension of local transit service to the northwest corner of Milwaukee County.

The second alternative plan developed to address identified deficiencies within Milwaukee County was termed an "extended grid" system plan, and involved the expansion of all elements of the Milwaukee County public transit system: local, express, and Freeway Flyer. Under this plan, service to some lower density areas and unserved areas in Milwaukee County would be provided by branches or extensions of existing routes as well as by new routes. Also, service levels would be improved under this plan. As shown on Map 152, one additional Freeway Flyer route would serve the northwest side study area under this plan. Finally, five additional express routes would be provided within the study area under this alternative plan, and local transit service would be extended to the northwest corner of Milwaukee County, as under the "timed-transfer" system plan.

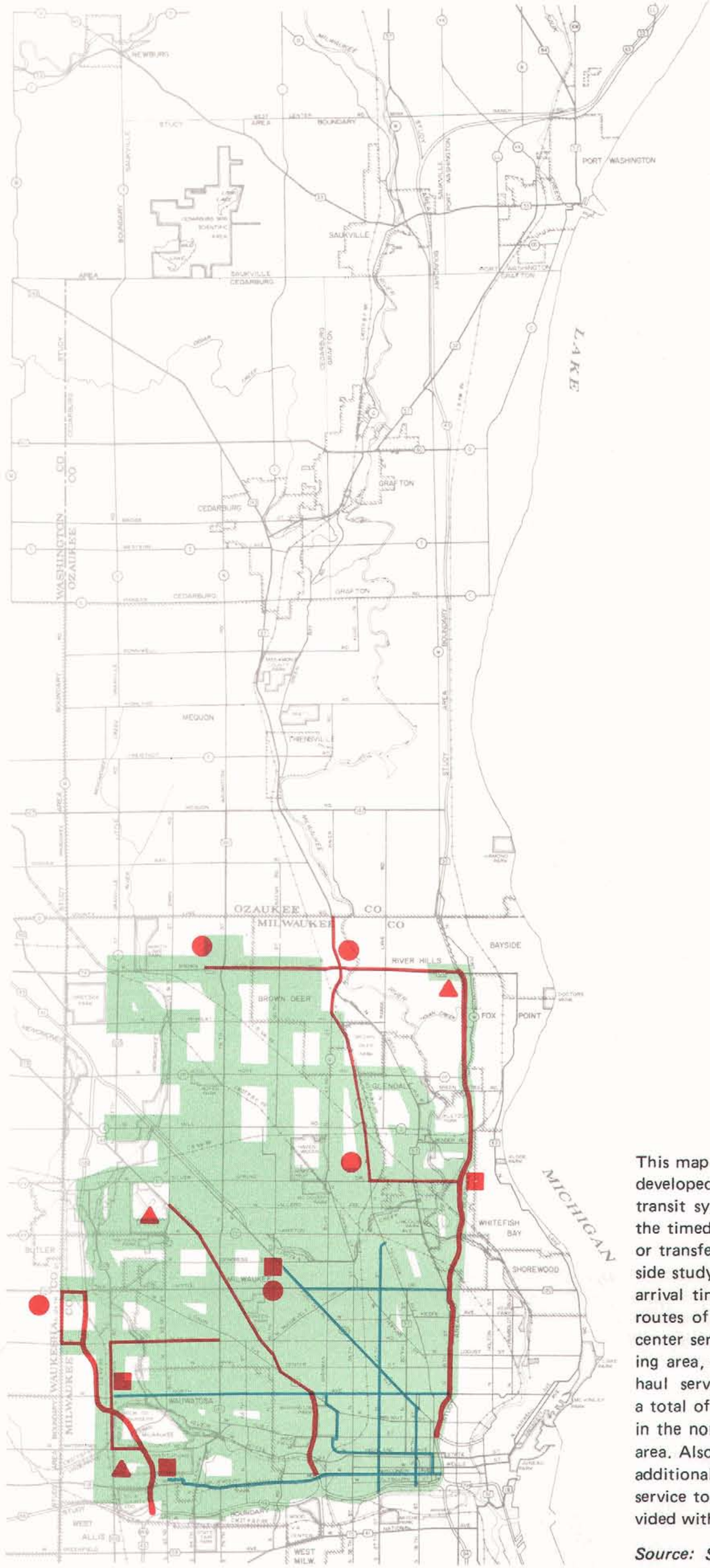
The performance of these four plans was reviewed and compared route-by-route, and a plan combining the best features of the four original plans was developed by the county study staff and the study task force. This plan was then further evaluated and presented at public informational meetings and hearings. Following this public review, revisions were made to the plan, and the plan was adopted by the study's task force, recommended by the Milwaukee County Board Mass Transit Committee for adoption by the Board, and subsequently adopted by the Board in September 1980.

The following sections of this chapter describe the recommendations of this adopted short-range public transit plan and program for Milwaukee County as they relate to the northwest side study area. A comparison of the recommended plan to the existing public transit system, in terms of its effect on the northwest side study area, is also provided. This comparison serves to indicate the degree to which the recommended short-range transit plan for the study area might better satisfy the adopted northwest side study transportation system objectives than a "status quo" plan of maintaining the existing transit system. This comparison was prepared for the year 1985, as the time frame for implementation of the recommendations under the study would be five years beginning in 1980.

The five-year, short-range transit system plan adopted by Milwaukee County includes the provision of three levels of transit service in the northwest side study area: 1) Freeway Flyer or primary service, 2) express or secondary service, and 3) local or tertiary service. Transit service would be expanded in the study area under the plan, as shown on Maps 153 and 154. Under the recommended plan, a total of about 164 route miles of Freeway Flyer service would be provided in the study area, an increase of about 67 route miles of primary transit service over the existing transit

Map 151

PUBLIC TRANSIT SYSTEM UNDER THE TIMED-TRANSFER SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

PRIMARY SERVICE

FREEWAY BUS LINE

NONFREEWAY EXTENSION

SECONDARY SERVICE

EXPRESS BUS LINE

PARK-RIDE LOTS

PUBLIC TRANSIT STATION

SHOPPING CENTER LOT

TRANSFER CENTER

TERTIARY SERVICE

SERVICE AREA

GRAPHIC SCALE

0 1 2 MILES

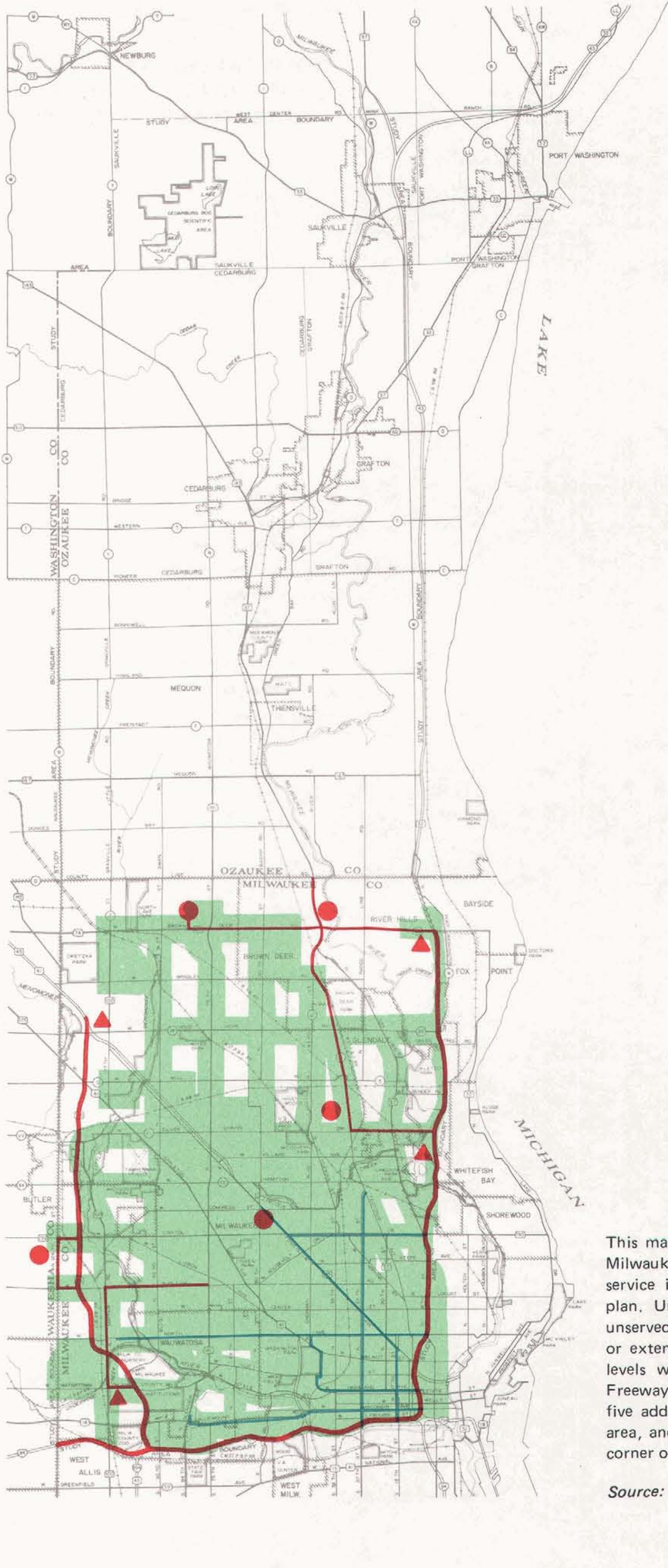
0 4000 8000 12000 FEET

This map shows one of the four alternative short-range transit plans developed by the Milwaukee County Transit System as part of its transit system service improvement study for Milwaukee County—the timed-transfer, short-range transit plan. Under this plan, transit, or transfer, centers would be established throughout the northwest side study area at which a number of routes would meet at common arrival times in order to facilitate transfers between routes. Local routes of short length and with short headways would meet at the center serving collection and distribution functions in the surrounding area, and express or Freeway Flyer routes would provide line-haul service connecting the centers. Under this alternative plan, a total of eight transit centers would be developed, including three in the northwest side study area and one on the border of the study area. Also under this plan, one additional Freeway Flyer route, five additional express routes, and some extensions of local transit service to the northwest corner of Milwaukee County would be provided within the northwest side study area.

Source: SEWRPC.

Map 152

PUBLIC TRANSIT SYSTEM UNDER THE EXTENDED GRID SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

PRIMARY SERVICE
- FREEWAY BUS LINE
- NONFREEWAY EXTENSION

SECONDARY SERVICE
- EXPRESS BUS LINE

PARK-RIDE LOTS
- PUBLIC TRANSIT STATION
- SHOPPING CENTER LOT

TERTIARY SERVICE
- SERVICE AREA

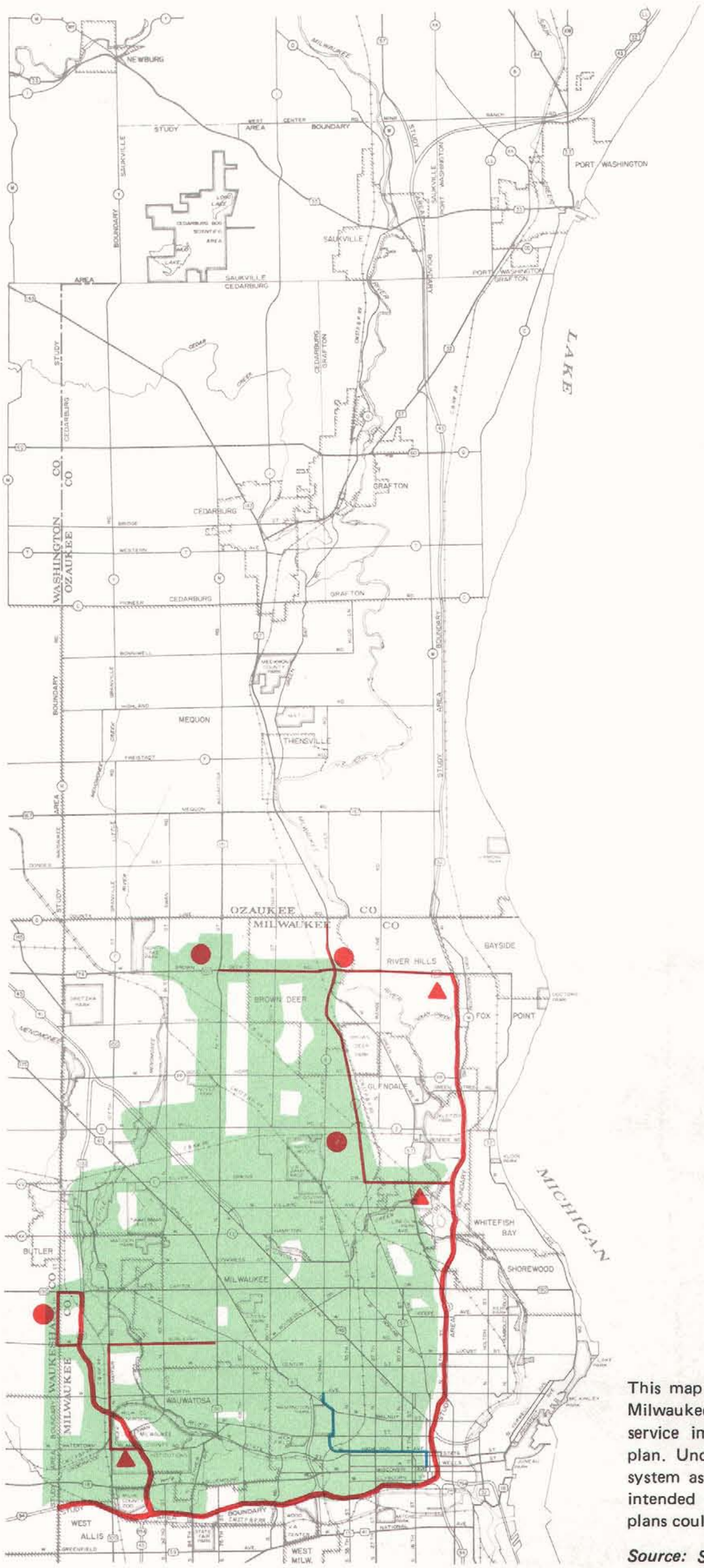
GRAPHIC SCALE
0 1 2 MILES
0 4000 8000 12000 FEET

This map shows another of the alternative plans developed by the Milwaukee County Transit System as part of its transit system service improvement study—the extended grid, short-range transit plan. Under this plan, service to some lower density areas and unserved areas in Milwaukee County would be provided by branches, or extensions, of existing routes, as well as by new routes. Service levels would also be improved under this plan. One additional Freeway Flyer route would serve the northwest side study area, five additional express routes would be provided within the study area, and local transit service would be extended to the northwest corner of Milwaukee County within the study area.

Source: SEWRPC.

Map 153

PUBLIC TRANSIT SYSTEM UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

PRIMARY SERVICE

- FREEWAY BUS LINE
- NONFREEWAY EXTENSION

SECONDARY SERVICE

- EXPRESS BUS LINE

PARK-RIDE LOTS

- PUBLIC TRANSIT STATION
- SHOPPING CENTER LOT

TERTIARY SERVICE

- SERVICE AREA

GRAPHIC SCALE

0 1 2 MILES

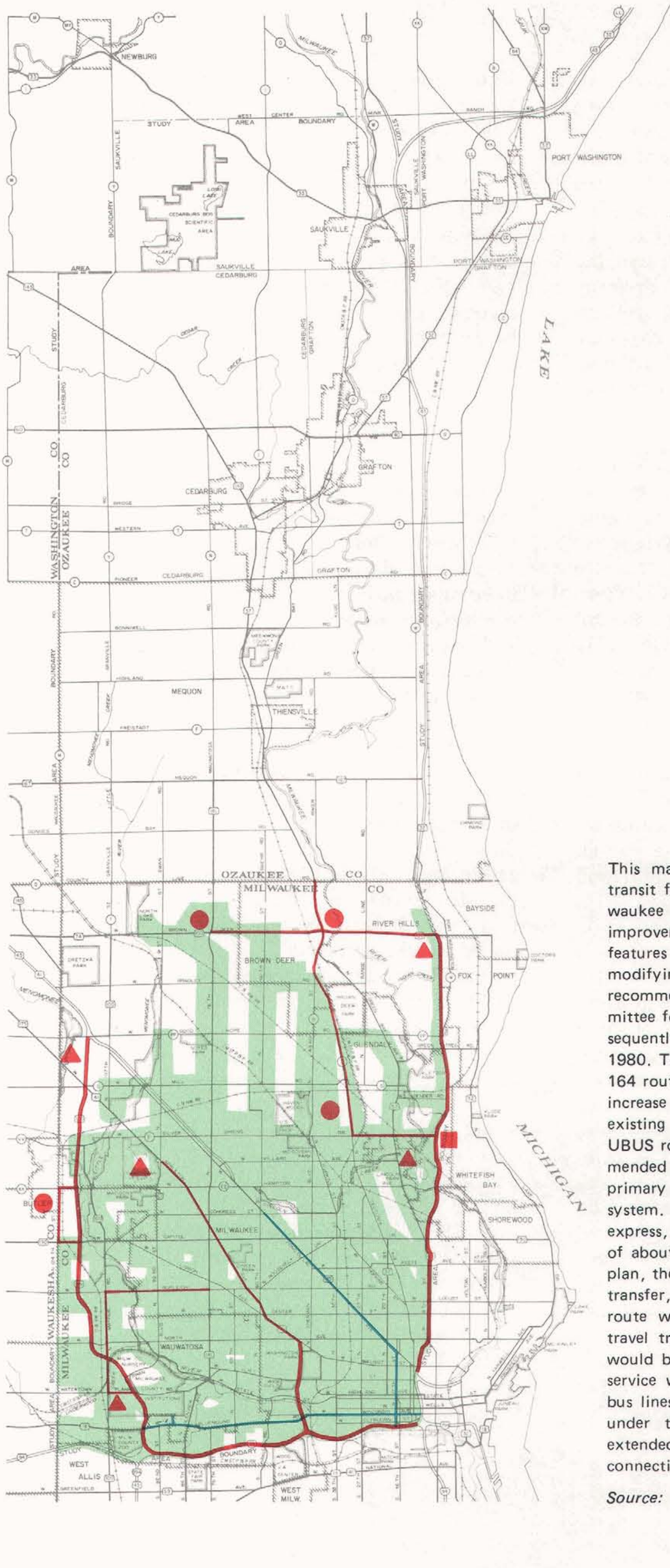
0 4000 8000 12000 FEET

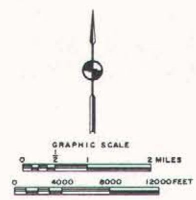
This map shows another of the alternative plans developed by the Milwaukee County Transit System as part of its transit system service improvement study—the "status quo" short-range transit plan. Under this plan, the routes and service levels of the transit system as it existed in 1980 would be maintained. This plan was intended to provide a benchmark against which other alternative plans could be evaluated.

Source: SEWRPC.

Map 154

PUBLIC TRANSIT SYSTEM UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985





LEGEND

PRIMARY SERVICE
- FREEWAY BUS LINE
- NONFREEWAY EXTENSION

SECONDARY SERVICE
- EXPRESS BUS LINE

PARK-RIDE LOTS
- PUBLIC TRANSIT STATION
- SHOPPING CENTER LOT
- TRANSFER CENTER

TERTIARY SERVICE
- SERVICE AREA

This map shows the recommended short-range plan for public transit for the northwest side study area as developed by the Milwaukee County Transit System as part of its transit system service improvement study. This plan was developed by combining the best features of the original alternative short-range transit plans and by modifying the resultant plan following public review. This plan was recommended by the Milwaukee County Board Mass Transit Committee for adoption by the Milwaukee County Board, and was subsequently adopted by the Milwaukee County Board in September 1980. This recommended plan would provide for a total of about 164 route miles of Freeway Flyer service within the study area, an increase of about 67 route miles of primary transit service over the existing transit system. Seven Freeway Flyer routes, including one UBUS route, would be provided in the study area under the recommended plan, along with nine park-ride lots, a total of two more primary transit routes and park-ride lots than under the existing system. Under this plan, about 23 route miles of secondary, or express, service would be provided in the study area, an increase of about 15 route miles over the existing system. Also, under this plan, the Bayshore Shopping Center would operate as a transit, or transfer, center where a number of local routes and one express route would terminate, with schedules coordinated to minimize travel transfer times. About 20 more route miles of local service would be provided under this plan. The configuration of the local service would remain largely a grid of north-south and east-west bus lines operating principally over surface arterial streets. Finally, under this recommended plan, six existing routes would be extended and 10 existing routes would be rerouted to improve connectivity and directness.

Source: SEWRPC.

system. Seven Freeway Flyer routes, including one UBUS route, would be provided in the study area under the recommended plan, along with nine park-ride lots, a total of two more routes and lots than under the existing system. One of the two new routes would be initiated from a new park-ride lot in the vicinity of W. Good Hope Road and the Zoo Freeway (USH 45), and would traverse the Zoo Freeway (USH 45) and the East-West Freeway (IH 94) to downtown Milwaukee. The second route would be initiated from a new park-ride lot at Timmerman Airport, and would traverse W. Appleton Avenue and the Stadium Freeway (USH 41) to downtown Milwaukee.

Under the recommended plan about 23 route miles of secondary, or express, service, would be provided in the study area. This compares to about eight route miles under the existing system, or "status quo" short-range plan. One of the two routes under the recommended plan would operate from the Bay Shore Shopping Center adjacent to the study area to the University of Wisconsin-Milwaukee and to downtown Milwaukee, and then west on W. Wisconsin Avenue within the study area to the Milwaukee County Medical Complex. The beginning of this route at the Bay Shore Shopping Center would be a transit center where a number of local routes and the express routes would terminate, with schedules coordinated to minimize transfer times. The other express route would begin at the Capitol Court Shopping Center and traverse W. Fond du Lac Avenue and N. 17th Street to downtown Milwaukee.

About 371 route miles of local transit service would be provided within the northwest side study area under the recommended plan. The existing system provides about 351 route miles of local service. The proposed local transit route network would remain largely a grid system of north-south and east-west local bus lines spaced between one-half mile and one mile apart, and operating principally over surface arterial streets. Under the recommended plan, six existing routes are to be extended, and 10 existing routes are to be rerouted over some portion of their route to improve connectivity and directness. The local transit service area provided under the recommended plan would be nearly the same as that under the existing transit system. With respect to levels of service, the frequency of buses would increase on four existing routes during peak time periods, and on 16 routes during off-peak time periods.

Under the recommended plan, an estimated 436 transit vehicles would be required for use in the study area during the morning peak period, as compared with an estimated 329 vehicles under the "status quo" plan, as shown in Table 165. During the midday period, an estimated 269 transit vehicles would be required for use in the study area, as compared with an estimated 210 vehicles under the "status quo" plan. Also under the recommended plan, a total of 53,400 bus miles would be traveled per weekday, compared with an estimated 37,500 bus miles under the "status quo" plan. Table 166 provides a summary of all of the improvements recommended under the short-range plan for public transit in the study area.

The testing and evaluation of the short-range transit system plan was conducted under two motor fuel price levels. One level was $1.50 per gallon in 1985 in 1980 dollars, which was consistent both with long-range projections of motor fuel price under the long-range element of the northwest side study and with the range of future motor fuel price established under the Milwaukee area primary transit system alternatives analysis. An average automobile fuel efficiency approaching 18 to 20 miles per gallon (mpg) in 1985 was assumed under this fuel price, and thus an $0.08-per-mile automobile motor fuel cost was used for estimating automobile out-of-pocket operating costs and transit ridership. The other motor fuel price level used was $2.00 per gallon in 1985 in 1980 dollars, the level used in the Milwaukee County transit system service study under which the five-year short-range transit plan for Milwaukee County was developed. Under the transit service study, an average automobile motor fuel efficiency approaching 17 mpg in 1985 was assumed, and thus a $0.12-per-mile motor fuel cost was used for estimating automobile out-of-pocket operating costs and transit ridership.

Table 167 indicates the number of person trips generated within the northwest side study area and internal to the Southeastern Wisconsin Region on an average weekday by trip purpose in the year 1985. As shown in this table, an estimated 1,230,900 person trips would be made within the study area in 1985, an increase of 74,200 trips, or about 6 percent, over the 1972 total. Under the recommended short-range transit plan, an estimated 109,100 to 137,100 person trips, or about 9 to 11 percent of all person trips generated within the study area and internal to the Region, would be made on the public transit system, the range

Table 165

PUBLIC TRANSIT FACILITIES IN THE STUDY AREA—RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Transit Facility Characteristic	Recommended Plan		"Status Quo" Plan	
	Miles	Percent of Total	Miles	Percent of Total
Route Miles				
Primary	163.5	29.3	96.3	21.1
Secondary	23.2	4.2	7.6	1.7
Tertiary	370.6	66.5	351.3	77.2
Total	557.3	100.0	455.2	100.0
Special Facilities				
Exclusive Rights-of-Way	--	--	--	--
Exclusive Lanes	--	--	--	--
Bus Miles per Weekday	53,400		37,500	
	Number		Number	
Vehicle Requirement				
Morning Peak Period	436		329	
Midday Period	269		210	

Source: SEWRPC.

Table 166

RECOMMENDED SHORT-RANGE PLAN FOR PUBLIC TRANSIT IN THE NORTHWEST SIDE STUDY AREA: SUMMARY OF RECOMMENDED IMPROVEMENTS

Summary of Improvements

Additional Service

Primary Service

- 67 additional route miles
- Two additional routes: Good Hope Road/Zoo Freeway Flyer
Timmerman Field/Appleton Avenue Flyer
- Two additional park-ride lots: Good Hope Road at Fond du Lac Freeway (USH 45)
Timmerman Field

Secondary Service

- 15 additional route miles
- Two new routes: Bay Shore Shopping Center/Downtown Milwaukee/Milwaukee County Medical Complex
Capitol Court Shopping Center/Downtown Milwaukee
(Highland Boulevard/Downtown Milwaukee route deleted)
- One new transfer center: Bay Shore Shopping Center

Tertiary Service

- 20 additional route miles
- Six route extensions
- Ten reroutings
- Frequency of service increases on four routes during peak period and 16 routes during off-peak period

Vehicle and Operational Requirements

Additional Buses Needed

- During peak period: 107 additional buses per weekday
- During off-peak period: 59 additional buses per weekday

Bus Hour Requirements

- 15,900 additional bus hours per weekday

Source: SEWRPC.

Table 167

DISTRIBUTION OF TOTAL INTERNAL PERSON TRIPS IN THE STUDY AREA ON AN AVERAGE WEEKDAY FOR THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS FOR THE NORTHWEST SIDE STUDY AREA: 1985

Plan or Condition	Internal Person Trips Generated				
	Transit Person Trips[a]	Percent of Total	Auto Person Trips	Percent of Total	Total Person Trips
Existing 1972	72,100	6.2	1,056,800	91.4	1,156,700
1985 "Status Quo" Plan					
$2.00 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars . . .	95,300	7.7	1,101,000	89.4	1,230,900
$1.50 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars . . .	77,000	6.2	1,119,300	90.9	1,230,900
1985 Recommended Plan					
$2.00 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars . . .	137,100	11.1	1,059,200	86.1	1,230,900
$1.50 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars . . .	109,100	8.9	1,087,200	88.3	1,230,900

[a] *The transit fare assumed in an analysis of a transit system plan will affect the estimated ridership on the system, the estimated farebox revenue of the transit system, and the estimated operating subsidy required.*

The levels of transit ridership presented in this table for the northwest side study area, and the attendant revenues and operating subsidies presented in Table 169, are all based upon an assumed $0.50 public transit fare in the year 1985, expressed in constant 1980 dollars—that is, a transit fare which will increase with general price inflation over the five-year, short-range planning period. This assumption is consistent with ridership estimates prepared under the Milwaukee County study in the spring of 1980. While the ridership levels under that plan were estimated based upon an assumed $0.50 fare, a 1985 fare of $0.40 was used to estimate revenue and operating subsidies. The latter fare, also expressed in constant dollars, was intended to be indicative of a fare structure which did not increase quite as rapidly as general price inflation. The ridership and revenue levels developed for the Milwaukee County plan are shown in Appendix B of this report. Also shown in Appendix B are the transit ridership, revenue, and operating subsidy estimates prepared for the same plan, with a $0.50 fare used to determine both ridership and estimate revenues. It should be noted that the difference in transit ridership between a $0.40 fare and a $0.50 fare for the Milwaukee County short-range transit plan is only 7 percent in the year 1985. This difference is not significant, given the accuracy with which the total future market for travel in the Milwaukee area can be estimated. The attendant differences in transit system revenue and operating subsidy are, however, 20 and 13 percent, respectively, with the revenue being lower and the operating subsidy being higher under the $0.40 transit fare. As shown in Appendix B, however, the effect of the assumptions made under the Milwaukee County short-range transit plan as published—that is, using a $0.50 fare to estimate ridership but a $0.40 fare to estimate revenue and subsidy—was to conservatively understate the transit system revenue by about 4 percent and to overstate the required subsidy by about 3 percent, as compared with estimates for the same plan using a $0.40 fare to estimate both ridership and revenue.

It should also be noted that there are factors affecting the estimation of transit ridership which, because of the uncertainties involved, may have a greater impact on any estimates of transit ridership and attendant revenues and operating subsidies than the modest differences assumed in fares. In the estimates of 1985 transit ridership prepared for the Milwaukee County plan, a $2.00 per gallon gasoline price was assumed, expressed in constant 1980 dollars, and an average automobile fuel utilization efficiency of 17 miles per gallon was assumed, resulting in an automobile fuel cost per mile, expressed in constant 1980 dollars, of about $0.12 per mile—more than 50 percent higher than in 1980. Based upon analyses of short- and long-range crude oil and motor fuel price projections and of automobile fuel utilization efficiencies prepared at the national level, the Regional Planning Commission determined under the Milwaukee area primary transit alternatives analysis study—conducted concurrently with this northwest side study—that the midpoint of the likely range of future gasoline price in 1985, expressed in constant 1980 dollars, may be expected to approximate $1.50 per gallon, and that automobile fuel efficiency may be expected to range from 18 to 20 miles per gallon, resulting in an automobile fuel cost of about $0.08 per mile. As shown in this table, estimates of transit ridership under the recommended short-range transit plan—assuming a $0.40 transit fare and this lower motor fuel cost—are well under the ridership estimates for this same plan at both the $0.40 and $0.50 fare level and at the higher motor fuel cost—22 percent and 16 percent, respectively. In addition, estimates of revenue are substantially lower—35 percent and 21 percent for the $0.50 and $0.40 fare, respectively; and estimates of operating subsidy are substantially higher—25 percent and 9 percent for the $0.50 and $0.40 fare, respectively.

Source: SEWRPC.

depending upon the amount of increase in motor fuel cost per mile assumed to the year 1985. This compares with an estimated 77,000 to 95,300 person trips, or about 6 to 8 percent of all person trips, under the "status quo" plan in 1985, the range again depending upon the motor fuel cost per mile in that year. In 1972, an estimated 72,100 trips were made on public transit within the study area, or about 6 percent of all person trips generated within the study area and internal to the Region in that year.

EVALUATION OF THE RECOMMENDED SHORT-RANGE TRANSIT PLAN FOR THE NORTHWEST SIDE STUDY AREA—SATISFACTION OF ADOPTED STUDY OBJECTIVES AND STANDARDS

The most effective way to evaluate the performance of the recommended short-range transit system plan is to scale this plan against the agreed-upon study objectives which pertain to public transit (see Chapter II of this report), and to compare this performance to that of the existing system, or "status quo" plan. Of the seven development objectives developed under this study, five are pertinent to the evaluation of the recommended short-range transit system plan: 1) the first objective, which pertains to the need for transit accessibility to land uses; 2) the second objective, which provides for the economic and energy efficiency of the transit system; 3) the third objective, which specifies that an appropriate range of transportation services be provided; 4) the fifth objective, which asserts that quick and convenient travel be provided; and 5) the sixth objective, which asserts that travel safety be provided. The fourth objective, which asserts that disruption of the existing and desirable future neighborhood and community development, including adverse impacts on the property tax and natural resource base, should be minimized, and the seventh objective, which provides for a transportation system with a high aesthetic quality, were not used in the evaluation of the recommended transit plan as each of these objectives serves largely to measure the impact of the construction of transportation facilities. As no such construction would be associated with the implementation of the short-range transit system plan, these two objectives were not used. It is important to note that the five development objectives used in this evaluation of the short-range transit plan were not the same objectives used by the Milwaukee County Transit System in the development of the recommended short-range transit plan, the transit system's objectives being more cost-oriented and less comprehensive.

Effectiveness of the Recommended and "Status Quo" Short-Range Transit System Plans in Serving the Land Use Pattern of the Study Area

The first transportation system development objective formulated under the study identifies the need for an integrated transportation system which, through its location, capacity, and design, will effectively serve the existing land use pattern of northwestern Milwaukee County and southern Ozaukee County and promote implementation of the adopted regional land use plan. This objective is supported by two standards which are considered relevant to the evaluation of the recommended short-range transit plan: one relating to maximum transit travel times between residential areas of the study area and major land use activity centers of the Region, and the other relating to the overall transit accessibility of residential areas of the study area to all urban land use activities in the Region.

Accessibility to Major Land Use Activities: The first standard under this objective specifies that the public transit system should provide service such that the maximum number of residents within the urbanized portion of the study area are within 30 minutes travel time of 40 percent of the Milwaukee area jobs; 35 minutes travel time of three of the Region's major retail and service centers; 30 minutes travel time of one of the Region's major medical centers, hospitals, and/or medical clinics; 40 minutes travel time of one of the Region's major parks and outdoor recreational areas; 40 minutes travel time of one of the Region's technical or vocational schools, colleges, or universities; and 60 minutes travel time of the Region's scheduled air transport facility. These accessibility levels are considered essential to the support of the land uses within the urbanized portion of the study area.

As summarized in Table 168, these travel accessibility standards are met to an extent under the recommended short-range transit plan. None of the standards are met in the urbanized part of the Ozaukee County portion of the study area, principally because no transit service accessible by walking is provided to this area under the recommended plan, and Freeway Flyer primary transit service accessible by a drive of three miles or less to park-ride lots is available to only the southern part of the Ozaukee County portion of the study area.

Table 168

ACCESSIBILITY OF THE POPULATION OF THE URBANIZED PORTION OF THE STUDY AREA TO EMPLOYMENT AND SELECTED MAJOR LAND USE AND ACTIVITY CENTERS BY PUBLIC TRANSIT: RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS

Resident Population Within:	Recommended Plan		"Status Quo" Plan	
	Milwaukee County Portion of Study Area	Ozaukee County Portion of Study Area	Milwaukee County Portion of Study Area	Ozaukee County Portion of Study Area
30 Minutes Travel Time of 40 Percent of Regional Jobs				
Population Served	72,200	- -	39,100	- -
Percent of Urbanized Area Population in 1985	14.5	- -	7.9	- -
Percent of Transit Service Area Population in 1985	16.0	- -	8.6	- -
35 Minutes Travel Time of Three or More Major Retail and Service Centers				
Population Served	279,400	- -	244,000	- -
Percent of Urbanized Area Population in 1985	56.4	- -	49.2	- -
Percent of Transit Service Area Population in 1985	61.8	- -	53.9	- -
30 Minutes Travel Time of a Major Medical Center, Hospital, or Medical Clinic				
Population Served	422,400	- -	402,000	- -
Percent of Urbanized Area Population in 1985	85.2	- -	81.1	- -
Percent of Transit Service Area Population in 1985	93.4	- -	88.9	- -
40 Minutes Travel Time of a Major Park or Outdoor Recreational Facility				
Population Served	424,000	- -	376,000	- -
Percent of Urbanized Area Population in 1985	85.6	- -	75.8	- -
Percent of Transit Service Area Population in 1985	93.7	- -	83.1	- -
40 Minutes Travel Time of an Accredited University, College, or County Technical or Vocational School				
Population Served	437,800	- -	421,600	- -
Percent of Urbanized Area Population in 1985	88.3	- -	85.1	- -
Percent of Transit Service Area Population in 1985	96.8	- -	93.2	- -
60 Minutes Travel Time of a Scheduled Air Transport Facility				
Population Served	186,500	- -	71,400	- -
Percent of Urbanized Area Population in 1985	37.6	- -	14.4	- -
Percent of Transit Service Area Population in 1985	41.2	- -	15.8	- -

Source: SEWRPC.

The northern part of the Milwaukee County portion of the study area, generally north of W. Mill Road, is not fully provided local transit service which is accessible by walking under this plan. Freeway Flyer primary transit service that is accessible by a drive of three miles or less to park-ride lots, or express transit service accessible by walking, is provided to nearly all parts of the Milwaukee County portion of the study area.

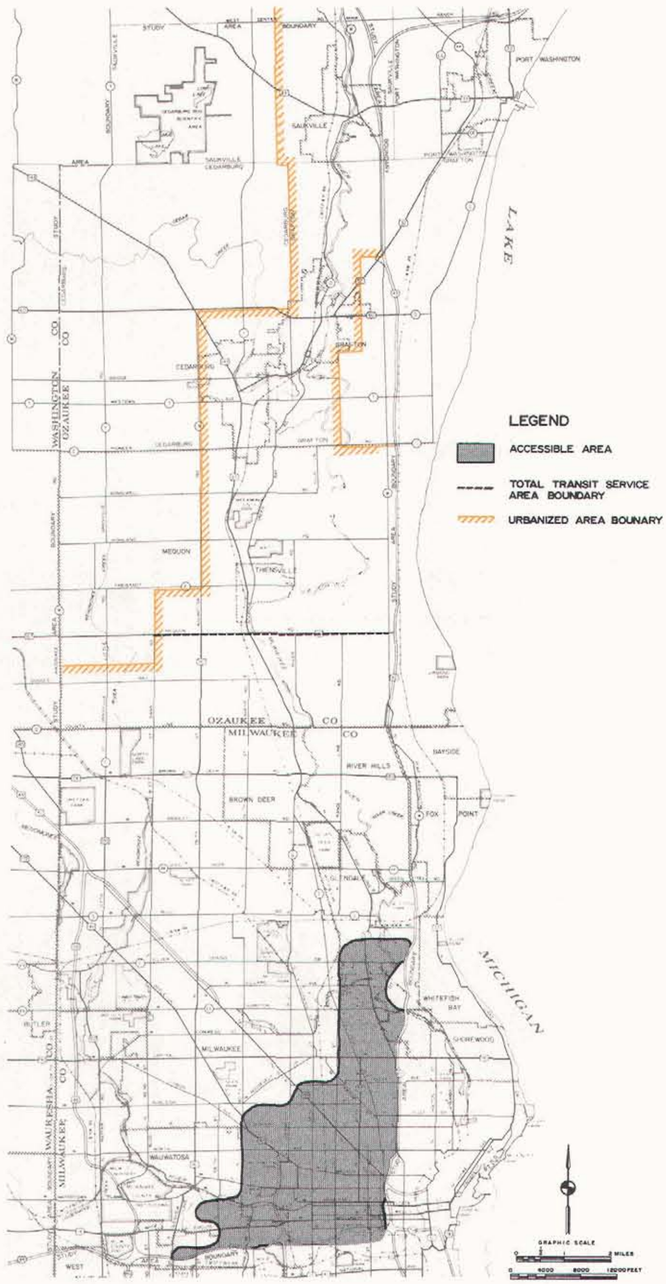
For residents within that area of the Milwaukee County portion of the study area served by local public transit, transit accessibility standards for major medical facilities, major educational facilities, and regional parks are generally met under the recommended plan. Transit accessibility standards with respect to a scheduled air transport facility and regional retail and service centers are generally met under this plan only in the southeastern corner of the local transit service area. Furthermore, only a very small part of the study area is *within 30 minutes by transit of 40 percent of the* Milwaukee area jobs. The recommended plan, however, provides some improvement over the existing public transit system, or "status quo" plan, in the degree of public transit accessibility afforded to all major land use activity centers, but particularly to General Mitchell Field and to jobs, as shown on Maps 155 through 158.

Accessibility Support of Land Use Plan: The second standard used under this objective in the evaluation of the short-range transit plan requires that the relative accessibility provided by the recommended plan be adjusted to the adopted year 2000 land use plan for this area, providing to areas in which development is to be supported or induced a higher relative accessibility than that provided to areas to be protected from urban development. An index of accessibility was computed which measured the ease with which each part of the study area could reach land use activity centers within the study area and the Region by public transit under the recommended and "status quo" short-range transit plans.

As shown on Maps 159 and 160, both transit plans would support the study area land use plan, as they would provide the highest accessibility in the extreme southeastern corner of the study area and would generally decrease in accessibility in all directions in the study area from the central business district of Milwaukee. A higher level of accessibility would be provided under the recommended *short-range transit plan*. However, under both plans

Map 155

ACCESSIBILITY WITHIN THE STUDY AREA TO GENERAL MITCHELL FIELD WITHIN 60 MINUTES TRAVEL TIME BY PUBLIC TRANSIT UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

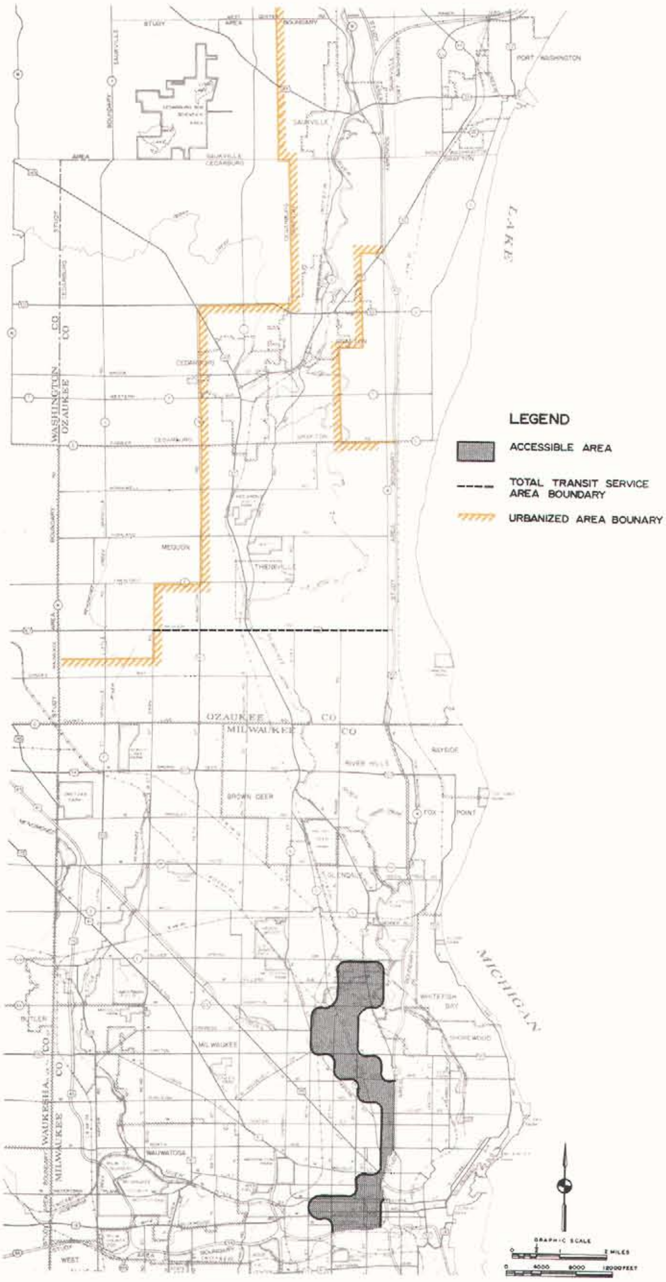


This map shows those portions of the study area which would be within 60 minutes travel time by public transit of General Mitchell Field airport under the recommended short-range transit plan in 1985. About 186,500 people—or approximately 38 percent of the urbanized population of the study area in 1985, and about 41 percent of the transit service area population in the study area in 1985—would be so served under this plan.

Source: SEWRPC.

Map 156

ACCESSIBILITY WITHIN THE STUDY AREA TO GENERAL MITCHELL FIELD WITHIN 60 MINUTES TRAVEL TIME BY PUBLIC TRANSIT UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985

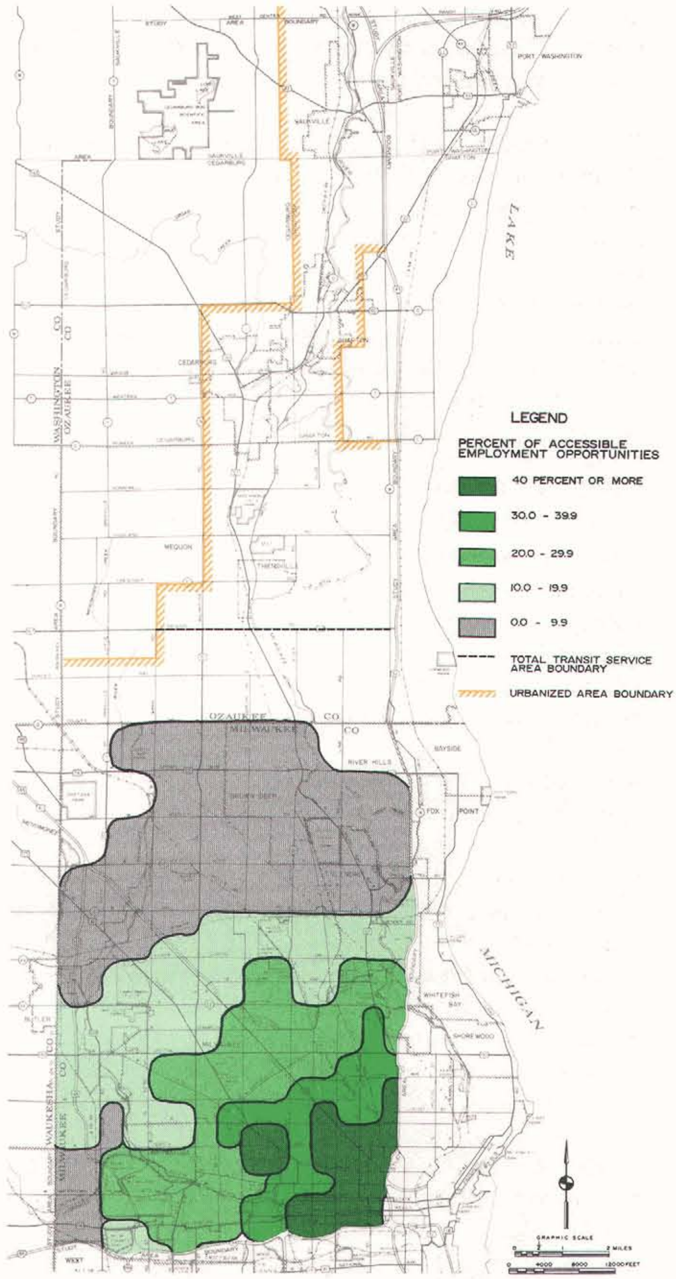


This map shows those portions of the study area which would be within 60 minutes travel time by public transit of General Mitchell Field airport under the "status quo" short-range transit plan for public transit in 1985. About 71,400 people—or about 14 percent of the urbanized population of the study area in 1985 and about 16 percent of the transit service area population in the study area in 1985—would be so served under the "status quo" short-range plan. As indicated by a comparison of this map with Map 155, the recommended short-range plan would serve nearly three times as many people within 60 minutes travel time by public transit of General Mitchell Field in 1985 as the "status quo" short-range plan for public transit.

Source: SEWRPC.

Map 157

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE AREA EMPLOYMENT OPPORTUNITIES WITHIN 30 MINUTES TRAVEL TIME BY PUBLIC TRANSIT UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

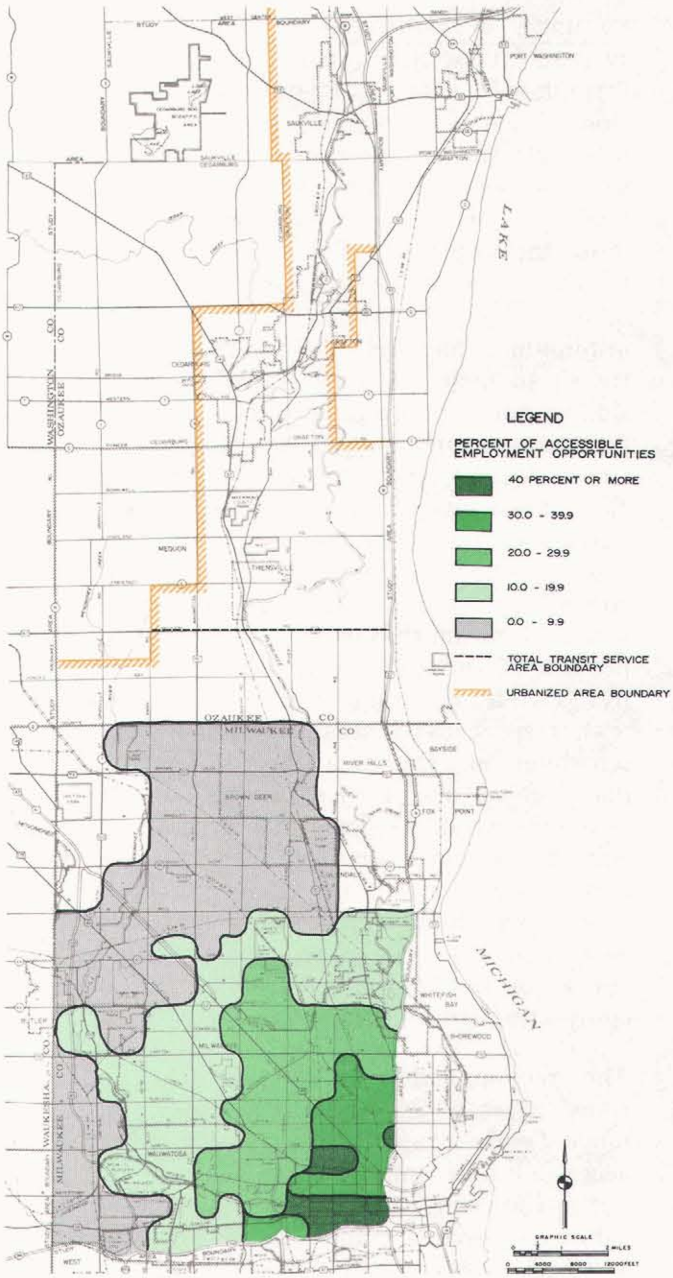


This map shows the percent of employment opportunities accessible within 30 minutes travel time by public transit under the recommended short-range transit plan in 1985. As shown on this map, only in the extreme southeastern portion of the study area would 40 percent or more of the employment opportunities be accessible within 30 minutes travel time by public transit under this plan. This area would house a population of 72,200 persons, or about 15 percent of the urbanized population of the study area in 1985 and about 16 percent of the transit service area population in the study area in 1985.

Source: SEWRPC.

Map 158

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE AREA EMPLOYMENT OPPORTUNITIES WITHIN 30 MINUTES TRAVEL TIME BY PUBLIC TRANSIT UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985

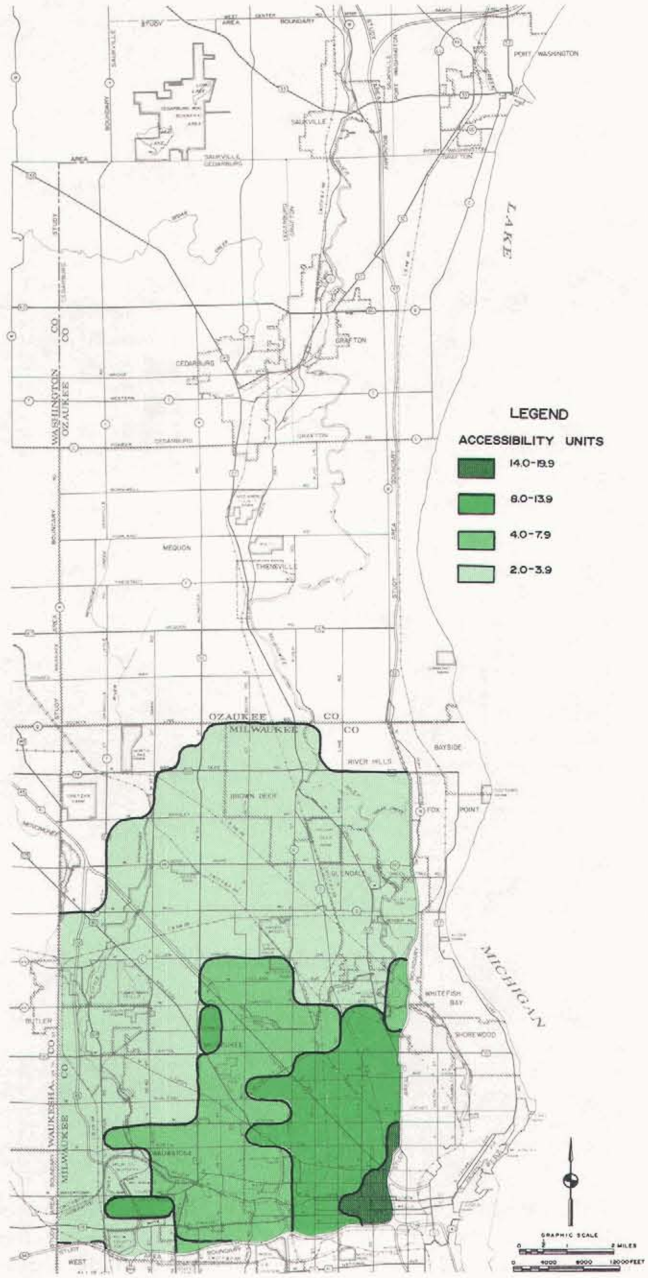


This map shows those areas of the study area in which 40 percent or more of all employment opportunities would be accessible within 30 minutes travel time by public transit under the "status quo" short-range transit plan in 1985. As shown on this map, only in limited parts of the southeastern portion of the study area would such accessibility be afforded. A total of 39,100 people would reside within these areas in 1985, or about 8 percent of the urbanized population of the study area in 1985 and about 9 percent of the transit service area population in the study area in 1985. As indicated by a comparison of this map with Map 157, under the recommended short-range transit plan nearly twice as many people would reside within areas in which 40 percent of the employment opportunities are within 30 minutes travel time by public transit in 1985 as under the "status quo" short-range transit plan.

Source: SEWRPC.

Map 159

PUBLIC TRANSIT ACCESSIBILITY TO LAND USE ACTIVITIES WITHIN THE STUDY AREA UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

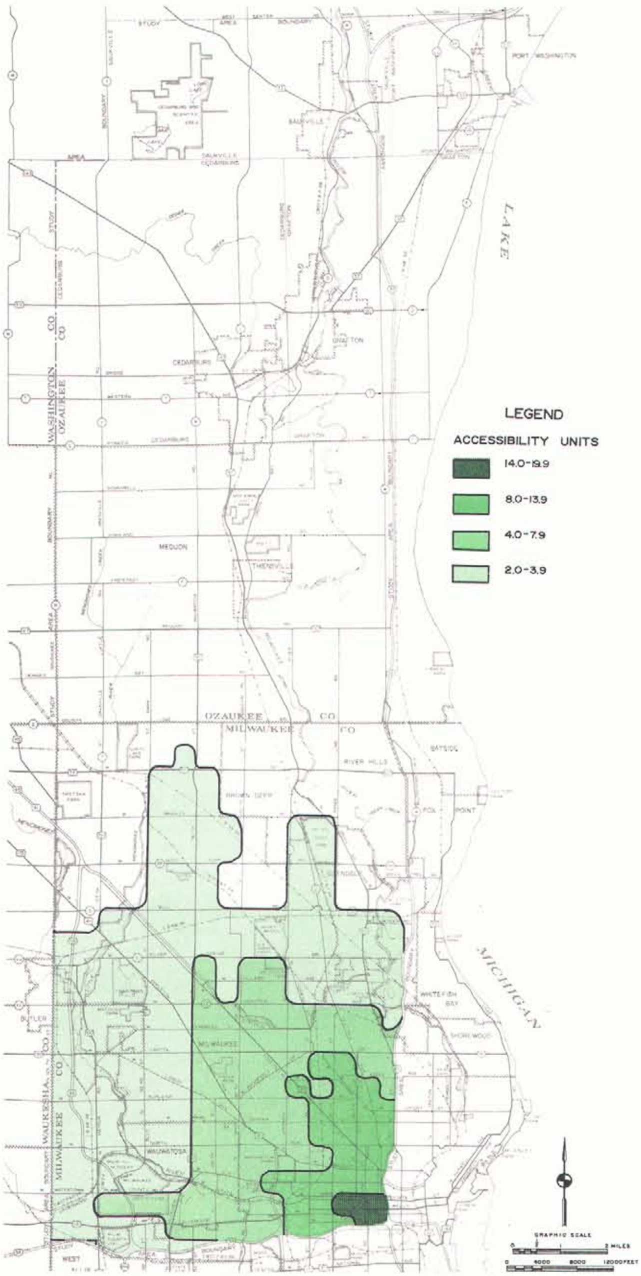


This map illustrates the relative accessibility to public transit which would exist in the study area under the recommended short-range transit plan in 1985. Areas of highest relative transit accessibility under this plan would be located in the extreme southeastern portion of the study area. From those locations, the accessibility levels would decrease in irregular concentric tiers.

Source: SEWRPC.

Map 160

PUBLIC TRANSIT ACCESSIBILITY TO LAND USE ACTIVITIES WITHIN THE STUDY AREA UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



This map illustrates the relative accessibility to public transit which would exist in the study area under the "status quo" short-range transit plan in 1985. As under the recommended plan, the areas of highest relative accessibility would be located in the extreme southeastern portion of the study area, and from these locations the accessibility levels would decrease in irregular concentric tiers. As indicated by a comparison of this map with Map 159, a higher level of transit accessibility would be provided under the recommended short-range transit plan. Some areas recommended for medium- and high-density development would, however, be afforded little transit accessibility under either plan. These areas would include the proposed Granville industrial land bank area, and the medium-density development recommended for the portion of the study area in Ozaukee County in and around the Villages of Grafton, Saukville, and Thiensville and the City of Cedarburg.

Source: SEWRPC.

some areas recommended for medium- and high-density development would be afforded little or no public transit accessibility, including the proposed Granville industrial land bank area and the medium-density development recommended for the portion of the study area in Ozaukee County in and around the Villages of Grafton, Saukville, and Thiensville and the City of Cedarburg.

Summary and Conclusions: The first transportation systems management and development objective formulated under this study and used in the evaluation of the recommended short-range transit plan sets forth the need to provide transportation facilities and services which will serve the anticipated land uses of the study area, and which will promote the implementation of the adopted regional land use plan for the study area.

Minimum standards for travel time by public transit to major land use centers under this accessibility objective would be met to a limited extent under the recommended short-range plan for public transit for the study area, and would not be met at all in the urbanized part of the Ozaukee County portion of the study area. Minimum transit travel time standards for major medical facilities, major educational facilities, and regional parks would be met only within that part of the Milwaukee County portion of the study area considered to be served by local transit. Minimum travel time standards with respect to General Mitchell Field (the only scheduled air transport facility in the Region), major retail and service centers, and Milwaukee area jobs would be met only in the southeastern portion of the study area. The overall level of accessibility provided by the recommended transit plan would, however, generally support the study area land use plan except in the northwestern corner of the Milwaukee County portion of the study area, and in parts of Ozaukee County.

The recommended short-range plan for public transit does have limited advantages over a short-range "status quo" plan regarding transit system accessibility to land use in the study area. A greater portion of the study area would be accessible within reasonable transit travel times to General Mitchell Field and to jobs under this plan, and a generally higher overall accessibility by transit would be provided to urban land use activity centers within the Milwaukee area.

Effectiveness of the Recommended and "Status Quo" Short-Range Transit System Plans in Providing a Transportation System Which is Economical and Efficient, and Which Satisfies All Other Objectives at the Lowest Possible Cost

The second transportation development objective formulated under the study and used in the

Table 169

PUBLIC TRANSIT SYSTEM COSTS IN THE STUDY AREA UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Public Transit System Cost Element (1980 dollars)	Recommended Plan (1980 dollars)	"Status Quo" Plan (1980 dollars)
Cumulative Operation and Maintenance Costs: 1980 to 1985[a]		
$2.00 per Gallon Motor Fuel Price.	$134,560,000	$111,360,000
$1.50 per Gallon Motor Fuel Price.	130,355,000	107,880,000
Total Operating Subsidy Required: 1985		
$2.00 per Gallon Motor Fuel Price.	$ 16,244,800	$ 11,631,800
$1.50 per Gallon Motor Fuel Price.	18,385,000	12,979,000
Total Operating Subsidy Required per Ride: 1985		
$2.00 per Gallon Motor Fuel Price.	$0.40	$0.42
$1.50 per Gallon Motor Fuel Price.	0.57	0.57
Farebox Revenue as a Proportion of Total Operating Cost: 1985		
$2.00 per Gallon Motor Fuel Price.	$0.49	$0.48
$1.50 per Gallon Motor Fuel Price.	0.40	0.40

[a] *Operation and maintenance costs include all costs necessary to operate and maintain the motor bus fleet, to maintain support equipment, and to cover administration and overhead expenses. The cost per bus-hour is estimated at $32 in 1980 dollars under the higher motor fuel price assumption for 1985, and $31 in 1980 dollars under the lower motor fuel price assumption.*

Source: SEWRPC.

evaluation of the recommended short-range plan for public transit identifies the need for a public transit system which is economical and efficient, satisfying all other objectives at the lowest possible cost. This objective is supported by four standards, two of which are applicable to the evaluation of short-range transit plans. One requires that transportation system operating and capital costs be minimized, and the other specifies that energy use in the operation of transportation systems should be minimized.

Operating and Capital Costs: The first standard indicates that transportation system operating and capital costs should be minimized. Total operation and maintenance costs for the recommended and "status quo" short-range plans for public transit in the study area were estimated in constant 1980 dollars for the period 1980 to 1985, and are presented in Table 169. Total operation and maintenance costs for the recommended short-range plan would approximate $130.4 to $134.6 million, depending upon the range of real increase in diesel motor fuel price to 1985. Total operation and maintenance costs for the "status quo" plan would approximate $107.9 to $111.4 million—or about 17 percent less than under the recommended plan—again depending upon the range of real increase in diesel motor fuel price. Under both plans, capital costs would be expended only for bus acquisition, with both plans requiring expenditures for bus replacement, and the recommended plan only requiring expenditures for additional buses. An average of 36 new buses per year would need to be added to the Milwaukee County bus fleet over and above vehicle replacement under the recommended plan, requiring a total of about $27 million over the next five years in 1980 dollars. Nearly 107 additional buses, or about 21 more buses per year, would be required in the northwest side study area during morning peak periods. Existing and planned renovated and new garages and shops could provide adequate storage and maintenance for existing and additional vehicles under either plan.

Under the recommended plan and assuming a transit fare that would increase only with inflation, a total operating subsidy in the study area of about $16.2 to $18.4 million, or about $0.40 to $0.57 per passenger, would be required in 1985 under a $0.50 transit fare in 1980 dollars. In comparison, under the "status quo" plan and the same transit fare, a total operating subsidy of about $11.6 to

$13.0 million, or about $0.42 to $0.57 per passenger, would be required in 1985.

Energy Use: Motor fuel consumption by the public transit system under the recommended short-range transit plan would total about 13,350 gallons per average weekday in the study area, or about 4,000 gallons, or 42 percent, more than under the "status quo" plan. However, under the recommended plan, between 32,100 and 41,800 fewer trips by automobile may be expected to be made on an average weekday. As a result, the recommended plan may be expected to have an automobile fuel savings of about 4,700 to 6,100 gallons per weekday, or about 3 to 4 percent of the total amount of motor fuel used by automobiles on the arterial street and highway system of the study area on an average weekday.

Summary and Conclusions: The second transportation development objective formulated under this study and used in the evaluation of the recommended short-range plan for public transit requires the provision of transportation facilities and services which are economical and efficient, and which satisfy all of the other objectives at the lowest cost. Under the recommended plan, the total operation and maintenance costs over the period 1980 to 1985 would range between $130.4 and $134.6 million, depending upon the extent of future real increase in diesel motor fuel price, or about $22.5 to $23.2 million more than would be required if the existing public transit system were maintained. Assuming a $0.50 transit fare in 1980 dollars in 1985, the total operating subsidy required in the year 1985 would also be higher under the recommended short-range transit plan than under a "status quo" plan—between $16.2 and $18.4 million compared with between $11.6 and $13.0 million. However, the total subsidy per ride under this transit fare in the year 1985 would be about the same under both plans—about $0.40 to $0.57 under the recommended plan compared with $0.42 to $0.57 under the "status quo" plan.

There also would be a fuel savings under the recommended short-range plan. Although the motor bus transit system would require nearly 4,000 more gallons of fuel per average weekday, automobiles would use between 4,700 and 6,100 fewer gallons of motor fuel per average weekday in the year 1985—about 3 to 4 percent of total automobile fuel use in the study area.

Effectiveness of the Recommended and "Status Quo" Short-Range Transit System Plans in Providing a Balanced Transportation System at an Adequate Level of Service

The third transportation system development and management objective formulated under this study specifies the need for a flexible, balanced transportation system which provides the appropriate types of transportation service needed by all residents in the northwestern portion of Milwaukee County and southern Ozaukee County at an adequate level of service. Nine of the 13 standards under this objective were used in the evaluation of the recommended transit system plan. The first standard under this objective was not used in this analysis as it does not relate to the public transit system, and the seventh, eighth, and ninth standards, which relate to passenger stop spacings along public transit routes, were not used in this analysis as specific passenger stop spacing was not addressed under the recommended short-range transit plan.

Provision of Primary and Secondary Public Transit Service: The first standard to be used in this evaluation of the recommended short-range transit plan specifies that primary and secondary public transit routes in the study area should connect and serve areas of concentrated land use activities, including major retail and service centers; major industrial centers; major medical centers, hospitals, and/or medical clinics; major parks and outdoor recreational areas; major educational institutions, including accredited universities, colleges, and county technical or vocational schools; scheduled air transport facilities; and high-density residential areas.

As summarized in Table 170 and shown on Map 161, all three major shopping centers in the study area, four of seven major industrial areas, nine of 11 major medical centers or hospitals, one of five major parks or outdoor recreational centers, and three of four universities, accredited four-year colleges, or county-operated technical or vocational schools may be considered to be served by primary or secondary public transit, or to be within one-half mile of a Freeway Flyer park-ride lot or stop or express bus stop.

In comparison to the existing transit system, one additional major shopping center—Capitol Court—and two additional major medical centers—the Milwaukee County Medical Complex and Northwest General Hospital—are considered to be served within walking distance of primary or secondary transit service.

Table 170

FACILITIES AND/OR POPULATION SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT IN THE STUDY AREA UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Type of Land Use or Activity Center	Served by Primary or Secondary Service Within Walking Distance			
	Recommended Plan		"Status Quo" Plan	
	Number Served	Total Number	Number Served	Total Number
Major Retail and Service	3	3	2	3
Major Industrial	4	7	4	7
Major Medical	9	11	7	11
Major Recreational	1	5	1	5
Major Educational	3	4	3	4
	Served by Primary or Secondary Service Within Walking Distance			
	Population	Percent	Population	Percent
High-Density Residential Development	217,400	58.7	76,500	20.6
	Served by Primary or Secondary Service Within Driving Distance of Park-Ride Lot or Walking Distance of Secondary Service			
	Population	Percent	Population	Percent
High-Density Residential Development	336,300	90.8	193,800	52.3

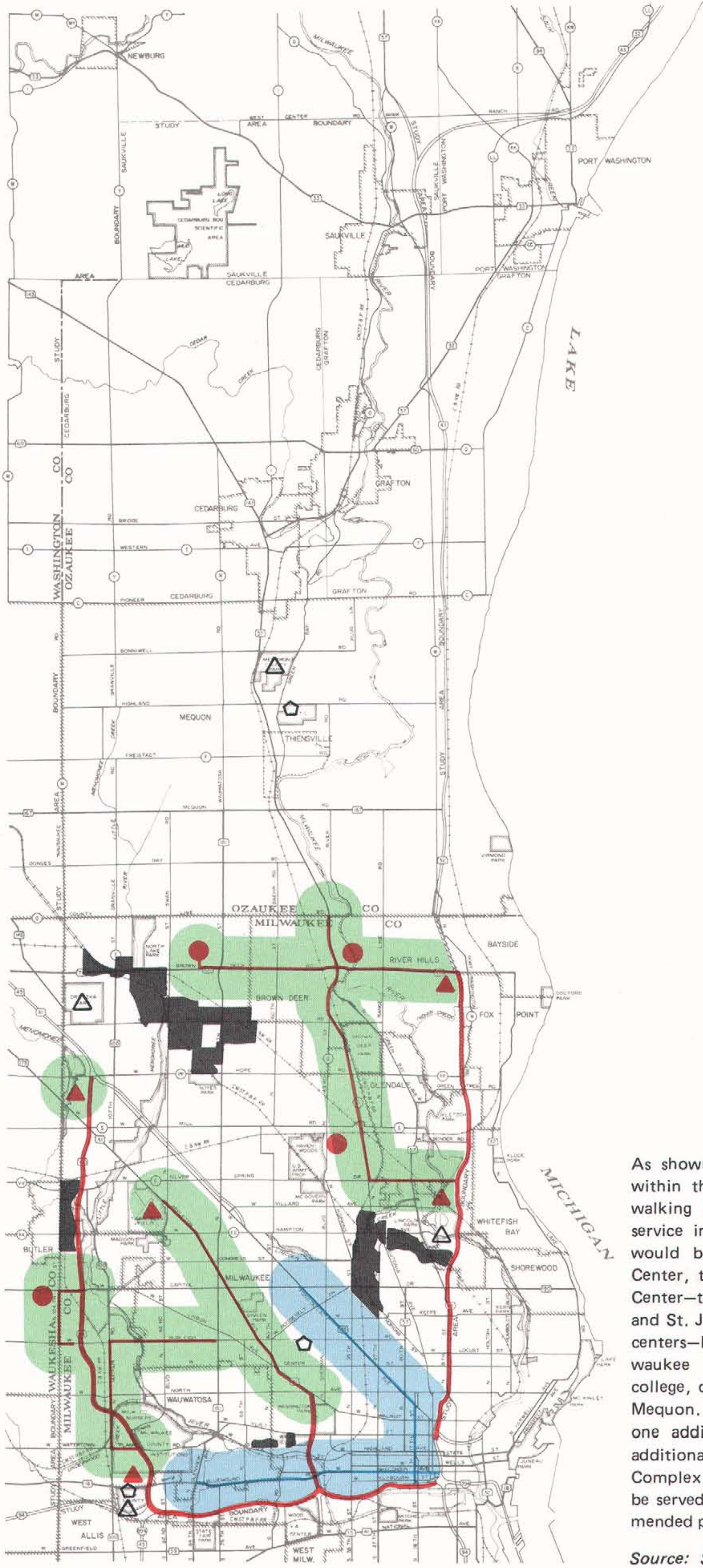
Source: SEWRPC.

As shown on Map 162 under the recommended plan, about 59 percent of the population of the high-density residential development of the study area, representing about 217,400 people, would be within a one-half-mile walking distance of Freeway Flyer or express bus service. Under the existing transit system, only 21 percent of the high-density development, representing 76,500 people, is within a one-half-mile walking distance of such service. Under the recommended plan, only a very small portion of the planned high-density residential development in the study area would not be within a three-mile driving distance of a primary transit park-ride lot and/or a one-half-mile walking distance of a secondary transit route stop. As shown on Map 163, the area not having access to primary or secondary transit, even when automobile access to primary transit is considered, includes a portion of the southeast corner of the Milwaukee County portion of the study area, representing about 34,000 people, or about 9 percent of the total population of the high-density residential area of the study area in 1985. The area not served by Freeway Flyer or express transit, even when driving access to the Freeway Flyer is considered, would be substantial under the "status quo" plan, as it would include about 176,500 people, or about 48 percent of the total population of the high-density residential areas of the study area in 1985.

Local Transit Service Route Spacing: The second standard used in the evaluation of the recommended short-range transit plan under this objective specifies that local public transit service should have route spacings not exceeding one mile in low-density areas and one-half mile in medium-density and high-density areas. Map 164 shows those areas of high-, medium-, and low-density development within the study area which are anticipated to be urbanized in 1985 and which would not meet this local public transit route spacing standard under the recommended short-range transit plan. None of the planned low-density development within the study area would be considered to be served by one-mile transit route spacing under this plan. Also, within those areas of planned contiguous high- and medium-density development within the study area, one-half-mile local public transit route spacing would be met only in limited portions of the southeastern part of the Milwaukee County portion of the study area under this plan. About 382,000 people would reside in those parts of the study area not meeting this standard under the recommended plan, or about 77 percent of the

Map 161

MAJOR LAND USE CENTERS AND AREAS WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

PRIMARY SERVICE

- SERVICE AREA
- FREEWAY BUS LINE
- NONFREEWAY EXTENSION

SECONDARY SERVICE

- SERVICE AREA
- EXPRESS BUS LINE

PARK-RIDE LOTS

- PUBLIC TRANSIT STATION
- SHOPPING CENTER LOT

MAJOR LAND USE CENTERS NOT SERVED

- RETAIL AND SERVICE
- PUBLIC OUTDOOR RECREATIONAL
- MEDICAL AND EDUCATIONAL

MAJOR LAND USE AREAS SERVED

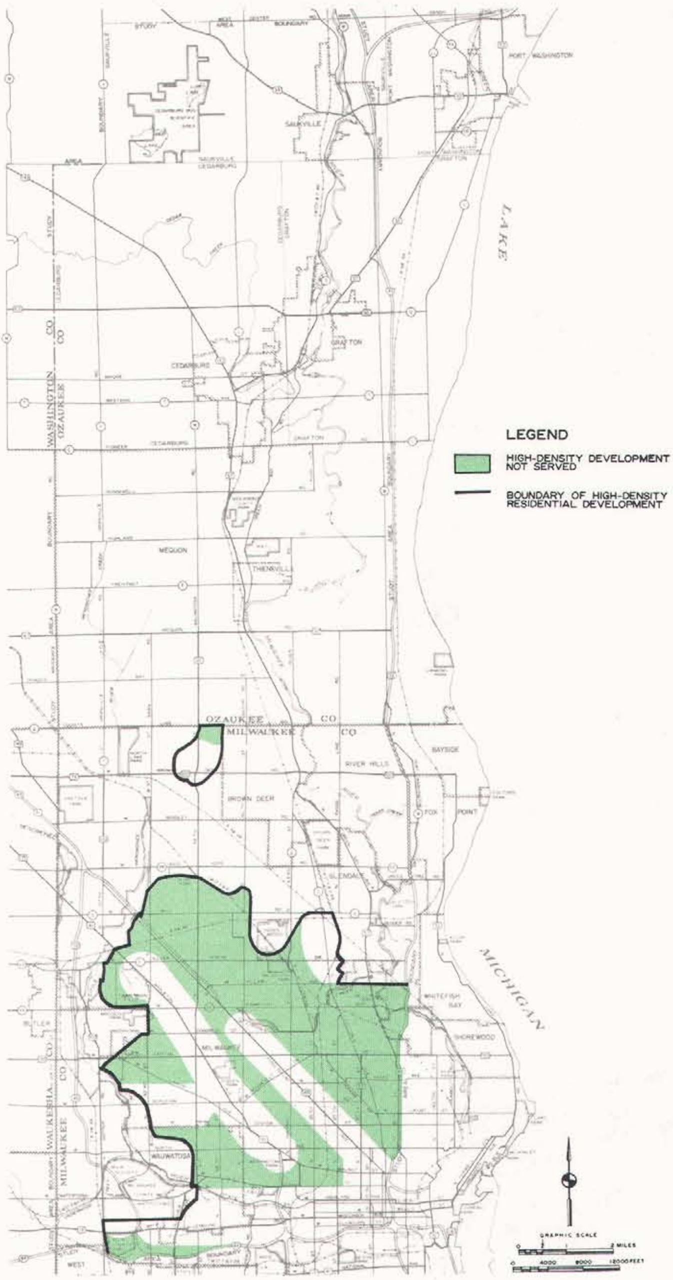
- INDUSTRIAL

As shown on this map, the only major land use centers or areas within the northwest side study area which would not be within walking distance of either primary or secondary public transit service in 1985 under the recommended short-range transit plan would be three major industrial areas—the Milwaukee-Granville Center, the West Allis West Center, and the Milwaukee-Glendale Center—two major medical centers or hospitals—Lakeview Hospital and St. Joseph's Hospital—four major parks or outdoor recreational centers—Dretzka Park, Lincoln Park, Mequon Park, and the Milwaukee County Zoo—and one university, accredited four-year college, or county-operated technical or vocational school—MATC Mequon. Compared to the "status quo" short-range transit plan, one additional major shopping center, Capitol Court, and two additional major medical centers, the Milwaukee County Medical Complex and Northwest General Hospital, would be considered to be served by primary or secondary transit service under the recommended plan.

Source: SEWRPC.

Map 162

AREAS OF HIGH-DENSITY RESIDENTIAL DEVELOPMENT WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY TRANSIT (WALK ACCESS) UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

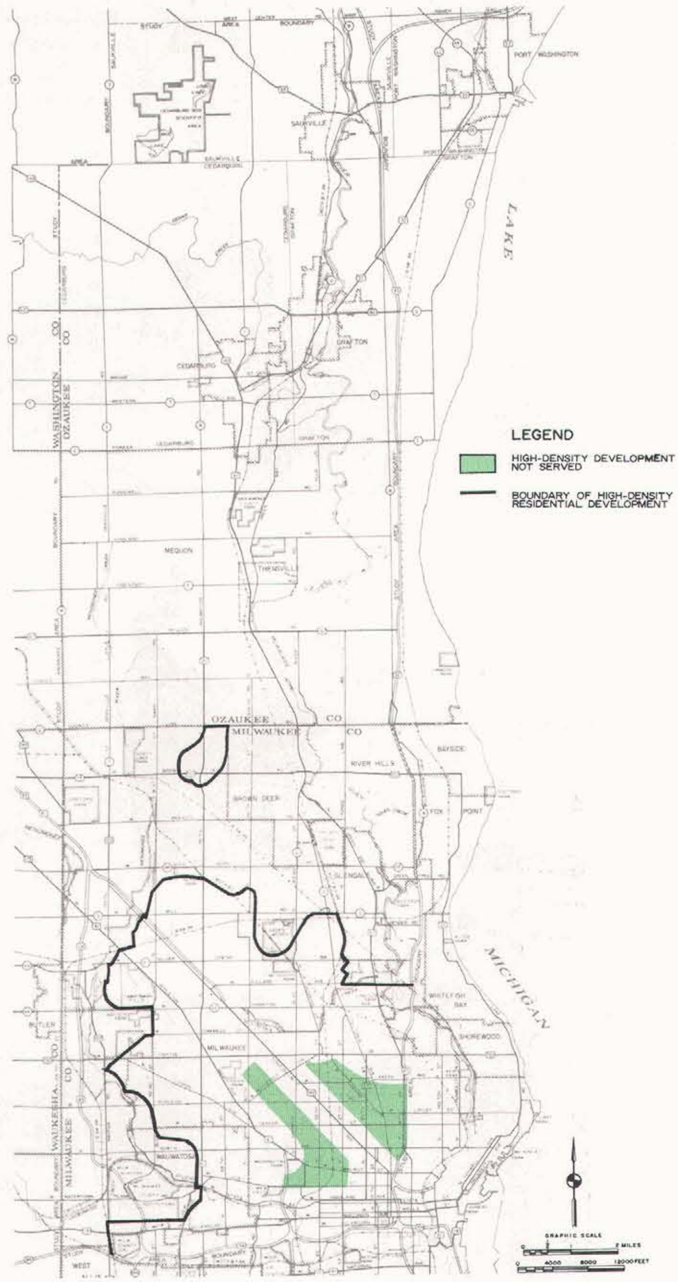


As shown on this map, under the recommended short-range transit plan, the greater portion of the planned high-density residential development of the study area in 1985, representing about 217,400 people, or about 59 percent of the total population of those areas having high-density residential development in 1985, would reside within a one-half-mile walking distance of Freeway Flyer or express bus service. This is about three times as many people as would be so served under the "status quo" short-range transit plan.

Source: SEWRPC.

Map 163

AREAS OF HIGH-DENSITY RESIDENTIAL DEVELOPMENT WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY TRANSIT (WALK AND DRIVE ACCESS) UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

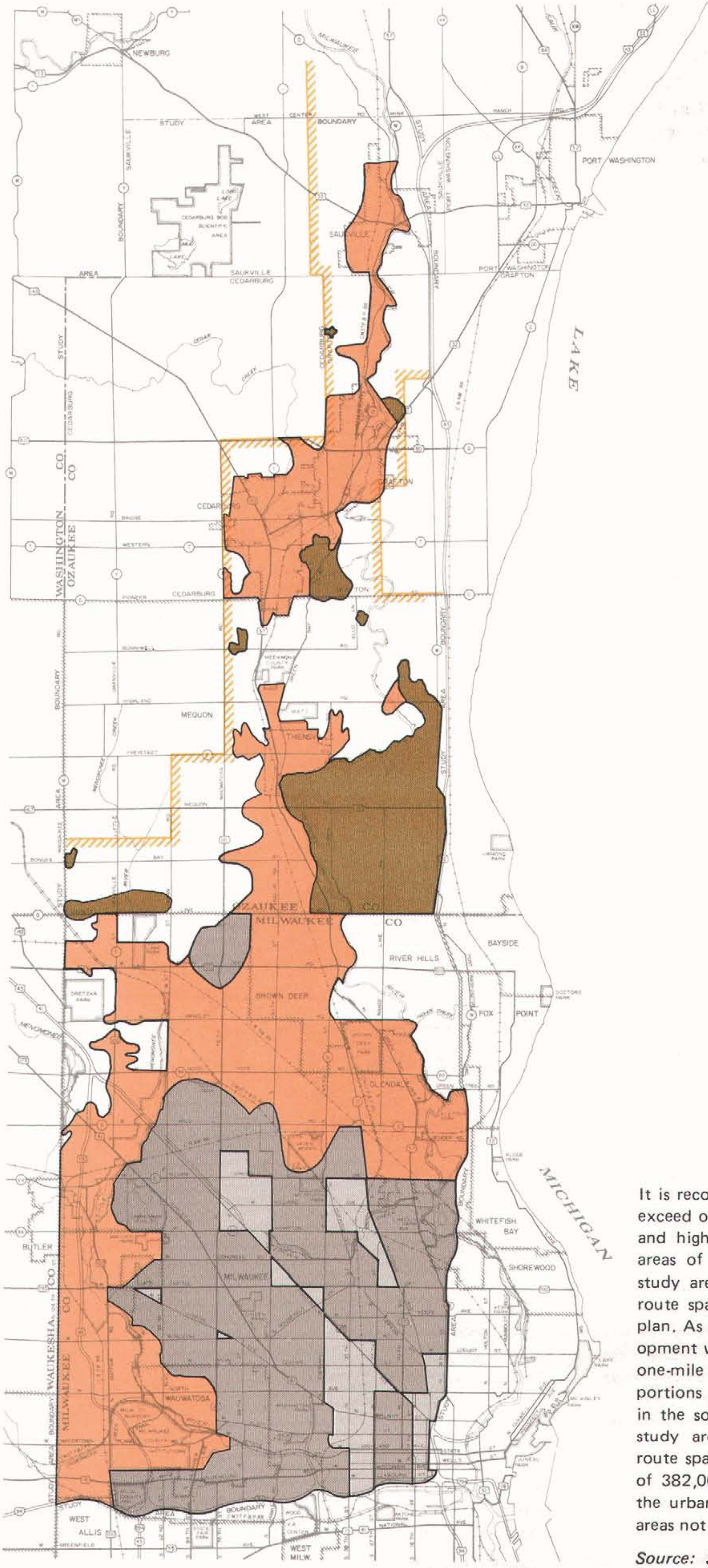


As shown on this map, under the recommended short-range transit plan, only a small portion of the planned high-density residential development in the study area in 1985 would not be within a three-mile driving distance of a primary transit park-ride lot and/or a one-half-mile walking distance of an express bus stop. The area not accessible to primary or secondary transit, even when automobile access to primary transit is considered, would represent a population of about 34,000, or about 9 percent of the total population of the high-density residential area of the study area in 1985. Under the recommended short-range transit plan, 140,000 more people would be so served by primary or express transit than under the "status quo" short-range plan.

Source: SEWRPC.

Map 164

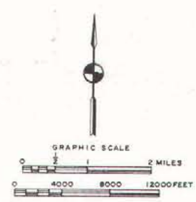
AREAS OF HIGH-, MEDIUM-, AND LOW-DENSITY RESIDENTIAL DEVELOPMENT NOT MEETING SUGGESTED TERTIARY PUBLIC ROUTE SPACING STANDARDS UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

AREAS MEETING OR NOT MEETING TRANSIT ROUTE SPACING STANDARDS

- HIGH-DENSITY AREA MEETING CRITERIA
- HIGH-DENSITY AREA NOT MEETING CRITERIA
- MEDIUM-DENSITY AREA NOT MEETING CRITERIA
- LOW-DENSITY AREA NOT MEETING CRITERIA
- URBANIZED AREA BOUNDARY



It is recommended that local public transit service route spacing not exceed one mile in low-density areas and one-half mile in medium- and high-density areas. Shown on this map are those urbanized areas of high-, medium-, and low-density development within the study area in 1985 which would not meet this local public transit route spacing standard under the recommended short-range transit plan. As shown on this map, none of the planned low-density development within the study area would be considered to be served by one-mile transit route spacing under this plan; and only limited portions of the planned high- and medium-density development in the southeastern part of the Milwaukee County portion of the study area would be considered to be served by one-half-mile route spacing under this plan. Under the recommended plan, a total of 382,000 people, or about 77 percent of the total population of the urbanized portion of the study area in 1985, would reside in areas not meeting this standard.

Source: SEWRPC.

total population of the urbanized portion of the study area in 1985. As shown on Map 165, the existing system would meet the provisions of this standard to a similar degree, as under that system 395,500 people, or approximately 80 percent of the population of the total urbanized area in 1985, would reside within areas not meeting this standard. It should be noted that it may not be reasonable to expect public transit routes to meet such desirable route spacing standards in certain parts of the Milwaukee County portion of the study area, as the necessary arterial street spacing is not met in these areas, nor in certain parts of the Ozaukee County portion of the study area, since Milwaukee transit service is, under current policy determinations, provided only within Milwaukee County. It must be noted also that, in the route planning effort as conducted by the Milwaukee County Transit System, additional routes were proposed only if the analyses indicated that certain productivity warrants would be met.

Public Transit Route Alignment: The third standard utilized in this evaluation of the recommended short-range transit plan under this objective specifies that public transit routes should be direct in alignment with a minimum number of turning movements, which cause circuitous paths or loops. This standard is generally met under both plans. Under the recommended short-range transit plan, only three routes in the study area would exhibit circuitous or loop routing over some part of their length which would not directly or conveniently serve travel. Under the "status quo" short-range transit plan, six routes would exhibit such circuitous or loop routing over some part of their length.

Duplication of Public Transit Service: The fifth standard under this objective asserts that public transit routes should be arranged to minimize duplication of service. Local service duplication consists of service area overlap, not including the overlap which occurs in the meeting or crossing of routes. As shown on Map 166, the largest amount of local service overlap under the recommended short-range transit plan would unavoidably occur in the extreme southeastern portion of the study area, where local routes provide access to and from the Milwaukee central business district. Overlapping local service also would occur to a lesser extent in the southwestern, west-central, east-central, and north-central portions of the Milwaukee County portion of the study area. Under this plan, there would also be some overlapping of secondary transit service in the extreme southeast portion of the study area. Also, there would be some overlap of areas within a three-mile radius surrounding park-ride lots under this plan, substantially less overlap at a two-mile radius, and no overlap at a one-mile radius.

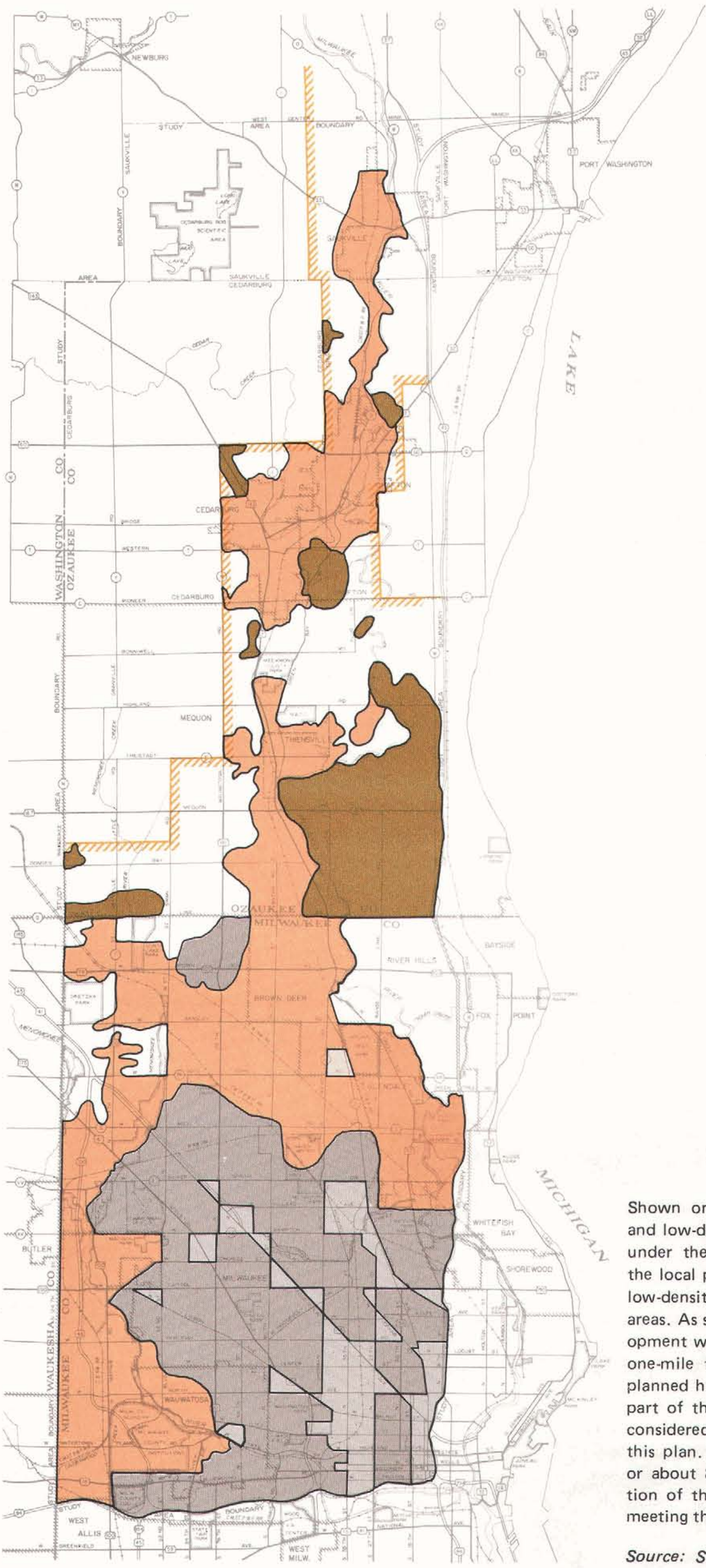
As shown on Map 167, similar duplication of local transit service would occur under the "status quo" short-range plan for public transit for the study area. No secondary transit service overlap would occur under the "status quo" plan, and less primary transit service overlap would occur under this plan.

Transfer Utilization on Public Transit: Another standard under this objective to be used in this analysis requires that public transit routes be arranged so that the number of transfers required for system utilization is minimized. As shown on Map 168, under the recommended short-range transit plan for the study area, the average number of transfers required per transit trip on an average weekday within the southeastern portion of the study area served by local public transit would be less than one-half transfer per trip. In sections of the west-central and north-central parts of the Milwaukee County portion of the study area served by local transit, an average of one-half to one transfer would be required per transit trip. The systemwide average number of transfers required per transit trip within the study area under the recommended short-range plan would be 0.47. This is a substantial increase in transfers in comparison to the "status quo" plan for the study area, as, as shown on Map 169, less than one-half transfer is required per transit trip in nearly all parts of the local transit service portion of the study area under this plan. Under the "status quo" short-range plan, the systemwide average number of transfers required per transit trip would be 0.35. However, the usual undesirable impacts associated with transfers are intended to be minimized under the recommended plan through increased coordination of arrival and departure times of connecting routes in actual operation.

Maximization of Residents Served by Public Transit: Another standard under this objective which can be used in the evaluation of the recommended short-range transit plan asserts that the number of residents of the study area served by public transit should be maximized. Under the recommended short-range plan, those parts of the study area which would be served by public transit—or specifically, which would be within one-quarter-mile

Map 165

AREAS OF HIGH-, MEDIUM-, AND LOW-DENSITY RESIDENTIAL DEVELOPMENT NOT MEETING SUGGESTED TERTIARY PUBLIC TRANSIT ROUTE SPACING STANDARDS UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

AREAS MEETING OR NOT MEETING TRANSIT ROUTE SPACING STANDARDS

- HIGH-DENSITY AREA MEETING CRITERIA
- HIGH-DENSITY AREA NOT MEETING CRITERIA
- MEDIUM-DENSITY AREA MEETING CRITERIA
- MEDIUM-DENSITY AREA NOT MEETING CRITERIA
- LOW-DENSITY AREA NOT MEETING CRITERIA
- URBANIZED AREA BOUNDARY

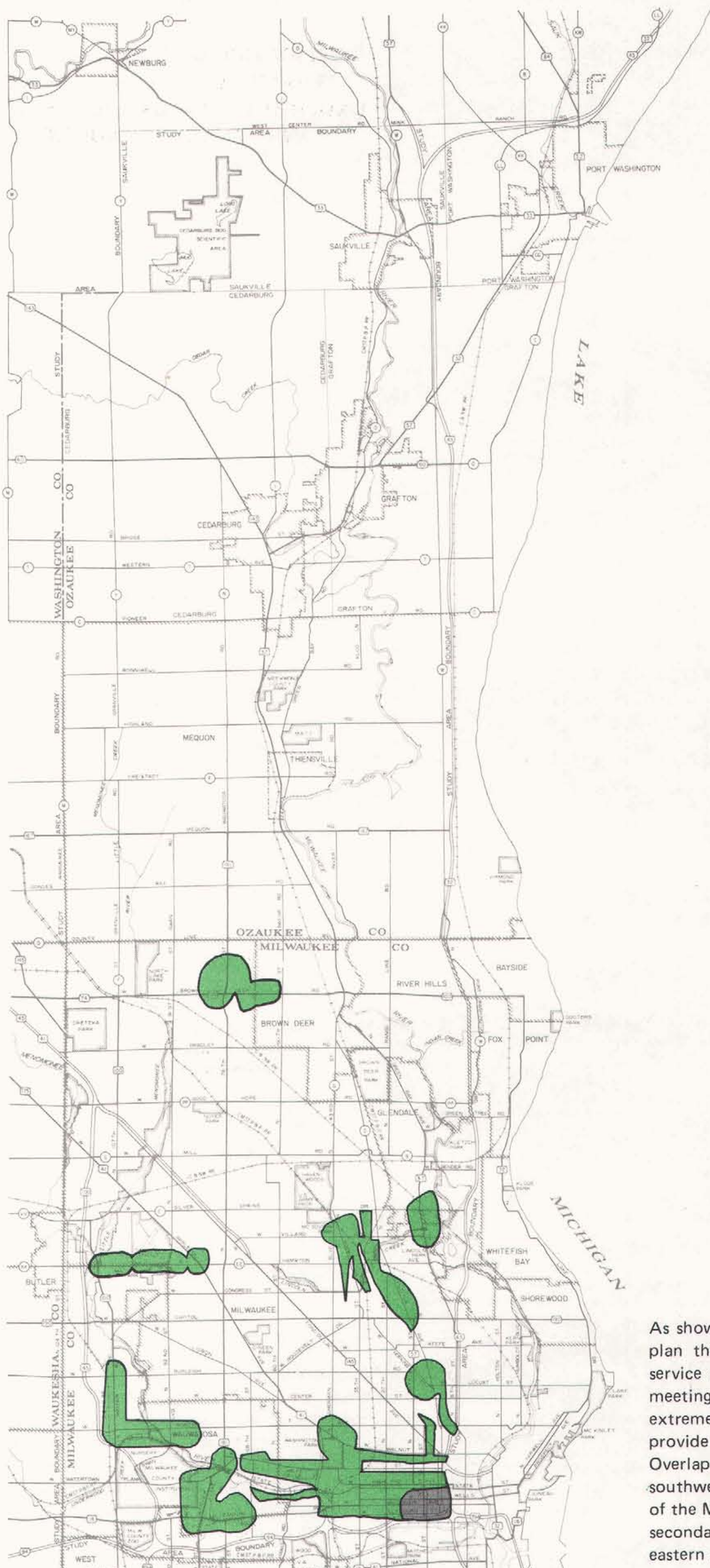
GRAPHIC SCALE
0 ½ 1 2 MILES
0 4000 8000 12000 FEET

Shown on this map are those urbanized areas of high-, medium-, and low-density development within the study area in 1985 which, under the "status quo" short-range transit plan, would not meet the local public transit route spacing standard of at least one mile in low-density areas and one-half mile in medium- and high-density areas. As shown on this map, none of the planned low-density development within the study area would be considered to be served by one-mile transit route spacing, and only limited portions of the planned high- and medium-density development in the southeastern part of the Milwaukee County portion of the study area would be considered to be served by one-half-mile local route spacing under this plan. Under the "status quo" plan, a total of 395,500 people, or about 80 percent of the total population of the urbanized portion of the study area under this plan, would reside in areas not meeting this standard.

Source: SEWRPC.

Map 166

DUPLICATION OF PUBLIC TRANSIT SERVICE IN THE STUDY AREA UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

DUPLICATION OF LOCAL TRANSIT SERVICE

DUPLICATION OF SECONDARY TRANSIT SERVICE

GRAPHIC SCALE

0 ½ 1 2 MILES

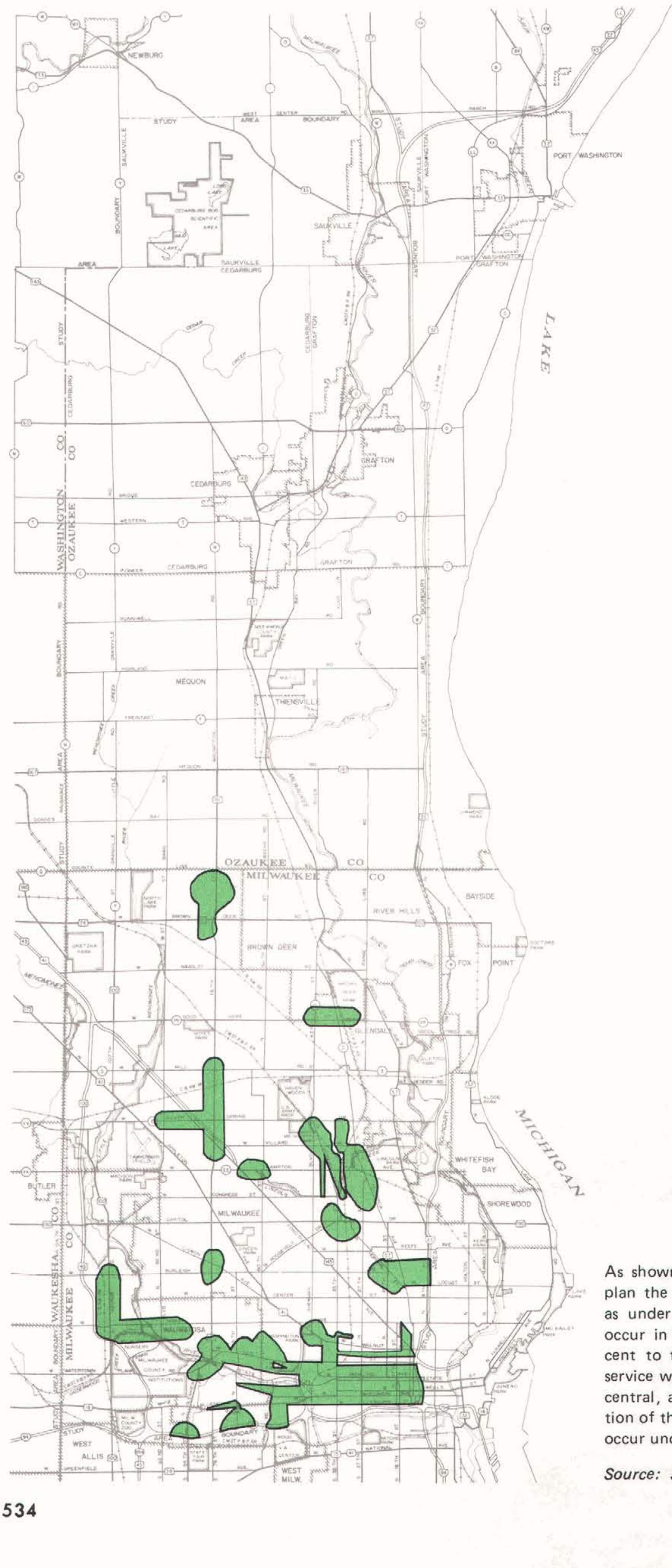
0 4000 8000 12000 FEET

As shown on this map, under the recommended short-range transit plan the largest amount of overlap of local service—consisting of service area overlap, not including the overlap which occurs in the meeting or crossing of routes—would unavoidably occur in the extreme southeastern portion of the study area, where local routes provide access to and from the Milwaukee central business district. Overlapping local service would also occur to a lesser extent in the southwest, west-central, east-central, and north-central portions of the Milwaukee County portion of the study area. Under this plan, secondary transit service would also overlap in the extreme southeastern portion of the study area.

Source: SEWRPC.

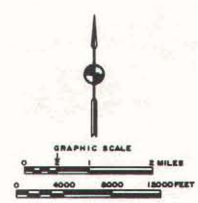
Map 167

DUPLICATION OF PUBLIC TRANSIT SERVICE IN THE STUDY AREA UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

(green)	DUPLICATION OF LOCAL TRANSIT SERVICE
NONE	DUPLICATION OF SECONDARY TRANSIT SERVICE

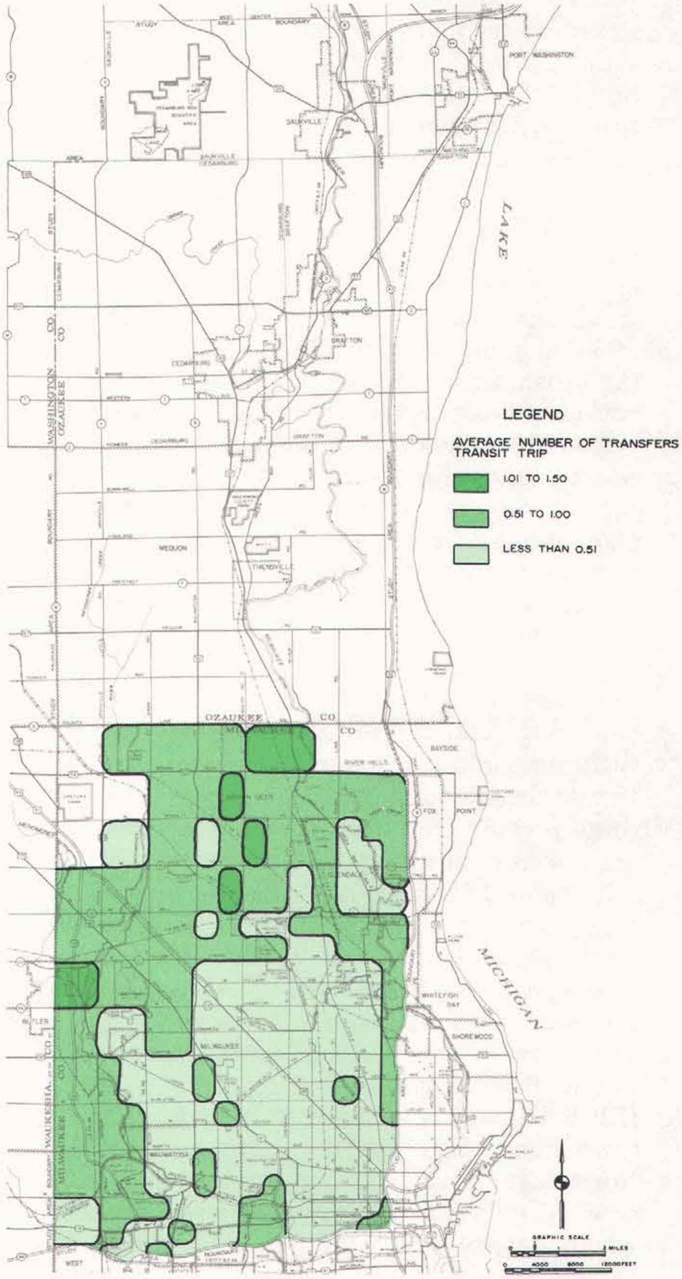


As shown on this map, under the "status quo" short-range transit plan the largest amount of overlap of local transit service would, as under the recommended short-range transit plan, unavoidably occur in the extreme southeastern portion of the study area adjacent to the Milwaukee central business district. Overlapping local service would also occur to a lesser extent in the west-central, east-central, and north-central portions of the Milwaukee County portion of the study area. No overlap of secondary transit service would occur under this plan.

Source: SEWRPC.

Map 168

AVERAGE NUMBER OF TRANSFERS REQUIRED PER TRANSIT TRIP WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

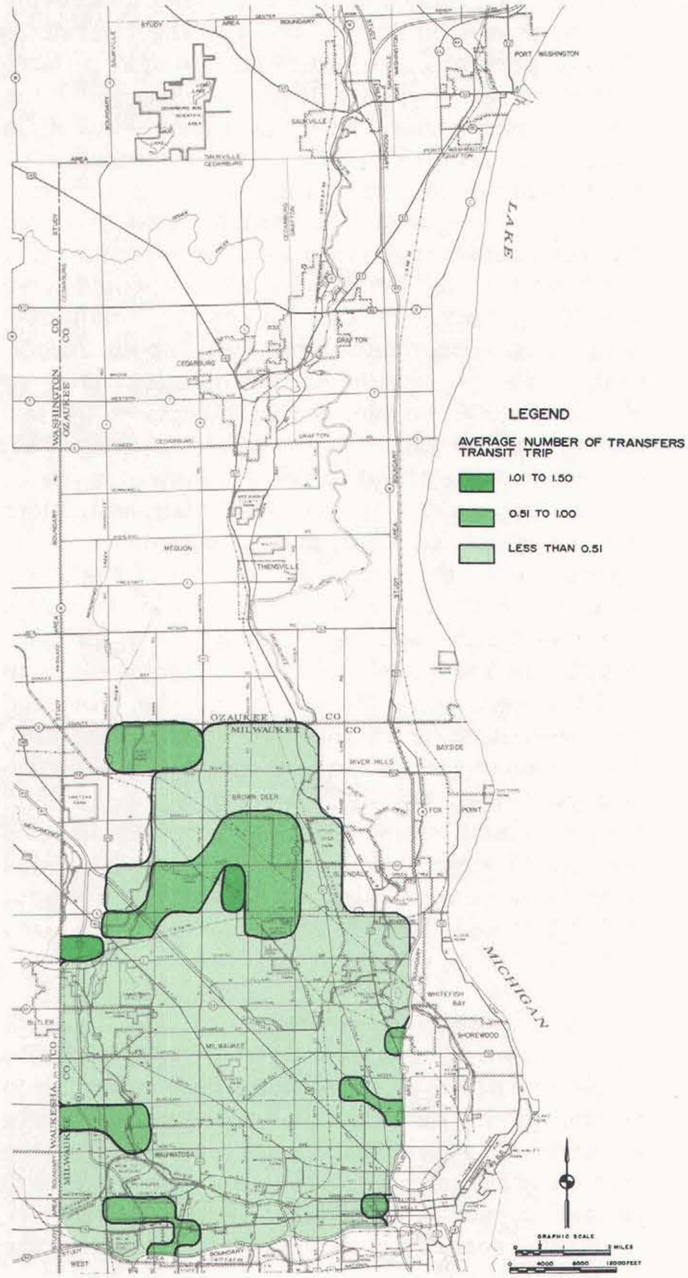


As shown on this map, under the recommended short-range transit plan for the study area, the average number of transfers required per transit trip on an average weekday within the southeastern portion of the study area served by local public transit would be fewer than one-half transfer per trip. In sections of the west-central and north-central parts of the Milwaukee County portion of the study area served by local transit, however, an average of between one and one and one-half transfer would be required per transit trip.

Source: SEWRPC.

Map 169

AVERAGE NUMBER OF TRANSFERS REQUIRED PER TRANSIT TRIP WITHIN THE STUDY AREA ON AN AVERAGE WEEKDAY UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



As shown on this map, substantially fewer transfers would be required per transit trip on an average weekday in the study area under the "status quo" short-range transit plan than under the recommended short-range transit plan. Under this plan, an average of less than one-half transfer per transit trip would be required in nearly all parts of the local transit service portion of the study area. The usual undesirable impacts associated with transfers are intended to be minimized under the recommended plan, however, through increased coordination of arrival and departure times of connecting routes in actual operation.

Source: SEWRPC.

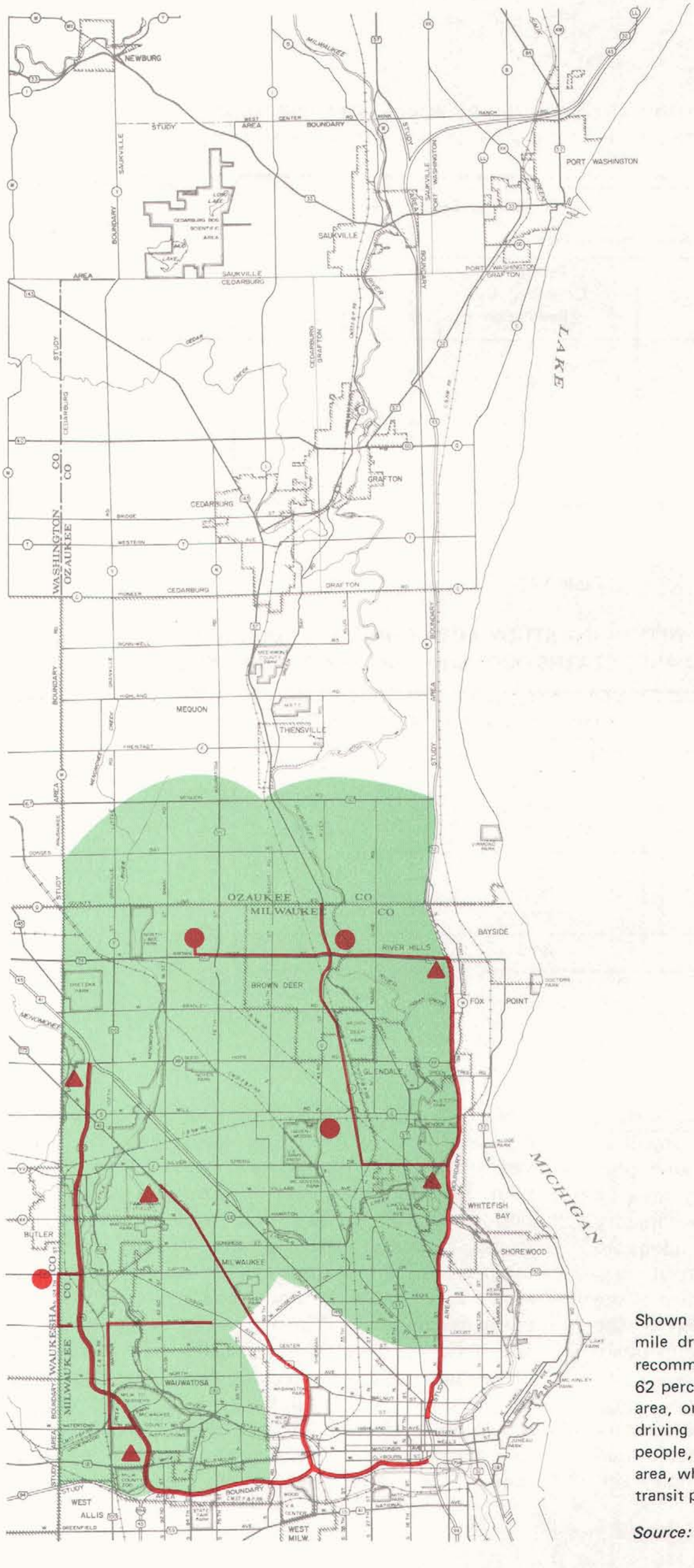
walking distance of a local service route—are shown on Map 154; and those areas which would be within a one-half-mile walking distance of a secondary transit service route are shown on Map 161, as are those areas which would be within a one-half-mile walking distance of a primary transit route. Those areas which would be within a three-mile driving distance of a primary transit park-ride lot are shown on Map 170. Only the Milwaukee County portion of the study area would in large part be served by local transit service under the recommended short-range plan. As shown in Table 171, about 85 percent of the population of the urbanized portion of the study area, or about 418,600 people, would be considered to be served by local transit in 1985 under the recommended short-range plan. The existing system would serve 419,900 people with local transit. Under the recommended short-range transit plan, about 26 percent of the population of the urbanized area, or about 130,000 people, would be served by secondary public transit in the study area in 1985, compared with about 65,800 people, or about 13 percent, under a "status quo" plan; and, under the recommended plan, about 36 percent of the population of the urbanized portion of the study area, or about 176,100 people, would be within a one-half-mile walking distance of a primary transit park-ride lot or stop, compared with 104,100 people, or 21 percent of the urbanized area population, under the "status quo" plan. Also, about 62 percent of the population of the urbanized portion of the study area, or about 308,600 people, would reside within a three-mile driving distance of a park-ride lot under the recommended short-range transit plan, compared with about 283,900 people, or 57 percent of the urbanized area population, under the "status quo" plan.

Considering the three elements of public transit service together, about 431,200 people, or about 87 percent of the total population of the urbanized portion of the study area, would be considered to be served by public transit within walking distance under the recommended plan, and about 423,200 people, or about 85 percent of the population, would be considered to be so served under the "status quo" plan.

<u>Maximization of Jobs Served by Public Transit:</u> The next standard under this objective used in the evaluation of the recommended short-range transit plan specifies that the number of jobs served by public transit in the study area should be maximized. As shown in Table 172, under the recommended short-range plan for public transit, about 84 percent of the jobs in the urbanized portion of the study area, or about 191,300 jobs, would be considered to be served by local transit in 1985, compared with about 186,900 jobs, or about 82 percent of all jobs in the urbanized portion of the study area, under the "status quo" plan. Under the recommended plan, about 33 percent of the jobs in the urbanized portion of the study area, or about 74,600 jobs, would be considered to be served by secondary transit service, compared with about 19 percent of all jobs in the urbanized portion of the study area under the "status quo" plan. Also, 96,100 jobs, or about 42 percent of all jobs in the urbanized portion of the study area, would be considered to be served within walking distance of primary public transit in the year 1985 under the recommended plan, compared with 76,700, or about 33 percent of all jobs in the urbanized area, under the "status quo" plan. In total, about 193,500 jobs, or about 85 percent of the jobs in the urbanized portion of the study area, would be considered to be served by public transit in the year 1985 under the recommended plan, as they would be within walking distance of primary, express, or local transit. Under the "status quo" plan, about 83 percent of the jobs in the urbanized portion of the study area, or about 189,900 jobs, would be considered to be served by the public transit system.

<u>Provision of Adequate Park-Ride Lot Capacity:</u> One of the standards of this objective requires that sufficient off-street parking be provided at primary transit service park-ride lots to accommodate the total parking demand generated by trips which change from automobile to public transit at those lots. Table 173 shows the estimated use by transit passengers of the nine primary transit park-ride lots which would be provided under the recommended short-range transit plan on an average weekday in the year 1985. Assuming a $2.00 per gallon motor fuel price in 1985 in 1980 dollars, six park-ride lots in the study area, including the Brown Deer (River Hills), North Shore (Glendale), and Watertown Plank Road public transit stations and the Northridge, Treasure Island (Brookfield), and Treasure Island (Brown Deer) shopping center lots, would not meet this standard. Assuming a $1.50 per gallon motor fuel price, only three park-ride lots would not meet this standard. While no park-ride lots would exceed this standard under the "status quo" plan, three park-ride lots, including the North Shore (Glendale) public transit station and the Northridge and Treasure Island (Brookfield) shopping center lots, would operate at capacity in 1985 under the higher motor fuel price assumption, and one would operate at capacity under the lower fuel price assumption.

AREAS WITHIN THE STUDY AREA WITHIN DRIVING ACCESS OF PRIMARY TRANSIT PARK-RIDE LOTS UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

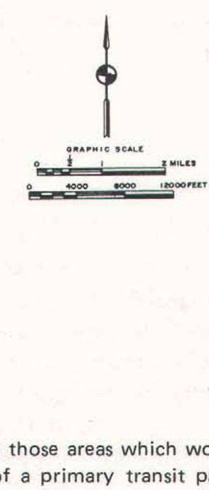
PRIMARY TRANSIT SHOPPING CENTER LOT

PRIMARY TRANSIT STATION

PRIMARY TRANSIT ROUTE ON FREEWAY

PRIMARY TRANSIT ROUTE ON SURFACE ARTERIAL

SERVICE AREA



Shown on this map are those areas which would be within a three-mile driving distance of a primary transit park-ride lot under the recommended short-range transit plan. Under this plan, about 62 percent of the population of the urbanized portion of the study area, or about 308,600 people, would reside within a three-mile driving distance of a park-ride lot. This compares with 283,900 people, or 57 percent of the urbanized area population of the study area, which would be so served under the "status quo" short-range transit plan.

Source: SEWRPC.

Table 171

POPULATION WITHIN THE STUDY AREA SERVED BY PUBLIC TRANSIT UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Type of Transit	Population Served by Public Transit			
	Recommended Plan		"Status Quo" Plan	
	Number	Percent of Urbanized Area Population	Number	Percent of Urbanized Area Population
Primary				
Drive Access	308,600	62.3	283,900	57.3
Walk Access.	176,100	35.5	104,100	21.0
Secondary	130,000	26.2	65,800	13.8
Tertiary	418,600	84.5	419,900	84.7
Total	431,200	87.0	423,200	85.4

Source: SEWRPC.

Table 172

EMPLOYMENT OPPORTUNITIES WITHIN THE STUDY AREA SERVED BY PUBLIC TRANSIT UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS

Type of Transit	Employment Opportunities Served by Public Transit			
	Recommended Plan		"Status Quo" Plan	
	Number	Percent of Total Jobs in Urbanized Area	Number	Percent of Total Jobs in Urbanized Area
Primary.	96,100	42.0	76,700	33.4
Secondary	74,600	32.6	35,900	18.9
Tertiary	191,300	83.6	186,900	81.7
Total	193,500	84.8	189,900	83.0

Source: SEWRPC.

Provision of Adequate Public Transit Seating Capacity: The next standard under this objective used in the evaluation of the recommended plan requires that public transit in the study area be operated so as to provide adequate vehicle capacity to meet travel demand. The provision of adequate vehicle capacity is determined by each route segment's average maximum load factor, which is the ratio of the number of passengers carried to the seating capacity provided. As indicated previously in this report, a load factor of 1.00 is considered to be the maximum desirable on primary, secondary, and tertiary public transit during off-peak periods. During peak periods, the maximum desirable load factors are considered to be 1.00 in primary service, 1.25 in secondary service, and 1.33 in tertiary service. Based on estimated travel demand in the year 1985 under the recommended transit system plan, load factors would be exceeded during peak periods on about 114 to 279 route miles of public transit routes in the study area in 1985, or 20 to 50 percent of the total system route miles in the study area under the lower and higher motor fuel price, respectively. The routes exceeding the load factor standard would include about 19 route miles of primary transit service and about 23 route miles of secondary service under both the low and high motor fuel price, and about 73 to 237 route miles of tertiary transit service under the low and high motor fuel price, respectively. During off-peak

Table 173

UTILIZATION OF PRIMARY PARK-RIDE LOTS IN THE STUDY AREA UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Lot	Type	Existing Spaces Available	Number of Parking Spaces Used on an Average Weekday in Year 2000: $2.00 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars — Recommended Plan	$2.00 per Gallon — "Status Quo" Plan	$1.50 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars — Recommended Plan	$1.50 per Gallon — "Status Quo" Plan
Existing						
Brown Deer (River Hills)	Public transit station	250	310 (over capacity)	190 (under capacity)	280 (over capacity)	180 (under capacity)
North Shore (Glendale)	Public transit station	190	280 (over capacity)	190 (at capacity)	250 (over capacity)	180 (under capacity)
Watertown Plank Road	Public transit station	200	220 (over capacity)	190 (under capacity)	200 (at capacity)	170 (under capacity)
Northland.	Shopping center lot	100	80 (under capacity)	50 (under capacity)	80 (under capacity)	50 (under capacity)
Northridge	Shopping center lot	100	120 (over capacity)	100 (at capacity)	110 (over capacity)	100 (at capacity)
Treasure Island (Brookfield)	Shopping center lot	250	270 (over capacity)	250 (at capacity)	240 (under capacity)	230 (under capacity)
Treasure Island (Brown Deer) . . .	Shopping center lot	125	130 (over capacity)	100 (under capacity)	120 (under capacity)	90 (under capacity)
Proposed (under recommended plan only)						
Good Hope Road	Public transit station	--	90	--	80	--
Timmerman Field	Public transit station	--	140	--	120	--

Source: SEWRPC.

periods, load factors would be exceeded on about 51 route miles of tertiary public transit routes under the higher motor fuel price. Under the "status quo" plan, load factors would be exceeded during peak periods on about 153 to 174 total route miles of transit service in the study area, or 34 to 38 percent of the system in the study area in the year 1985, including about 4 route miles of secondary transit service under both the low and high motor fuel price, and 149 to 170 route miles of tertiary transit service under the lower and higher motor fuel price, respectively. During off-peak periods, load factors would be exceeded on 7 route miles of public transit service in 1985 under both motor fuel prices, all on the tertiary transit system.

Summary and Conclusions: The third transportation system management and development objective formulated under this study and used in the evaluation of the recommended short-range plan asserts the need for the achievement of a flexible, balanced transportation system which provides the appropriate types of transportation needed by all residents of the study area at an adequate level of service. Under the recommended short-range plan, some areas of the study area would not be provided with adequate and balanced service. Primary and secondary service would not be provided to the south-central parts of the Milwaukee County portion of the study area, leaving areas of high-density development, three of seven major industrial centers, two of 11 major medical centers or hospitals, four of five parks, one of four universities, accredited four-year colleges, or county-operated technical and vocational schools, and General Mitchell Field not adequately served. Also under this plan, less than one-quarter of the resident population of the study area would be located in areas meeting public transit route spacing requirements; three public transit routes would be indirectly aligned; some local transit service area overlap would occur, particularly in the southeastern corner of the study area; and transfer use on the public transit system would increase. The recommended plan would provide transit service to about 87 percent of the population of the urbanized portion of the study area, or to about 431,200 people, and would serve about 85 percent of all employment opportunities in the urbanized portion of the study area, or about 193,500 jobs. Finally, under the recommended plan, depending on the motor fuel price assumed in the year 1985, three to six out of a total of nine park-ride lots would operate over capacity, and 114 to 279 route miles, or about 20 to 50 percent of the total public transit system in the study area, would exceed specified load factors during peak periods.

The advantages of the recommended short-range plan for public transit over a short-range transit plan which would advocate no improvement over the 1980 public transit system are that one additional major shopping center and two additional hospitals would be served by transit; nearly three times as much high-density residential development would be within walking distance of a Freeway Flyer or express transit route; nearly 75 percent more high-density residential development would be within driving distance of a Freeway Flyer park-ride lot and walking distance of secondary service; three less transit routes would be misaligned; and 20 to 50 percent of the total transit route miles in the study area, compared with 34 to 38 percent under the "status quo" plan, would operate at greater than suggested load factors during peak periods. Also, although the recommended plan and "status quo" plan would provide similar accessibility by tertiary transit service to the study area's population, about 64,200 more residents, or nearly twice as many people, would be served within walking distance of secondary transit under the recommended plan, and about 72,000 more residents, or about 70 percent more people, would be within walking distance of primary transit routes under the recommended plan. In addition, the recommended plan, although providing access within walking distance to tertiary public transit service similar to that provided by the "status quo" plan, would provide access to 38,700 more jobs, or to more than twice as many jobs, within walking distance of secondary transit, and to 19,400 more jobs, or 25 percent more jobs, within walking distance of primary transit.

Effectiveness of the Recommended and "Status Quo" Short-Range Transit System Plans in Facilitating Quick and Convenient Travel

Another adopted study objective which can be used in evaluating the recommended short-range transit plan asserts the need for the provision of a transportation system which, to support the everyday activities of business, shopping, and social intercourse, facilitates reasonably fast and convenient travel among parts of northwestern Milwaukee County and southern Ozaukee County, and between this area and other component parts of the Southeastern Wisconsin Region. Ten standards support and quantify the achievement of this objective, seven of which were used in the evaluation of the recommended short-range transit plan.

Quantity of Travel: The first, second, and third standards under this objective indicate that the total passenger hours of travel, total vehicle hours of travel, and total vehicle miles of travel, respectively, should be minimized within the study area. As shown in Table 174, under the recommended short-range transit plan there would be about 53,400 vehicle miles of travel, and 3,400 vehicle hours of travel, on the public transit system on an average weekday within the study area in the year 1985. The average speed of travel on the public transit system under the recommended plan would be about 15.7 miles per hour (mph) in the design year. Total transit passenger hours of travel in the study area would range between 36,300 and 51,200 on an average weekday in 1985. Under the "status quo" plan, there would be an estimated 37,500 vehicle miles of travel on an average weekday on the public transit system in 1985, or 15,900, or about 30 percent, fewer vehicle miles than under the recommended plan. In addition, there would be an estimated 2,400 vehicle hours of travel on the public transit system, or 1,000, or 29 percent, fewer vehicle hours of travel than under the recommended short-range plan. The average speed of travel on the public transit system under the "status quo" plan would be 15.6 mph, about the same as under the recommended plan. Total passenger hours of travel under the "status quo" short-range plan would range from 24,700 to 30,800—11,600 to 20,400, or 32 to 46 percent, fewer passenger hours than under the recommended plan.

Minimum Transit Overall Speeds: The next standard under this objective which can be used in the evaluation of the recommended short-range transit system plan specifies minimum speeds on the public transit system by the type of service and type and location of facility. Overall speed on the public transit system is a direct measure of that system's performance. Those public transit route segments which would not attain the minimum overall average weekday speed specified in this standard by facility type and location in the year 1985 under the recommended short-range transit plan are shown on Map 171 and summarized in Table 175. About 98 route miles, or about 18 percent of all transit route miles in the study area, would operate below suggested minimum speeds on an average weekday in 1985, including about six route miles of secondary transit service and about 52 route miles of local transit service. Most of the transit facilities in violation of this standard, with the exception of the primary transit route facilities, would be located in the southeastern corner of the local transit service area. About 91 route miles, or about 20 percent of the transit system in the study area, would be in violation of

Table 174

COMPARISON OF THE AMOUNT OF TOTAL TRAVEL AND THE SPEED OF TRAVEL ON THE PUBLIC TRANSIT SYSTEM IN THE STUDY AREA UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS: 1985

Travel Characteristic	1985 Average Weekday Travel			
	Recommended Plan		"Status Quo" Plan	
	$2.00 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars	$1.50 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars	$2.00 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars	$1.50 per Gallon Motor Fuel Cost in 1985 in 1980 Dollars
Vehicle Miles of Travel	53,400	53,400	37,500	37,500
Vehicle Hours of Travel	3,400	3,400	2,400	2,400
Average Speed (mph)	15.7	15.7	15.6	15.6
Passenger Hours of Travel	51,200	36,300	30,800	24,700

Source: SEWRPC.

Table 175

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT BELOW SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY UNDER THE RECOMMENDED AND "STATUS QUO" SHORT-RANGE TRANSIT PLANS

Transit Routes Below Minimum Speed (round-trip route miles)	Routes in Violation of Minimum Speed Standard			
	Recommended Plan		"Status Quo" Plan	
	Miles	Percent of Total Round-Trip Route Miles by Facility Type	Miles	Percent of Total Round-Trip Route Miles by Facility Type
Primary	39.8	24.3	30.0	31.2
Secondary	6.4	27.6	7.6	100.0
Tertiary	52.0	14.0	53.4	15.2
Total	98.2	17.6	91.0	20.0

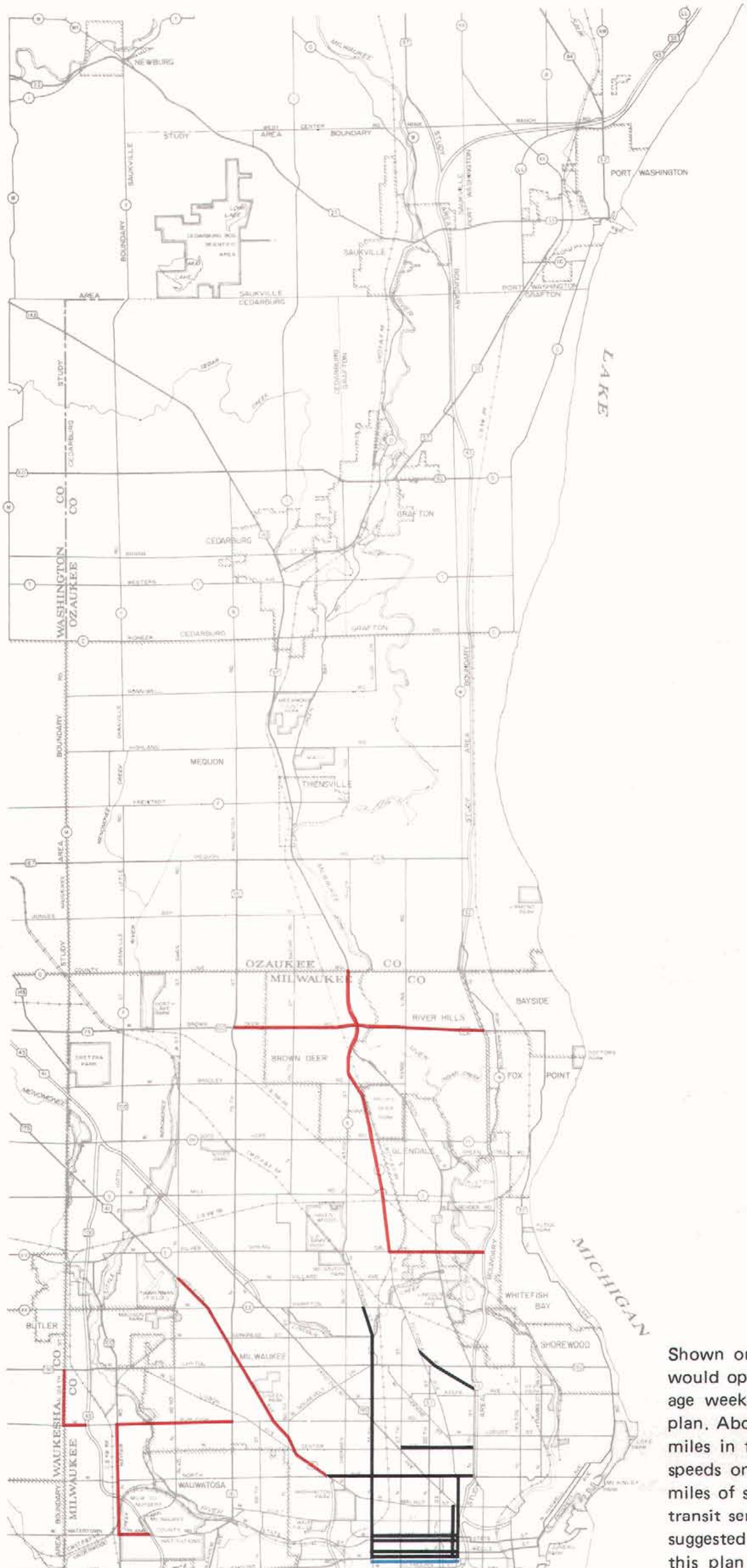
Source: SEWRPC.

this standard under the "status quo" plan, including 30 route miles of the primary transit system, about eight route miles of the secondary transit system, and about 53 route miles of the tertiary transit system (see Map 172).

Comparability of Highway and Transit Travel Times: The next standard used in the evaluation of the recommended short-range transit plan under this objective requires that public transit overall travel times be comparable to arterial street overall travel times among component parts of the study area and between parts of the area and the remainder of the Milwaukee transit service area. As shown on Map 173, the average midday travel times for public transit trips from those parts of the study area served by local and Freeway Flyer or express transit service would generally be two to three times longer than travel times from these areas for equivalent trips by automobile under the recommended plan. Only in the far northwestern and northeastern portions of the transit service area would transit travel times be three to four times longer than highway travel times, and only in those areas served solely by drive access to park-ride primary transit lots would such travel times be more than four times longer than highway travel times. As shown on Map 174, under the "status quo" short-range plan for public transit, there are more areas in which transit travel times would be three to four times longer than travel times by automobile.

Map 171

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT BELOW SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

ROUTES OPERATING BELOW SUGGESTED SPEED STANDARDS

PRIMARY SERVICE

SECONDARY SERVICE

TERTIARY SERVICE

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

Shown on this map are those public transit route segments which would operate below suggested minimum overall speeds on an average weekday in 1985 under the recommended short-range transit plan. About 98 route miles, or about 18 percent of all transit route miles in the study area, would operate below suggested minimum speeds on an average weekday in 1985, including about six route miles of secondary transit service and about 52 route miles of local transit service. Nearly all of the local transit routes operating below suggested minimum overall speeds on an average weekday under this plan were located in the extreme southeastern corner of the Milwaukee County portion of the study area adjacent to the City of Milwaukee central business district.

Source: SEWRPC.

Map 172

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT BELOW SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985

LEGEND

ROUTES OPERATING BELOW SUGGESTED SPEED STANDARDS

PRIMARY SERVICE

SECONDARY SERVICE

TERTIARY SERVICE

GRAPHIC SCALE

0 1 2 MILES

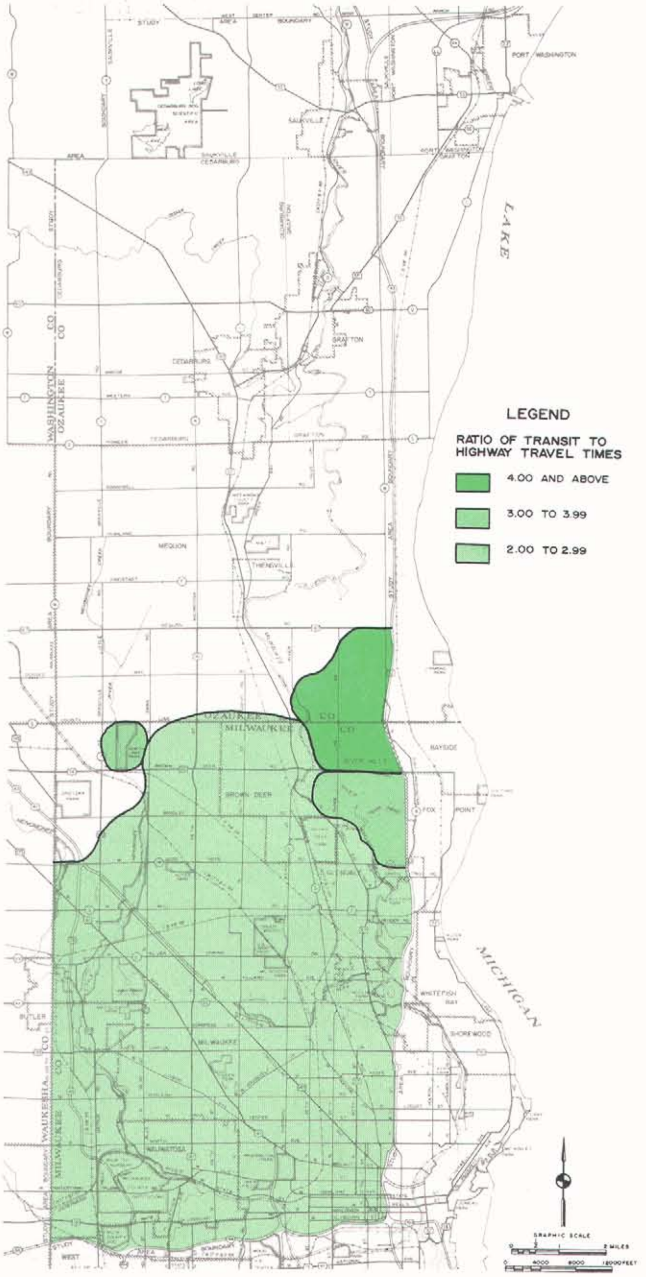
0 4000 8000 12000 FEET

Shown on this map are those public transit route segments which would operate below suggested minimum overall speeds on an average weekday in 1985 under the "status quo" short-range transit plan. About 91 route miles, or about 20 percent of all transit route miles in the study area, would operate below suggested minimum speeds on an average weekday in 1985 under the "status quo" short-range transit plan, including about 30 route miles of the primary transit system, about eight route miles of the secondary transit system, and about 53 route miles of the tertiary transit system. As under the recommended short-range transit plan, nearly all of the local transit routes operating below suggested overall speeds on an average weekday under this plan were located in the extreme southeastern corner of the Milwaukee County portion of the study area adjacent to the City of Milwaukee central business district.

Source: SEWRPC.

Map 173

COMPARISON OF AVERAGE PUBLIC TRANSIT SYSTEM AND ARTERIAL STREET AND HIGHWAY SYSTEM MIDDAY TRAVEL TIMES WITHIN THE STUDY AREA UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

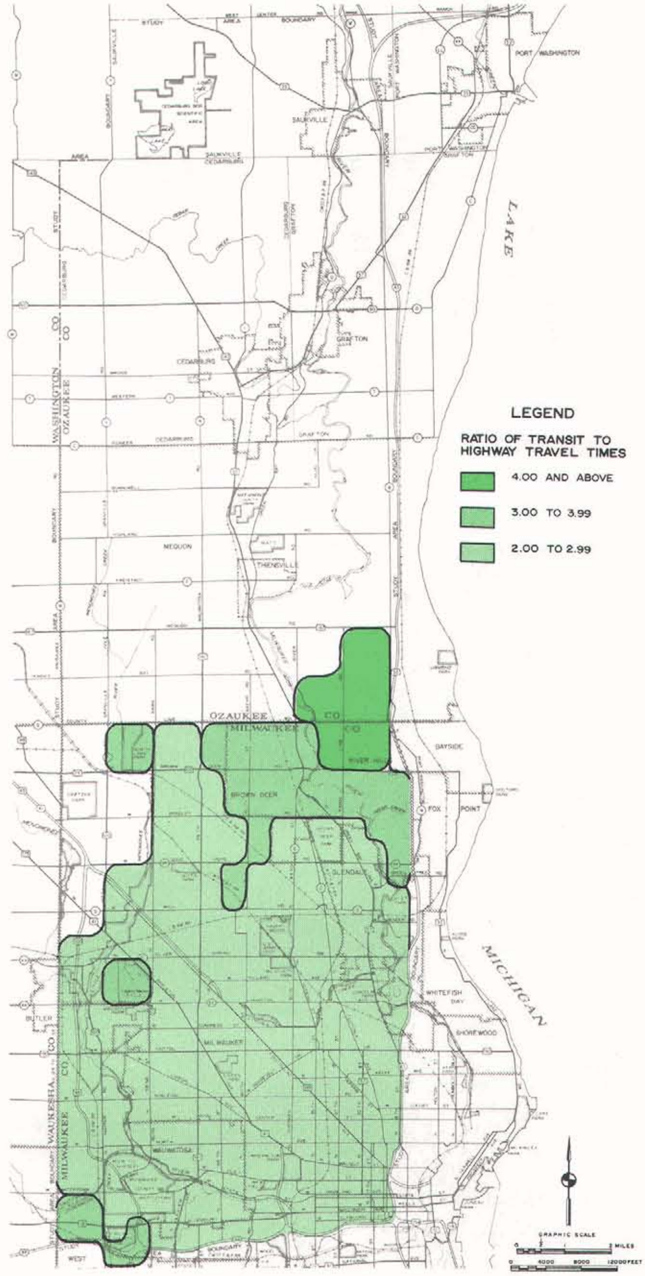


As shown on this map, the average midday travel times by public transit from those parts of the study area which would be served by local, express, or Freeway Flyer transit service under the recommended short-range transit plan would generally be two to three times longer than equivalent travel times from those same areas by automobile. Only in the extreme northwestern and northeastern portions of the public transit service area would transit travel times be three to four times longer than highway travel times under this plan, and only in those areas served solely by drive access to park-ride primary transit lots would travel times by public transit be more than four times longer than the travel times for equivalent trips by automobile.

Source: SEWRPC.

Map 174

COMPARISON OF AVERAGE PUBLIC TRANSIT SYSTEM AND ARTERIAL STREET AND HIGHWAY SYSTEM MIDDAY TRAVEL TIMES WITHIN THE STUDY AREA UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



As shown on this map, under the "status quo" short-range transit plan, the average midday travel times by public transit from those parts of the study area served by local, express, or Freeway Flyer transit service would generally be two to three times longer than equivalent travel times from those same areas by automobile. Unlike under the recommended short-range transit plan, however, more areas would have transit travel times three to four times longer than travel times by automobile under the "status quo" plan.

Source: SEWRPC.

Frequency of Public Transit Service: The next standard under this objective which can be used in the evaluation of the recommended short-range transit plan specifies that the frequency of public transit service should be sufficient to accommodate passenger volume so as not to exceed specified maximum load factors, but should not, in any case, be less than one transit vehicle every 30 minutes during peak travel periods or one transit vehicle every 60 minutes during off-peak travel periods. Using service frequencies assumed in the simulation model studies conducted of the recommended short-range transit plan, it was determined that the frequency-of-service standard of at least one bus per hour during off-peak periods would be met on all public transit route segments. During the peak periods, however, as shown on Map 175, one primary transit route in the study area would violate the frequency-of-service standard of at least two motor buses per hour under this plan. Using existing service frequencies to analyze the "status quo" short-range plan for public transit, segments of two primary routes and two tertiary routes would violate the frequency-of-service standard of at least two buses per hour during the peak periods, while no public transit routes would exceed the frequency-of-service standard during off-peak periods (see Map 176). It should be noted that the two primary routes shown to violate frequency-of-service standards during the peak periods do so because they provide service with frequencies which are designed to accommodate irregular ridership demand.

Maximization of Public Transit Use: Another standard under this objective used in the evaluation of the recommended short-range plan for public transit system should be maximized. From 109,100 to 137,100 transit trips are anticipated to be made on an average weekday under the recommended plan in 1985, as shown in Table 167. About 9 to 11 percent of all trips in the study area would be made by public transit in 1985 under this plan, depending upon the assumed 1985 motor fuel price. The variation in transit use in the study area under the recommended plan is shown on Maps 177 and 178. As shown on those maps, the highest percentage of transit utilization under the recommended plan would be in the extreme southeastern corner of the study area adjacent to the City of Milwaukee central business district. Transit utilization would decrease with increasing distance from the Milwaukee central business district area. In comparison, an estimated 77,000 to 95,300 transit person trips are forecast to be made on an average weekday under the "status quo" plan in 1985, and about 6 to 8 percent of all trips in the study area would be made by public transit. Under this plan, the percent of trips using public transit would generally be lower throughout the transit service area than under the recommended plan.

Summary and Conclusions: The fifth transportation systems management and development objective formulated under this study and used in the evaluation of the recommended short-range plan asserts the need for the provision of a transportation system which, to support the everyday activities of business, shopping, and social intercourse, facilitates reasonably fast and convenient travel among component parts of northwestern Milwaukee County and southern Ozaukee County, and between this area and other component parts of the Region.

Under the recommended short-range plan for public transit for the study area, there would be about 53,400 vehicles miles of travel and about 3,400 vehicles hours of travel on the public transit system in 1985. The average speed of travel on the public transit system would be about 16 mph. About 98 route miles, or about 18 percent of the public transit system, would operate at less than suggested minimum speeds under this plan; and transit travel times generally would be two to three times longer by public transit than by automobile for equivalent trips. Also, all but one primary transit route would meet the frequency-of-service standard during the peak periods of at least one bus every 30 minutes under this plan, and all transit routes would meet this standard during off-peak periods. Depending on the cost of motor fuel, between 9 and 11 percent of all trips in the study area would be made by public transit under the recommended short-range plan.

The principal advantage of the recommended short-range plan for public transit over the "status quo" plan regarding this objective is that more service would be provided: there would be 15,900, or 30 percent, more vehicle miles of travel; 1,000, or about 29 percent, more vehicle hours of travel; and more frequent service—three fewer routes would not meet the frequency-of-service standards. Transit travel times under the recommended short-range plan, particularly outside the southeastern corner of the study area, would be more comparable to highway travel times, and a greater percentage of trips would be made by public transit within the study area,

Map 175

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT BELOW SUGGESTED FREQUENCY-OF-SERVICE STANDARDS DURING THE PEAK PERIODS UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985

LEGEND

ROUTES OPERATING BELOW SUGGESTED FREQUENCY OF SERVICE STANDARD

PRIMARY SERVICE

GRAPHIC SCALE

0 2 MILES

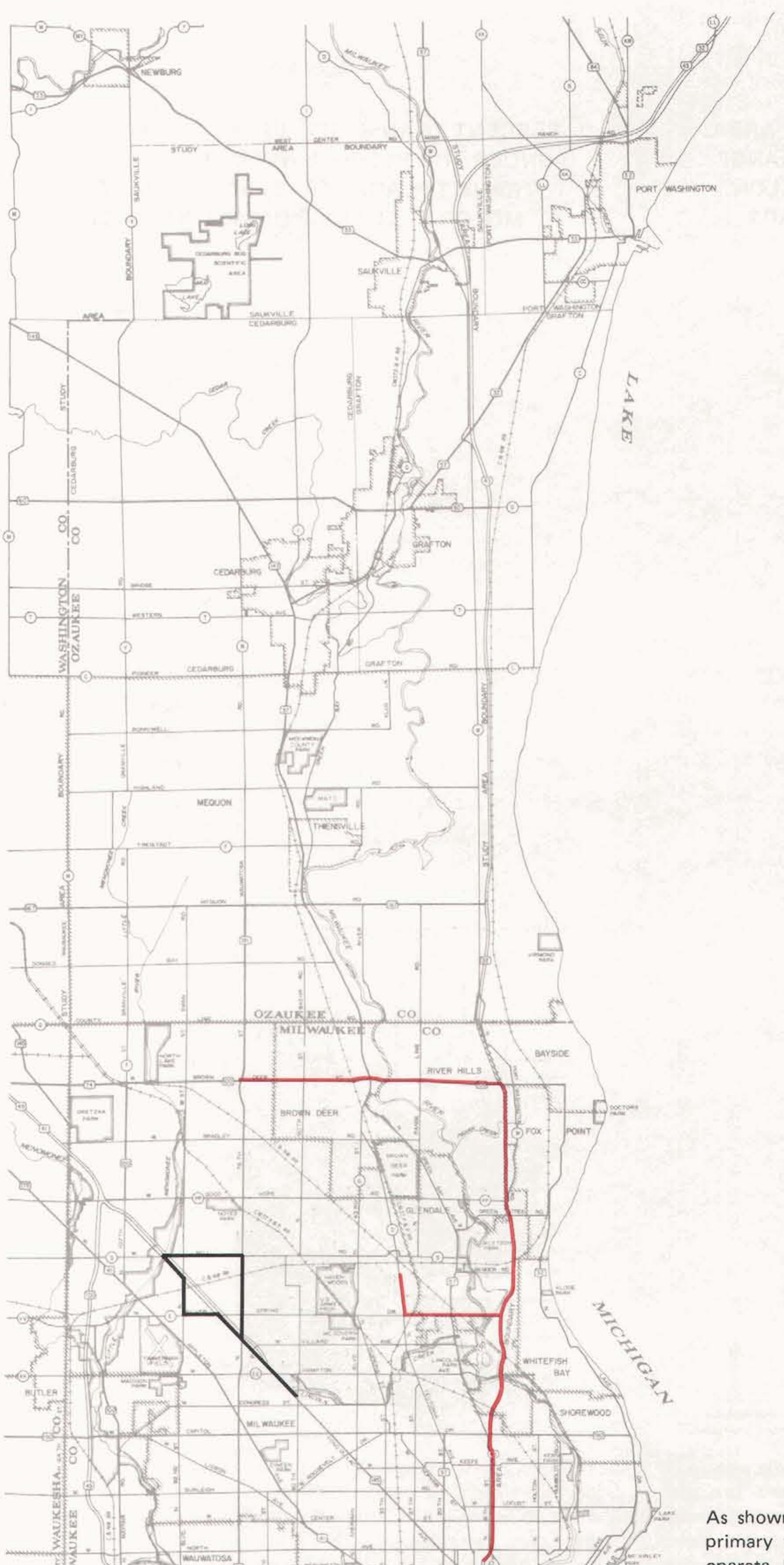
0 4000 8000 12000 FEET

As shown on this map, during peak periods, one primary transit route in the service area would operate below the suggested frequency-of-service standard of at least two motor buses per hour in 1985 under the recommended short-range transit plan. No public transit route segments under this plan would operate below suggested frequency-of-service standards during off-peak periods.

Source: SEWRPC.

Map 176

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT BELOW SUGGESTED FREQUENCY-OF-SERVICE STANDARDS DURING THE PEAK PERIODS UNDER THE "STATUS QUO" SHORT-RANGE TRANSIT PLAN: 1985



LEGEND

ROUTES OPERATING BELOW SUGGESTED FREQUENCY OF SERVICE STANDARD

PRIMARY SERVICE

TERTIARY SERVICE

GRAPHIC SCALE

0 1 2 MILES

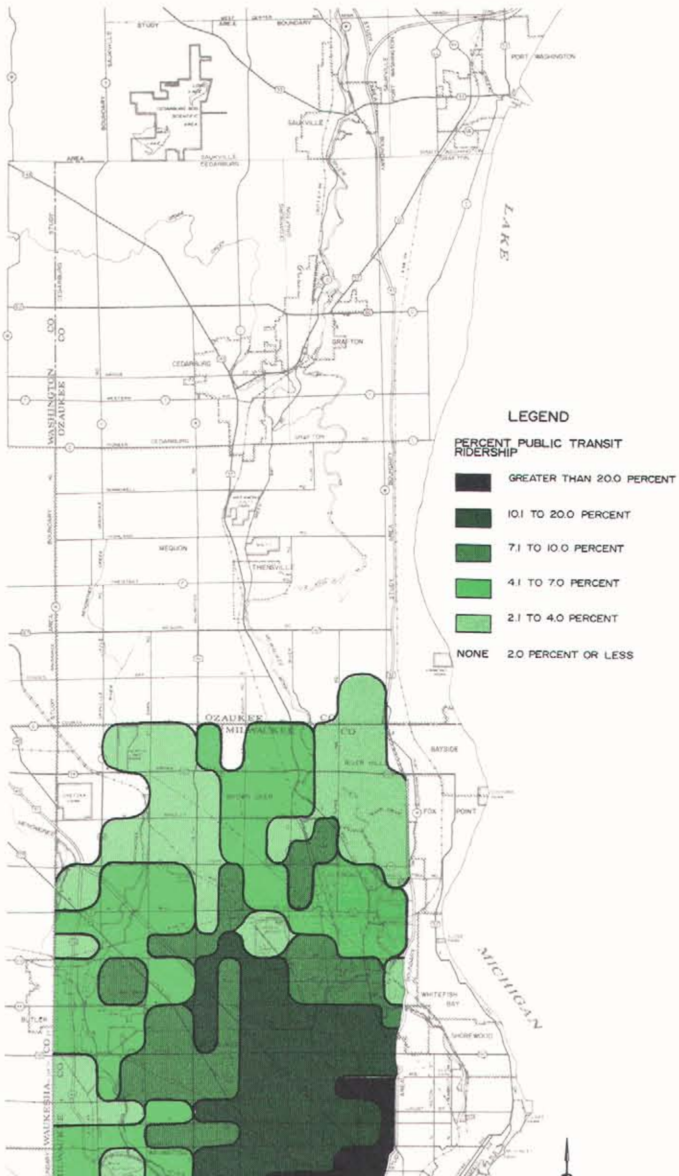
0 4000 8000 12000 FEET

As shown on this map, during off-peak periods, segments of two primary transit routes and two tertiary public transit routes would operate below the suggested frequency-of-service standard of at least two buses per hour under the "status quo" short-range transit plan. Both of the primary routes shown to violate frequency-of-service standards during the peak hour under this plan do so because they provide a service frequency which is designed to accommodate irregular ridership demand.

Source: SEWRPC.

Map 177

PERCENT TRANSIT USE IN THE STUDY AREA UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985—$2.00 PER GALLON MOTOR FUEL PRICE IN 1980 DOLLARS

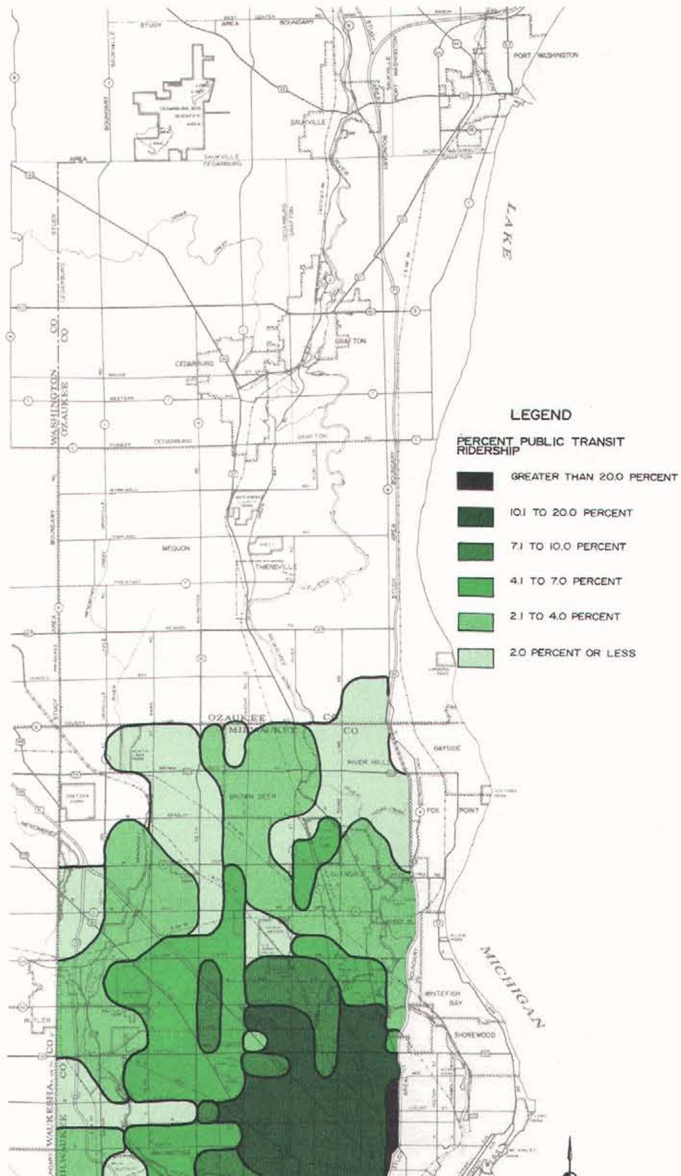


This map shows the variation in transit use in the study area under the recommended short-range transit plan under a motor fuel price of $2.00 per gallon in 1985 in 1980 dollars. The highest percentage of transit utilization under the recommended plan at this motor fuel price would be in the extreme southeastern corner of the study area adjacent to the City of Milwaukee central business district, and transit utilization would decrease with increasing distance from the Milwaukee central business district.

Source: SEWRPC.

Map 178

PERCENT TRANSIT USE IN THE STUDY AREA UNDER THE RECOMMENDED SHORT-RANGE TRANSIT PLAN: 1985—$1.50 PER GALLON MOTOR FUEL PRICE IN 1980 DOLLARS



This map shows the variation in transit use in the study area under the recommended short-range transit plan under a motor fuel price of $1.50 per gallon in 1985 in 1980 dollars. As shown on this map, the highest percentage of transit utilization under the recommended plan at this motor fuel price would be in the extreme southeastern corner of the study area adjacent to the City of Milwaukee central business district, as with a motor fuel price of $2.00 per gallon, and transit utilization would decrease with increasing distance from the Milwaukee central business district.

Source: SEWRPC.

9 to 11 percent of all trips in the study area compared with 6 to 8 percent of all trips under the "status quo" plan.

Effectiveness of the Recommended and "Status Quo" Short-Range Transit System Plans in the Provision of Travel Safety

The sixth objective formulated under the study asserts the need for the reduction of accident exposure and the provision of increased travel safety within the study area. This objective is supported by three standards, one of which is applicable to this evaluation.

The standard used under this objective for the evaluation of the recommended short-range plan for public transit for the study area specifies that travel on facilities exhibiting the lowest accident exposure should be maximized so as to reduce the number of travel accidents. The underlying assumption of this standard, based on historical traffic safety experience, is that travel on transit is safer than travel by automobile.

Under the recommended short-range transit plan, 32,100 to 41,800 fewer automobile trips would be generated within the study area than under the "status quo" plan on an average weekday. As a result, between 179,000 and 317,700 more passenger miles of travel would be made by the public transit than by automobile. Therefore, less traffic accident exposure can be expected within the study area under the recommended plan in 1985 than under the "status quo" plan.

Summary and Conclusions of the Evaluation of the Recommended Short-Range Transit Plan for the Northwest Side Study Area

The transportation systems management and development objectives adopted under the Milwaukee Northwest Side/Ozaukee County transportation improvement study are intended to define the transportation needs of the study area. These adopted objectives—which pertain to the need for transit accessibility to land use, economic and energy efficiency in the transportation system, the provision of an appropriate range of transit services, the provision of quick and convenient transit travel, and the assurance of travel safety—have been utilized to evaluate the recommended five-year Milwaukee County Transit System short-range plan as it affects public transit in the short range within the study area. An evaluation was made of the degree to which these objectives would be met under the recommended short-range public transit plan, and of the degree to which this recommended plan would provide an improvement over a "status quo" plan which would simply maintain the existing public transit service within the study area.

The recommended short-range plan for public transit would provide a total of about 558 route miles of transit service within the northwest side study area by the year 1985, including about 371 route miles of local service, about 23 route miles of express service, and about 164 route miles of Freeway Flyer service. This would represent an increase of about 102 route miles over a "status quo" plan, including about 20 more route miles of local transit service, about 15 more route miles of express transit service, and about 67 more route miles of Freeway Flyer service, including two additional park-ride lots. The level of service on the transit system within the study area would also be upgraded under the recommended short-range plan, as the frequency of bus service would be increased on four routes within the study area during peak travel periods and on 16 routes during off-peak travel periods. These system improvements are expected to require 107 additional buses during weekday peak periods and 59 more buses during weekday off-peak periods and to generate an additional 15,900 bus miles of travel per weekday within the study area.

Under the recommended transit plan, about 87 percent of the population of the urbanized portion of the study area would be considered to be served by transit. Local service would be provided to about 85 percent of the urbanized study area population. Express transit service would be provided to about 26 percent of that population, and about 36 percent of that population would be within walking distance of a Freeway Flyer route and about 62 percent would be within reasonable driving distance of a Freeway Flyer park-ride lot. About 85 percent of the total employment opportunities in the urbanized portion of the study area would be considered to be served by public transit. Local transit would serve about 84 percent of the jobs in the urbanized portion of the study area. Moreover, about 33 percent of the jobs in the urbanized portion of the study area would be served by express transit, and about 42 percent would be served by Freeway Flyer transit. The recommended plan provides a significant increase in the availability of express and Freeway Flyer transit service to the study area. Nearly twice as many study area residents and more than twice as many area jobs would be served by express transit, and about 70 percent more residents and about 25 percent more jobs would be within walking distance of primary transit. Also, one additional shopping center and two additional hospitals, and nearly three times as much high-density residential development, would be within walking distance of primary or express public transit. As a result, transit travel times, particularly in some of the more outlying parts of the study area, will be more comparable to automobile travel times.

Based on the study objectives, the recommended short-range plan would provide the necessary access to major land use activity centers in only a limited part of the Milwaukee County portion of the study area, and not at all in the Ozaukee County portion of the study area. Minimum transit travel time standards for major medical facilities, major educational facilities, and regional parks would be met only within that part of the Milwaukee County portion of the study area that is served by local transit, and, for General Mitchell Field, major retail and service centers, and Milwaukee area jobs, would be met only in the southeastern portion of the study area. The overall level of accessibility provided by the recommended transit plan would, however, generally support the implementation of the study area land use plan, with areas planned for higher density development provided the highest levels of transit accessibility.

Between 109,100 and 137,100 transit trips would be made within the study area under the recommended plan on an average weekday in 1985, or about 9 to 11 percent of the total number of person trips generated within the study area and internal to the Region on an average weekday in that year. The lower estimate is based on a somewhat lesser increase in motor fuel cost over the next five years, about 30 percent in 1980 dollars, while the upper estimate is based on an 80 percent increase. Under a "status quo" plan, between 77,000 and 95,300 transit trips would be made within the study area in 1985. The approximately 40 percent increase in transit ridership under the recommended plan means that an estimated 32,100 to 41,800 fewer automobile trips would be generated within the study area in 1985, and that an average weekday savings of between 4,700 and 6,100 gallons of motor fuel used by automobiles within the study area would be realized, or between 3 to 4 percent of the total automobile fuel use in the study area. The increased use of transit for travel within the study area should also mean a safer transportation system, as historical accident rates for automobile travel are much higher than those for public transit.

The total operation and maintenance costs of the recommended short-range transit plan over the five-year time period of the plan would range between \$130.4 and \$134.6 million, or about \$22.5 to \$23.2 million more than under the "status quo" plan. The total operating subsidy required under the recommended short-range transit plan in the last year of the plan, 1985, would also be higher than under the "status quo" plan—or between \$16.2 and \$18.4 million for the recommended plan compared with between \$11.6 and \$13.0 million for the "status quo" plan. The operating subsidy per ride in 1985, however, would be about \$0.40 to \$0.57 per passenger under the recommended plan, depending on the future price of motor fuel, compared with \$0.42 to \$0.57 per passenger under the "status quo" plan. Farebox revenues would cover between 40 and 49 percent of the total operating costs of the recommended plan. A summary of all of the improvements recommended under the short-range plan for public transit in the study area, as well as the costs and benefits of the plan, is provided in Table 176.

It is recommended that this five-year, short-range plan for the Milwaukee County Transit System as adopted by the Milwaukee County Board be integrated into the transportation system plan for northwestern Milwaukee and southern Ozaukee Counties as the short-range transit element of the plan. Evaluation of the recommended short-range transit system plan of the Milwaukee County Transit System as adopted by the Milwaukee County Board indicates that it may be expected over the next five years to abate many of the existing problems and deficiencies of the public transit system in the northwest side study area at reasonable cost. The plan would expand the existing minimal Freeway Flyer and express transit service in the study area, resulting in significant increases in the provision of such services to the study area resident population and jobs, as well as to major land use activity centers and areas. This planned improvement in transit service may be expected to provide reduced travel times by transit in parts of the study area, and to lead to increased transit use. Under the recommended short-range plan, capital costs would be required only for bus acquisition. An average of 36 new buses per year would need to be added to the Milwaukee County bus fleet over and above vehicle replacement, at

Table 176

RECOMMENDED SHORT-RANGE PLAN FOR PUBLIC TRANSIT IN THE NORTHWEST SIDE STUDY AREA: SUMMARY OF RECOMMENDED IMPROVEMENTS, COSTS, AND BENEFITS

Summary of Improvements

Additional Service

Primary Service

- 67 additional route miles
- Two additional routes: Good Hope Road/Zoo Freeway Flyer
  Timmerman Field/Appleton Avenue Flyer
- Two additional park-ride lots: Good Hope Road at Fond du Lac Freeway (USH 45)
  Timmerman Field

Secondary Service

- 15 additional route miles
- Two new routes: Bay Shore Shopping Center/Downtown Milwaukee/Milwaukee County Medical Complex
  Capitol Court Shopping Center/Downtown Milwaukee
  (Highland Boulevard/Downtown Milwaukee route deleted)
- One new transfer center: Bay Shore Shopping Center

Tertiary Service

- 20 additional route miles
- Six route extensions
- Ten reroutings
- Frequency of service increases on four routes during peak period and 16 routes during off-peak period

Vehicle and Operational Requirements

Additional Buses Needed

- During peak period: 107 additional buses per weekday
- During off-peak period: 59 additional buses per weekday

Bus Hour Requirements

- 15,900 additional bus hours per weekday

Summary of Costs		
Total Operation and Maintenance Costs: 1980 to 1985		
$2.00 per gallon motor fuel price and a transit fare of $0.50:	$134,560,000	($23.2 million additional)
$1.50 per gallon motor fuel price and a transit fare of $0.50:	$130,355,000	($22.5 million additional)
Total Operating Subsidy Required: 1985		
$2.00 per gallon motor fuel price and a transit fare of $0.50:	$ 16,244,800	($ 4.6 million additional)
$1.50 per gallon motor fuel price and a transit fare of $0.50:	$ 18,385,000	($ 5.4 million additional)
Total Operating Subsidy per Ride: 1985		
$2.00 per gallon motor fuel price and a transit fare of $0.50:	$ 0.40	($0.02 less)
$1.50 per gallon motor fuel price and a transit fare of $0.50:	$ 0.57	(same)
Estimated Capital Cost: 1980 to 1985:	$ 27,000,000	

Summary of Benefits

Service to the Land Use Pattern of the Study Area

- Greater levels of accessibility to jobs and to General Mitchell Field

Provision of Economical and Efficient Transportation System

- Estimated average weekday savings of between 4,700 and 6,100 gallons of motor fuel use by automobiles, or between 3 and 4 percent of total automobile fuel used in the study area. The net savings of motor fuel, given the increased use of motor fuel by buses under the recommended plan, is between 700 and 2,100 gallons of motor fuel per average weekday

Provision of a Balanced Transportation System at an Adequate Level of Service

- One additional major shopping center—Capitol Court—and two additional major medical facilities—Milwaukee County Medical Complex and Northwest General Hospital—served within walking distance of primary or secondary transit service
- Nearly three times as much high-density residential development served within walking distance of primary or secondary transit service
- About 75 percent more high-density residential development served within driving distance of primary service or walking distance of secondary service
- Three fewer transit routes misaligned
- About twice as many people served within walking distance of secondary transit service
- About 70 percent more people served within walking distance of primary transit service
- About twice as many jobs served within walking distance of secondary transit service
- About 25 percent more jobs served within walking distance of primary transit service

Provision of Quick and Convenient Travel

- Three fewer routes not meeting frequency-of-service standards
- Transit travel times more comparable to highway travel times
- A greater percentage of total trips made by public transit (9 to 11 percent compared with 6 to 8 percent of all trips)

Provision of Travel Safety

- Between 179,000 and 317,000 more passenger miles of travel to be made by public transit rather than by automobile

Source: SEWRPC.

a total cost of about $27 million over the next five years in 1980 dollars. About 107 additional buses, or about 21 additional buses per year, would be required in the study area over this period. The plan would also require an additional operating subsidy of between $4.6 and $5.4 million per year in 1985 in 1980 dollars, depending upon the motor fuel price in 1985. Assuming that the U. S. Department of Transportation, Urban Mass Transportation Administration, and the Wisconsin Department of Transportation continue to fund 50 percent and 33 percent of the total Milwaukee County Transit System operating subsidy, respectively, the cost in 1985 to Milwaukee County of this additional operating subsidy would be between $769,000 and $901,000 in 1980 dollars.

SUMMARY AND CONCLUSIONS

In Chapter IV of this report, specific arterial street segments within the northwest side study area were identified as having sufficiently severe existing traffic problems to warrant the development of alternative short-range measures for their improvement. Certain elements of the public transit system of the study area were also identified as being deficient and in need of improvement. To address these existing problems, a short-range plan was developed under the northwest side study for the alleviation of traffic congestion and related traffic problems on the arterial street and highway and public transit systems of the study area by the year 1985. Also included in this short-range plan were provisions for integrating the freeway "stub ends" at the Stadium Freeway-North and at the Hillside Interchange into the surface arterial street system of the study area. The development of such a short-range plan was considered an essential step in the formulation of a comprehensive transportation plan for the study area.

Arterial Street and Highway Problem Intersection Analysis and Recommended Traffic Management Plan

The development of a short-range plan for the arterial street and highway system of the study area consisted first of an intensive examination of each of the 20 arterial street segments identified in Chapter IV of this report as having severe traffic problems. The first step in this examination was an evaluation of the existing congestion problems at each arterial intersection along each of these problem segments. Accordingly, a traffic engineering analysis was performed of each of the 210 intersections along these arterial street problem segments at which the problem arterial facility was controlled by either a traffic signal or stop sign. For the 63 intersections indicated by the analyses to have an existing traffic congestion or related problem, alternative traffic management actions were developed and evaluated, and actions were recommended to abate the problem. Alternative actions were also developed and evaluated for each of 19 intersections along these problem arterial segments which, while not exhibiting congestion problems, were determined to have inadequate turn-lane storage capacity and/or an inefficient signal timing plan (see Maps 146 and 147 of this chapter). In the development of measures to abate the problems identified at each intersection, the least costly and least disruptive traffic management actions were considered first, and recommended where appropriate. The types of traffic management actions considered to abate the congestion at these problem intersections were, in order of increasing disruption and cost: the retiming of the existing signal timing plan, modification of the total cycle length or other signal modifications, the addition of new signal phases along with new traffic controllers where necessary, the prohibition of on-street parking at intersection approaches, the installation of pavement markings to facilitate traffic flow, the construction of new turn lanes or the addition of additional capacity to an existing turn lane, and the installation of new traffic signals.

A total of 209 traffic management actions, with an estimated capital cost of between $1,637,000 and $1,972,000 in 1980 dollars, were recommended for intersections along the 20 arterial street problem segments. This cost was expressed as a range because additional right-of-way would have to be purchased for certain of the recommended actions, and precise right-of-way needs and costs cannot be determined without more detailed engineering studies.

A total of 192 of the 209 traffic management actions were recommended to abate the traffic congestion problems experienced at the 63 intersections, at an estimated capital cost of between $1,485,000 and $1,820,000, expressed in 1980 dollars. Of this total cost, between $190,000 and $410,000 would be required for additional right-of-way at five intersections, the only new right-ofway required under the short-range plan. In the abatement of the traffic congestion or congestion-related storage problems identified at these 63 intersections, it was recommended that the traffic signal timing plans be retimed at 38 intersections, that 55 new signal phases be added, and that 24 to 31 new traffic controllers be added to accommodate these signal phase changes; that the total traffic signal cycle be modified at five intersections during the morning peak and/or evening peak hour; that on-street parking be prohibited on nine intersection approaches during the morning peak hour and on 23 approaches during the evening peak hour; that pavement markings be installed at five intersections; that new traffic signals be installed at one intersection; and that new signal heads be installed at one intersection. New roadway construction recommended at these 63 congested intersections included lengthening three single right-turn lanes and 10 single left-turn lanes; adding five single right-turn lanes and two single left-turn lanes; lengthening one double left-turn lane; adding four double left-turn lanes and one double right-turn lane; and expanding 13 single left-turn lanes to double turn lanes.

Implementation of these recommended traffic management actions may be expected to abate existing traffic congestion at all but one intersection during the morning and evening peak hours—the intersection of W. Lisbon Avenue with W. North Avenue; at all but one intersection during the morning peak period only—W. Appleton Avenue with N. 60th Street, and all but one intersection during the evening peak period only—STH 57 (Wisconsin Avenue) and STH 60 (Washington Street) in the Village of Grafton. It was also determined that all but one of the congestion-related problems resulting from inadequate exclusive turn-lane storage capacity during the morning peak hour—that at the intersection of W. Silver Spring Drive with N. 76th Street (STH 181)—and all but two such problems during the evening peak hour—those at the intersections of W. Silver Spring Drive with N. 76th Street, and N. 76th Street with W. Capitol Drive (STH 190)—could be abated.

Besides the actions discussed above, a total of 27 additional traffic management actions were recommended to be implemented at those 21 intersections which, while not exhibiting congestion problems, either were shown to exhibit inadequate turn-lane storage capacity during the morning and/or evening peak hours, or were shown to have an inefficient signal timing plan. The capital cost of these 27 actions would approximate $152,200. Specifically, to alleviate the inadequate storage problems at these intersections, it was recommended that five single left-turn lanes and two double left-turn lanes be lengthened, and that on-street parking be prohibited on one intersection approach during the evening peak hour. To remove inefficiencies within the signal timing systems during the morning and evening peak hours at 14 of these 21 intersections, it was recommended that the signal timing systems at each be retimed, and that three of the problem intersections be interconnected. It was concluded that implementation of these actions would serve to abate all but one of the exclusive turn-lane storage capacity problems and all of the inefficient signal timing problems at these intersections. The one insufficient storage problem that would not be abated occurs during both the morning and evening peak hours in conjunction with the east-to-northbound left-turn lane at the intersection of N. 76th Street (STH 181) and W. Harwood Avenue; it is anticipated, however, that the storage problems at this intersection will be abated with the opening of the new Harwood Avenue bridge in Wauwatosa.

Arterial Street and Highway Midblock Problem Analysis and Recommended Plan

The second step in the examination of existing problems along the 20 identified arterial problem segments consisted of an evaluation of congestion and accident problems which occur between signalized intersections at median openings along divided portions of arterial streets and in areas of high-volume driveways, high on-street parking turnover, and pedestrian crossings, and at nonsignalized local street intersections. In accordance with this step, a comprehensive traffic management plan which deals, in part, with the abatement of problems between signalized intersections was prepared by the Wisconsin Department of Transportation for a median-divided portion of the identified problem segment of N. 76th Street (STH 181)—that is, for the segment from W. Center Street to W. Bradley Road. It was recommended that this plan be used as a prototype by the levels and units of government having jurisdictional responsibility for the remaining median-divided portions of the 20 problem arterial segments in the study area, and that these bodies consider preparing similar traffic management plans for the abatement of problems between signalized intersections . The limits of this problem analysis of N. 76th Street which are relevant to the northwest side study are W. Grantosa Drive on the south and W. Bradley Road on the north, a distance of 3.6 miles.

In the Wisconsin Department of Transportation analysis, it was concluded that five nonsignalized intersections along N. 76th Street display problems: W. Green Tree Road, W. Carmen Avenue, W. Bobolink Avenue, W. Denver Avenue, and W. Calumet Road.

Six midblock segments along N. 76th Street were also identified as exhibiting traffic accident or congestion problems: the 7100 and 7200 blocks immediately north and south of W. Good Hope Road, the 7900 block immediately south of W. Bradley Road, the 6900 block between W. Green Tree and W. Good Hope Road, the 6200 block between W. Florist Avenue and W. Mill Road, and the 7400 block between W. Good Hope Road and W. Calumet Road (see Table 160).

Based on traffic movement and accident collision diagrams prepared for each problem location and for all stretches of N. 76th Street adjacent to commercial land uses, it was determined that, with the exception of that segment of N. 76th Street adjacent to its intersection with W. Good Hope Road, most of the safety and operational problems at median openings and nonsignalized intersections along this stretch of N. 76th Street could be resolved through the provision of exclusive left-turn lanes and on-street parking prohibition, as well as the installation of new traffic signals at the intersection of N. 76th Street and W. Green Tree Road.

Those segments of N. 76th Street immediately north and south of W. Good Hope Road were identified as having the most severe problems along the entire segment. To abate the existing problems along N. 76th Street immediately south of its intersection with W. Good Hope Road, it was recommended that 1) an exclusive northbound left-turn lane be added at an existing median opening; and 2) that median opening be channelized to prohibit northbound left turns from the driveway extrance on the west side of the roadway. To abate the existing problems along N. 76th Street immediately north of its intersection with W. Good Hope Road, it was recommended that 1) left-turn lanes be provided on both sides of the second median opening north of W. Good Hope Road in order to provide refuge areas for vehicles using the opening from the north and south; and 2) the first median opening north of W. Good Hope Road be moved slightly to the north in alignment with new driveway entrances on both sides of N. 76th Street. This latter median relocation would require that an existing driveway on the east side of N. 76th Street be moved to the south, and that a new consolidated driveway entrance on the west side of N. 76th Street be constructed.

Alternative and Recommended Completion Plans for Hillside Interchange and Stadium Freeway-North "Stub Ends"

The development of a short-range plan for the arterial street and highway system of the northwest side study area included another important element—the development of proposals and the recommendation of a design for integration of the "stub ends" of the Park Freeway-West and Park Freeway spur at the uncompleted Hillside Interchange, and of the "stub ends" of the Stadium Freeway-North (USH 41), into the arterial street system of the study area. These "stub ends" are the result of the removal of two proposed freeways—the Park Freeway-West Park spur and the Stadium Freeway-North "gap closure" Freeways—from the adopted long-range regional transportation system plan in 1978.

Alternative and Recommended Completion Plans for Hillside Interchange "Stub End": Five alternative plans for the integration of the Hillside Interchange "stub ends" into the surface arterial street system were prepared under the northwest side study by the Wisconsin Department of Transportation. Each provided access to the North-South Freeway (IH 43) from W. Fond du Lac Avenue (STH 145) and from W. Walnut Street. On January 30, 1980, the northwest side study Advisory Committee adopted one of these five alternatives and recommended its implementation. The adopted alternative would provide a direct connection between the northbound lanes of the North-South Freeway, the eastbound lanes of the Park Freeway-East, and W. Fond du Lac Avenue and W. Walnut Street (see Figure 70). This alternative has a relatively low capital cost, estimated at $3,520,000 in 1980 dollars, meets desirable design standards, and requires no new right-of-way, but could be expected to involve some peak-hour traffic congestion, both at the intersection of W. Fond du Lac Avenue and W. Walnut Street and on the freeway ramps.

Alternative and Recommended Completion Plans for Hillside Interchange Northern Spur: Eight alternative plans for the integration of the Hillside Interchange northern spur "stub end" into the surface arterial street system were also prepared by the Wisconsin Department of Transportation and considered by the Advisory Committee. Three of these alternatives were comparatively costly and provided full access between the North-South Freeway (IH 43) and the arterial street system. Four of these alternatives were designed as lower cost alternatives which treated each potential connection between the North-South Freeway and the arterial street system at the northern spur separately so that they could be implemented separately. An eighth alternative plan was considered by the Committee at the request of the Park West Redevelopment Task Force, and was a very low-cost modification of a design previously prepared which involved only one connection to the northbound lanes of the North-South Freeway. After consideration of these eight alternatives, the Advisory Committee, on December 11, 1980, acting on the recommendation of the Park West Redevelopment Task Force, adopted the "status quo" plan for the Hillside Interchange northern spur. Under this plan, no action would be taken to either connect or remove the existing "stub end" ramps. During the preliminary engineering phase attendant to implementation of the earlier adopted plan for completion of the Hillside Interchange proper early in 1981, however, it became necessary for the Advisory Committee to reconsider the recommended "status quo" plan for the Hillside Interchange northern spur. It was concluded by the Wisconsin Department of Transportation that the ramp bridges at the northern spur would have to be removed to provide the three continuous lanes for through traffic both northbound and southbound on the North-South Freeway through the Interchange and Interchange northern spur, and, as recommended in the adopted regional transportation system plan, to provide improved travel safety by superelevating the existing southbound curve through the ramp bridges at the Interchange northern spur. The ramps leading to these bridges were also recommended to be removed, as were the south-to-eastbound uncompleted "stub end" ramps from the North-South Freeway and from W. North Avenue to the previously proposed Park Freeway-West, another part of the Hillside Interchange northern spur (see Figure 78). Removal of these "stub end" ramps would require that the elevated structure of the North Avenue southbound freeway on-ramp be removed and replaced by a fill. The total cost of these removals and improvements was estimated at $500,000 in 1980 dollars.

Alternative and Recommended Completion Plans for Stadium Freeway-North "Stub End": Ten alternative plans for the connection of the Stadium Freeway-North "stub end" to the surface arterial street system were prepared under the study. The first six of these plans were prepared by the Wisconsin Department of Transportation (WisDOT) and the last four were prepared by the City of Milwaukee. A primary concern of the design of these alternative plans was the alleviation of the traffic congestion at the intersection of W. Lisbon Avenue and W. North Avenue. Six of the 10 plans considered were found to accomplish this. The first three alternative plans prepared by the WisDOT treated each type of connection between the Stadium Freeway-North and the surface arterial street system separately. The other three alternative plans prepared by the Department provided both on- and off-ramp access between the Stadium Freeway-North and the surface arterial street system. The four alternative plans prepared by the City of Milwaukee were the least costly of the alternatives, but two of these plans involved moderate disruption. Eight of the 10 alternatives involved the taking of some new right-of-way. After consideration of these 10 alternatives, the Advisory Committee, in 1982, adopted the eighth alternative plan considered and recommended it for implementation. This alternative provides for a new southbound entrance ramp to the Stadium Freeway (USH 41) southbound which would have an entrance from W. Lisbon Avenue at a point between N. 47th and N. 46th Streets, and would provide for the widening of the intersection of W. Lisbon Avenue and W. North Avenue in order to accommodate a new left-turn lane in the northwest-bound approach. Left turns would be permitted under this alternative during the peak periods in the northwest-bound direction. This alternative plan was recommended in conjunction with the adoption in the long-range element of the northwestside study of an improvement proposal for W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue, under which no physical improvement would be made to either of these arterial segments. Under the adopted plan for completion of the Stadium Freeway-North "stub end," as in the recommended plan for the improvement of W. Appleton Avenue and W. Lisbon Avenue, minimal urban disruption would be incurred, and no business or residential structures would be taken.

Development of Recommended Short-Range Plan for Public Transit

In the preparation of the short-range plan, those elements of the public transit system which were identified in Chapter IV of this report as having deficiencies were also considered. Those problems consisted primarily of the lack of Freeway Flyer and express transit service in the most intensively developed parts of the study area. Short-range plans for public transit system development to treat these problems were designed, tested, and evaluated as part of the concurrent Milwaukee County Transit System service improvement study. The alternative transit system plans prepared under this Milwaukee County study were developed to include as alternatives those improvements necessary to address the identified major public transit system problems of the study area. Four alternative short-range plans were developed for the public transit system of Milwaukee County and the study area under the short-range transit improvement planning effort. Of these, two plans—a "status quo" plan and "augmented" system plan—were intended to serve as "benchmark" plans against which alternative plans developed to address the existing problems and needs of Milwaukee County could be compared. Two other plans—a "timed transfer" system plan and an "extended grid" system plan—were designed to specifically address the identified transit deficiencies within the Milwaukee area and the study area. The performance of these four plans was reviewed and compared route by route, and a plan combining the best features of these four plans was then further evaluated and subsequently adopted by the Milwaukee County Board in September 1980 (see Map 154).

Under the recommended short-range plan for public transit, an additional 102 route miles of transit service would be provided by 1985 within the northwest side study area over the "status quo" plan, the latter consisting essentially of the existing transit system, including about 20 more route miles of local service, about 15 more route miles of express service, and about 67 more route miles of Freeway Flyer service, plus two additional park-ride lots. The level of service on the transit system would also be upgraded under the recommended plan, as the frequency of bus service would be increased on four routes within the study area during peak travel periods, and on 16 routes during off-peak periods. These improvements would require an additional 107 buses during weekday peak periods and 59 more buses during weekday off-peak periods, and would generate an additional 15,900 bus miles of travel per weekday within the study area. With these improvements, nearly twice as many residents of the study area and more than twice as many jobs in the study area would be served by express transit, and about 70 percent more residents and about 25 percent more jobs would be within walking distance of primary transit service. Also, one additional shopping center and two additional hospitals, and nearly three times as much high-density residential development, would be within walking distance of primary or express transit service. As a result, transit travel times, particularly in some of the more outlying parts of the study area, would be more comparable to automobile travel times. The overall level of accessibility provided by the plan would generally support the adopted regional land use plan, with areas planned for higher density development provided the highest levels of transit accessibility. Under this plan, transit ridership could be expected to be 40 percent higher than under the "status quo" plan, resulting in between 32,100 and 41,800 fewer automobile trips and an attendant average weekday savings of between 4,700 and 6,100 gallons of motor fuel.

The estimated total operation and maintenance costs of the recommended short-range transit plan over the five-year period from 1980 to 1985 would range between $130.4 and $134.6 million, or about $22.5 to $23.2 million more than the cost of maintaining the existing system. Although the total operating subsidy required under this plan would be about $5.0 million higher than that required under the "status quo" plan, because of an expected increase in ridership the subsidy per ride would be about the same under both plans. The primary capital cost of the recommended plan would be expended for the acquisition of an average of 36 new buses per year over the five-year implementation period, at a cost of $27 million, expressed in 1980 dollars, to serve the greater Milwaukee area, of which 21 new buses per year would be required to serve the study area.

Chapter VI

FORECAST AND PLANNED CHANGE IN THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY AREA AND THE REGION

INTRODUCTION

One of the objectives of the Milwaukee Northwest Side/Ozaukee County transportation improvement study is the preparation of a long-range transportation system plan for northwestern Milwaukee and southern Ozaukee Counties. This plan is intended to be an amendment to the recently adopted long-range transportation system plan for the Region for the design year 2000, and to include those transportation systems management measures, transit facilit facility and service improvements, and arterial highway facility improvements necessary to accommodate the future travel that was to have been accommodated on the previously proposed Park Freeway-West and Stadium Freeway-North "gap closure."

Accordingly, and as dictated by sound planning practice, a necessary step in the assessment of the future transportation needs of the northwestern Milwaukee and southern Ozaukee County study area is the consideration of probable future change in the area. Change is one of the basic characteristics of the modern world, and no area which participates in modern life can avoid being influenced by change. Since change is inevitable, the principal question dealt with in the planning process is not whether change will occur, but how much may be expected to occur, when and where it may be expected to occur, and how it can be shaped and guided in the public interest. Chapter III of this report summarized the recent changes in the level and characteristics of demographic, economic, and land use activity that have occurred in the northwest side study area. Based upon the recently completed land use and transportation plan reevaluation for the Region, this chapter summarizes the anticipated and planned changes to the design year 2000 in the level and characteristics of population, economic activity, and land use in the northwest side study area and in the Southeastern Wisconsin Region, of which the study area is an integral part.

Future change in the northwest side study area, as considered in the regional land use and transportation plan reevaluation, is in part forecast and in part planned. Under that planning effort, the total future changes in population and economic activity levels, and, therefore, in aggregate land use demand, in the Region had to be anticipated, or forecast. This is because in southeastern Wisconsin, as in any urban region, control of future changes in population and economic activity levels and characteristics lies largely, although not entirely, outside the scope of the planning effort, as well as outside the scope of governmental activity at regional and local levels.

Alternative normative plan designs, however, and not forecasts, were prepared for the future spatial distribution of this population and economic activity in the Region to the year 2000, and a plan to better shape and guide land use development in the public interest was selected and adopted. The preparation of alternative plans, and the selection of a recommended plan from among those alternatives, was based, in part, upon an evaluation of the extent to which the alternative plans considered met adopted areawide land use development objectives, which included considerations of land use compatibility, natural resource base protection, and accessibility, as well as economy. The future spatial distribution of land use in the Region was determined through a design process which attempted to best meet the adopted objectives, rather than through a forecast, because guidance of the future spatial distribution of land use was considered to be among the most important responsibilities of state and local government.

It is important to recognize that the adopted regional land use plan is a normative plan which recommends how the Region should develop to best meet stated development objectives, and that it is not a projection of how the Region may be expected to develop based upon an extrapolation of historic trends. Thus, the future regional population and economic activity levels used in the preparation of, or derived from, that adopted land use plan, and the allocations of future population and employment levels to the northwest side study area presented in this chapter, represent a planned and desirable state of the study area.

Despite dramatic changes in recent years in the cost and availability of energy, particularly petroleum-based fuels, in inflationary economic trends, and in population lifestyles, it is believed that the plan nevertheless represents a desirable future state of the northwest side study area. It must be recognized that year-to-year fluctuations in population or employment and economic activity and the deviations from the forecast levels resulting from these fluctuations may represent only short-term aberrations from a long-term forecast trend. Over the 20-year forecast period, these fluctuations may even out. It must also be recognized that many of the recent changes in energy price and availability and in inflation should be viewed as working to help bring about the land use development pattern, and, therefore, the attendant population and employment levels and distributions envisioned in the plan. The scarcity of inexpensive motor fuel, and its implications for both automobile availability and use, as well as continued "urban sprawl" into suburban rural-urban fringe areas of the Region, must be viewed as factors which in the future can help bring about the normative land use plan for the area.

This chapter reviews the forecasts of population and economic activity levels and characteristics prepared as part of the land use and transportation plan reevaluation process. Projections of land use demand and automobile availability are also summarized.[1] Moreover, the recommended spatial distribution of population, employment, and attendant supporting land uses to the year 2000 set forth in the adopted regional land use plan is summarized, and the allocations of anticipated regional population, economic activity, and land use change under the adopted land use plan to the northwest side study area are discussed in some detail. Finally, future residential neighborhoods in the study area are identified and delineated.

REGIONAL CHANGE TO THE YEAR 2000

Any consideration of anticipated and planned change in the northwest side study area must begin with an assessment of probable change in the Southeastern Wisconsin Region, of which the study area is an integral part. In this respect, it is important to understand the basic concepts underlying forecasting in general, the methods used to prepare the particular forecasts under consideration, and the consequent limitations of these forecasts.

Many methods have been developed for forecasting change in a region such as southeastern Wisconsin. Some of these methods are quite simple; some are highly complex. But all are ultimately based upon historical experience and, in general, rely on a combination of mathematical formulation and professional judgment to analyze this experience and project it into the future. The principal difference between any of the forecasting methods generally lies in the differing emphasis placed upon these two basic elements.

To date, no single mathematical or judgmental method of forecasting the basic components of regional change has proven to be more accurate than any other. For this reason, it is generally unwise to rely on the results of a single method of forecasting; it is better instead to utilize, if possible, a number of methods; compare the results; and then, after careful consideration of any differences, select the "best" estimate utilizing the best professional judgment available. This procedure was generally followed in the preparation of forecasts for the regional land use and transportation plan reevaluation.

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[1] *In planning practice it is conventional to distinguish between "projections" and "forecasts." The former term refers to the use of mathematical or graphical extrapolation of historic trends in population, employment, or other factors to make conditional statements about future conditions of such factors. These projections imply the continuation of a stated set of trends. The latter term refers to an unconditional assertion about a future condition to be used in the preparation of plans. A forecast may be one of the developed projections or a modification of one of the developed projections conditioned on the assumption of potential changes in historic trends. Completely unconditional assertions, however, are seldom if ever made for planning purposes. Hence, the term "forecast" as used herein refers to population and employment projections used as inputs to nondemographic and noneconomic aspects of plan preparation. While the future population and employment data presented in this chapter are forecast in that they are inputs to the plan preparation, it will be seen that the automobile availability and land use demand data presented are, in fact, projections, to be modified by alternative plan designs.*

In the preparation of the population forecasts, four different demographic techniques were used to make independent projections of the regional population to the year 2000. In addition, the separate population projections were converted to employment projections, and these were compared to independently prepared employment forecasts. Based on this analysis, a single "best" population forecast range and level was selected by technical and intergovernmental advisory committees from the complete array of projections. In the preparation of the employment forecasts, a forecast range and level of employment was prepared for each of the dominant and subdominant industry groups within the Region, based on a series of inputs including analysis and extrapolation of the historic trends evident for each industry group in the Region; analysis of employment in the nation, the east north-central states, and the State of Wisconsin in each industry group from 1950 to 1970; a survey of 165 manufacturing firms in the Region; industry outlooks to 1980 as published by the U. S. Department of Commerce; unpublished forecasts to the year 2000 of employment in the nation and the east north-central states by industry group; recent studies of regional business attitudes published by the Bureau of Business Research of the University of Wisconsin; and work force industry projections to the year 1980 published cooperatively by the state government.

The regional population and employment forecasts used in the preparation of the regional land use and transportation plan were made interdependently; that is, employment forecasts were not derived solely from population forecasts prepared by purely demographic analyses, nor were population forecasts derived solely from employment forecasts prepared by purely economic analyses. Rather, both demographic and economic analyses were independently made, the resulting sets of population and employment projections compared, and the comparison used as an aid in the selection of the "best" set of projections as forecasts.

Regional Population Forecast

The Commission and its technical and intergovernmental advisory committees reviewed 15 different population projections, utilizing differing sets of assumptions on fertility and migration, before agreeing upon a probable range of future resident population levels in the Region, and within that range, a forecast population level. The 15 population projections are summarized in Table 177. The probable future range of resident population in the Region was established at between 1.9 million and 2.4 million persons by the year 2000.

Table 177

PROJECTED REGIONAL POPULATION IN THE YEAR 2000 USING VARIOUS COMBINATIONS OF FERTILITY AND MIGRATION ASSUMPTIONS

Projection Number	Fertility and Migration Assumptions	2000 Population
1	Continuation of current[a] fertility and mortality rates to 2000; migration rates at 1950-60 level.	3,756,400
2	Reduction in fertility to replacement level from 1975 to 2000; migration rates at 1950-60 level; current mortality.	3,532,000
3	Continuation of current fertility and mortality rates to 2000; migration rates at 1950-70 level.	3,167,700
4	Reduction in fertility to replacement level from 1975 to 2000; migration rates at 1950-70 level; current mortality.	2,968,400
5	Continuation of current fertility and migration rates through 1980, then replacement level fertility to 2000; migration rates between the current and the 1950-70 levels to 2000; current mortality.	2,701,700
6	Continuation of current fertility, mortality, and migration rates to 2000.	2,684,100
7	Continuation of current fertility rates to 1985 then replacement level fertility to 2000; continuation of current mortality and migration rates to 2000.	2,590,100
8	Continuation of current fertility rates to 1980, then replacement level fertility to 2000; continuation of current mortality and migration rates to 2000.	2,560,300
9	Reduction in fertility rates to replacement level from 1975 to 2000; continuation of current mortality and migration rates.	2,506,800
10	Reduction in fertility rates to below replacement level from 1975 to 1985, then replacement level fertility to 2000; reversal of net out-migration of the 1960's to net in-migration from 1970 to 2000; current mortality.	2,427,000[b]
11	Continuation of current fertility and migration rates to 1985, then replacement level fertility and no migration to 2000; current mortality.	2,380,800
12	Continuation of current fertility and mortality rates to 2000; no migration.	2,338,300
13	Reduction in fertility to below replacement level from 1975 to 1985, then replacement level fertility to 2000; slowdown in the out-migration of the 1960's to a slight net in-migration by 2000; current mortality.	2,219,300[c]
14	Reduction in fertility rates to replacement level from 1975 to 2000; continuation of current mortality rates; no migration.	2,175,200
15	Reduction in fertility to below replacement level from 1975 to 1985, then replacement fertility to 2000; continuation of current out-migration and current mortality.	1,971,800[d]

[a] *Current refers to 1970 fertility and mortality rates and to 1960-70 migration rates.*

[b] *Selected by Commission staff and Advisory Committees as the probable upper limit of regional population in 2000.*

[c] *Selected by Commission staff and Advisory Committees as the best forecast of regional population in 2000.*

[d] *Selected by Commission staff and Advisory Committees as the probable lower limit of regional population in 2000.*

Source: SEWRPC.

Table 178

REGIONAL POPULATION FORECAST BY COUNTY: 1970-1980

County	Population					
	1970 Census Count	1980	Forecast 1990	2000	Change: 1970-2000	
					Number	Percent
Kenosha	117,917	139,200	159,900	174,800	56,883	48.2
Milwaukee	1,054,249	1,014,500	1,022,200	1,049,600	- 4,649	- 0.4
Ozaukee	54,461	76,200	97,400	114,000	59,539	109.3
Racine	170,838	185,600	203,600	217,700	46,862	27.4
Walworth.	63,444	74,700	86,600	99,600	36,156	57.0
Washington . . .	63,839	90,900	117,600	143,000	79,161	124.0
Waukesha	231,338	292,300	356,600	420,600	189,262	81.8
Region	1,756,086	1,873,400	2,043,900	2,219,300	463,214	26.4

Source: U. S. Bureau of the Census and SEWRPC.

A single forecast level of 2.2 million persons was selected as the basis for the preparation of the new plans. This forecast population level was based on an assumed reduction in population fertility rates to below replacement level by the year 1985 and then a gradual increase to replacement level from 1985 to 2000, and on an assumed halving of regional net out-migration by the year 1985, with no substantial net in- or out-migration occurring thereafter. The forecast regional population for the year 2000 represents an increase of about 463,000 persons, or about 26 percent, over the 1970 enumerated population of 1,756,000 persons.

Unlike the regional forecast, future population levels prepared for the seven counties of the Region were normative, based upon the Commission's adopted areawide land use development objectives. The forecasts, chosen from among a number of alternatives, assumed that the continued diffusion of urban development into the outlying areas of the Region would be curtailed in the public interest through the exercise of land use controls and other public policy actions. They further assumed that the present trends in population decentralization would be stabilized and reversed in the mid- to late 1980's and that the central areas of the Region would again experience population growth. While at variance with existing trends, this assumption is consistent with current federal policies which seek to discourage urban sprawl and protect critical environmental and prime agricultural lands.

At the county level, as shown in Table 178, the population forecasts indicate moderate population growth in Ozaukee, Washington, and Waukesha Counties, with slower rates of population growth in Kenosha, Racine, and Walworth Counties. Milwaukee County, currently experiencing a significant decline in population, is expected to continue to lose population until about 1980, at which time its population would stabilize; after 1985, population in Milwaukee County would, under the plan, begin to again increase. County population forecasts based specifically on trends since 1970 would indicate a continued decline in the population in Milwaukee County and continued growth in the population of surrounding counties. A population redistribution of this nature would, over time, result in the partial abandonment of a large and expensive urban infrastructure already in place in Milwaukee County and the re-creation of this infrastructure in the outlying counties. The selection of alternative county population forecasts based exclusively on this accommodation of current trends would have the effect of encouraging urban sprawl.

A comparison of the forecast prepared in 1972 and the estimated actual regional population in the year 1978 is set forth in Table 179. Based on the design year 2000 population forecast, the overall resident population level in the Region was anticipated to reach 1.85 million by the year 1978. The estimated population of the Region in 1978 was 1.77 million, or about 4 percent below the forecast level for that year. The Commission's regional population forecast, as noted earlier, is based upon anticipated changes in the two basic components of population change: natural increase, or the difference between births and deaths, and net migration, or the difference between in-migration and out-migration. Review of the available data on these two components of population change since 1970 indicates that observed rates of natural increase have generally been in conformance with the assumptions underlying the population forecast. For the Region as a whole, the observed change in population due to natural increase is slightly higher than the change anticipated in the forecast. The opposite is true, however, for the net migration component of population change. The forecast had assumed a slight excess of out-migration over in-migration for the Region during the 1970's. Available data indicate, however, that the excess of out-migration over in-migration has been substantially greater than forecast.

Estimated and normative population forecasts for the year 1978 by county are also shown in Table 179. All of the counties except Waukesha lag somewhat behind the anticipated population growth, with the most significant deviation occurring in Milwaukee County.

Table 179

COMPARISON OF THE FORECAST AND ESTIMATED POPULATION: 1978

County	1978 Population		Difference: Estimate Minus Forecast	
	Forecast	Estimated	Number	Percent
Kenosha	134,640	126,244	- 8,396	- 6.24
Milwaukee . . .	1,020,020	954,109	- 65,911	- 6.46
Ozaukee	71,840	70,431	- 1,409	- 1.96
Racine	182,320	177,452	- 4,868	- 2.67
Walworth. . . .	72,420	69,161	- 3,259	- 4.50
Washington . .	85,460	84,114	- 1,346	- 1.58
Waukesha . . .	280,260	288,973	8,713	3.11
Total	1,846,960	1,770,484	- 76,476	- 4.14

Source: April 1, 1978 Wisconsin Department of Administration preliminary estimates.

Regional Household Forecast: An important characteristic of the forecast regional population level is the number of households in the Region which this level may represent. Forecasts of increases in the number of households have important implications for land use and transportation planning because the number of households is more directly correlated with the demand for land and transportation than is population. The number of households in the Region is forecast to increase from about 536,500 in 1970 to about 747,700 in the year 2000, an increase of about 39 percent. Implicit in the forecast are the assumptions that the same proportion of the total population will reside in households in 2000 as did in 1970, and that average household size will continue to decline from its 1970 level. The forecast of a continuing decrease in average household size in the Region reflects the fact that forecasts of total population for the Region assume that birthrates to the year 2000 will remain substantially below the pre-1970 rates.

Regional Automobile Availability Projection: Another important characteristic of the forecast population level of the Region is the future availability of automobiles to that population. The level of automobile availability will affect future tripmaking and public transit use in the Region. The projected number of automobiles available within the Region, as a whole and by county, is shown in Table 180. The number of automobiles available in the Region is expected to reach 1,168,000 by the year 2000, an increase of approximately 534,100 automobiles, or 84 percent, over the 1970 level. The corresponding ratio of persons per available automobile is projected to decline in the Region from 2.77 in 1970 to 1.90 by the year 2000. Automobile availability in Milwaukee and Ozaukee Counties is predicted to increase by approximately 162,200 and 43,100, respectively, representing increases of about 44 and 205 percent. The average number of persons per available automobile is expected to decrease from 2.87 to 1.98 in Milwaukee County and from 2.59 to 1.78 in Ozaukee County by the year 2000.

The projection of the number of automobiles available to residents of the Region as a whole, and to each county within the Region, was derived from regional and county population forecasts by dividing the future population levels by projected changes in the ratio of persons per available automobile. The projection of the ratio of population to available automobiles was based upon observed trends, recognizing the existence of a saturation level of auto ownership in the population, and projected or forecast changes to the year 2000 in factors which have affected automobile ownership

Table 180

AUTOMOBILE AVAILABILITY AND NUMBER OF PERSONS PER AUTOMOBILE IN THE REGION BY COUNTY: SELECTED YEARS 1950-2000

Year	Kenosha Autos Available	Kenosha Persons Per Auto	Milwaukee Autos Available	Milwaukee Persons Per Auto	Ozaukee Autos Available	Ozaukee Persons Per Auto	Racine Autos Available	Racine Persons Per Auto
1950	18,400	4.11	197,600	4.41	6,500	3.60	26,900	4.07
1955	24,500	3.53	244,400	3.96	8,900	3.24	34,700	3.61
1960	32,500	3.10	288,800	3.58	12,600	3.05	43,200	3.28
1965	38,100	2.94	328,100	3.36	15,900	2.89	53,300	2.93
1970	43,900	2.69	367,700	2.87	21,000	2.59	62,400	2.74
1975	53,600	2.38	420,600	2.45	29,100	2.24	76,100	2.33
1980	65,600	2.12	448,200	2.26	37,000	2.06	86,300	2.15
1985	73,700	2.03	468,800	2.16	44,100	1.97	95,400	2.05
1990	81,900	1.95	493,600	2.07	52,000	1.87	104,200	1.95
1995	88,300	1.90	513,200	2.03	57,900	1.83	110,600	1.91
2000	94,300	1.85	529,900	1.98	64,100	1.78	116,800	1.86

Year	Walworth Autos Available	Walworth Persons Per Auto	Washington Autos Available	Washington Persons Per Auto	Waukesha Autos Available	Waukesha Persons Per Auto	Region Autos Available	Region Persons Per Auto
1950	12,100	3.44	9,400	3.61	22,700	3.78	293,600	4.23
1955	15,100	3.06	11,600	3.19	33,500	3.19	372,700	3.76
1960	18,000	2.91	14,300	3.22	51,800	3.06	461,200	3.41
1965	21,100	2.70	18,300	2.84	71,100	2.70	545,900	3.15
1970	24,700	2.57	23,500	2.71	90,800	2.55	634,000	2.77
1975	29,600	2.33	32,500	2.38	117,900	2.22	759,400	2.38
1980	34,100	2.19	41,700	2.18	138,600	2.11	851,500	2.20
1985	38,700	2.08	50,600	2.05	160,200	2.01	931,500	2.10
1990	44,100	1.96	61,100	1.93	185,300	1.92	1,022,000	2.00
1995	48,700	1.92	68,700	1.89	209,800	1.86	1,097,400	1.95
2000	52,700	1.89	77,500	1.85	232,800	1.81	1,168,100	1.90

Source: Wisconsin Department of Transportation and SEWRPC.

in the past, including personal income, family size, land development patterns, public transit availability, and, importantly, motor fuel cost and availability. It is important to point out that these projections of automobile availability were not used as inputs to the preparation of the land use and transportation plans under the plan reevaluation. In fact, recommendations were made in alternative land use and transportation plans to change the projected levels of automobile availability, particularly with respect to recommended changes in urban land use density and in public transit service availability.

The estimated number of automobiles available in the Region in 1978 can be compared with the automobile availability projected in 1972. A total of 815,000 automobiles were projected to be available in the Region in 1978. The actual automobile availability level of 758,900 was 7 percent lower than the projected level for 1978. Despite this difference for projected levels of regional automobile availability, the planned level of automobile availability for the Region under the adopted long-range land use and transportation plans was 755,000 automobiles in 1978, about 0.5 percent lower than the estimated level for 1978 of 758,900

Table 181

REGIONAL EMPLOYMENT FORECAST BY COUNTY: 1970-2000

County	Employment					
	Estimated 1970	Revised Forecast			Change: 1970-2000	
		1980	1990	2000	Number	Percent
Kenosha	39,200	44,200	49,300	54,300	15,100	38.5
Milwaukee . . .	510,900	538,400	566,000	593,600	82,700	16.2
Ozaukee	17,900	24,600	31,300	38,000	20,100	112.3
Racine	61,900	73,100	84,300	95,500	33,600	54.3
Walworth. . . .	24,200	29,900	35,500	41,200	17,000	70.2
Washington . .	20,300	25,500	30,800	36,000	15,700	77.3
Waukesha . . .	67,200	97,300	127,300	157,400	90,200	134.2
Region	741,600	833,000	924,500	1,016,000	274,400	37.0

Source: SEWRPC.

automobiles. The projected number of persons per automobile for 1978, 2.31, was only 0.8 percent lower than the estimated actual level in 1978 of 2.33 persons per available automobile. The planned number of persons per automobile in 1978, 2.51, was higher.

Regional Employment Forecast

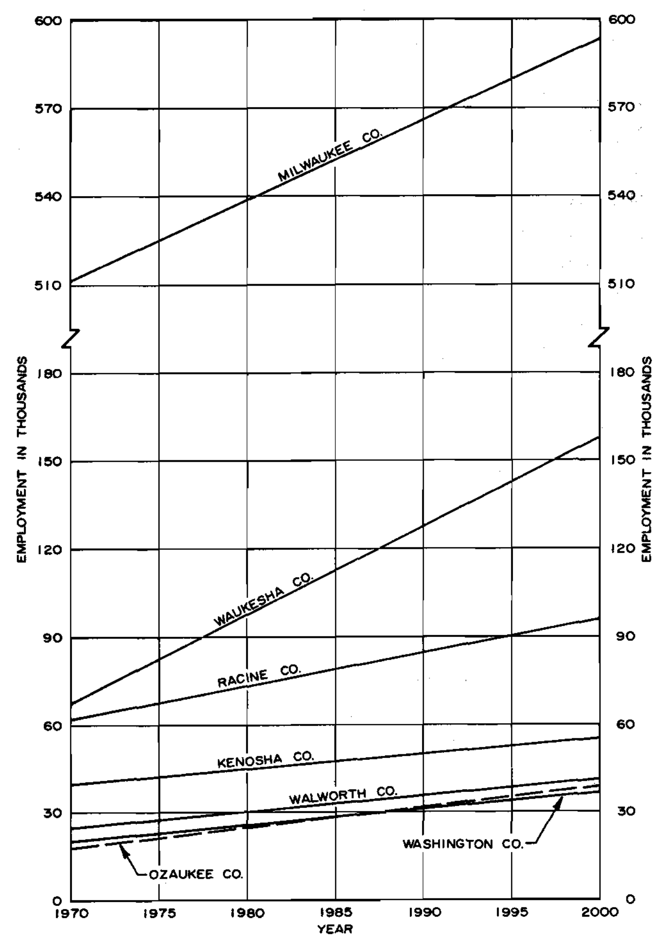
Employment in the Region was projected to range from 994,500 to 1,101,400 jobs in the year 2000 under the land use and transportation plan reevaluation effort. From this range, a forecast regional employment level of 1,016,000 jobs was selected. This forecast employment total was allocated to the seven counties of the Region based upon an analysis of past trends in each county over the period 1950 through 1974.

Under this forecast, the employment level in the Region for the year 2000 could be expected to increase by 274,400 jobs, or about 37 percent, over the 1970 level of 741,600 jobs. The forecast distribution of jobs by county is shown in Table 181 and Figure 91. Under this forecast distribution, it is envisioned that the number of jobs in all seven counties will increase, with the largest increases occurring in Milwaukee and Waukesha Counties. Milwaukee County's proportion of total regional employment, however, is forecast to continue to decline, reflecting some continued decentralization of jobs in the Region.

Employment forecasts by major industry group to the year 2000 are shown in Table 182 and Figure 92. Between 1970 and 2000 employment in the trade, governmental and educational services, and private service groups is expected to show greater percentage growth increases than the total regional employment increase of 37 percent. Employment in manufacturing is forecast to increase at a rate approximately 10 percent below the overall rate of employment increase, but to remain the singularly largest employment group with 320,300 jobs by the year 2000. Employment in private services is forecast to constitute the second largest employment group, with 276,800 jobs in the design year. Only one industry group, agriculture, is expected to decline in employment from 1970 to 2000. As shown in Table 182, agricultural employment in the Region is expected to decline by 3,100 jobs, or 29 percent—from 10,600 jobs in 1970 to 7,500 jobs in the year 2000. This expected decline in agricultural employment in the Region is a continuation of a long-established trend, and is due, in part, to the mechanization of

Figure 91

FORECAST EMPLOYMENT LEVELS IN THE REGION BY COUNTY: 1970-2000



Source: SEWRPC.

Table 182

FORECAST EMPLOYMENT LEVELS IN THE REGION BY MAJOR INDUSTRY GROUP: 1970, 1980, 1990, AND 2000

Major Industry Group	Employment (in Thousands)				Change 1970-2000	
	1970	1980	1990	2000	Number	Percent
Agriculture	10.6	9.5	8.3	7.5	-3.1	-29.2
Construction	24.0	26.0	28.0	30.1	6.1	25.4
Manufacturing	251.0	274.1	297.2	320.3	69.3	27.6
Trade	143.2	164.3	185.4	206.4	63.2	44.1
Transportation, Communication, and Utility	36.0	38.5	41.2	43.7	7.7	21.4
Private Services	198.1	224.4	250.7	276.8	78.7	39.7
Government and Education Services	78.7	96.2	113.7	131.2	52.5	66.7
Total	741.6	833.0	924.5	1,016.0	274.4	37.0

Source: SEWRPC.

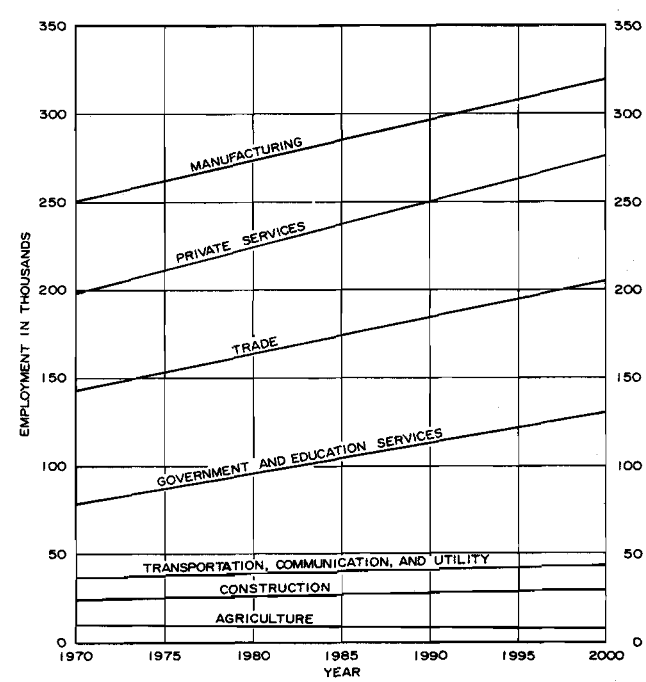
farming processes, but more importantly to the loss of farmland in the Region through the conversion of land from agricultural to urban use.

Forecast employment and estimated employment for the Region as a whole and by county are compared in Table 183 for the year 1978. Based upon the regional employment forecast of 1,016,000 jobs in the year 2000, the employment level of the Region was anticipated to total 814,700 jobs by 1978. As noted in Table 183, the estimated number of jobs in the Region in 1978 was 851,800, or about 37,100 jobs, or 4.6 percent, higher than forecast. Most of the difference between the forecast and estimate occurred in Milwaukee County, where the estimate of employment was more than 29,000 jobs, or 5 percent, greater than the forecast level of employment.

The increase of approximately 15 percent in the number of jobs in the Region from 1972 to 1978, coupled with a total regional population increase of less than 1 percent for the same period, presents an apparent paradox. Relatively healthy and growing national, state, and local economies are continuing to create new jobs. In the Region these newly created jobs are not resulting in net in-migration, as would have occurred in the past, but are being absorbed by the existing regional population base. Three factors in particular appear to be making this absorption possible: rapidly increasing labor force participation rates for women; the changing age structure of the resident population of the Region, with greater proportions of work force age; and, perhaps, an increasing tendency for one person to hold more than one job.

Figure 92

FORECAST EMPLOYMENT LEVELS IN THE REGION BY MAJOR INDUSTRY GROUP: 1970-2000



Source: SEWRPC.

Table 183

COMPARISON OF FORECAST AND ESTIMATED REGIONAL EMPLOYMENT: 1978

County	1977 Employment		Difference: Estimate Minus Forecast	
	Forecast	Estimated	Number	Percent
Kenosha	43,200	44,500	1,300	2.9
Milwaukee . . .	532,800	562,200	29,400	5.2
Ozaukee	23,300	23,800	500	2.1
Racine	70,900	74,800	3,900	5.2
Walworth. . . .	28,800	28,900	100	0.3
Washington . .	24,400	24,700	300	1.2
Waukesha . . .	91,300	92,900	1,600	1.7
Total	814,700	851,800	37,100	4.4

Source: Wisconsin Department of Industry, Labor and Human Relations, and SEWRPC.

Table 184 compares the forecast and estimated regional employment by major industry group for the year 1978. Estimated 1978 employment levels were found to be greater than forecast levels in the construction, trade, private service, and governmental and educational service industry groups, and lower than anticipated in the agriculture, manufacturing, transportation, and communication and utility industry groups. The most substantial difference between estimated and forecast levels of employment was in the private services group, where an increase of only about 10 percent was anticipated from 1970 to 1978, from 198,100 jobs to 218,500 jobs, and an estimated actual increase of 31 percent, to 260,200 jobs, occurred.

Regional Land Use Demand Projection

Projections of land use demand in the Region were prepared for use in the plan reevaluation using trends determined through analysis of the land use inventory data collected under the initial land use plan preparation effort in 1963, and the plan reevaluation effort in 1970. As shown in Table 185, the projection indicates that if existing trends in land use development continue within the Region, nearly 319 square miles of land will be converted from rural to urban use during the 30-year period from 1970 to the year 2000. This conversion of rural land to urban use would represent an increase of about 62 percent in the amount of land in urban use within the Region since 1970. The projection further indicates that the bulk of the land converted to urban use would be agricultural land, with approximately 293 square miles of agricultural land being converted during the 30-year period. Major changes in the regional land use pattern can be expected to result from this projected conversion of land from rural to urban use. For example, in 1970 urban land uses accounted for approximately 19 percent of the total area of the Region. Based upon the projections, nearly 31 percent of the Region would be devoted to urban use by the year 2000. Similarly, rural land uses, which accounted for nearly 81 percent of the land area of the Region in 1970, would account for approximately 69 percent in the year 2000.

Table 184

COMPARISON OF FORECAST AND ESTIMATED EMPLOYMENT BY INDUSTRY GROUP: 1978

Major Industry Group	1978 Employment (in thousands)		Difference: Estimate Minus Forecast	
	Forecast	Estimate	Number (in thousands)	Percent
Agriculture.	9.7	9.5	-0.2	-2.1
Construction.	25.6	28.6	3.0	11.7
Manufacturing.	269.5	257.8	-11.7	-4.3
Trade	160.1	163.8	3.7	2.3
Transportation, Communication, and Utilities	38.3	37.3	-1.0	-2.6
Private Services	218.5	260.2	41.7	19.8
Governmental and Educational Services	93.0	94.6	1.6	1.7
Total	814.7	851.8	37.1	4.6

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

Table 185

PROJECTED LAND USE DEMAND IN THE REGION: 1970-2000

Land Use Category	Existing Land Use[a]					1963-1970 Change			Average Annual Change 1963-1970			1970-2000 Projected Change[b]			Total Projected Land Use 2000		
	1963		1970														
	Acres	Square Miles	Acres	Square Miles	Percent of Region	Acres	Square Miles	Percent	Acres	Square Miles	Percent	Acres	Square Miles	Percent	Acres	Square Miles	Percent of Region
Residential.	129,219	201.91	156,266	244.17	9.1	27,047	42.26	20.9	3,863	6.04	3.00	115,890	181.09	74.2	272,156	425.24	15.8
High Density.	*21,471*	*33.55*	*25,401*	*39.69*	*1.5*	*3,930*	*6.14*	*18.3*	*561*	*0.88*	*2.61*	*16,830*	*26.30*	*66.3*	*42,231*	*65.99*	*2.5*
Medium Density . .	*31,596*	*49.37*	*43,230*	*67.55*	*2.5*	*11,634*	*18.18*	*36.8*	*1,662*	*2.60*	*5.26*	*49,860*	*77.91*	*115.3*	*93,090*	*145.45*	*5.4*
Suburban and Low Density.	*76,152*	*118.99*	*87,635*	*136.93*	*5.1*	*11,483*	*17.94*	*15.1*	*1,640*	*2.56*	*2.16*	*49,200*	*76.88*	*56.1*	*136,835*	*213.80*	*7.9*
Retail Sales and Service[c]	6,759	10.56	9,464	14.79	0.6	2,705	4.23	40.0	387	0.61	5.71	11,610	18.14	128.0	21,074	32.93	1.2
Industrial[c]	9,668	15.11	11,383	17.79	0.7	1,715	2.68	17.7	245	0.38	2.53	7,350	11.48	64.5	18,733	29.27	1.1
Transportation, Communication, and Utilities[c]	96,121	150.19	103,350	161.48	6.0	7,229	11.29	7.5	1,033	1.61	1.07	30,990	48.42	30.0	134,340	209.91	7.8
Governmental and Institutional[c]	14,910	23.30	17,878	27.93	1.0	2,968	4.63	19.9	424	0.66	2.84	12,720	19.87	71.1	30,598	47.81	1.8
Recreational[d]	23,548	36.79	29,502	46.10	1.7	5,954	9.31	25.3	851	1.33	3.61	25,530	39.89	86.5	55,032	85.99	3.2
Total Urban	280,225	437.86	327,843	512.26	19.1	47,618	74.40	17.0	6,803	10.63	2.43	204,090	318.89	62.3	531,933	831.15	30.9
Agricultural	1,083,800	1,693.44	1,040,121	1,625.19	60.4	-43,679	-68.25	-4.0	-6,240	-9.75	-0.57	-187,200	-292.50	-18.0	852,921	1,332.69	49.6
Other Open Lands[f]	357,075[e]	557.93[e]	353,136	551.78	20.5	-3,939	-6.15	-1.1	-563	-3.00	-0.16	-16,890	-26.39	-4.8	336,246	525.39	19.5
Total Rural	1,440,875[e]	2,251.37[e]	1,393,257	2,176.97	8.09	-47,618	-74.40	-3.3	-6,803	-10.63	-0.47	-204,090	-318.89	-14.6	1,189,167	1,858.08	69.1
Region Total	1,721,030[e]	2,689.23[e]	1,721,100	2,689.23	100.0	--	--	--	--	--	--	--	--	--	1,721,100	2,689.23	100.0

[a] *Based on SEWRPC regional land use inventories conducted in April 1963 and April 1970.*

[b] *Based on a 30-year projection of the 1963-1970 average annual change.*

[c] *Includes related off street parking.*

[d] *Includes only "active" recreation areas within parks or parkways and related off street parking. All other uses within parks or parkways are tabulated in the appropriate land use category.*

[e] *Includes 85 acres added to make the 1963 and 1970 data directly comparable.*

[f] *Includes water, wetlands, woodlands, unused lands, and quarries.*

Source: SEWRPC.

Along with trends in land use demand, urban population density trends were projected. Based on the forecast regional population for the year 2000 of 2.2 million, and the projected demand for land, it was projected that the overall density of the developed area of the Region would fall from 4,350 persons per square mile in 1970 to about 3,000 persons per square mile in the year 2000, a decrease in gross density of approximately 30 percent.

It is important to point out that these land use projections are neither plans nor forecasts, and were not used to guide the development of the year 2000 land use plan. On the contrary, recommendations were made in the year 2000 land use plan to change the projected land conversion in order to bring about a more efficient, healthful, and attractive regional development pattern.

THE REGIONAL LAND USE PLAN FOR THE YEAR 2000

One of the most critical tasks in the land use and transportation plan reevaluation was the selection from the alternatives available of the regional development pattern which offered the greatest potential for attaining agreed-upon areawide land use development objectives, while accommodating the forecast probable population and economic activity within the Region. Two alternative land use plans were prepared, compared, and evaluated under the plan reevaluation for the Southeastern Wisconsin Region for the year 2000: a controlled centralization plan and a controlled decentralization plan.[2] In the controlled centralization plan alternative the development concept was one of centralization, with virtually all new urban development occurring at medium urban densities, in planned neighborhood units, and in areas of the Region which could be readily served by such important urban facilities and services as centralized public sanitary sewer, public water supply, and public transit. In contrast, the controlled

[2] *Under the Commission's initial land use planning effort in 1963, four alternative land use plans were prepared and evaluated: a satellite city plan, an urban corridor plan, a controlled existing trend plan, and an uncontrolled existing trend plan.*

decentralization plan alternative emphasized lower development densities and more diffused residential development and the use of onsite soil absorption sewage disposal (septic tank) systems and private water supply wells. Based upon a careful evaluation of these two land use plan alternatives against the adopted regional land use development objectives and standards, the recommendations of the advisory committees concerned, and an intensive public review culminating in a series of public informational meetings and public hearings concerning the land use plan alternatives held throughout the Region, the Commission selected and adopted the controlled centralization plan alternative as the recommended new land use plan for southeastern Wisconsin. This plan is shown on Map 179 and summarized in Table 186.

The recommended land use plan for the year 2000, as shown on Map 179, advocates a return to historic development trends within the Region that were most evident prior to the late 1950's, with urban development proposed to occur largely in concentric rings along the full periphery of, and outward from, existing urban centers. While the plan places heavy emphasis on the continued effect of the urban land market in determining the location, intensity, and character of future urban development, the plan proposes to regulate to a greater degree than in the past the effect of this market on development in order to ensure that new urban development occurs at densities consistent with the provision of urban facilities and services, and in locations where such facilities and services can be readily and economically extended or obtained, particularly including the older central cities. In so doing, the plan seeks to provide a more orderly and economic development pattern and an abatement of areawide development and environmental problems within the Region, thereby channeling the results of market forces into better conformance with the established regional development objectives.

In summary, the adopted plan seeks to centralize land use development to the greatest degree practicable, and to encourage new urban development to occur at densities consistent with the provision of urban facilities and services, and in areas covered by soils well-suited to urban use and not subject to special hazards such as flooding. The plan seeks to preserve prime agricultural lands in agricultural use, and to protect environmentally significant areas from intrusion of incompatible uses.

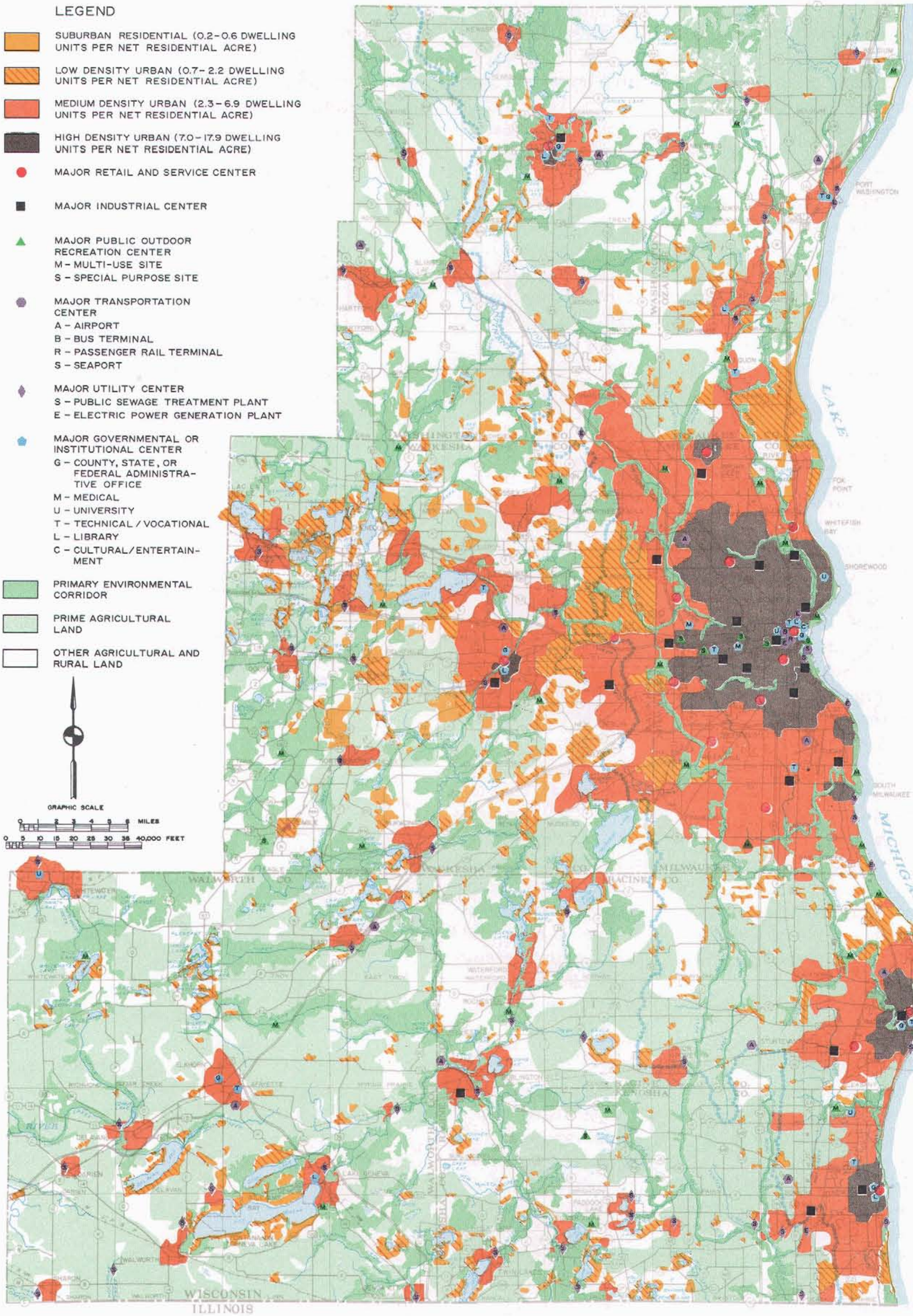
Future Regional Urban and Residential Development

The year 2000 land use plan proposes to accommodate forecast increases in growth in regional population, about 460,000 people, and employment, about 267,000 jobs, through the conversion of approximately 113 square miles of land from rural to urban use by the year 2000. The degree of centralization of the plan is indicated by the fact that over 60 percent of the incremental population would be located within 20 miles of the Milwaukee central business district. To meet the additional housing needs associated with the forecast increase in the regional population by the plan design year, the plan proposes adding about 60,900 acres to the existing stock of residential land within the Region. As indicated in Table 186, about 38,600 acres, or 63 percent of this new residential land, would be considered to be urban in nature—that is, of medium, low, or suburban density—and about 22,300 acres would be considered to be rural in nature, or of very low density with lot sizes exceeding five acres. As a consequence, the plan envisions that most of the additional housing required in the Region by the year 2000 will be developed in urban residential areas, and, as shown in Table 186, predominantly at medium densities—with a typical single-family lot size of about 10,000 square feet, and a typical multiple-family-development density of about 10 dwelling units per net acre. While rural residential development accounts for a substantial proportion of the total proposed increase in residential land, 37 percent, such development would accommodate only a small proportion, approximately 10 percent, of the incremental future population because of the large lot size recommended for such development.

In total, the recommended land use plan would accommodate an increase of approximately 26 percent in the regional population, with an approximately 22 percent increase in urban land area. As indicated in Table 187, the population density within the developed area of the Region under the recommended land use plan would continue to decline over the planning period—from the 1970 level of about 4,350 persons per square mile to a year 2000 level of about 3,500 persons per square mile—thus continuing the trend toward declining densities evident in the Region since 1920. The rate of decline would, however, be sharply reduced by implementation of the plan proposals to develop the majority of new residential land use within the Region at medium, instead of low, densities.

Map 179

ADOPTED REGIONAL LAND USE PLAN FOR SOUTHEASTERN WISCONSIN: 2000



The adopted regional land use plan envisions the conversion of about 113 square miles of land from rural to urban use over the period 1970 to 2000 to accommodate the 463,000-person increase in the regional population expected over this time period. The degree of centralization of the adopted plan is indicated by the fact that over 60 percent of all new urban residential land and about 49 percent of the incremental resident population would be located within 20 miles of the central business district of the City of Milwaukee. Even with this emphasis on centralization of land use development, the average population density of the developed urban area of the Region would decline from about 4,350 persons per square mile in 1970 to about 3,500 persons per square mile in the year 2000.

Source: SEWRPC.

Table 186

EXISTING AND PROPOSED LAND USE IN THE REGION: 1970 AND 2000 REGIONAL LAND USE PLAN

Land Use Category	Existing 1970 Acres	Existing 1970 Percent of Major Category	Planned Increment Acres	Planned Increment Percent Change	Total 2000 Acres	Total 2000 Percent of Major Category
Urban Land Use						
Residential						
Urban High Density	24,389	7.4	371	1.5	24,760	6.2
Urban Medium Density	37,092	11.3	41,046	110.7	78,138	19.5
Urban Low Density	72,701	22.2	- 7,689	- 10.6	65,012	16.2
Suburban Density	22,079	6.7	4,862	22.0	26,941	6.7
Subtotal	156,261	47.6	38,590	24.7	194,851	48.6
Commercial	6,517	2.0	698	10.7	7,215	1.8
Industrial	10,038	3.1	6,672	66.5	16,710	4.2
Governmental and Institutional	16,628	5.1	951	5.7	17,579	4.4
Transportation, Communication, and Utilities[a]	109,430	33.4	21,441	19.6	130,871	32.7
Recreation	28,982[b]	8.8	4,166[c]	14.4	33,148	8.3
Urban Land Use Subtotal	327,856	100.0	72,518	22.1	400,374	100.0
Rural Land Use						
Residential	--[d]	--	22,306	--	22,306	1.7
Agriculture	1,040,119	74.7	- 79,779	- 7.7	960,340	72.7
Other Open Lands[e]	353,125	25.3	- 15,045	- 4.3	338,080	25.6
Rural Land Use Subtotal	1,393,244	100.0	- 72,518	- 5.2	1,320,726	100.0
Total	1,721,100	--	--	--	1,721,100	--

[a] *Includes off-street parking uses.*

[b] *Includes net site area of public and nonpublic recreation sites.*

[c] *Includes only that net site area recommended for public recreation use.*

[d] *Includes in land use inventory as part of urban residential land use.*

[e] *Includes woodlands, water, wetlands, unused lands, and quarries.*

Source: SEWRPC.

Future Regional Commercial Development

As shown in Table 186, the land use plan proposes the development of approximately 700 acres of new commercial land within the Region over the plan design period, increasing the total stock of commercial land in the Region to about 7,200 acres by the year 2000. This increase would meet the area requirements of the increases anticipated in retail and service employment and the demands of a growing population within the Region, and would be distributed so as to make the operation of business and the provision of goods and services to the people of the Region both efficient and convenient. This increase is proposed to be accomplished through the development of planned, integrated commercial centers properly located with respect to the existing and proposed transportation system and residential areas; through the discouragement of strip commercial development along major streets and highways; through the encouragement of the provision of adequate off-street parking and loading facilities; and through the efficient provision of adequate utility services. As shown on Map 180, there were 12 major retail and service centers in the Region in 1970. The regional plan for 2000 envisions retaining 11 of these existing major centers and adding five new major centers. Additional land for community and

Table 187

POPULATION DENSITY IN THE REGION: SELECTED YEARS 1850-1970 AND 2000 RECOMMENDED LAND USE PLAN

Year	Population					Area (square miles)		Persons Per Square Mile	
	Urban		Rural						
	Number	Percent of Total	Number	Percent of Total	Total	Urban	Total	Urban	Total
1850	28,623	25.2	84,766	74.8	113,389	4	2,689	7,156	42.2
1880	139,509	50.3	137,610	49.7	277,119	18	2,689	7,751	103.1
1900	354,082	70.6	147,726	29.4	501,808	37	2,689	9,570	186.6
1920	635,376	81.1	148,305	18.9	783,681	56	2,689	11,346	291.4
1940	991,535	92.9	76,164	7.1	1,067,699	90	2,689	11,017	397.1
1950	1,179,084	95.0	61,534	5.0	1,240,618	138	2,689	8,544	461.4
1963	1,634,200	97.6	40,100	2.4	1,674,300	340	2,689	4,807	622.6
1970	1,728,949	98.5	27,137	1.5	1,756,086	397	2,689	4,355	653.1
2000	2,201,100	99.2	18,200	0.8	2,219,300	635	2,689	3,466	825.3

Source: SEWRPC.

neighborhood commercial development is also provided in the plan auxiliary to the proposed residential uses.

Future Regional Industrial Development

As indicated in Table 186, the land use plan proposes to add about 6,600 acres of industrial land in the Region by the year 2000, increasing the total stock of such land in the Region to more than 16,700 acres by the plan design year. This increase would meet the land requirements of the increases anticipated in manufacturing and wholesaling employment within the Region, and would be distributed so as to protect and enhance the efficient operation of these most important components of the economic base of the Region. This increase is proposed to be accomplished through the development of planned industrial centers properly located with respect to the existing and proposed transportation system; through the protection and enhancement of existing industrial areas; and through the efficient provision of adequate utility services. The plan provides adequate sites for industrial development which meet the full array of criteria for such development, including ready accessibility to high-speed, all-weather arterial highway facilities; soils which are suitable for industrial development; adequate power and water supply; sanitary sewer service and storm water drainage; reasonable access to airport and railway facilities; and ready access to labor supply.

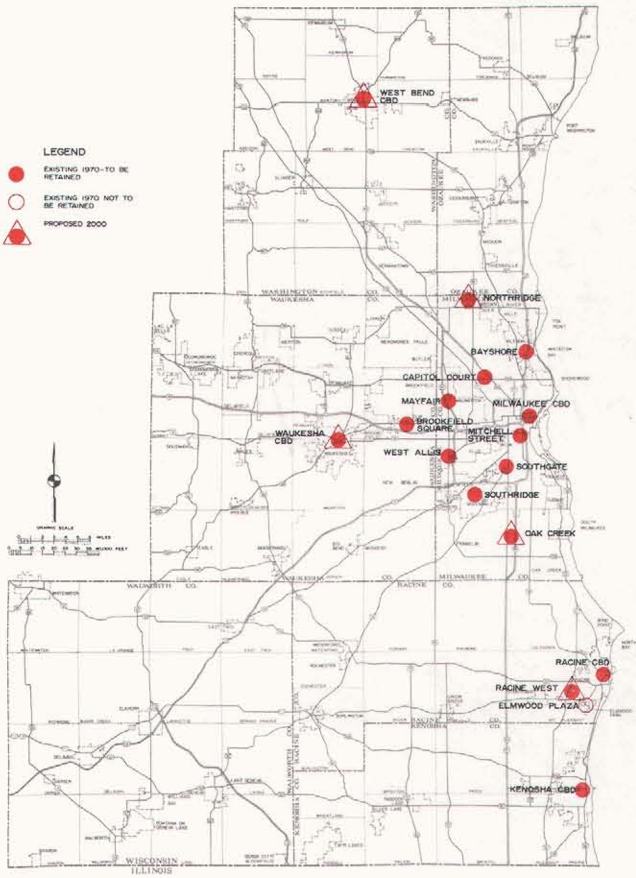
In 1970 there were 17 major industrial centers within the Region, providing employment for about 179,000 persons. The recommended land use plan proposes to retain these 17 areas as major industrial areas through the year 2000 and, furthermore, proposes the expansion of certain of these existing centers and the addition of five new major industrial centers (see Map 181). These 22 major industrial centers are planned to provide for the employment of more than 239,000 people in the year 2000. Additional land for community level industrial development is also provided in the plan auxiliary to the proposed residential uses.

Future Regional Governmental and Institutional Development

As indicated in Table 186, the regional land use plan proposes to add about 950 acres of new governmental and institutional land to the existing stock of such land within the Region by the year 2000, resulting in a total of about 17,600 acres of governmental and institutional land by the plan design year. Most of the additional governmental and institutional lands proposed under the recommended plan would be of neighborhood and community, rather than of regional, significance. Specifically, of the planned increment of 951 acres of governmental and institutional land, 897 acres, or 94 percent, would be developed for such neighborhood and community uses as new schools, hospitals, and churches; for public facilities includ-

Map 180

MAJOR RETAIL AND SERVICE CENTERS IN THE REGION: 2000

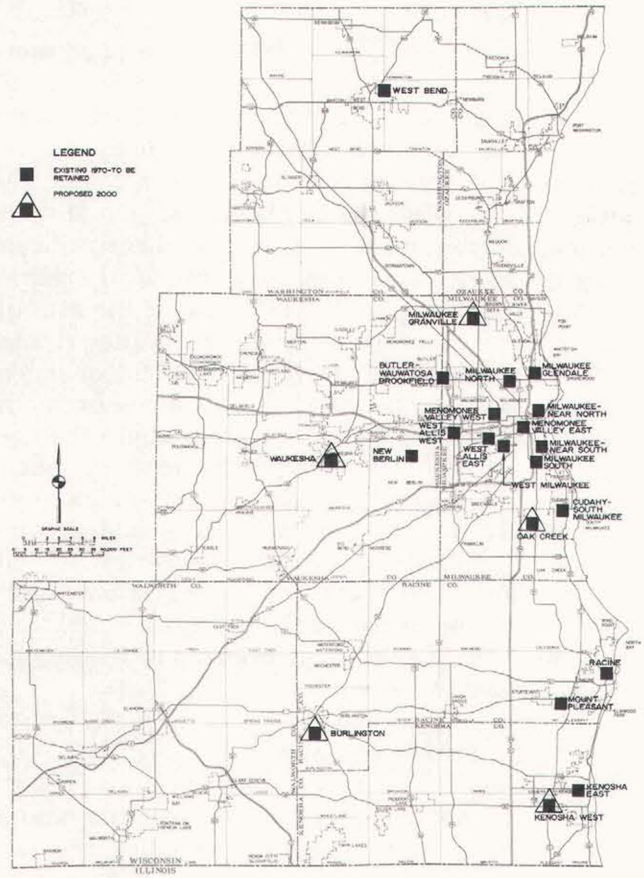


The adopted land use plan envisions that 16 major retail and service centers will be provided to serve the needs of the resident population of the Region through the year 2000. Twelve of these centers existed in 1970, 11 of which are to be retained. (One of the 12 centers—Elmwood Plaza located in Racine—is proposed to become a community level center.) Five of the 16 proposed centers are new. The proposed new centers have a minimum gross site area of 70 acres each and are to be located in or near the Cities of Milwaukee, Oak Creek, Racine, Waukesha, and West Bend. The new Milwaukee center has been constructed since 1970 as the Northridge Shopping Center.

Source: SEWRPC.

Map 181

MAJOR INDUSTRIAL CENTERS IN THE REGION: 2000



The adopted land use plan envisions that 22 major industrial centers will be provided within the Region by the year 2000. Seventeen of these centers existed in 1970 and are to be retained and enlarged, and five are proposed new centers. The five proposed new centers, each having a minimum gross site area of 320 acres, are Kenosha-West, Milwaukee-Granville, Oak Creek, Burlington, and Waukesha.

Source: SEWRPC.

ing police and fire stations; and for city, village, and town halls.

Future Regional Transportation, Communication, and Utility Development

As indicated in Table 186, the regional land use plan proposes to add approximately 21,400 acres of new transportation, communication, and utility land to the existing stock of such land within the Region. A total of about 130,900 acres of land in the Region would be devoted to transportation, communication, and utility uses by the year 2000, an increase of about 20 percent over the 1970 level. These proposed increases would be required under the land use plan to accommodate the expansion of existing airport facilities; the construction of new and the expansion of existing sewage treatment plants; and the improvement of existing and the provision of new arterial streets, and the provision of new collector and local land access streets needed to serve new land use development or to provide adequate transportation service to existing urban development.

Future Regional Open Space—Recreational Land Use

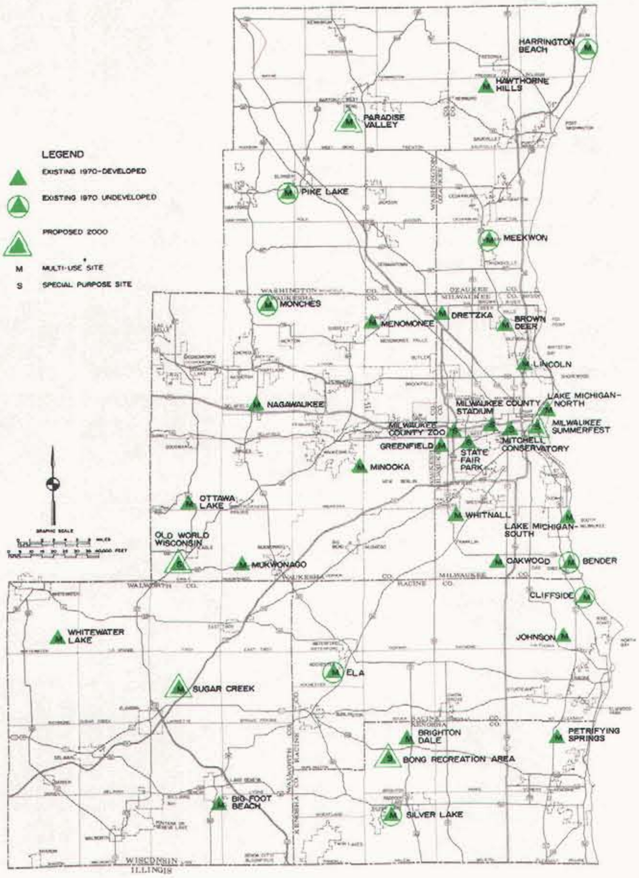
Under the adopted year 2000 land use plan, more than 4,100 acres of land would be added to the existing stock of net recreational land use in the Region (see Table 186). This represents an increase of about 14 percent over the 1970 acreage. The rather small planned increment in major park acreage in the Region is due to the significant progress made since the adoption of the initial regional land use plan in 1966 toward the acquisition of the 12 proposed major park sites recommended in that plan. Only two new major public parks, having a site area of 250 acres or more, would be added by the year 2000 under the new land use plan, which, along with the development of certain existing publicly owned undeveloped or partially developed park sites, would provide a total of 29 major parks in southeastern Wisconsin by the plan design year (see Map 182). Community and neighborhood park and open space land area is also provided under the plan auxiliary to the proposed residential uses.

Future Regional Open Space—Environmental Corridors

The most important elements of the natural resource base of the Region, including the best remaining woodlands; wetlands; wildlife habitat areas; surface waters and associated shorelands and floodlands; areas covered by organic soils; areas containing rough topography and significant geological formations; scenic, historic, and scientific sites; groundwater recharge and discharge areas; existing park sites; and the best remaining potential park and related open space sites, have been found by Commission inventories to occur largely together in linear patterns in the natural landscape (see Map 179). These linear patterns have been termed primary environmental corridors. The year 2000 regional land use plan proposes that these corridors be protected and preserved in essentially natural, open space use. Such protection and preservation is considered essential to the maintenance of a wholesome environment in the Region and to the preservation of the Region's cultural heritage and natural beauty, as well as to the prevention of new, and the intensification of existing, environmental problems such as flooding and water pollution. The topography, soils, and flood hazards existing in these corridors, moreover, make them poorly suited to intensive urban development of any kind, but well suited to recreational and conservancy uses.

Map 182

MAJOR PUBLIC OUTDOOR RECREATION CENTERS IN THE REGION: 2000



Under the adopted land use plan, a total of 29 major outdoor recreation sites are proposed to serve the needs of the Region by the year 2000. Of these 29 sites, 19 were in public ownership and use in 1970 and are to be retained. Eight sites, including Silver Lake, Bender, Mee-Kwon, Harrington Beach, Cliffside, Ela, Monches, and Pike Lake, were in public ownership in 1970, but had not been fully developed. Two sites—Sugar Creek and Paradise Valley—are not yet in public ownership.

Source: SEWRPC.

Together, these primary environmental corridors encompass about 542 square miles, or about 20 percent of the area of the Region. Of this total, about 437 square miles, or 16 percent of the area of the Region, are considered "net" corridor—that is, not in an urban land use or covered by surface water. The adopted regional park and open space plan includes definitive recommendations for the protection and preservation of these lands, including identification of which corridor lands should be preserved through public acquisition and which should be preserved in private ownership through application of appropriate land use regulations. About 72 square miles, or 16 percent of the net corridor area, are already in public ownership. The park and open space plan calls for public acquisition of an additional 113 square miles of net corridor, or an additional 26 percent of the total corridor area. The remaining 252 square miles of net corridor land are recommended to be protected through appropriate local land use controls.

Future Regional Open Space—Agricultural and Other Open Land Use

There were approximately 1,393,000 acres, or 2,177 square miles, of open land within the Region in 1970, including 1,040,000 acres of agricultural land and 353,000 acres of other open lands (see Table 186). As proposed in the adopted regional land use plan, the expansion of urban activities into presently rural areas would result in the conversion of about 72,500 acres, or about 113 square miles, of rural land to urban land uses between 1970 and 2000. In addition, up to 22,300 additional acres, or 35 square miles, of rural land could be developed for rural or "country estate" residential use. Because of the very low density recommended for such use—at least five acres per lot—such rural estate development would maintain the basic natural state of the open land.

As indicated in Table 186, much of the urban expansion and country estate residential development proposed under the recommended land use plan—79,800 acres—would take place on lands now in agricultural use, with such expansion and development resulting in a decrease of about 8 percent in the existing stock of agricultural land within the Region. The year 2000 regional land use plan proposes to preserve to the greatest extent practicable those areas identified as prime agricultural lands in agricultural use. In 1970 these lands totaled about 746 square miles, or 28 percent of the total area of the Region. The year 2000 plan proposes to convert to urban use only those prime agricultural lands which have already been committed to urban development owing to proximity to existing and expanding concentrations of urban uses and the prior commitment of heavy capital investments in utility extensions. Only about 8,000 acres, or about 2 percent, of the prime agricultural lands in the Region would be converted to urban use under the plan.

In addition to agricultural lands, there were 353,100 acres of other open land uses in the Region in 1970, including woodlands, water, wetlands, quarries, and unused land. As indicated in Table 186, under the land use plan a total of 15,000 acres, or about 4 percent of the remaining acreage of these other open lands, would be converted to urban use or to rural estate residential use by the year 2000. Most of this acreage would consist of individual woodlots located directly in the path of urban growth, most of which are of insufficient size or quality to warrant permanent preservation. Careful subdivision design, however, can preserve the full aesthetic and some of the ecological value of these woodlands and can, at the same time, provide more desirable and valuable building sites.

ANTICIPATED AND PLANNED CHANGES IN THE NORTHWEST SIDE STUDY AREA

As already noted, future change in the northwest side study area as envisioned in the adopted regional land use plan is in part forecast and in part planned. This is because the aggregate forecast regional population and economic activity levels were normatively allocated within the Region according to a land use plan which had, as its objective, the centralization and recentralization of urban land use development in the Region at densities and in locations which could support the ready and economic extension of urban facilities and services. In the following paragraphs, future changes in the northwest side study area as anticipated and planned will be described. Probable future levels of population, households, and employment in the study area will be described first, followed by a description of proposed land use development in the area.

Future Population in the Study Area

The anticipated and planned levels of population in the design year 2000 for the northwest side study area and its Milwaukee and Ozaukee County portions are set forth in Table 188. The study area population in the year 2000 is anticipated to approximate 528,700 people, an increase of about 12,900 people, or about 2 percent, over the 1970 population level of 515,800 people. The Milwaukee County portion of the study area is anticipated to lose more than 34,200 people, or about 7 percent of its total 1970 population, by the year 2000. During this same period, the Ozaukee County portion of the study area is anticipated to increase in population by about 47,100 people, or about 132 percent over its 1970 level.

Table 188

POPULATION CHANGES IN THE NORTHWEST SIDE STUDY AREA, ITS COUNTY PORTIONS, AND THE REGION: 1970-2000

Area	1970 Census Count	Percent of Regional Population	Estimated 1975	Future		Percent of Regional Population	Change: 1970-2000	
				1985	2000		Number	Percent
Milwaukee County Portion	480,131	27.3	455,050	443,420	445,890	20.1	- 34,241	- 7.1
Ozaukee County Portion	35,649	2.0	44,130	60,790	82,760	3.7	47,111	132.2
Total Study Area	515,780	29.3	499,180	504,210	528,650	23.8	12,870	2.5
Region	1,756,086	100.0	1,788,320	1,954,100	2,219,300	100.0	463,214	26.4

Source: SEWRPC.

As a result of these planned and anticipated levels of population, the future distribution of population within the study area may be expected to be somewhat different from the distribution in 1970. The proportion of the total study area population in the Milwaukee County portion of the study area, notably, may be expected to decrease from approximately 93 percent to about 84 percent. Moreover, the proportion of the regional population in the Milwaukee County portion of the study area may be expected to decrease from 27 percent to 20 percent. The proportion of the total study area population within the Ozaukee County portion of the study area may be expected to increase from approximately 7 percent to about 16 percent. The proportion of the regional population in the Ozaukee County portion of the study area may be expected to increase from 2 percent to 4 percent.

The detailed distribution of the study area population for the years 1970 and 2000 is summarized in Table 189 and on Maps 183 and 184. Population losses are anticipated from 1970 to 2000 in all but the northern one-third of the Milwaukee County portion of the study area, with the most substantial losses anticipated in the southeastern corner of this portion of the study area. Increases in population are planned and anticipated for the remainder of the study area, with the most significant of these increases occurring in the northwestern corner of the City of Milwaukee and in areas in and around the City of Mequon and the Village of Grafton.

With regard to the timing of the population change in the study area from 1970 to the year 2000, the adopted land use plan calls for continued steady population growth in the Ozaukee County portion of the study area beginning in 1970. Within the Milwaukee County portion, population loss is anticipated to occur until about 1985, at which time a reversal, or population increase, is expected to occur to the year 2000 as a result of the halt in population decentralization, discouragement of urban sprawl, and protection of critical environmental corridor and prime agricultural lands as recommended in the regional land use plan, all serving to encourage population growth in and around the older central urban areas of the Region.

A comparison of the study area population under the year 2000 land use plan and the estimated population in the study area in 1975 is provided in Table 190 and Figure 93. The total resident population of the study area was expected to reach about 511,800 persons by 1975. The estimated study area population level of 499,200 in 1975 is about 2.5 percent below the expected level. Comparisons of the estimated and anticipated population levels are also shown in Table 190 and in Figure 93. Actual population levels in the Milwaukee County portion of the study area were found in 1975 to be lagging behind allocated population levels by about 3 percent, while in the Ozaukee County portion, such levels were found to be very near the anticipated levels, with the planned

Table 189

POPULATION DISTRIBUTION IN THE NORTHWEST SIDE STUDY AREA: 1970-2000

Subarea	1970 Population	Planned Future Population		Planned Change: 1970-2000	
		1985	2000	Number	Percent
Milwaukee County Portion					
1	37,861	32,810	30,850	- 7,011	- 18.5
2	31,476	29,930	27,880	- 3,596	- 11.4
3	7,911	4,320	3,960	- 3,951	- 49.9
4	20,338	17,830	18,500	- 1,838	- 9.0
5	48,140	42,920	40,630	- 7,510	- 15.6
6	56,714	54,910	51,280	- 5,434	- 9.6
7	30,854	27,550	25,080	- 5,774	- 18.7
8	45,931	38,150	33,560	- 12,371	- 26.9
9	23,290	18,350	16,250	- 7,040	- 30.2
10	27,894	21,220	18,800	- 9,094	- 32.6
11	46,452	44,740	44,590	- 1,862	- 4.0
12	53,636	47,770	50,120	- 3,516	- 6.6
13[a]	17,715	18,790	21,470	3,755	21.2
14	6,383	6,770	8,820	2,437	38.2
15	1,557	2,060	2,920	1,363	87.5
16	17,280	18,730	22,020	4,740	23.6
17[a]	6,699	16,570	29,160	22,461	335.3
Subtotal	480,131	443,420	445,890	- 34,241	- 7.1
Ozaukee County Portion					
18	1,065	1,460	3,490	2,425	227.7
19	5,439	6,170	9,600	4,161	76.5
20	5,805	15,240	20,280	14,475	249.4
21	1,900	2,270	3,020	1,120	58.9
22	7,871	10,900	13,860	5,989	76.1
23	1,636	2,420	2,520	884	54.0
24	8,152	14,760	19,610	11,458	140.6
25	1,347	2,190	2,680	1,333	99.0
26	1,423	3,070	4,050	2,627	184.6
27	1,011	2,310	3,650	2,639	261.0
Subtotal	35,649	60,790	82,760	47,111	132.2
Total Study Area	515,780	504,210	528,650	12,870	2.5

[a]*Population projections for the year 2000 for these two subareas of the study area by the City of Milwaukee Department of City Development indicate that growth in this area may be expected to be 15 percent greater than indicated by the figures in this table.*

Source: SEWRPC.

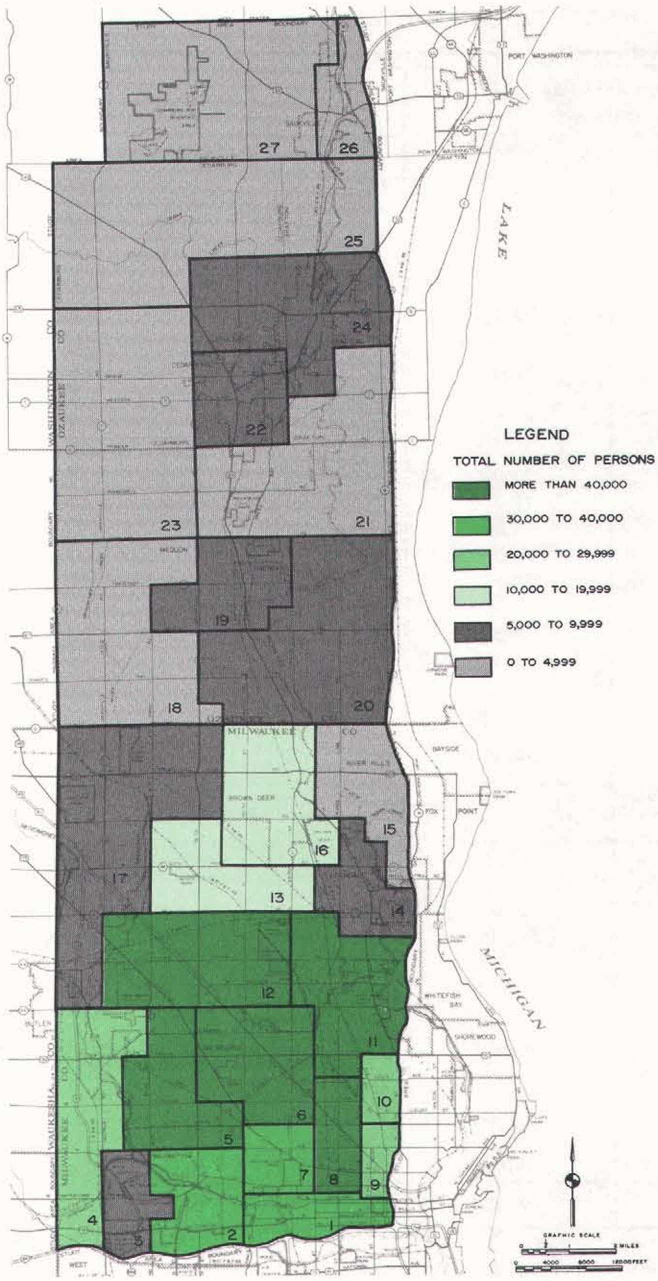
population being 43,800 and the actual level being 44,100.

Future Households in the Study Area

The total number of households in the study area is expected to increase from about 164,000 in 1970 to about 193,300 by the year 2000, an increase of about 18 percent (see Table 191). In the Milwaukee County portion of the study area, the number of households is expected to increase by 15,200, or about 10 percent, and in the Ozaukee County portion of the study area the number is expected to increase by about 14,100, or about 146 percent. This compares to a forecast increase in the number of households in the Region over the same period of from 536,500 to 747,700, or about a 39 percent increase. As in the Region as a whole, these anticipated increases in the number

Map 183

DISTRIBUTION OF POPULATION IN THE STUDY AREA: 1970

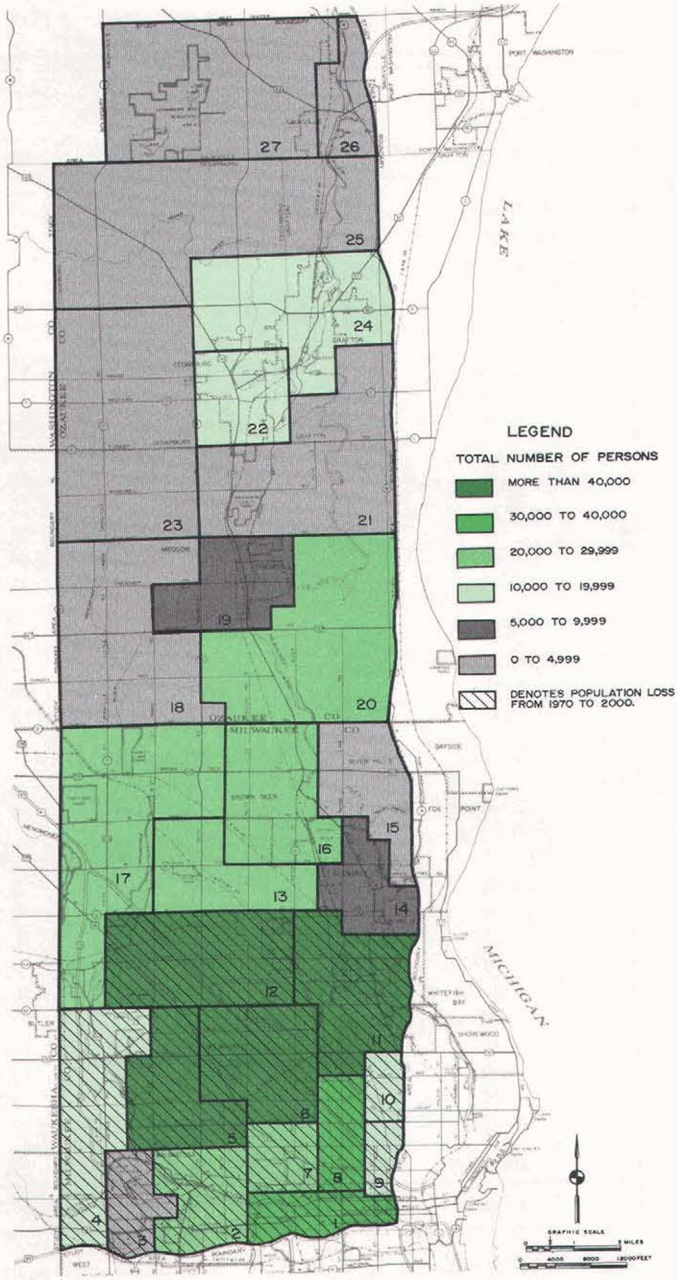


In 1970 the total population of the northwest side study area was estimated to be 515,800 persons. Of this population, about 480,100 persons, or about 93 percent, resided in the Milwaukee County portion of the study area. About 35,700 persons, or about 7 percent, resided in the Ozaukee County portion of the study area. The greatest concentrations of population were located in the southeastern and central portions of the Milwaukee County portion of the study area.

Source: SEWRPC.

Map 184

DISTRIBUTION OF POPULATION IN THE STUDY AREA: 2000



The resident population of the study area is anticipated to approximate 520,700 persons by the year 2000, an increase of about 12,900 persons, or about 2 percent, over the 1970 population level of about 515,800 persons. Over that time period, the Milwaukee County portion of the study area is anticipated to lose more than 34,000 people, or about 7 percent of its total 1970 population. Over this same period, the Ozaukee County portion of the study area is anticipated to increase in population by about 47,000 people, or by about 132 percent over its 1970 level. Population losses are anticipated over this time period in all but the northern one-third of the Milwaukee County portion of the study area, with the most substantial losses anticipated in the southeastern portion of the study area. Increases in population are planned and anticipated for the remainder of the study area, with the most significant of these increases occurring in the northwestern corner of the City of Milwaukee and the area in and around the City of Mequon and the Village of Grafton.

Source: SEWRPC.

Table 190

COMPARISON OF PLANNED AND ESTIMATED POPULATION IN THE NORTHWEST SIDE STUDY AREA: 1975

Subarea	1975 Population		Difference: Estimate Minus Forecast	
	Planned	Estimated	Number	Percent
Milwaukee County Portion	468,000	455,050	- 12,950	- 2.8
Ozaukee County Portion.	43,800	44,130	330	0.8
Total Study Area	511,800	499,180	- 12,620	- 2.5
Region (forecast)	1,800,000	1,788,320	- 12,620	- 0.6

Source: SEWRPC.

of households in the study area imply an increase in the demand for residential land from 1970 to 2000.

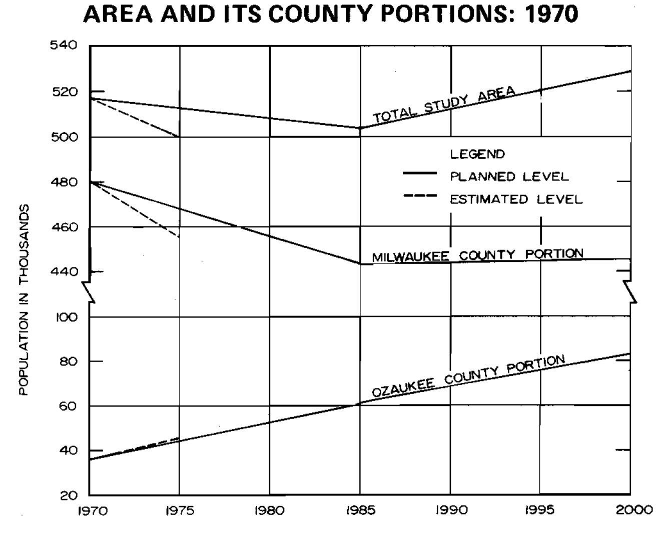
The proportional increase in the number of households in the study area and Region is larger than the proportional increase in population in the study area and the Region because of the decreases in average household size anticipated from 1970 to 2000, as shown in Table 191. The anticipated decreases in average household size reflect, in part, the expectation that crude birthrates during this period will remain below past levels in the study area and in the Region, thereby reducing traditional family sizes, and, in part, the increasing number of nontraditional households.

Future Employment in the Study Area

The anticipated year 2000 employment level in the study area under the adopted regional land use plan is 252,100 jobs, an increase of 44,000 jobs, or 21 percent, over the 1972 employment level in the study area, as shown in Table 192. The employment level of the Milwaukee County portion of the study area is expected to increase by 30,700 jobs, or by nearly 16 percent, while the employment level of the Ozaukee County portion of the study area is expected to increase by 13,300 jobs, or by about 102 percent. The lower relative increase in jobs in the Milwaukee County portion of the study area, compared to the forecast increase of 36 percent in the Region over the same period, reflects the county level forecasts of year 2000 employment which indicated that, while Milwaukee County is anticipated to remain the dominant location of employment in the Region, its proportional share of regional employment will decline. Within the Milwaukee County portion of the study area, gains in employment are expected to occur generally throughout the area, as shown in Table 193 and on Maps 185 and 186. The most significant increases may be expected to occur in the northwestern corner of the study area. Within the Ozaukee County portion of the study area, the most substantial gains in employment are expected to occur in the City of Mequon and the Village of Grafton. Industry may be expected to continue to account for the largest portion of employment in the study area with 102,100 jobs in the year 2000, an increase of 21,500 jobs over the 1970 total. The largest relative increase in employment of all major industry groups in the study area is also expected to be in industry—27 percent (see Figure 94 and Table 194).

Figure 93

COMPARISON OF PLANNED AND ESTIMATED POPULATION IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970



Source: SEWRPC.

Table 191

NUMBER OF HOUSEHOLDS AND PERSONS PER HOUSEHOLD IN THE NORTHWEST SIDE STUDY AREA, ITS COUNTY PORTIONS, AND THE REGION: 1970-2000

Area	1970 Census	Forecast		Change: 1970-2000	
		1985	2000	Number	Percent
Milwaukee County Portion					
Number of Households	154,300	161,460	169,500	15,200	9.9
Persons per Household	3.07	2.61	2.56	- 0.51	- 16.6
Ozaukee County Portion					
Number of Households	9,700	17,200	23,840	14,140	145.8
Persons per Household	3.69	3.50	3.45	- 0.24	- 6.5
Study Area					
Number of Households	164,000	178,660	193,340	29,340	17.9
Persons per Household	3.10	2.75	2.67	- 0.43	- 13.9
Region					
Number of Households	536,490	632,180	747,700	211,210	39.4
Persons per Household	3.20	3.02	2.90	- 0.30	- 9.4

Source: SEWRPC.

Table 192

EMPLOYMENT CHANGE IN THE NORTHWEST SIDE STUDY AREA, ITS COUNTY PORTIONS, AND THE REGION: 1972-2000

Area	Estimated 1972	Planned		Change: 1972-2000	
		1985	2000	Number	Percent
Milwaukee County Portion . . .	195,100	209,000	225,800	30,700	15.7
Ozaukee County Portion.	13,000	19,100	26,300	13,300	102.7
Total Study Area	208,100	228,110	252,100	44,000	21.1
Region (forecast)	749,800	878,800	1,016,000	266,200	35.6

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

The employment level in the study area was expected to approximate 211,800 jobs in 1975. The actual number of jobs in the study area in 1975 was 199,300—about 12,500, or about 6 percent, fewer jobs than anticipated and planned. Figure 95 illustrates the differences in estimated and allocated employment levels in 1975 in the study area and in its Milwaukee and Ozaukee County portions. Both the Milwaukee and Ozaukee County portions of the study area exhibit similar differences between estimated employment levels and planned employment levels in 1975—that is, an estimated employment level in 1975 somewhat below allocated levels. This difference in estimated and allocated employment levels also occurred in the Region in 1975, largely as a result of the effects of a minor recession that year. Since 1975, estimated regional employment has increased to the point that in 1978 it was greater than forecast employment levels, as shown in Figure 95.

Future Residential Development in the Study Area

The adopted year 2000 land use plan for the Region proposes to accommodate the growth in

Table 193

DISTRIBUTION OF TOTAL EMPLOYMENT IN THE NORTHWEST SIDE STUDY AREA: 1972-2000

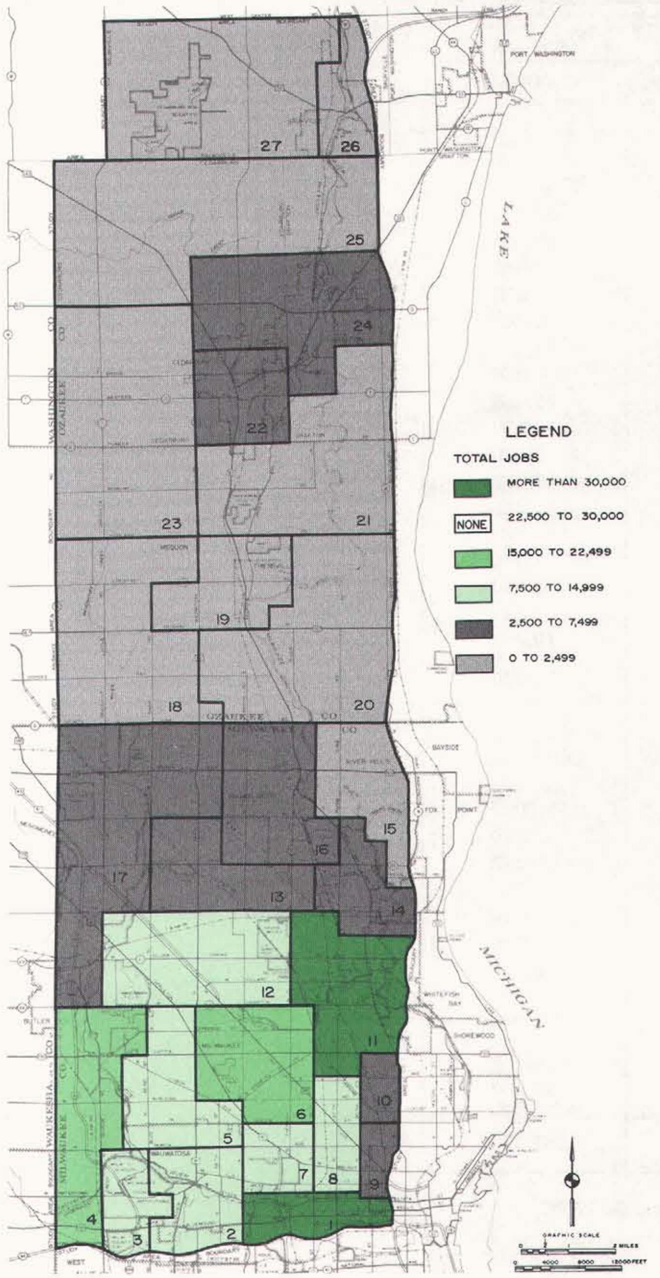
Subarea	Total Jobs			Change: 1972-2000	
	1972	1985	2000	Number	Percent
Milwaukee County Portion					
1	35,140	25,290	26,200	- 8,940	- 25.5
2	9,540	9,830	10,160	620	6.5
3	8,540	8,830	11,640	3,100	36.3
4	21,180	23,330	23,820	2,630	12.4
5	8,530	8,930	9,280	750	8.8
6	16,360	16,770	17,240	880	5.4
7	8,220	8,550	8,870	650	8.0
8	14,360	14,940	15,480	1,120	7.8
9	6,310	9,180	9,530	3,220	5.4
10	3,000	3,200	3,380	380	12.7
11	35,580	36,320	37,220	1,640	4.6
12	9,700	10,590	11,720	2,020	20.8
13	5,180	7,530	9,420	4,240	81.9
14	3,460	3,630	3,930	480	13.9
15	820	850	1,010	190	23.2
16	5,880	6,780	7,920	2,040	34.7
17	3,340	14,410	19,000	15,600	468.8
Subtotal	195,160	208,960	225,820	30,660	15.7
Ozaukee County Portion					
18	830	790	890	60	7.2
19	1,370	1,920	2,810	1,440	105.1
20	1,610	3,390	5,240	3,630	225.5
21	810	840	900	90	11.1
22	2,880	3,900	5,050	2,170	75.3
23	310	320	370	60	19.4
24	4,520	6,200	8,000	3,480	77.0
25	100	490	870	770	770.0
26	430	1,170	1,940	1,510	351.2
27	90	120	180	90	100.0
Subtotal	12,950	19,140	26,250	13,300	102.7
Total Study Area	208,110	228,110	252,070	43,960	21.1

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

the study area population of about 13,000 people, and employment of about 44,000 jobs, through the conversion of approximately 9,810 acres of rural land to urban use. That part of the adopted regional land use plan which pertains to the study area is shown on Map 187 and summarized in Table 195. As shown on Map 187, the regional land use plan as it applies to the study area advocates a return to the historic development trends most evident within the study area prior to the late 1950's, with new urban development proposed to occur largely in concentric rings along the full periphery of, and outward from, existing urban centers. In the Milwaukee County portion of the study area, new development is proposed to occur principally in the northwestern corner of the City of Milwaukee. In the Ozaukee County portion, new development is proposed to occur principally in and around the Villages of Thiensville and Grafton and the City of Cedarburg. In addition, the recommended land use plan calls for new urban development in the study area to occur largely at densities

Map 185

DISTRIBUTION OF EMPLOYMENT IN THE STUDY AREA: 1972

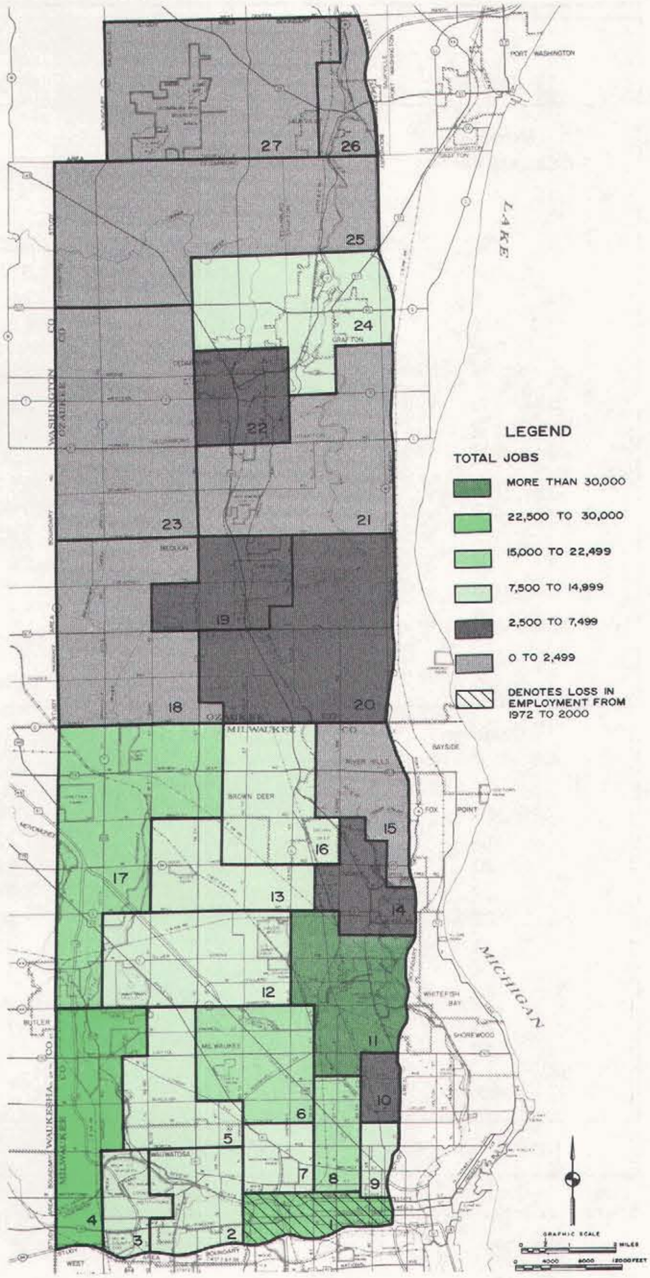


In 1972 the estimated total employment in the study area was 208,000 jobs. Of these jobs, about 195,000, or about 94 percent, were located in the Milwaukee County portion of the study area. About 13,000 of the total jobs, or about 6 percent, were located in the Ozaukee County portion of the study area. Principal concentrations of jobs were found in the extreme southeastern portion of the study area adjacent to the City of Milwaukee central business district, in the western, or Wauwatosa, portion of the study area, and in the northeastern, or Glendale, portion of the study area.

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

Map 186

DISTRIBUTION OF EMPLOYMENT IN THE STUDY AREA: 2000



Employment in the study area is anticipated to reach 252,000 jobs by the year 2000, an increase of about 44,000 jobs, or about 21 percent, over the 1972 employment level in the study area. The employment level of the Milwaukee County portion of the study area is expected to increase by about 30,700 jobs, or by nearly 16 percent, while the employment level of the Ozaukee County portion of the study area is expected to increase by 13,300 jobs, or by about 102 percent. Increases in employment are expected to occur generally throughout the study area, but most significantly in the northwestern corner of the Milwaukee County portion of the study area. Within the Ozaukee County portion of the study area, the most substantial gains in employment are expected to occur in the Grafton and Mequon areas.

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

Table 194

FUTURE EMPLOYMENT LEVELS BY MAJOR INDUSTRY GROUP IN THE NORTHWEST SIDE STUDY AREA: 1970-2000

Major Industry Group	Employment			Change: 1972-2000	
	Estimated 1972	Future			
		1985	2000	Number	Percent
Industrial.	80,590	93,020	102,130	21,540	26.7
Retail Trade	34,320	39,710	42,330	8,110	23.3
Governmental and Educational Services	31,250	28,130	33,810	2,560	8.2
Other Employers	61,950	67,250	73,800	11,850	19.1
Total Employment	208,110	228,110	252,070	43,960	21.1

Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

consistent with the economical provision of public centralized sanitary sewer, water supply, and public transit facilities and services.

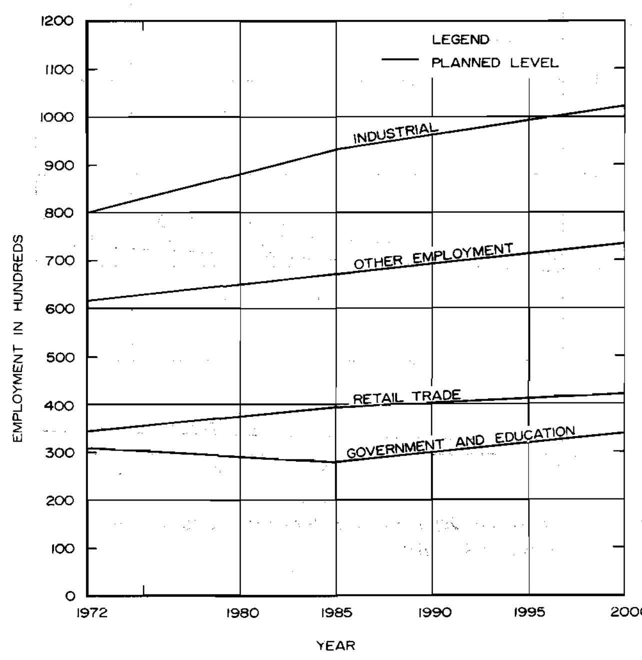
About 5,995 acres are proposed to be added to the existing stock of residential land within the study area by the year 2000 to meet the additional housing needs attendant to the increase in the study area population anticipated by the plan design year. The plan, as indicated in Table 195, recommends that nearly all of this increase in residential land—5,411 acres, or over 90 percent—occur at medium density.

As noted earlier, the Milwaukee County portion of the study area is anticipated to lose about 34,000 persons while gaining about 30,000 jobs from 1970 to 2000. Furthermore, as a result of decreasing household size, Milwaukee County is anticipated to gain about 15,200 households. The anticipated increase in households, in conjunction with the anticipated increase in employment, is proposed to be accommodated by the conversion of approximately 4,424 acres of land from rural to urban use by the year 2000 in the Milwaukee County portion of the study area (see Table 196). Of these 4,424 acres of new urban land, approximately 2,026 acres are proposed to accommodate residential development to the year 2000, with 84 percent of the additional residential land acreage being in the medium-density range.

To meet the increase in population and employment levels anticipated for the Ozaukee County portion of the study area—approximately 47,000

Figure 94

PLANNED EMPLOYMENT CHANGE BY MAJOR INDUSTRY GROUP IN THE NORTHWEST SIDE STUDY AREA: 1972-2000

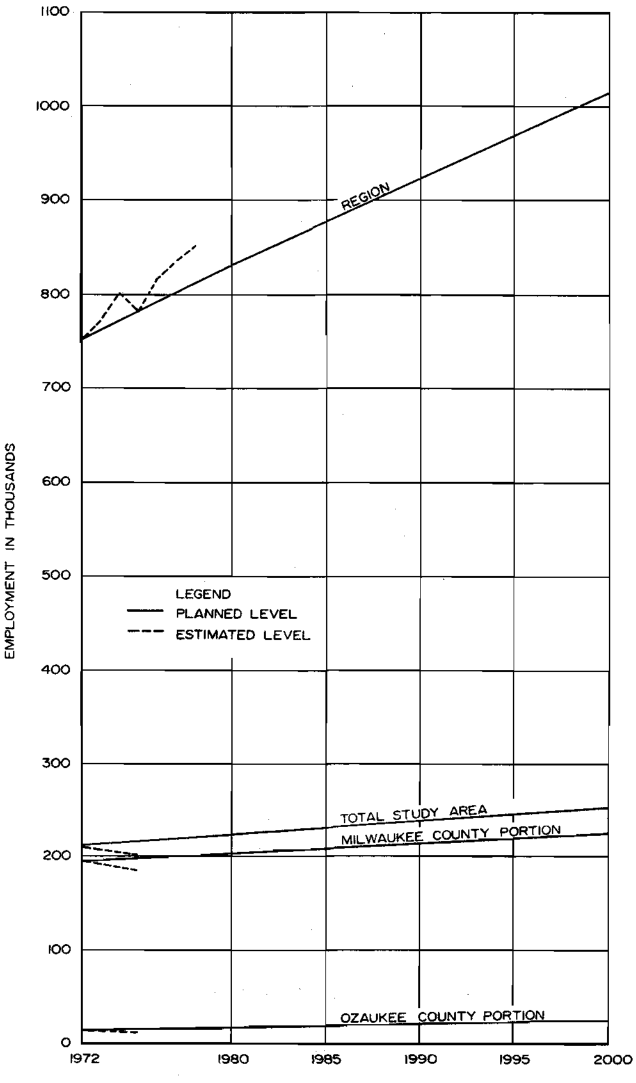


Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

persons and 14,000 jobs—about 5,386 acres of land are proposed to be converted from rural to urban use from 1970 to 2000, as shown in Table 197. About 3,970 acres are proposed to be added to the stock of residential land, and about 74 percent of this land is proposed to be developed at medium densities.

Figure 95

COMPARISON OF PLANNED AND ESTIMATED EMPLOYMENT TRENDS IN THE NORTHWEST SIDE STUDY AREA, ITS COUNTY PORTIONS, AND THE REGION: 1972-2000



Source: Wisconsin Department of Industry, Labor and Human Relations and SEWRPC.

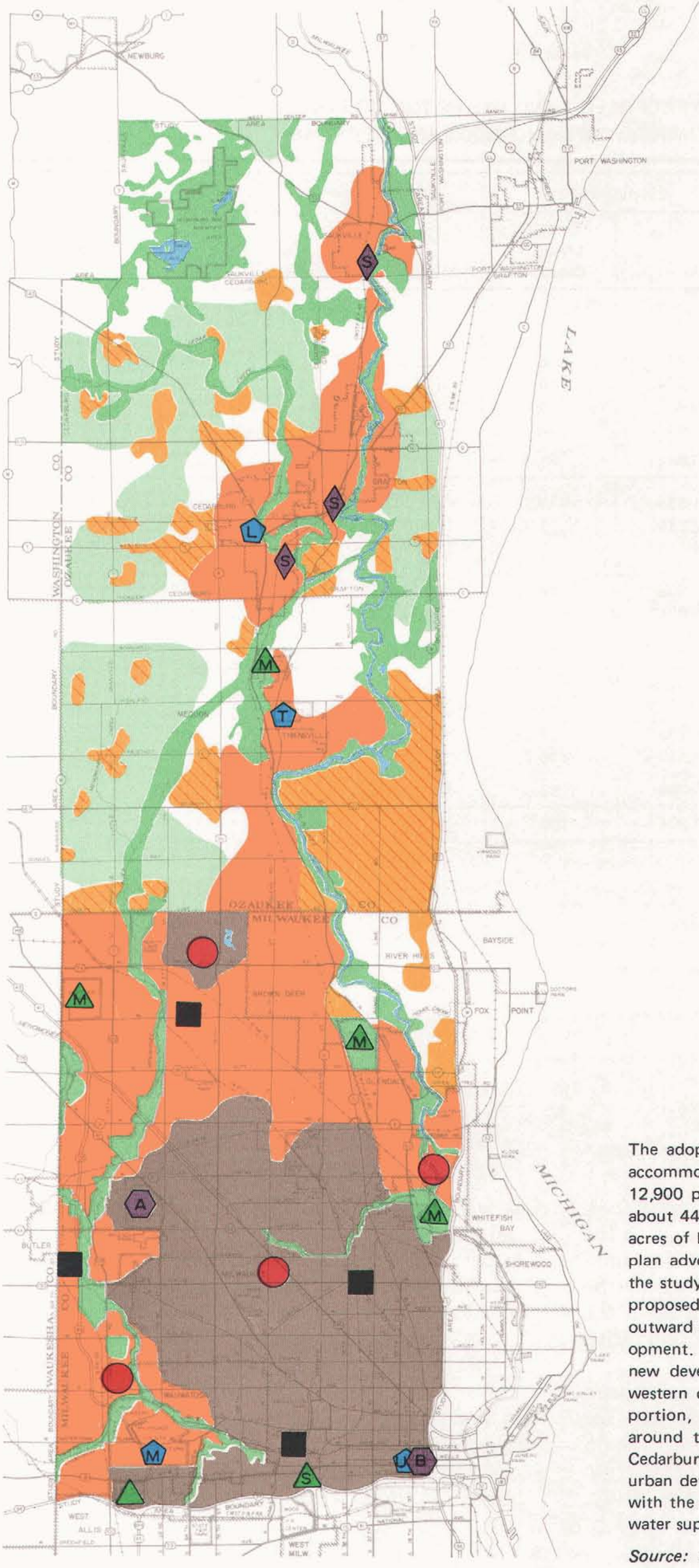
Two important recommendations of the adopted regional land use plan relating to future residential land use are that new urban residential development should occur in planned neighborhood units, and that the conservation of existing residential development should be encouraged by the identification and by the planned preservation, and, as may be necessary, rehabilitation and redevelopment of neighborhood units. Since the adoption in the year 1966 of the Commission's first regional land use plan for the year 1990, the Commission has emphasized the importance of concentrating new urban residential development in planned development units, or neighborhoods. Similarly, within fully developed areas, the Commission has long recommended that urban conservation and rehabilitation plans and programs be formulated within the context of identified neighborhoods. The emphasis on the neighborhood as the most basic urban planning unit in both developing and developed areas is advanced by the Commission partly as an aesthetic principle, partly as a matter of efficiently organizing and supplying public services, partly as a matter of convenience in living and traveling, and partly as a matter of bringing the size of the area in which a family lives into a scale in which an individual can feel at home and within which he may take a more active part in community affairs.

Ideally, each neighborhood should have its own elementary school, park, churches, and local shopping area. Its size should be such as to provide housing for that population for which one public elementary school is required. The size will, therefore, vary with the size of the school, the development density, the ratio of public elementary school population to total population, and the desirable maximum walking distance to school. Each neighborhood should have isolating boundaries such as arterial streets, major parks or parkways, or streams or lake shorelines to separate it from other such neighborhood units. Its internal street pattern should facilitate vehicular and pedestrian circulation within the unit, but discourage penetration of the unit by through traffic. There should be one central feature or focal point, such as the school and park site around which the design is built, thereby creating an integrated environment.

As a part of its land use planning efforts, the Commission has proposed residential planning unit, or neighborhood, development standards for the size, resident population, and land use composition of neighborhoods which are developed, or are to be developed, at low, medium, and high densities. These standards suggest, for example, a gross area of about 160 acres and a resident population of about 4,200 persons within a high-density neighborhood; a gross area of about 640 acres and a resident population of about 6,500 persons within a medium-density neighborhood; and a gross area of about 2,560 acres and a resident population of about 8,200 persons within a low-density neigh-

Map 187

REGIONAL LAND USE PLAN FOR THE STUDY AREA: 2000



GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

LEGEND

PRIMARY LAND USES

- SUBURBAN RESIDENTIAL (0.2-0.6 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- LOW DENSITY RESIDENTIAL (0.7-2.2 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- MEDIUM DENSITY RESIDENTIAL (2.3-6.9 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- HIGH DENSITY RESIDENTIAL (7.0-17.9 DWELLING UNITS PER NET RESIDENTIAL ACRE)
- MAJOR RETAIL AND SERVICE CENTER
- MAJOR INDUSTRIAL CENTER
- MAJOR PUBLIC OUTDOOR RECREATIONACENTER
  M-MULTI-USE SITE
  S-SPECIAL PURPOSE SITE
- MAJOR TRANSPORTATION CENTER
  A-AIRPORT
  B-BUS TERMINAL
- MAJOR UTILITY CENTER
  S-PUBLIC SEWAGE TREATMENT PLANT
- MAJOR GOVERNMENTAL OR INSTITUTIONAL CENTER
  M-MEDICAL
  U-UNIVERSITY
  T-TECHNICAL/VOCATIONAL
  L-LIBRARY
- PRIMARY ENVIRONMENTAL CORRIDOR
- PRIME AGRICULTURAL LAND
- OTHER AGRICULTURAL AND RURAL LAND
- WATER

The adopted year 2000 land use plan for the Region proposes to accommodate the growth in the study area population of about 12,900 people, and the growth in the study area employment of about 44,000 jobs, through the conversion of approximately 9,800 acres of land from rural to urban use. The adopted regional land use plan advocates a return to the historic development trends within the study area evident prior to 1960, with new urban development proposed to occur largely at medium densities in concentric rings outward from and along the full periphery of existing urban development. In the Milwaukee County portion of the study area, new development is proposed to occur principally in the northwestern corner of the City of Milwaukee. In the Ozaukee County portion, development is proposed to occur principally in and around the Villages of Thiensville and Grafton and the City of Cedarburg. Importantly, the adopted land use plan calls for new urban development in the study area to occur at densities consistent with the economical provision of public centralized sanitary sewer, water supply, and public transit facilities and services.

Source: SEWRPC.

Table 195

EXISTING AND PROPOSED LAND USE IN THE NORTHWEST SIDE STUDY AREA: 1970 AND 2000 LAND USE PLAN

Land Use Category	Existing 1970		Planned Increment		Plan 2000	
	Acres	Percent of Major Category	Acres	Percent Increment	Acres	Percent of Major Category
Urban Land Use						
Residential						
Urban High Density	9,948	8.2	295	3.0	10,243	8.3
Urban Medium Density	6,304	5.1	5,411	85.8	11,715	9.5
Urban Low Density	6,953	5.6	- 266	- 3.8	6,687	5.4
Suburban Density	3,637	2.9	- 9	- 0.2	3,628	2.9
Subtotal	26,842	21.8	5,431	20.2	32,273	26.1
Commercial	1,334	1.2	107	8.0	1,441	1.2
Industrial	2,374	1.9	1,477	62.2	3,851	3.1
Governmental and Institutional	4,116	3.3	153	3.7	4,269	3.5
Transportation, Communication, and Utilities[a]	18,336	14.9	2,348	12.6	20,684	16.8
Recreational	5,084[c]	4.1	294[e]	5.8	5,378	4.4
Urban Land Use Subtotal	58,086	47.2	9,810	16.9	67,896	55.1
Rural Land Use						
Residential	--[d]	--	565	--	565	0.5
Agricultural	45,798	37.1	- 8,025	- 17.5	37,773	30.6
Other Open Lands[b]	19,410	15.7	- 2,350	- 12.1	17,060	13.8
Rural Land Use Subtotal	65,208	52.8	- 9,810	- 15.0	55,398	44.9
Total	123,294	100.0	--	--	123,294	100.0

[a] *Includes off-street parking uses.*

[b] *Includes woodlands, water, wetlands, and unused lands.*

[c] *Includes net site area recommended for public recreational use.*

[d] *Included in land use inventory as part of urban residential land use.*

[e] *Includes only that net site area recommended for public recreational use.*

Source: SEWRPC.

borhood. The standards, it should be emphasized, have been proposed as general guidelines, with the ultimate size, population, and land use mix of individual neighborhood units to be determined by the variety of site-specific factors impinging upon the delineation and design of such neighborhood units.

As part of this study, existing and planned future neighborhood unit boundaries were suggested for the northwest side study area in order to help guide the development and evaluation of alternative arterial street system plans under the study. It was recognized, in this respect, that major arterial street improvements and new arterial street locations had the potential either to reinforce the cohesiveness and integrity of neighborhoods by forming logical boundaries for the neighborhoods, or to increase the undesirable division of such neighborhoods by penetrating the neighborhoods.

In the fully developed portions of the study area, two basic features of a neighborhood unit were considered in delineating the existing neighborhoods: 1) those which help to typify the character

Table 196

EXISTING AND PROPOSED LAND USE IN THE MILWAUKEE COUNTY PORTION OF THE STUDY AREA: 1970 AND 2000 LAND USE PLAN

Land Use Category	Existing 1970		Planned Increment		Plan 2000	
	Acres	Percent of Major Category	Acres	Percent Increment	Acres	Percent of Major Category
Urban Land Use						
Residential						
Urban High Density	9,904	18.4	339	3.4	10,243	19.0
Urban Medium Density	4,964	9.2	2,456	49.5	7,420	13.8
Urban Low Density	1,995	3.7	-907	-45.5	1,088	2.0
Suburban Density	1,665	3.1	138	8.3	1,803	3.3
Subtotal	18,528	34.4	2,026	10.9	20,554	38.1
Commercial	1,108	2.0	79	7.1	1,187	2.2
Industrial	1,770	3.3	1,120	63.3	2,890	5.4
Governmental and Institutional	3,575	6.6	60	1.6	3,635	6.7
Transportation, Communication, and Utilities[a]	13,935	25.9	1,095	7.9	15,030	27.9
Recreational	4,145[c]	7.7	44[e]	1.1	4,189	7.8
Urban Land Use Subtotal	43,061	79.9	4,424	10.3	47,485	88.1
Rural Land Use						
Residential	--[d]	--	--	--	--	--
Agricultural	5,378	10.0	-2,692	-50.1	2,686	5.0
Other Open Lands[b]	5,438	10.1	-1,732	-31.8	3,706	6.9
Rural Land Use Subtotal	10,816	20.1	-4,424	-40.9	6,392	11.9
Total	53,877	100.0	--	--	53,877	100.0

[a] *Includes off-street parking uses.*

[b] *Includes woodlands, water, wetlands, and unused lands.*

[c] *Includes net site area recommended for public recreational use.*

[d] *Includes in land use inventory as part of urban residential land use.*

[e] *Includes only that net site area recommended for public recreational use.*

Source: SEWRPC.

of the neighborhood, including particularly such interior components as elementary schools, neighborhood and community parks, and shopping areas; and 2) those which determine the boundaries of the neighborhood unit, including such exterior features as arterial streets, waterways, major park and open space reservations, industrial areas, cemeteries, institutional areas, and railroads. In delineating the neighborhood units, consideration was also given to desirable physical size and resident population levels.

The delineation of neighborhoods in the developed portions of the study area which met the interior and exterior feature and size considerations was particularly difficult, and required some com-

Table 197

EXISTING AND PROPOSED LAND USE IN THE OZAUKEE COUNTY PORTION OF THE STUDY AREA: 1970 AND 2000 LAND USE PLAN

Land Use Category	Existing 1970		Planned Increment		Plan 2000	
	Acres	Percent of Major Category	Acres	Percent Increment	Acres	Percent of Major Category
Urban Land Use						
Residential						
Urban High Density	44	0.1	- 44	- 95.7	- -	- -
Urban Medium Density	1,340	1.9	2,955	220.4	4,295	6.2
Urban Low Density	4,958	7.1	641	12.9	5,599	8.1
Suburban Density	1,972	2.8	- 147	- 7.4	1,825	2.6
Subtotal	8,314	11.9	3,405	40.9	11,719	16.9
Commercial	226	0.3	28	12.4	254	3.7
Industrial	604	0.9	357	59.1	961	1.4
Governmental and Institutional	541	0.8	93	17.2	634	0.9
Transportation, Communication, and Utilities[a]	4,401	6.3	1,253	28.5	5,654	8.1
Recreational	939[c]	1.4	250[e]	26.7	1,189	1.7
Urban Land Use Subtotal	15,025	21.6	5,386	35.9	20,411	29.4
Rural Land Use						
Residential	- -[d]	- -	565	- -	565	0.8
Agricultural	40,420	58.2	- 5,333	- 13.2	35,087	50.5
Other Open Lands[b]	13,972	20.2	- 618	- 4.4	13,354	19.2
Rural Land Use Subtotal	54,392	78.4	- 5,386	- 9.9	49,006	70.6
Total	69,417	100.0	- -	- -	69,417	100.0

[a] *Includes off-street parking uses.*

[b] *Includes woodlands, water, wetlands, and unused lands.*

[c] *Includes net site area recommended for public recreational use.*

[d] *Included in land use inventory as part of urban residential land use.*

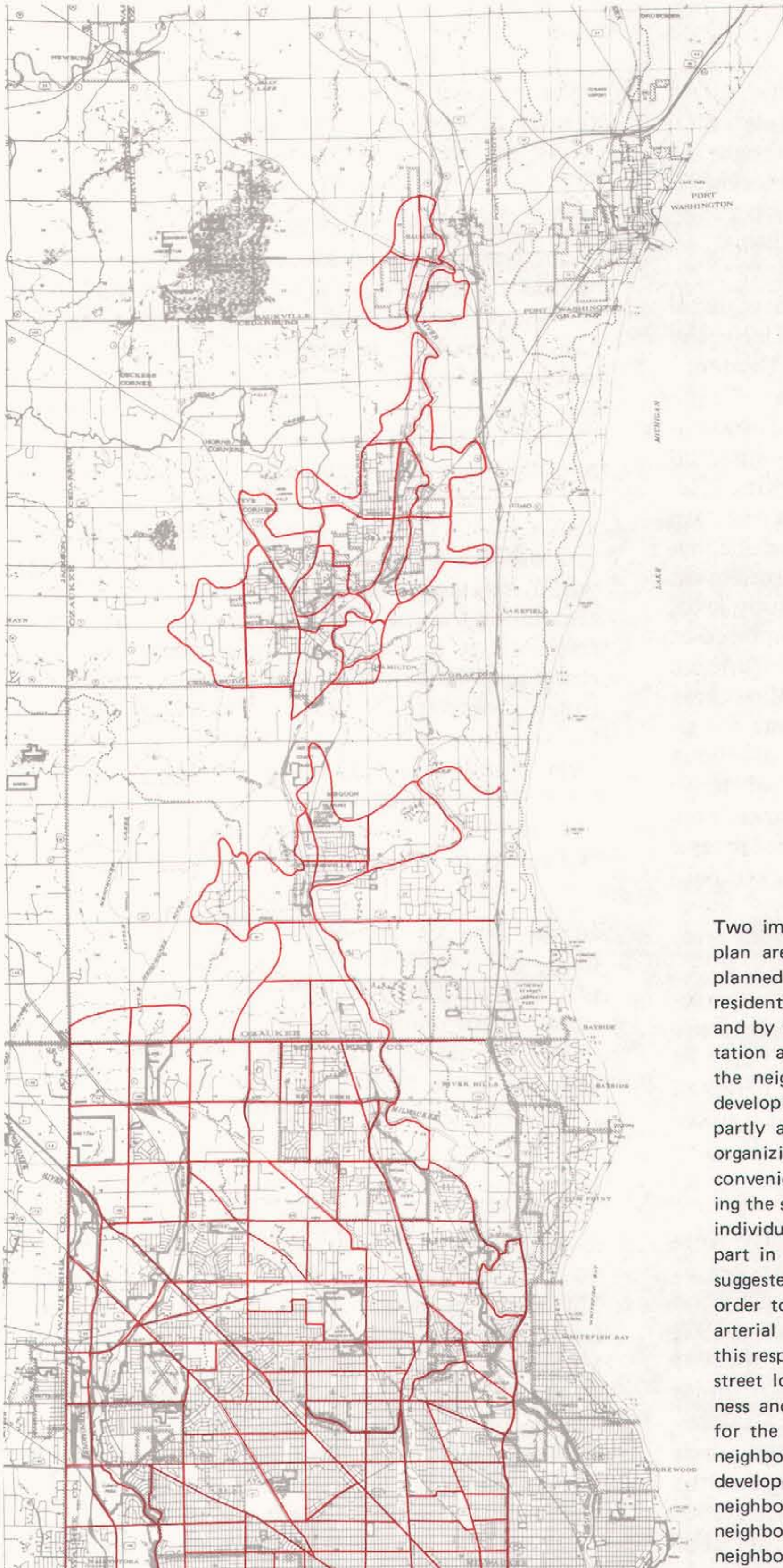
[e] *Includes only that net site area recommended for public recreational use.*

Source: SEWRPC.

promise in the application of these criteria. Generally, however, the neighborhoods as delineated and shown on Map 188 meet the size and external and internal feature criteria.

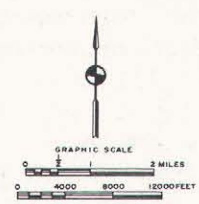
Future Commercial Development in the Study Area

As shown in Tables 195 through 197, the land use plan for the study area proposes the development of 107 acres of new commercial land from 1970 to 2000, including an additional 79 acres in the Milwaukee County portion and an additional 28 acres in the Ozaukee County portion of the study area, increasing the total stock of commercial land in the study area to more than 1,440 acres by the year 2000. It is anticipated that this increase will meet the area requirements of the expected increases in retail and service employment and the demands of the growing study area household population, and will be distributed to make the operation of business and the provision of services to the study area more efficient. As proposed in the land use plan for the Region, commercial development in the study area is to be accomplished through the



Map 188

FUTURE RESIDENTIAL NEIGHBORHOODS IN THE NORTHWEST SIDE STUDY AREA



Two important recommendations of the adopted regional land use plan are that new urban residential development should occur in planned neighborhood units, and that the conservation of existing residential development should be encouraged by the identification and by the planned preservation, and, as may be necessary, rehabilitation and redevelopment of neighborhood units. The emphasis on the neighborhood as the most basic urban planning unit of both developing and developed areas is advanced by the Commission partly as an aesthetic principle, partly as a matter of efficiency in organizing and supplying public services, partly as a matter of convenience in living and traveling, and partly as a matter of bringing the size of an area in which a family lives into a scale in which an individual can feel at home and in which he may take a more active part in community affairs. Planned neighborhood boundaries were suggested for the northwest side study area for these reasons and in order to help guide the development and evaluation of alternative arterial street system plans under the study. It was recognized, in this respect, that major arterial street improvements and new arterial street locations have the potential either to reinforce the cohesiveness and integrity of neighborhoods by forming logical boundaries for the neighborhoods, or to increase undesirable division of such neighborhoods by penetrating the neighborhoods. In the fully developed portions of the study area, two basic features in the neighborhood unit were considered in delineating the existing neighborhoods: 1) those which help to typify the character of the neighborhood, including particularly such interior components as elementary schools, neighborhood and community parks, and shopping areas; and 2) those which determine the boundaries of the neighborhood unit, including such exterior features as arterial streets, waterways, major park and open space reservation, industrial areas, cemeteries, institutional areas, and railroads. Desirable physical size and resident population levels were also considered in delineating the neighborhood units.

Source: SEWRPC.

development of planned commercial centers located in such areas as to be integrated with residential areas and the transportation system; through the discouragement of strip arterial development; through the encouragement of off-street parking; and through the provision of adequate utilities.

As shown on Map 189, there were two regional commercial centers in the study area in 1970—the Capitol Court and Mayfair Mall Shopping Centers—both in the Milwaukee County portion of the study area. As shown in Table 198, these two centers comprised a total of 49 acres of commercial land uses—excluding related off-street parking. The land use plan for the study area proposed to retain these two centers as well as add an additional regional center—Northridge—in the northern section of the Milwaukee County portion of the study area. The Northridge Shopping Center was completed in 1972. With the planned addition of the Northridge Shopping Center, total acreage in the study area devoted to major commercial land use was anticipated to reach 111 acres, an increase of about 127 percent, by the year 2000. Each of these major centers is anticipated to serve a market area containing at least 100,000 persons or more and have a net site area of at least 20 acres, and to contain a full range of commercial and service enterprises necessary to serve the surrounding trade area.

In addition to the two major existing and one proposed commercial center, the year 2000 land use plan for the study area provides for 45 acres of additional community- and neighborhood-oriented commercial and service land—17 in the Milwaukee County portion and 28 in the Ozaukee County portion of the study area (see Table 198).

Future Industrial Development in the Study Area

The land use plan for the study area proposes to add more than 1,470 acres of industrial land by the year 2000, as indicated in Tables 195 through 197, with 1,120 of these additional acres being located in the Milwaukee County portion and 350 of these additional acres being located in the Ozaukee County portion of the study area. The total stock of such land in the study area is thus proposed to increase to more than 3,850 acres by the year 2000. This increase in industrial acreage would meet the land requirements of the anticipated increases in manufacturing and wholesaling employment within the study area. These new industrial land uses are proposed to be accommodated primarily in planned industrial centers located so as to protect and enhance existing industrial areas, and so as to be readily accessible to essential transportation and utility services, as well as to a labor supply.

As shown on Map 190, there were six regional industrial centers located either wholly or partly within the northwest side study area in 1970—the Milwaukee North center in its entirety, and portions of the Wauwatosa, Milwaukee Glendale, Milwaukee Menomonee Valley West, Milwaukee Menomonee Valley East, and West Allis centers. These six centers encompassed a total area of about 850 acres of manufacturing and warehousing land uses, excluding off-street parking (see Table 199). The land use plan for the study area proposes to retain all six of these regional centers within the study area through the year 2000. As also indicated on Map 190, the plan calls for the addition of one regional industrial center in the study area—Milwaukee-Granville—in an area located roughly between N. 107th and N. 68th Street on the west and east and W. Good Hope and W. Brown Deer Road on the south and north. By the year 2000, this industrial center is expected to encompass 1,116 net acres, making it the largest contiguous center in the Region.

In addition to the major existing and proposed industrial centers shown on Map 190, the plan provides for 361 acres of new industrial land for smaller community-oriented industrial development—four acres in the Milwaukee County portion and 357 acres in the Ozaukee County portion of the study area (see Table 199).

Future Governmental and Institutional Land Use in the Study Area

As indicated in Tables 195 through 197, the land use plan for the study area proposes to add about 150 acres of new governmental and institutional land by the year 2000, 60 additional acres in the Milwaukee County portion of the study area and more than 90 additional acres in the Ozaukee County portion of the study area, increasing the total stock of land devoted to governmental and institutional uses to more than 4,260 acres by the year 2000, or about 4 percent over the 1970 level. Existing and proposed regional governmental and institutional centers are shown on Map 191, including seats of county, state, and federal governments; medical complexes with at least 600 beds, 30 types of medical services, and 250 attending physicians; accredited universities; technical and vocational

Map 189

MAJOR RETAIL AND SERVICE CENTERS IN THE STUDY AREA: YEAR 2000 LAND USE PLAN

There were two regional commercial centers in the study area in 1970—the Capitol Court and Mayfair Mall Shopping Centers—both in the Milwaukee County portion of the study area. These two centers comprised a total of 49 acres of commercial land uses, excluding related off-street parking. The land use plan for the study area proposes to retain these two centers, as well as to add an additional regional center—Northridge—in the northern section of the Milwaukee County portion of the study area. This new center, originally proposed in the year 2000 regional land use plan adopted in 1966, was actually completed in 1972. Each of these major centers is anticipated to serve a market area of at least 100,000 persons, to have a site area of at least 20 acres, and to provide the full range of commercial and service enterprises necessary to serve the surrounding trade area.

Source: SEWRPC.

Table 198

EXISTING AND PROPOSED COMMERCIAL LAND USE IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970-2000

Commercial Land Use Type	Acres		
	Milwaukee County Portion	Ozaukee County Portion	Total Study Area
Major			
Existing 1970.	49	- -	49
Planned Increment. . .	62	- -	62
Total 2000	111	- -	111
Community and Other			
Existing 1970.	1,059	226	1,285
Planned Increment. . .	17	28	45
Total 2000	1,076	254	1,330
Total			
Existing 1970.	1,108	226	1,334
Planned Increment. . .	79	28	107
Total 2000	1,187	254	1,441

Source: SEWRPC.

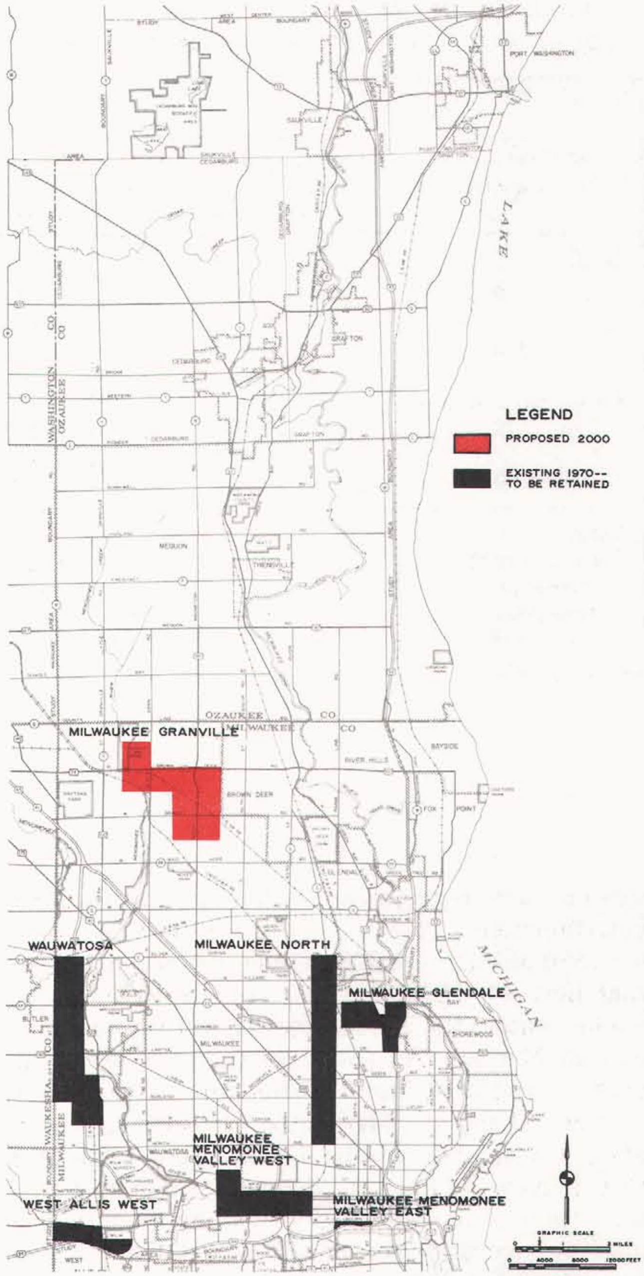
schools; large regional central libraries; and cultural-entertainment facilities having an annual attendance of at least 350,000 people. The plan proposes that between 1970 and 2000 only one additional major center, the Milwaukee Area Technical College in Mequon, be added so that by the design year, a total of six centers—the Milwaukee County Medical Complex, Marquette University, Mount Mary College, Concordia College, the Cedarburg City Library, and MATC-Mequon—will exist within the study area. The MATC-Mequon facility was upgraded to major center status by 1975. As indicated in Table 200, most of the additional governmental and institutional lands proposed under the recommended plan—138 additional acres, 60 in the Milwaukee County portion and 78 in the Ozaukee County portion of the study area—would be of neighborhood and community, rather than regional, significance. Such community and neighborhood centers include new schools, hospitals and churches, police and fire stations, and city, village, and town halls.

Future Transportation, Communication, and Utility Land Use in the Study Area

As indicated in Tables 195 through 197, the land use plan for the study area proposes to add about

Map 190

MAJOR INDUSTRIAL CENTERS IN THE STUDY AREA: YEAR 2000 LAND USE PLAN



There were six regional industrial centers located either wholly or partially within the northwest side study area in 1970—the Milwaukee-North center in its entirety, and portions of the Wauwatosa, Milwaukee, Glendale, Milwaukee Menomonee Valley-West, Milwaukee Menomonee Valley-East, and West Allis centers. These six centers encompassed a total area of about 850 acres of manufacturing and warehousing land uses, excluding off-street parking. The land use plan for the study area proposes to retain all six of these regional centers within the study area through the year 2000. The plan also calls for the addition of one additional regional center in the study area—Milwaukee-Granville—in an area located roughly between N. 68th Street on the east, N. 107th Street on the west, W. Brown Deer Road on the south, and W. Good Hope Road on the north. This industrial center is expected to encompass about 1,100 net industrial acres by the year 2000, making it the largest contiguous center in the Region.

Source: SEWRPC.

Table 199

EXISTING AND PROPOSED INDUSTRIAL LAND USE IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970-2000

Industrial Land Use Type	Acres		
	Milwaukee County Portion	Ozaukee County Portion	Total Study Area
Major			
Existing 1970	850	- -	850
Planned Increment	1,116[a]	- -	1,116
Total 2000	1,966	- -	1,966
Community and Other			
Existing 1970	920	604	1,524
Planned Increment	4	357	361
Total 2000	924	961	1,885
Total			
Existing 1970	1,770	604	2,374
Planned Increment	1,120	357	1,477
Total 2000	2,890	961	3,851

[a] *According to the land use classification criteria promulgated by the Commission, a contiguous aggregation of industrial land use is classified as a community industrial center until it exceeds 240 net acres, at which time it is classified as a major, or regional, industrial center. In 1970, the 96 acres of industrial land included within the Milwaukee Granville Industrial Land Bank area was consequently classified as a community center. By the year 2000, contiguous industrial acreage in the Granville Land Bank area is planned and expected to increase by 1,116 acres, so that this area can then be developed as a regional industrial center. These 1,116 acres are to be composed of the 96 existing industrial acres contained in this land bank area in 1970, plus an additional 1,020 acres to be added to this area by the year 2000. Because of this reclassification of community acreage, the planned increment in community industrial acreage is calculated as: (- 96 acres [converted within the land bank area to major industrial status]) + (100 acres [actual community acreage added throughout the Milwaukee County portion of the study area]), to equal 4 net acres of community status industrial land in this portion of the study area.*

Source: SEWRPC.

2,350 acres of new transportation, communication, and utility land uses by the year 2000, with 1,095 acres being added in the Milwaukee County portion of the study area and about 1,250 acres being added in the Ozaukee County portion of the study area, bringing the existing stock of such land within the study area to about 20,680 acres—an increase of about 13 percent over the 1970 level. Major transportation centers, including major bus and rail terminals and major airports, along with major utility plants, including public sewage treatment plants and major electric power generation plants, are shown on Map 192. Of the five major centers in the study area in 1970—Timmerman Field, and the Cedarburg, Grafton, Saukville, and Thiensville

Map 191

MAJOR GOVERNMENTAL AND INSTITUTIONAL CENTERS IN THE STUDY AREA: YEAR 2000 LAND USE PLAN

The land use plan for the study area proposes to add about 150 acres of new governmental and institutional land, about 60 acres in the Milwaukee County portion of the study area and more than 90 additional acres in the Ozaukee County portion of the study area, by the year 2000. Existing and proposed regional governmental and institutional centers are shown on this map, including seats of county, state, and federal governments; medical complexes with at least 600 beds, 30 types of medical services, and 250 attending physicians; accredited universities; technical and vocational schools; large regional central libraries; and cultural and entertainment facilities having an annual attendance of at least 350,000 people. As proposed in 1972, the plan calls for only one additional major center, the Milwaukee Area Technical College (MATC) in Mequon, by the year 2000, so that by the design year, a total of four centers—the Milwaukee County Medical Complex, Marquette University, the Cedarburg City Library, and MATC-Mequon—will exist within the study area. The MATC center in Mequon has now been developed.

Source: SEWRPC.

Table 200

EXISTING AND PROPOSED GOVERNMENTAL AND INSTITUTIONAL LAND USE IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970-2000

Governmental and Institutional Land Use Type	Acres		
	Milwaukee County Portion	Ozaukee County Portion	Total Study Area
Major[a]			
Existing 1970.	210	1	211
Planned Increment. . .	- -	15	15
Total 2000	210	16	226
Community and Other			
Existing 1970.	3,365	540	3,905
Planned Increment. . .	60	78	138
Total 2000	3,425	618	4,043
Total			
Existing 1970.	3,575	541	4,116
Planned Increment. . .	60	93	153
Total 2000	3,635	634	4,269

[a] *Includes the following governmental centers—county seats, state and federal office buildings, medical complexes—and the following institutional centers—universities, technical and vocational schools, libraries, and cultural/entertainment centers.*

Source: SEWRPC.

sewage treatment plants—four are to remain in the year 2000, the Thiensville facility being proposed for abandonment.

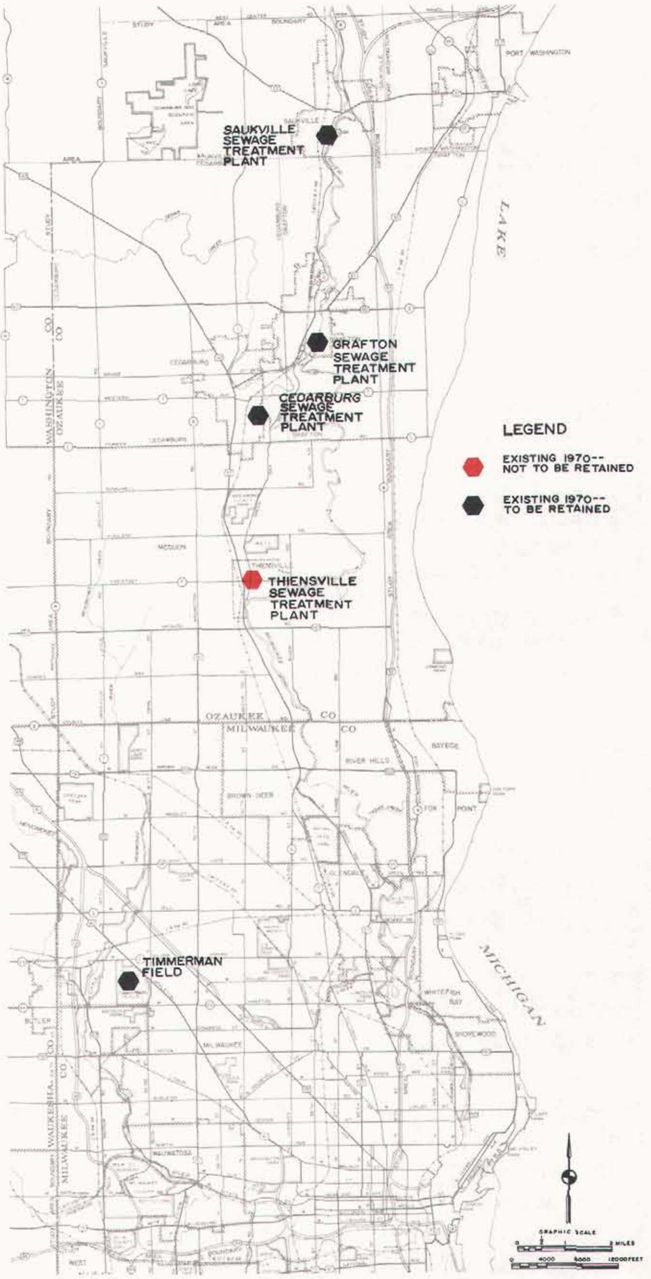
In addition to the foregoing major transportation and utility land uses, the recommended land use plan calls for the provision of about 2,339 additional acres of lands devoted to other transportation, communication, and utility uses in the study area by the year 2000—1,095 acres in the Milwaukee County portion and 1,244 acres in the Ozaukee County portion of the study area (see Table 201). Most of this land would be required for rights-of-way for new and improved collector and land access streets needed to serve new land use development or to provide adequate transportation service to existing urban development.

Future Recreational Land Use in the Study Area

As shown in Tables 195 through 197, under the year 2000 land use plan for the study area, more than 290 acres of land would be added to the existing stock of net recreational land use—44 acres in the Milwaukee County portion and 250 acres in the Ozaukee County portion of the study area. This represents an increase of about 6 percent over

Map 192

MAJOR TRANSPORTATION AND UTILITY CENTERS IN THE STUDY AREA: YEAR 2000 LAND USE PLAN



The land use plan for the study area proposes to add about 2,350 acres of new transportation, communication, and utility land uses to the existing stock of 18,340 acres of such land by the year 2000, with 1,095 acres being added in the Milwaukee County portion of the study area and about 1,250 acres being added in the Ozaukee County portion of the study area. Major transportation centers, including major bus and rail terminals and major airports, along with major utility plants, including public sewage treatment plants and major electric power generation plants, are shown on this map. Of the five major centers in the study area in 1970—Timmerman Field and the Cedarburg, Grafton, Saukville, and Thiensville sewage treatment plants—four are to remain in the year 2000, the Thiensville sewage treatment facility being proposed for abandonment.

Source: SEWRPC.

Table 201

EXISTING AND PROPOSED TRANSPORTATION, COMMUNICATION, AND UTILITY LAND USE IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970-2000

Transportation, Communication, and Utility Land Use Type[a]	Acres		
	Milwaukee County Portion	Ozaukee County Portion	Total Study Area
Major[b]			
Existing 1970.	381	6	387
Planned Increment. . .	- -	9	9
Total 2000	381	15	396
Community and Other			
Existing 1970.	13,554	4,395	17,949
Planned Increment. . .	1,095	1,244	2,339
Total 2000	14,649	5,639	20,288
Total			
Existing 1970.	13,935	4,401	18,336
Planned Increment. . .	1,095	1,253	2,348
Total 2000	15,030	5,654	20,684

[a] *Includes communication and utility uses—harbor, railroad, and airport uses; truck terminals; and off-street parking associated with other land use development—as well as streets and highways.*

[b] *Includes the following transportation centers—airports, seaports, bus terminals, and rail passenger terminals—and the following utility centers—public sewage treatment plants and electric power generation plants.*

Source: SEWRPC.

the 1970 acreage. It should be noted that this additional recreational land represents only the increase recommended in land devoted to public recreational use.

One new major park is proposed for the study area under the land use plan, as shown on Map 193. Substantial additions are recommended to be made to the Mee-Kwon Park site in the Ozaukee County portion of the study area between 1970 and 2000, raising it to major park status. Five major recreational centers—Brown Deer Park, Dretzka Park, Lincoln Park, Mee-Kwon Park, and the Milwaukee County Zoo—are thus proposed for the year 2000 in the study area.

In addition to an increase in the major park acreage, the land use plan proposes expansion by 110 acres—44 acres in the Milwaukee County por-

Table 202

EXISTING AND PROPOSED RECREATIONAL LAND USE IN THE NORTHWEST SIDE STUDY AREA AND ITS COUNTY PORTIONS: 1970-2000

Recreational Land Use Type	Acres		
	Milwaukee County Portion	Ozaukee County Portion	Total Study Area
Major			
Existing 1970.	1,053	- -	1,053
Planned Increment. . .	- -	184	184
Total 2000	1,053	184	1,237
Community and Other			
Existing 1970.	3,092	939	4,031
Planned Increment. . .	44	66	110
Total 2000	3,136	1,005	4,141
Total			
Existing 1970.	4,145	939	5,084
Planned Increment. . .	44	250	294
Total 2000	4,189	1,189	5,378

Source: SEWRPC.

tion and 66 acres in the Ozaukee County portion of the study area—of the area devoted to other public outdoor recreational uses, including major special-use outdoor recreation sites and neighborhood parks (see Table 202).

Future Rural Land Use—Residential, Agricultural, and Other Open Land Use in the Study Area

There were approximately 65,200 acres of open land within the northwest side study area in 1970, including about 45,800 acres of agricultural land and about 19,400 acres of other open lands (see Table 195). As proposed under the land use plan for the study area, the expansion of urban activities into these land uses would result in the conversion of about 9,810 acres of rural land to urban land uses in the study area between 1970 and 2000. Much of this urban expansion into the study area—8,025 acres—would take place on lands now in agricultural use, and would result in a decrease of about 18 percent in the existing stock of agricultural land within the study area. However, the regional land use plan recommended expansion into only those agricultural lands which were already committed to urban development because of proximity to expanding urban uses. As indicated in Table 197, the greater part of this agricultural land use stock, about 5,333 acres of the 8,025 acres, or 66 percent of the total agricultural land use taken, would be in the Ozaukee County portion of the study area.

Map 193

MAJOR PUBLIC RECREATIONAL CENTERS IN THE STUDY AREA: YEAR 2000 LAND USE PLAN

The land use plan for the study area proposes to add more than 294 acres of public parkland to the existing stock of 5,085 acres of such land, with 44 acres being added in the Milwaukee County portion of study area and 250 acres being added in the Ozaukee County portion of the study area. One new major regional park is proposed to be developed in the study area under the land use plan as shown on this map—Mee-Kwon Park in the Ozaukee County portion of the study area. This park is to be raised to regional park status by substantial additional land acquisition. Four major regional parks—Brown Deer Park, Lincoln Park, Dretzka Park, and Mee-Kwon Park—are thus proposed for the year 2000 in the study area. In addition, the Milwaukee County Zoo, a regional special-purpose recreational facility, lies within the study area.

Source: SEWRPC.

In addition to agricultural lands, there were more than 19,400 acres of other open lands in the study area in 1970, of which 72 percent was in the Ozaukee County portion of the study area. This land included woodlands, water, wetlands, and other unused land. As indicated in Table 195, a total of 2,350 acres, or 12 percent of the remaining acreage of open land, would be converted to urban use by the year 2000. Under the plan, most of this remaining open land—more than 1,730 acres, or 74 percent—would be taken from the Milwaukee County portion of the study area for conversion to urban uses.

Besides the consumption of rural land uses by urban growth in the study area, the plan anticipates the conversion of 565 acres of land to rural residential, or rural estate, uses. All of this conversion will take place in the Ozaukee County portion of the study area, and is proposed to be of such low density that the character of the surrounding land will be preserved.

SUMMARY AND CONCLUSIONS

One of the purposes of the Milwaukee Northwest Side/Ozaukee County transportation improvement study is to find the best means of meeting the probable future transportation needs of northwestern Milwaukee County and southern Ozaukee County in the absence of the Park Freeway-West and the Stadium Freeway-North "gap closure." A necessary step in the assessment of these future transportation needs is the consideration of probable future change within the area in those factors affecting transportation needs.

Such change in the northwest side study area, as considered in the recently completed regional land use and transportation plan reevaluation, is in part forecast and in part planned. This is because under that planning effort, the probable future change in population and economic activity levels within the Region as a whole had to be anticipated, or forecast, since the control of such levels was considered to be largely outside the scope of regional land use and transportation planning, as well as largely, although not entirely, outside the scope of governmental activity at regional and local levels. However, because the future spatial distribution of the land use pattern required to accommodate the forecast population and economic activity levels was considered to be within the scope of regional and local governmental activity, alternative normative land use plan designs, and not forecasts, were prepared for this future spatial distribution to the year 2000, and a plan to shape and guide future land use development in the Region, of which the northwest side study area is an integral part, was selected from among the alternatives considered and adopted.

This chapter has reviewed the forecasts of the level and characteristics of future population and economic activity in the Region prepared as part of the land use-transportation plan reevaluation. Projections of land use demand and automobiles available were also summarized. Moreover, the recommended spatial distribution of population, employment, and attendant supporting land uses to the year 2000 set forth in the adopted regional land use plan were summarized, and the allocations of anticipated regional population, economic activity, and land use change under the adopted land use plan to the northwest side study area were detailed.

The following points summarize the expected change in regional population and economic activity, regional land use, and, as a result, anticipated and planned change in the northwest side study area to the year 2000.

1. The population of the Region is forecast to increase from about 1,756,000 persons in 1970 to about 2,219,300 persons in the year 2000, an increase of about 463,000 persons, or about 26 percent, over the 30-year period. As a result of expected declines in household size in the Region, the number of households in the Region is forecast to increase faster than population—from 536,500 households in 1970 to about 747,700 in the year 2000, or an increase of 39 percent. The number of automobiles available in the Region is expected to reach 1,168,000 by the year 2000, an increase of approximately 534,100 automobiles, or 84 percent, over the 1970 level. The corresponding ratio of persons per available auto is projected to decline in the Region from 2.77 in 1970 to 1.90 by the year 2000.

2. Employment in the Region is forecast to reach 1,016,000 jobs by the year 2000—an increase of about 274,400 jobs, or 37 percent, over the 1970 level of 741,600 jobs. It is envisioned that the number of jobs in all seven counties will increase, with the largest increases occurring in Milwaukee and

Waukesha Counties. The proportion of total regional employment in Milwaukee County, however, is forecast to continue to decline, reflecting the continued decentralization of jobs in the Region.

Manufacturing is forecast to continue to be the largest employment group in the Region, and, along with trade, governmental and educational services, and private service industry groups, is expected to increase in employment between 1970 and 2000. Only one industry group, agriculture, is expected to decline in employment during the forecast period.

3. The adopted land use plan for the Region to the year 2000 recommends the centralization of land use development in the Region to the greatest degree practicable, and encourages new urban development to occur at densities consistent with the economical provision of public centralized sanitary sewer, water supply, and public transit facilities and services. It further recommends that such development occur only in areas covered by soils well suited to urban use, and not subject to special hazards such as flooding, and in those areas contiguous to existing urban centers, and, consequently, into which urban facilities and services can be readily and economically extended. Present trends in regional population decentralization are to be reversed under the land use plan in the middle to late 1980's, at which time the central areas of the Region are envisioned to again experience population growth. Continued moderate population growth is forecast in Ozaukee, Washington, and Waukesha Counties, with slower rates of growth in Kenosha, Racine, and Walworth Counties. Milwaukee County, currently experiencing a significant decline in population, would, under the adopted normative land use plan, be expected to lose population until about 1980, at which time its population would stabilize. After 1980, the population of Milwaukee County would again begin to increase.

4. The adopted regional land use plan for the year 2000 proposes to accommodate forecast increases in regional population and employment through the conversion of approximately 113 square miles of land from rural to urban use by the year 2000. Over one-half of this land would be converted to urban residential use, virtually all at medium-density development. In total, the recommended land use plan would accommodate an increase of approximately 26 percent in the regional population, 39 percent in households, and 37 percent in employment, along with an increase of approximately 22 percent in urban land area. Over the planning period, the population density within the developed area of the Region under the recommended land use plan would continue its historical decline since 1920, but at a significantly reduced rate—decreasing from the 1970 level of about 4,300 persons per square mile to a year 2000 level of about 3,500 persons per square mile.

   The plan provides for the addition of four major retail and service centers, five major industrial centers, and two major parks in the Region by the year 2000. In addition, it includes definitive recommendations for the protection and preservation of primary environmental corridors and prime agricultural land in the Region.

5. As allocated in the adopted regional land use plan based on forecast regional levels of population and economic activity for the year 2000, the northwest side study area population in the year 2000 is anticipated to be 528,700 people, an increase of about 12,900 people, or 2 percent, over the 1970 level. The Milwaukee County portion of the study area is anticipated to lose more than 34,200 people, or about 7 percent of its total 1970 population, by the year 2000, and the Ozaukee County portion of the study area is anticipated to gain 47,100 people, or 132 percent over its 1970 level. Population increases, however, are planned to occur in the northern one-third of the Milwaukee County portion of the study area. Within the Milwaukee County portion of the study area as a whole, loss of population is anticipated to occur until about 1985, at which time a slight reversal, or population increase, is expected to the year 2000 as a result of the reversal of population decentralization and the discouragement of "urban sprawl" called for under the regional land use plan. Because of continued decreases

in household size forecast in the Region and study area to the year 2000, the number of households in the study area is anticipated to increase faster than population. Both Milwaukee and Ozaukee Counties are expected to experience increases in the number of households to the year 2000—15,200 and 14,100 households, respectively.

6. Under implementation of the adopted regional land use plan and based on the forecast regional levels of population and economic activity for the year 2000, the employment level of the study area for the year 2000 is anticipated to increase by 44,000 jobs, or 21 percent, over the 1972 employment level to 252,100 jobs. The employment level of the Milwaukee County portion of the study area is anticipated to increase by 30,700 jobs, or by nearly 16 percent, while the employment level of the Ozaukee County portion of the study area is to increase by 13,300 jobs, or by about 102 percent. Although the growth in employment in the Ozaukee County portion is anticipated and planned to be significantly greater than that in the Milwaukee County portion, employment in the Milwaukee County portion may be expected to represent nearly 90 percent of total employment in the study area in the year 2000.

7. The adopted regional land use plan calls for the conversion of 9,810 acres of rural land in the study area to urban uses from the year 1970 to 2000. Most of the new urban development is to occur in a highly centralized manner, largely in concentric rings outward from existing urban centers, including, importantly, the northwestern corner of the City of Milwaukee and areas in and around the Village of Thiensville and Grafton and the City of Cedarburg. Over one-half of this new urban land is to be converted to urban residential uses, virtually all at medium densities. The 17 percent increase in urban land in the study area to the year 2000 is planned to accommodate the 2 percent increase in study area population, 18 percent increase in households, and 21 percent increase in employment anticipated to occur over the same period. Over the plan design period, one major retail service center, one major industrial center, and one major park are planned to be added to the study area.

The Region and study area may be expected to be quite different in the future than at present, based upon the adopted regional land use plan and the forecasts of regional activity. Population may be expected to increase by 26 percent in the Region and 2 percent in the study area. Employment may be expected to increase by 37 percent in the Region and 21 percent in the study area. The number of households may be expected to increase by 39 percent in the Region and 18 percent in the study area. Although even greater increases may be expected to occur in the outlying portions of the Region than in the study area, the central parts of the Region—importantly, Milwaukee County—and of the study area—its Milwaukee County portion—are envisioned to remain the dominant centers of activity in the Region and study area, and to experience an increase in numbers of households and level of employment by the year 2000.

One implication of this anticipated and planned future change would appear to be significant increases in future levels of tripmaking in the Region and the study area. However, because the land use plan recommends a reversal of historic land use trends in the study area and Region through the centralization of new urban land use and development of new urban land uses at densities which can economically support urban facilities and services, including, importantly, public transit, a potential should exist for effecting a more efficient means of meeting this travel demand.

Chapter VII

ALTERNATIVE AND RECOMMENDED LONG-RANGE TRANSPORTATION SYSTEM PLANS

INTRODUCTION

Growth, change, and redistribution in population and economic activity, together with attendant increases in the demand for transportation facilities and services, appear likely within the Region to the turn of the century. Under the normative regional land use plan described in Chapter VI, increases in the demand for transportation facilities and services appear likely as well in the northwest corridor study area. Consequently, a question facing citizen leaders and public officials within the northwest corridor area is how such increased travel demand may best be accommodated in the future by transportation systems management actions, the improvement and expansion of public transit facilities and services, and the improvement and expansion of the arterial street system of the study area.

The future demand for transportation in the northwest corridor area may be accommodated in various combinations of these three types of actions, and could include taking no action. These alternative transportation system plans could be expected to meet the agreed-upon transportation system development and management objectives to varying degrees. Because of this, and because the adopted objectives are comprehensive, a critical and particularly difficult task in the planning process will be selecting from the possible alternative system plans the one which offers the greatest potential for the balanced attainment of the objectives.

In an attempt to help resolve this problem, it is proposed that alternative transportation system plans be designed, tested, and evaluated in a stepwise procedure, in which each successive alternative plan is designed to more fully resolve the transportation system problems and deficiencies which remain unresolved under the previous plan. The first plan considered is that of taking no further action, the "status quo"—or baseline—alternative plan. The second plan considered consists solely of traffic management measures of relatively low capital cost and minimal disruption to the urban fabric, actions which are directed at obtaining the maximum capacity from the existing arterial street and highway system in order to resolve the problems and deficiencies inherent in the "status quo" plan, and actions directed at the improvement and expansion of the public transit system.

Consideration of transportation systems management and public transit actions in this manner is intended to assure that such actions are adequately explored under the study prior to consideration of any arterial street improvement or expansion. It has been contended in the past that such existing systems management and transit system improvement actions have lower financial and social costs than do arterial street improvement and expansion actions and can provide similar mobility and economic advantages to the latter, but have not been adequately considered in transportation system planning. The third plan considered is directed toward resolving the deficiencies which remain under the second, or combined traffic management and transit, plan, and includes actions to improve and expand the arterial street system of the study area.

The following sections of this chapter describe these three alternative transportation system plans: the "status quo" plan; the transportation system plan limited to traffic management actions and transit improvement and expansion actions; and the transportation system plan which includes, in addition to systems management and transit improvement actions, arterial street improvement and expansion actions. The characteristics of each of the three alternative transportation system plans are initially set forth, followed by a description of the amount of travel expected to be accommodated and the means by which such travel is to be accommodated under each plan; the measurement of the degree to which each plan meets the adopted transportation systems management and development objectives, principles, and standards; and, in conclusion, the identification of the deficiencies which remain unresolved under that transportation system plan.

It should be noted that designing each of the transportation system plans will be a difficult step in the planning process. The sheer size of the system being planned, together with the complex interaction between each of the components of the transportation system, and between the transportation system and the land use pattern, make the design task a particularly difficult one. The need to design the plan to serve probable future, as well as existing, conditions in the study area, conditions which could be significantly different from those which presently influence transportation needs in the study area, further complicates this task. One aid in designing the plans, however, will be the fact that each plan will aim to resolve the unmet needs of the previous plan examined under the study.

The consideration of the alternative transportation system plans will necessarily involve quantitative testing, including the preparation of forecasts of the amount of travel each element of each proposed transportation system plan may be expected to carry. Without such forecasts, the degree to which the plans meet certain objectives cannot be ascertained. The provision of new or improved transportation facilities and services will affect traffic flows on the remainder of the system, diverting persons and vehicles to or from other facilities and services, which, together with the new or improved facilities, constitute the total transportation system. No alternative transportation system plan can be soundly planned or designed without determining the probable utilization of the proposed facilities and services, and the attendant effects of the utilization on the remainder of the transportation system. In addition, it must be recognized that future travel patterns in the northwest side study area and the Region will differ from existing patterns in form and intensity, as existing land uses change and as new land uses are added to the regional complex. Therefore, it is necessary to quantitatively test alternative transportation system plans by estimating the probable future levels of travel demand based on the future land use pattern, and the distribution of that demand over the proposed transportation facilities and services. This quantitative testing of alternative transportation system plans is an important part not only of the planning process, constituting an invaluable aid in plan evaluation, but also of the subsequent stepwise plan synthesis, providing an important basis for the assessment of the engineering feasibility of the alternative plans and of the degree to which each of the alternative plans meets the transportation systems development and management objectives.

The procedures, including the mathematical travel and traffic simulation models, to be used in the quantitative test and evaluation of alternative transportation system plans under the study are described in Chapter IV of SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000. The inputs required to apply these simulation models in the forecast of future travel and traffic conditions in the study area were described in Chapter VI of this report, which presented pertinent data on the probable future levels of population, employment, and land use in the study area and in the Region, as anticipated and planned for in the adopted regional land use plan. Not discussed, however, were the future costs of automobile and transit travel upon which the transportation plans examined under this study must, in part, be based. It will be assumed for the purpose of this study, based upon the midpoint of the probable ranges of future change developed under the alternative futures analysis conducted by the Commission under the concurrent Milwaukee area primary transit system alternatives analysis, that the price of motor fuel per gallon in 1979 dollars will approach $1.90 by the year 2000, and that the average fuel efficiency of the automobile fleet will approach 30 miles per gallon of motor fuel. Thus, the average cost of motor fuel to operate an automobile is anticipated under this study to remain at its present historically high level. Other costs of operating an automobile which travelers must consider, including some routine maintenance and parking costs—particularly when deciding whether to use transit as an alternative to the automobile—will be assumed to experience no significant increase in real dollar terms. The current transit fare of $0.50 will also be assumed not to increase in real dollar terms but simply to keep pace with general price inflation.

THE "STATUS QUO" TRANSPORTATION SYSTEM PLAN FOR THE NORTHWEST SIDE STUDY AREA

One possible course of action for the provision of transportation services and facilities in the northwest side study area would be to make no major improvements in, and not to provide for any expansion of, the facilities and services provided by the existing transportation system. This alternative would propose to serve the existing and probable future travel demand of the study area entirely with the existing arterial streets and highways and public transit facilities and services. The "status quo" or "no build" alternative represents a possible transportation policy alternative for the study area—specifically, that of minimizing capital investment in transportation facilities and services. From a technical standpoint, consideration of a "status quo" plan also provides a required point of departure for the development of alternative transportation plans which do incorporate facility and service improvements, by establishing quantitatively the consequences of "doing nothing" in terms of future levels of service provided, needs not met, and problems and deficiencies, and in terms of the environmental impacts which result from "doing nothing."

Characteristics of Base Year Transportation System

In defining the "status quo" transportation system plan for the study area in the plan design year, a number of assumptions had to be made regarding the status of the public transit and arterial street and highway systems. The basic structure of the "status quo" arterial street and highway system was assumed to be the arterial street system as it was inventoried for the base year 1978. This arterial street and highway system was modified for use as the "status quo" system by including all arterial street and highway system improvements or expansion completed during the year 1979, or scheduled for construction and completion during the 1980 annual element of the transportation improvement program for the Milwaukee urbanized area.[1] Regarding the capacity of the arterial street system, only those arterial streets in which peak-hour curb parking was prohibited in 1978 were assumed to have such restrictions under the "status quo" plan, and the signal timing in effect in 1978 was assumed to be continued.

The "status quo" public transit system was defined to include the primary, secondary, and tertiary transit routes in operation in the study area in 1980. In addition, the level of service on the "status quo" public transit system, as measured by the frequency of service, or headway interval, was assumed to be identical to the service level existing on the public transit system in 1980. Because the findings and recommendations of the northwest corridor study are intended to provide an amendment to the adopted long-range regional transportation system plan only as that plan relates to the northwest side study area, the transportation system of the remainder of the Southeastern Wisconsin Region was assumed to approximate that recommended in the adopted long-range transportation system plan for the year 2000 in the quantitative testing of the "status quo" plan, and of all other alternative transportation system plans for the study area.

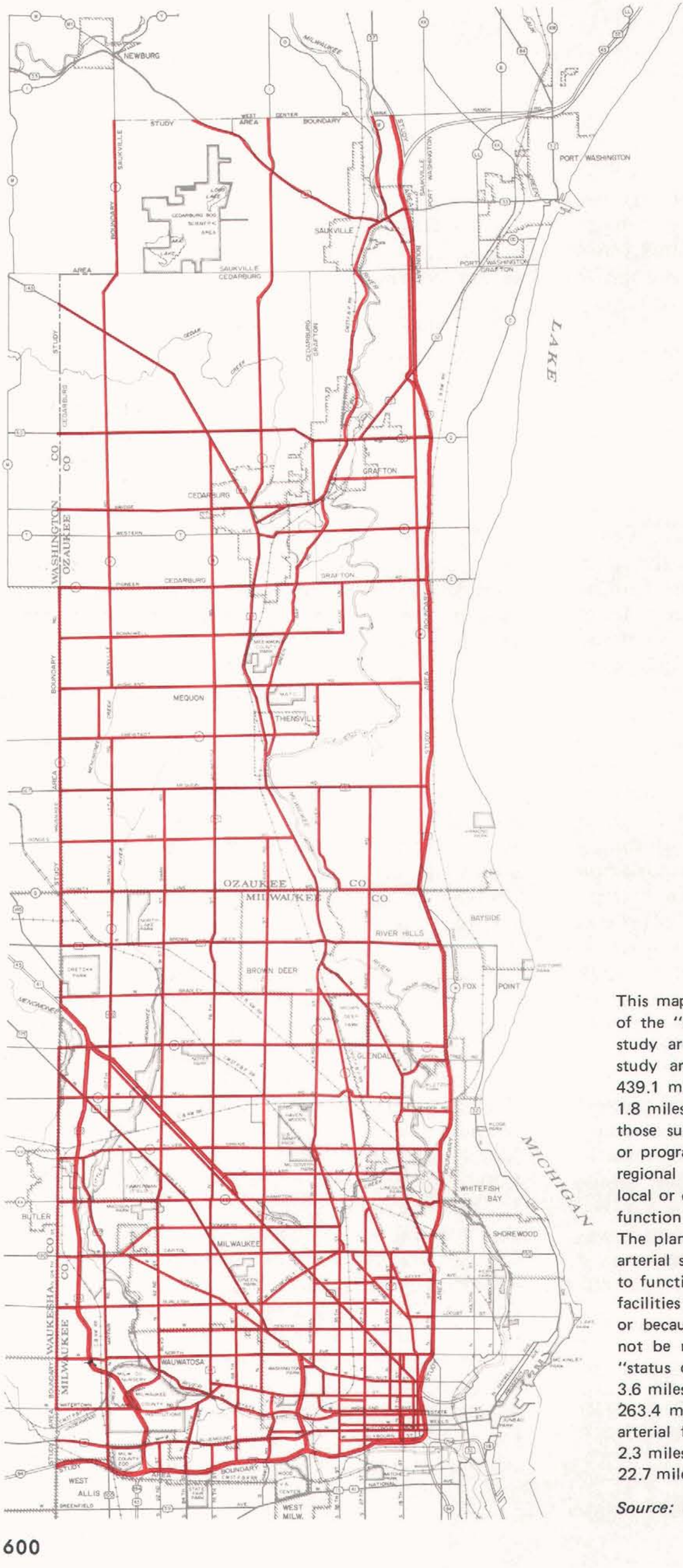
The "status quo" arterial street and highway system for the study area is shown on Map 194. The number of miles of arterial streets and highways in the study area is categorized by facility type in Table 203. The planned increment shown in this table for the "status quo" plan accounts only for those surface arterial streets and highways completed since 1978 or programmed for completion in the 1980 annual element of the regional transportation improvement program, or whose current local or collector function is proposed to be changed to an arterial function under anticipated year 2000 travel demand conditions. The planned increment also includes, as deletions, those existing arterial streets and highways which are not proposed to continue to function as arterials by the year 2000 either because replacement facilities have been constructed or are programmed for construction, or because, under year 2000 travel demand conditions, they will not be needed to serve an arterial function.

The total arterial street and highway system of the study area would only minimally increase under the "status quo" plan—from 439.1 miles in 1978, to 440.9 miles in 2000, an increase of 1.8 miles, or 0.04 percent. In the Milwaukee County portion of the study area, the supply of arterial streets and highways would increase under this plan, from 273.9 miles in 1978 to 274.1 miles in the year 2000—an increase of 0.2 mile, or 0.01 percent. In the Ozaukee County portion of the study area, this increase would be from 165.2 miles in 1978 to 166.8 miles in 2000, an increase of 1.6 miles, or 1 percent. Specifically, in the Milwaukee County portion of the study area, the only additions to the existing 1978 arterial street system assumed were N. 60th Street from W. Florist Avenue to W. Mill Road; the completion of the Hillside Interchange in accordance with recommendations set forth in Chapter V of this report; and the new Harwood Avenue bridge connecting Harwood and N. Wau-

[1] *See A Transportation Improvement Program for the Kenosha, Milwaukee, and Racine Ubanized Areas in Southeastern Wisconsin: 1980-1984, adopted by SEWRPC in December 1979.*

Map 194

ARTERIAL STREET AND HIGHWAY SYSTEM IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

FREEWAY

STANDARD ARTERIAL

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

This map shows the arterial street and highway system component of the "status quo" alternative transportation system plan for the study area. The total arterial street and highway system of the study area would, under the "status quo" plan, increase from 439.1 miles in 1978 to 440.9 miles in 2000, an increase of only 1.8 miles, or four-tenths of 1 percent. This increment accounts for those surface arterial streets and highways completed since 1978 or programmed for completion in the 1980 annual element of the regional transportation improvement program, or whose current local or collector function is proposed to be changed to an arterial function under anticipated year 2000 travel demand conditions. The planned increment also reflects the deletion of those existing arterial streets and highways which are not proposed to continue to function as arterials by the year 2000 either because replacement facilities have been constructed or are programmed for construction, or because under year 2000 travel demand conditions, they will not be needed to serve in an arterial function. Specifically, the "status quo" plan calls for a decrease within the study area of 3.6 miles, or 1.3 percent, in two-lane arterial facilities—from 267 to 263.4 miles; an increase of 3.1 miles, or 3.1 percent, in four-lane arterial facilities—from 101.2 to 104.3 miles; and an increase of 2.3 miles, or 11.3 percent, in six-lane arterial facilities—from 20.4 to 22.7 miles .

Source: SEWRPC.

Table 203

ARTERIAL STREETS AND HIGHWAYS IN THE STUDY AREA BY FACILITY TYPE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Arterial Facility Type	Existing 1978		Planned Increment		Year 2000	
	Miles	Percent of Total	Miles	Percent Change	Miles	Percent of Total
Total Study Area						
Freeway						
Four Lanes	21.0	4.8	--	--	21.0	4.8
Six Lanes	29.1	6.6	--	--	29.1	6.6
Eight Lanes	0.4	0.1	--	--	0.4	0.1
Standard Arterial						
Two Lanes	267.0	60.8	-3.6	-1.3	263.4	59.7
Four Lanes	101.2	23.0	3.1	3.1	104.3	23.7
Six Lanes	20.4	4.7	2.3	11.2	22.7	5.1
Total	439.1	100.0	1.8	0.4	440.9	100.0
Milwaukee County Portion						
Freeway						
Four Lanes	5.7	2.1	--	--	5.7	2.1
Six Lanes	29.1	10.6	--	--	29.1	10.6
Eight Lanes	0.4	0.1	--	--	0.4	0.1
Standard Arterial						
Two Lanes	119.0	43.4	-5.2	-4.4	113.8	41.5
Four Lanes	99.3	36.3	3.1	3.1	102.4	37.4
Six Lanes	20.4	7.5	2.3	11.3	22.7	8.3
Total	273.9	100.0	0.2	0.1	274.1	100.0
Ozaukee County Portion						
Freeway						
Four Lanes	15.3	9.3	--	--	15.3	9.2
Six Lanes	--	--	--	--	--	--
Eight Lanes	--	--	--	--	--	--
Standard Arterial						
Two Lanes	148.0	89.6	1.6	1.1	149.6	89.7
Four Lanes	1.9	1.1	--	--	1.9	1.1
Six Lanes	--	--	--	--	--	--
Total	165.2	100.0	1.6	1.0	166.8	100.0

Source: SEWRPC.

watosa Avenues in the City of Wauwatosa. Deletions from the arterial street system within Milwaukee County under the "status quo" plan include only Harwood Avenue between the Menomonee River and N. Wauwatosa Avenue in the City of Wauwatosa, which will revert to a collector street. One arterial street segment in the Ozaukee County portion of the study area, Falls Road from Port Washington Road (CTH W) to Wisconsin Avenue (STH 57), was assumed to be added to the arterial street and highway network under the "status quo" plan alternative.

As shown in Table 203, based on actual construction in 1979, programmed construction in 1980, or attendant changes in arterial function, the "status quo" transportation system alternative calls for a decrease of 3.6 miles, or 1.3 percent, in two-lane arterial facilities—from 267 to 263.4 miles; an increase of 3.1 miles, or 3.1 percent, in four-lane arterial facilities—from 101.2 to 104.3 miles; and an increase of 2.3 miles, or 11.3 percent, in six-lane arterial facilities, from 20.4 to 22.7 miles, within the study area. Of these additional facilities, the Milwaukee County portion of the study area would

Table 204

PUBLIC TRANSIT FACILITIES IN THE STUDY AREA: 1980 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Transit Facilities Characteristic	Existing 1980		Total 2000	
	Miles	Percent of Total	Miles	Percent of Total
Total Study Area				
Route Miles				
Primary	96.3	21.1	96.3	21.1
Secondary	7.6	1.7	7.6	1.7
Tertiary	351.3	77.2	351.3	77.2
Total	455.2	100.0	455.2	100.0
	Miles		Miles	
Special Facilities				
Exclusive Rights-of-Way	--		--	
Exclusive Lanes on Streets	--		--	
	Vehicles		Vehicles	
Vehicle Requirements[a]				
Peak Period	329		329	
Midday Period	210		210	
Bus Miles per Day	37,500		37,500	

[a] *Vehicle requirements are for those routes serving the study area.*

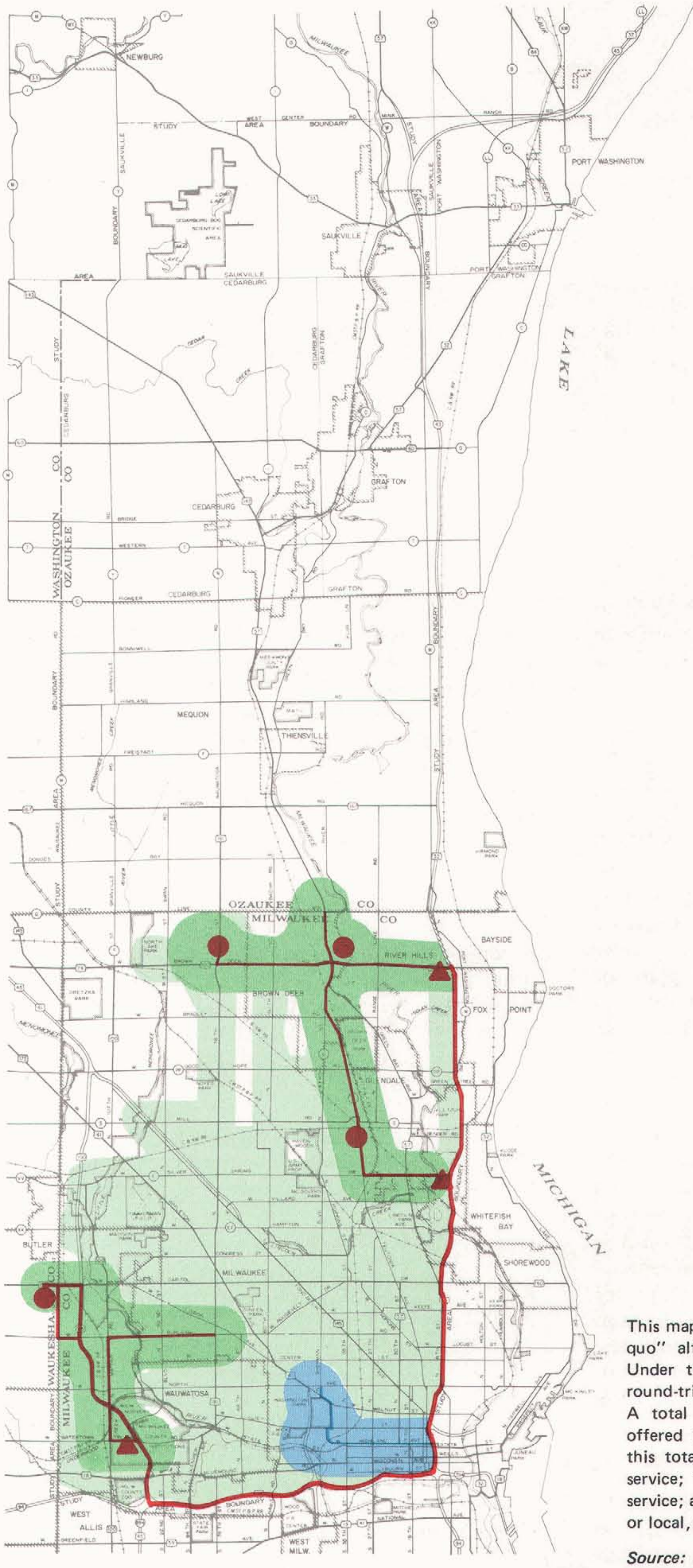
Source: SEWRPC.

account for 5.2 miles of the decrease in two-lane facilities; 3.1 miles, or 100 percent, of the additional four-lane facilities; and 2.3 miles, or 100 percent, of the additional six-lane facilities. The Ozaukee County portion of the study area would account for a 1.6-mile, or 1.1 percent, increase in the total miles of two-lane arterial facilities.

The public transit system component of the "status quo" alternative transportation system plan for the northwest side study area is shown on Map 195 and summarized in Table 204. As seen by the tertiary, secondary, and primary public transit service areas shown on Map 195, and as indicated in Table 204, under the "status quo" public transit system neither the service area nor the round-trip route miles operated, the bus miles operated, or the number of buses required would change from 1980 levels.

Automobile Availability

The forecast number of automobiles available to residents of the study area under the "status quo" plan alternative is set forth in Table 205. Under this alternative, about 260,350 automobiles would be available to residents of the study area in the year 2000, or about 24 percent of all regional automobiles in the year 2000, as compared with about 188,990 automobiles, or 27 percent of all regional automobiles, in 1972. This level of automobile availability in the study area represents an increase of about 71,360 autos, or about 38 percent, over the 1972 level, as compared with an increase of 391,500 autos, or about 56 percent, over the same period in the Region as a whole. Consequently, the number of persons per automobile in the study area would, over this period, decline from 2.69 in 1972 to 2.03 in 2000, a decrease of 0.66 person per automobile, or nearly 25 percent, as com-



Map 195

PUBLIC TRANSIT SYSTEM IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

LEGEND

TRANSIT SERVICE AREA,

- PRIMARY
- SECONDARY
- LOCAL

TRANSIT SERVICE ROUTES

- PRIMARY ROUTE ON FREEWAY
- PRIMARY ROUTE COLLECTION / DISTRIBUTION EXTENTION
- SECONDARY ROUTE

PRIMARY TRANSIT STATIONS

- PARK-RIDE LOT
- TRANSIT STATION

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

This map shows the public transit system component of the "status quo" alternative transportation system plan for the study area. Under this alternative, neither the transit service areas nor the round-trip route miles operated would change from the 1980 levels. A total of 455.2 route-miles of public transit service would be offered under the "status quo" transportation system plan. Of this total, 96.3 miles, or 21.1 percent, would consist of primary service; 7.6 miles, or 1.7 percent, would consist of secondary service; and 351.3 miles, or 77.2 percent, would consist of tertiary, or local, service.

Source: SEWRPC.

Table 205

AUTOMOBILES AVAILABLE IN THE STUDY AREA AND THE REGION
1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Area	Existing 1972			Planned 2000		
	Population	Number of Automobiles	Persons per Auto	Population	Number of Automobiles	Persons per Auto
Total Study Area	507,470	188,989	2.69	528,650	260,350	2.03
Milwaukee County Portion . . .	467,230	170,333	2.74	445,890	218,070	2.04
Ozaukee County Portion.	40,240	18,656	2.16	82,760	42,280	1.96
Region	1,810,700	704,600	2.60	2,166,900	1,096,100	2.00

Source: SEWRPC.

pared with a change in the Region as a whole from 2.60 to 2.00 persons per automobile over this period. Recent figures indicate that from 1972 to 1979, the number of persons per automobile in the Region has already decreased to 2.2 persons per automobile.

Person Trip Generation

The distribution of internal person trips in the Region which may be expected to be generated in the study area on an average weekday in the year 2000 under the "status quo" plan is set forth in Table 206 by trip purpose. If fully developed, the land use pattern proposed under the adopted land use plan for the northwest corridor area, together with the transportation system proposed under the "status quo" transportation system plan for that area, may be expected to generate more than 1.40 million person trips internal to the Region on an average weekday in the year 2000, or nearly 25 percent of all internal person trips made within the Region. As shown in Table 206, this represents an increase of about 22 percent over the approximately 1.16 million person trips internal to the Region generated within the study area on an average weekday in 1972. Nearly 85 percent of these trips would be generated by the Milwaukee County portion of the study area, with the remaining 15 percent generated by the Ozaukee County portion. This 22 percent increase can be compared to an expected increase in population within the study area of 4 percent, households of 18 percent, and automobile availability of 28 percent over the same period.

Mode of Travel

Table 207 shows the distribution of trips generated in the study area and internal to the Region by mode of travel under the "status quo" transportation system plan. Under this alternative, 940,600 auto driver trips would be generated in the study area and internal to the Region in the year 2000, an increase of 195,200 trips, or 26 percent, over the 1972 figure; 336,200 auto passenger trips would be generated, an increase of 24,800 trips, or 8 percent, over the 1972 figure; 85,000 transit passenger trips would be generated, an 18 percent increase over the 1972 figure; and 44,500 school passenger trips would be generated, an increase of 16,800 trips, or 61 percent, over the 1972 figure.

The trip purposes at the trip destination for transit person trips, automobile person trips, and automobile driver trips generated under this "status quo" plan within the study area and internal to the Region are indicated in Tables 208, 209, and 210, respectively. Total vehicle trip production, including both automobiles and trucks, is shown in Table 211. On an average weekday under the "status quo" alternative, total vehicle trips may be expected to increase by about 24 percent—from about 856,700 trips in the study area and internal to the Region in 1972 to about 1,061,900 trips in 2000.

EVALUATION OF THE "STATUS QUO" ALTERNATIVE TRANSPORTATION SYSTEM PLAN—SATISFACTION OF OBJECTIVES AND STANDARDS

The extent to which the "status quo" plan meets the agreed-upon transportation system development and management objectives and standards for the study area provides a measure of the extent to which a course of action involving no further trans-

Table 206

DISTRIBUTION OF TOTAL INTERNAL PERSON TRIPS IN THE STUDY AREA AND THE REGION BY TRIP PURPOSE: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Trip Purpose Category	Internal Person Trips on an Average Weekday					
	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Total Study Area						
Home-Based Work	288,000	24.9	63,200	21.9	351,200	25.0
Home-Based Shopping	166,700	14.4	37,300	22.4	204,000	14.5
Home-Based Other	386,900	33.5	81,500	21.1	468,400	33.3
Nonhome-Based	212,000	18.3	45,700	21.6	257,700	18.3
School	102,900	8.9	22,100	21.5	125,000	8.9
Total	1,156,500	100.0	249,800	21.6	1,406,300	100.0
Milwaukee County Portion						
Home-Based Work	266,400	25.2	35,100	13.2	301,500	25.2
Home-Based Shopping	154,900	14.6	20,500	13.2	175,400	14.7
Home-Based Other	353,500	33.4	47,200	13.4	400,700	33.6
Nonhome-Based	197,400	18.7	30,100	15.2	227,500	19.1
School	86,200	8.1	2,400	2.8	88,600	7.4
Total	1,058,400	100.0	135,300	12.8	1,193,700	100.0
Ozaukee County Portion						
Home-Based Work	21,600	22.0	28,100	130.1	49,700	23.4
Home-Based Shopping	11,800	12.0	16,800	142.4	28,600	13.5
Home-Based Other	33,400	34.1	34,300	102.7	67,700	31.8
Nonhome Based	14,600	14.9	15,600	106.8	30,200	14.2
School	16,700	17.0	19,700	118.0	36,400	17.1
Total	98,100	100.0	114,500	116.7	212,600	100.0

Source: SEWRPC.

portation system improvement of any kind can meet the transportation needs of the area. The transportation system development and management objectives adopted under the study, together with the standards to be evaluated against those objectives, are set forth in Chapter II of this report. To determine the ability of the "status quo" alternative transportation system plan to meet the development objectives, this alternative was evaluated against the standards supporting each development objective. Some of these standards are, by nature, comparative standards, and no desirable value can be assigned to them. These standards can be applied only through a comparison of the pertinent measures under alternative plans, and the alternative plan with the highest or lowest measurement of the standard, as the case may be, is deemed to best meet the standard.

Effectiveness of the "Status Quo" Transportation System Plan in Serving the Existing and Future Land Use Pattern of the Milwaukee Northwest Side/Ozaukee County Study Area

The first transportation system development objective formulated under the study identifies the need for an integrated transportation system which, through its location, capacity, and design, will effectively serve the existing land use pattern of northwestern Milwaukee County and southern Ozaukee County and promote implementation of the adopted regional land use plan. This objective is supported by two specific standards, one relating to maximum travel times between residential areas of the study area and major land use activity centers of the Region, and the other to the overall accessibility of residential areas of the study area to all urban land use activities in the Region.

Table 207

DISTRIBUTION OF INTERNAL PERSON TRIPS IN THE STUDY AREA BY MODE OF TRAVEL: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Mode of Travel	Internal Person Trips on an Average Weekday					
	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Total Study Area						
Auto Driver	745,400	64.5	195,200	26.2	940,600	66.9
Auto Passenger	311,400	26.9	24,800	8.0	336,200	23.9
Transit Passenger	72,000	6.2	13,000	18.1	185,000	6.0
School Passenger	27,700	2.4	16,800	60.6	44,500	3.2
Total	1,156,500	100.0	249,800	21.6	1,406,300	100.0
Milwaukee County Portion						
Auto Driver	684,000	64.6	116,000	17.0	800,000	67.0
Auto Passenger	285,400	27.0	-2,400	0.8	287,800	24.1
Transit Passenger	71,800	6.8	13,100	18.2	84,900	7.1
School Passenger	17,200	1.6	3,800	22.1	21,000	1.8
Total	1,058,400	100.0	135,300	12.8	1,193,700	100.0
Ozaukee County Portion						
Auto Driver	61,400	62.6	79,200	129.0	140,600	66.1
Auto Passenger	26,000	26.5	22,400	86.2	48,400	22.8
Transit Passenger	200	.0.2	-100	-50.0	100	0.1
School Passenger	10,500	10.7	13,000	123.8	23,500	11.0
Total	98,100	100.0	114,500	116.7	212,600	100.0

Source: SEWRPC.

Accessibility to Major Land Use Activities: The first standard under this objective specifies that the transportation system should provide service, both by public transit and by private automobile, such that the maximum number of residents within the urbanized portion of the study area are within 30 minutes travel time of 40 percent of the Milwaukee area's jobs; 35 minutes travel time of three of the Region's major retail and service centers; 30 minutes travel time of one of the Region's major medical centers, hospitals, and/or medical clinics; 40 minutes travel time of one of the Region's major parks and outdoor recreation areas; 40 minutes travel time of one of the Region's technical or vocational schools, colleges, or universities; and 60 minutes travel time of the Region's scheduled air transport facilities. These accessibility levels are considered essential to the support of the land uses within the urbanized portion of the study area.

As indicated in Table 212 and shown on Map 196, all parts of the urbanized portion of the study area would meet all of these accessibility standards for automobile travel under the "status quo" plan with the exception of the northern part of the urbanized portion of Ozaukee County, which is not accessible within 30 minutes by automobile of 40 percent of the jobs in the Milwaukee area. As shown on Maps 197 through 202, and in Table 212, these same standards are not met to the same extent for public transit under the "status quo" plan. None of the standards are met in the urbanized part of the Ozaukee County portion of the study area, principally because no transit service is accessible by walking in this part of the study area under the "status quo" plan, and "Freeway Flyer" primary transit service accessible via park-ride lots is available only to the southern part of this portion of the study area. Nearly all of the Milwaukee County portion of the study area under the "status

Table 208

DISTRIBUTION OF AVERAGE WEEKDAY INTERNAL TRANSIT TRIPS IN THE STUDY AREA BY TRIP PURPOSE: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Trip Purpose Category	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Total Study Area						
Home-Based Work	25,500	35.4	5,200	20.4	30,700	36.1
Home-Based Shopping	5,300	7.4	4,600	86.8	9,900	11.6
Home-Based Other	12,400	17.2	8,000	64.5	20,400	24.0
Nonhome-Based	4,600	6.4	-2,700	-58.7	1,900	2.2
School	24,200	33.6	-2,100	-8.7	22,100	26.0
Total	72,000	100.0	13,000	18.1	85,000	100.0
Milwaukee County Portion						
Home-Based Work	25,400	35.4	5,200	20.5	30,600	36.0
Home-Based Shopping	5,300	7.4	4,600	86.8	9,900	11.7
Home-Based Other	12,300	17.1	8,100	65.9	20,400	24.0
Nonhome-Based	4,600	6.4	-2,700	-58.7	1,900	2.2
School	24,200	33.7	-2,100	-8.7	22,100	26.0
Total	71,800	100.0	13,100	18.2	84,900	100.0
Ozaukee County Portion						
Home-Based Work	100	50.0	--	--	100	100.0
Home-Based Shopping	--	--	--	--	--	--
Home-Based Other	100	50.0	-100	-100.0	--	--
Nonhome-Based	--	--	--	--	--	--
School	--	--	--	--	--	--
Total	200	100.0	-100	-50.0	100	100.0

Source: SEWRPC.

quo" plan is provided local transit service that is accessible by walking, as well as Freeway Flyer primary transit service that is accessible by driving to park-ride lots. Transit accessibility standards for medical facilities, major education centers, and regional parks are generally met within that area served by local transit in the Milwaukee County portion of the study area. Transit accessibility standards for jobs, major retail and service centers, and a scheduled air transport facility are met under the "status quo" plan only in small parts of the Milwaukee County portion of the study area, generally limited to the southeastern corner of the study area.

Accessibility Support of Land Use Plan: The second standard under this objective requires that the relative accessibility provided by the future transportation system of northwestern Milwaukee County and southern Ozaukee County be adjusted to the land use plan for this area, providing areas in which development is to be supported or induced a higher relative accessibility than that provided to areas to be protected from urban development. An index of accessibility was computed which measured the ease with which each part of the study area could reach land use activity within the study area and the Region for both automobile and public

Table 209

DISTRIBUTION OF INTERNAL AUTOMOBILE PERSON TRIPS IN THE STUDY AREA BY TRIP PURPOSE: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Trip Purpose Category	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Total Study Area						
Home-Based Work	262,500	24.8	58,000	22.1	320,500	25.1
Home Based Shopping	161,400	15.3	32,700	20.3	194,100	15.2
Home-Based Other	374,500	35.3	73,500	19.6	448,000	35.1
Nonhome-Based	207,400	19.6	48,400	23.3	255,800	20.0
School	51,000	4.8	7,400	14.5	58,400	4.6
Total	1,056,800	100.0	220,000	20.8	1,276,800	100.0
Milwaukee County Portion						
Home-Based Work	241,000	24.9	29,900	12.4	270,900	24.9
Home-Based Shopping	149,600	15.4	15,900	10.6	165,500	15.2
Home-Based Other	341,200	35.2	39,100	11.5	380,300	35.0
Nonhome-Based	192,800	19.9	32,800	17.0	225,600	20.7
School	44,800	4.6	700	1.6	45,500	4.2
Total	969,400	100.0	118,400	12.2	1,087,800	100.0
Ozaukee County Portion						
Home-Based Work	21,500	24.6	28,100	130.7	49,600	26.3
Home-Based Shopping	11,800	13.5	16,800	142.4	28,600	15.1
Home-Based Other	33,300	38.1	34,400	103.3	67,700	35.8
Nonhome-Based	14,600	16.7	15,600	106.8	30,200	16.0
School	6,200	7.1	6,700	108.1	12,900	6.8
Total	87,400	100.0	101,600	116.2	189,000	100.0

Source: SEWRPC.

transit travel under the "status quo" plan.[2] As shown on Map 203, the degree of accessibility provided by the arterial street and highway system under the "status quo" plan would be higher in the Milwaukee County portion of the study area than in the Ozaukee County portion, as in 1978. The areas of highest arterial highway accessibility in the study area under this plan are located principally in the west-central and, to a much lesser extent, east-central and southwestern sections of the Milwaukee County portion of the study area.

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[2] *The transit and highway accessibility indexes are determined for each subarea of the study area by summing the products of an inverse function of the travel time from the subarea, as appropriate by automobile or public transit, to all other subareas of the Region, and of the number of trip attractions in all those other subareas of the Region. The number of trip attractions in a subarea of the Region represents the intensity with which its land use activity may be expected to be traveled to from the residential areas of the Region, as it measures the number of trips which will end in an area other than those ending at a traveler's residence. The number of trip attractions in any area has been found to be a function of an area's amount and type of employment and land use. The inverse function of travel time between subareas, which results in giving more weight in the accessibility index to land use activity in those subareas of the Region which are quicker to travel to from the subarea being considered, reflects the anticipated likelihood of tripmaking within the Region to occur at different lengths of travel time, and has been empirically calibrated in the trip distribution model of the Commission's travel simulation models.*

Table 210

DISTRIBUTION OF AUTOMOBILE DRIVER TRIPS IN THE STUDY AREA BY TRIP PURPOSE: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Trip Purpose Category	Internal Automobile Driver Trips on an Average Weekday					
	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Total Study Area						
Home-Based Work	225,600	30.3	55,800	24.7	281,400	29.9
Home-Based Shopping.	109,400	14.7	27,300	25.0	136,700	14.5
Home-Based Other.	246,300	33.0	60,000	24.4	306,300	32.6
Nonhome-Based	148,200	19.9	48,500	32.7	196,700	20.9
School.	15,900	2.1	3,600	22.6	19,500	2.1
Total	745,400	100.0	195,200	26.2	940,600	100.0
Milwaukee County Portion						
Home-Based Work	206,300	30.1	30,400	14.7	236,700	29.6
Home-Based Shopping.	101,100	14.8	14,200	14.0	115,300	14.4
Home-Based Other.	224,200	32.8	34,700	15.5	258,900	32.3
Nonhome-Based	138,200	20.2	35,400	25.6	173,600	21.7
School.	14,200	2.1	1,300	9.2	15,500	2.0
Total	684,000	100.0	116,000	17.0	800,000	100.0
Ozaukee County Portion						
Home-Based Work	19,300	31.4	25,400	131.6	44,700	31.8
Home-Based Shopping.	8,300	13.5	13,100	157.8	21,400	15.2
Home-Based Other.	22,100	36.0	25,300	114.5	47,400	33.7
Nonhome-Based	10,000	16.3	13,100	131.0	23,100	16.4
School.	1,700	2.8	2,300	135.3	4,000	2.9
Total	61,400	100.0	79,200	129.0	140,600	100.0

Source: SEWRPC.

Table 211

DISTRIBUTION OF TOTAL VEHICLE TRIPS IN THE STUDY AREA BY VEHICLE CLASS: 1972 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Vehicle Class	Vehicle Trips Generated on an Average Weekday					
	Existing 1972		Planned Increment		Total 2000	
	Number	Percent of Total	Number	Percent Change	Number	Percent of Total
Automobile						
Internal	745,400	87.0	195,200	26.2	940,600	88.6
External.	7,200	0.9	200	2.8	7,400	0.7
Other	6,900	0.8	- 200	- 2.9	6,700	0.6
Subtotal	759,500	88.7	195,200	25.7	954,700	89.9
Truck						
Internal	94,600	11.0	9,300	9.8	103,900	9.8
External.	1,200	0.1	500	41.7	1,700	0.2
Other	1,400	0.2	200	14.3	1,600	0.1
Subtotal	97,200	11.3	10,000	10.3	107,200	10.1
Total	856,700	100.0	205,200	24.0	1,061,900	100.0

Source: SEWRPC.

Table 212

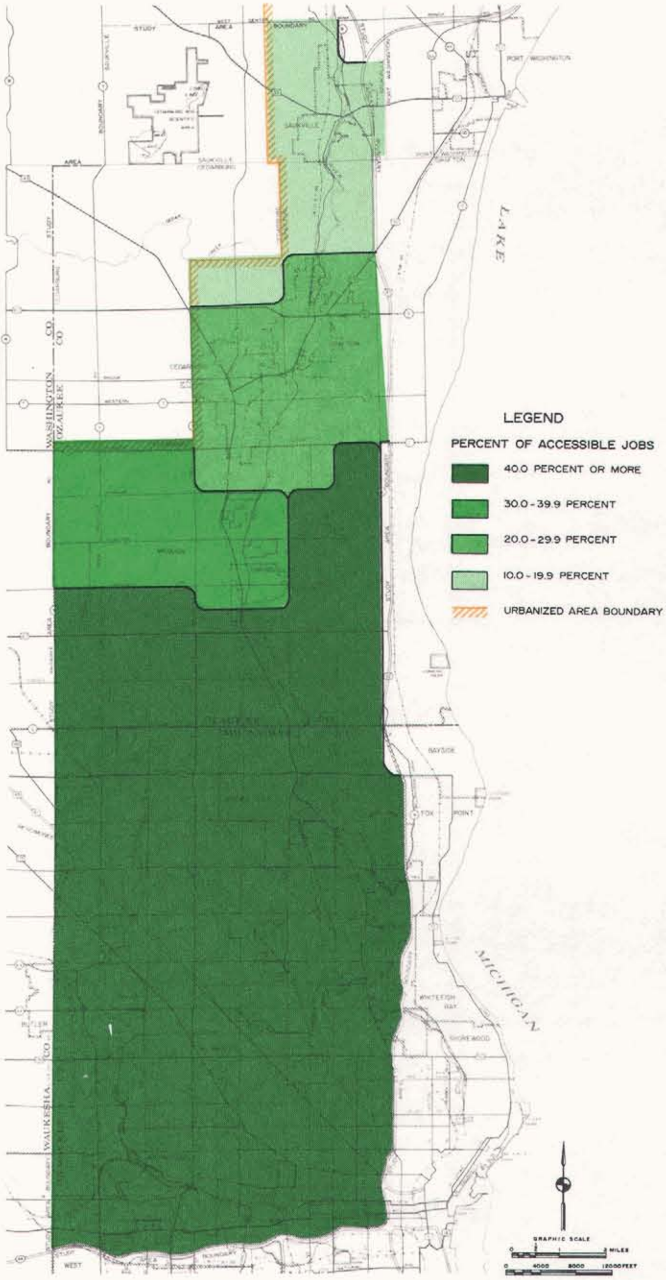
ACCESSIBILITY OF THE POPULATION OF THE URBANIZED PORTION OF THE STUDY AREA TO EMPLOYMENT AND SELECTED MAJOR LAND USE AND ACTIVITY CENTERS BY AUTOMOBILE AND PUBLIC TRANSIT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Population of Urbanized Portion of Study Area Within:	By Automobile		By Public Transit	
	1978	2000	1978	2000
30 Minutes Travel Time of 40 Percent of Milwaukee Area Jobs	464,887	474,400	--	18,600
Percent of Urbanized Area Population	95.0	91.0	--	3.6
Percent of Urbanized Area Population Within Total Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	--	4.0
35 Minutes Travel Time of Three or More Major Retail and Service Centers	489,316	521,300	101,029	217,300
Percent of Urbanized Area Population	100.0	100.0	20.6	41.7
Percent of Urbanized Area Population Within Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	22.0	47.2
30 Minutes Travel Time of a Major Medical Center, Hospital, or Medical Clinic	489,316	521,300	375,218	371,200
Percent of Urbanized Area Population	100.0	100.0	76.7	71.2
Percent of Urbanized Area Population Within Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	81.5	80.7
40 Minutes Travel Time of a Major Park or Outdoor Recreation Area	489,316	521,300	260,003	369,700
Percent of Urbanized Area Population	100.0	100.0	53.1	70.9
Percent of Urbanized Area Population Within Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	56.6	80.3
40 Minutes Travel Time of an Accredited University, College, or County Technical/Vocational School	489,316	521,300	387,220	411,300
Percent of Urbanized Area Population	100.0	100.0	79.1	78.9
Percent of Urbanized Area Population Within Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	84.2	89.4
60 Minutes Travel Time of a Scheduled Air Transport Facility	489,316	521,300	63,040	59,200
Percent of Urbanized Area Population	100.0	100.0	12.9	11.4
Percent of Urbanized Area Population Within Public Transit Service Area (total of 459,000 people in 1978 and 460,133 people in 2000)	--	--	13.7	12.9

Source: SEWRPC.

Map 196

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE AREA JOBS WITHIN 30 MINUTES TRAVEL TIME BY AUTOMOBILE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

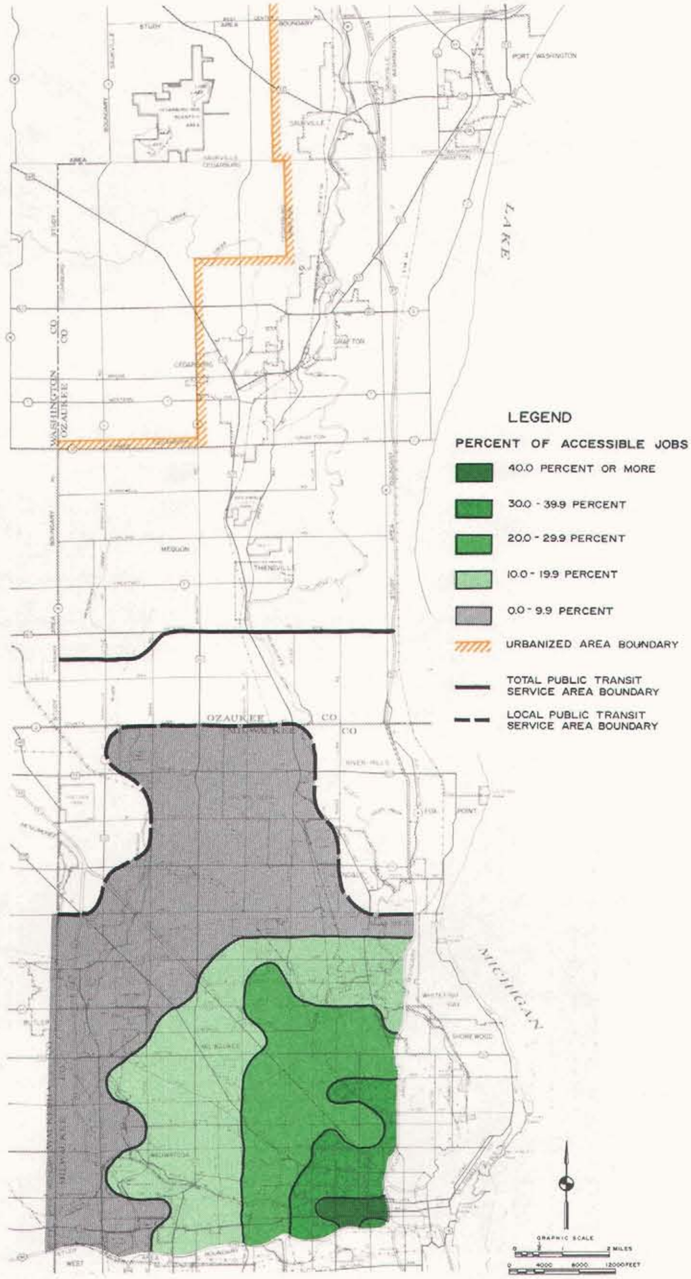


This map shows those areas of the urbanized portion of the northwest side study area which would meet the highway accessibility standard for employment—that is, those areas which are within 30 minutes travel time by highway of at least 40 percent of the employment opportunities in the Milwaukee urbanized area. Only the northern part of the urbanized portion of Ozaukee County would not be accessible within 30 minutes by automobile of 40 percent of the jobs in the Milwaukee area under the "status quo" plan. A total of 474,400 people, or 91 percent of the population of the urbanized portion of the study area, would reside within areas meeting this standard in the year 2000.

Source: SEWRPC.

Map 197

ACCESSIBILITY WITHIN THE STUDY AREA TO MILWAUKEE AREA JOBS WITHIN 30 MINUTES TRAVEL TIME BY PUBLIC TRANSIT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

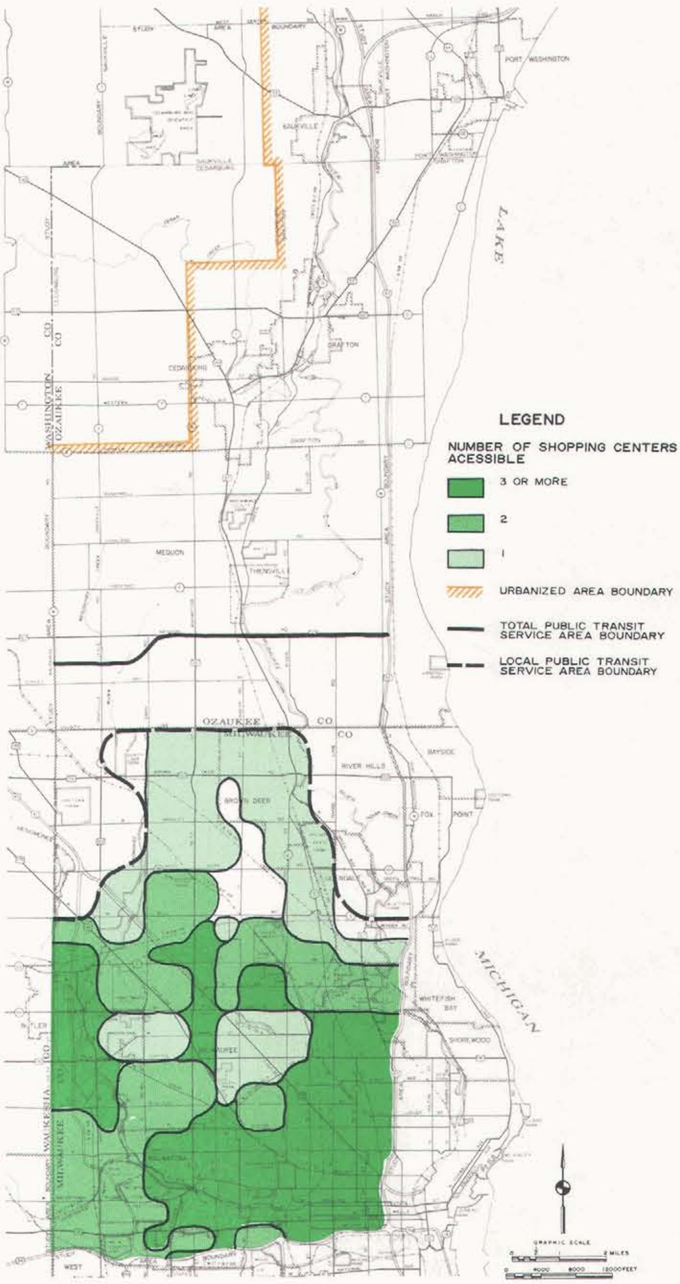


As shown on this map, only a small portion of the extreme southeastern part of the study area would be within 30 minutes travel time by public transit of 40 percent of the Milwaukee urbanized area's total employment opportunities under the "status quo" plan. A total of 18,600 people, or about 4 percent of the population of the urbanized portion of the study area and of the population within the public transit service area, would reside in areas meeting this standard.

Source: SEWRPC.

Map 198

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL RETAIL AND SERVICE CENTERS WITHIN 35 MINUTES TRAVEL TIME BY PUBLIC TRANSIT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

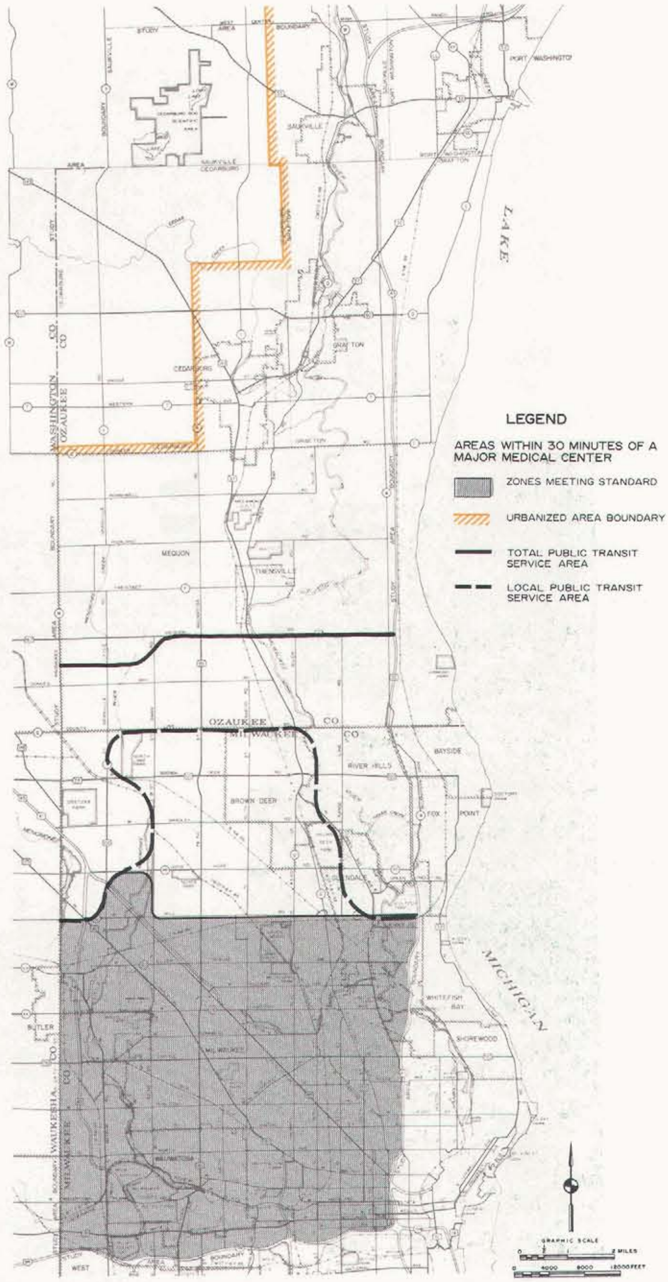


As shown on this map, those areas of the urbanized portion of the northwest side study area which would meet the transit accessibility standard for major retail and service centers under the "status quo" plan—that is, those areas which would be within 35 minutes travel time of three or more major retail service centers—would be located in large part in the southern half of the Milwaukee County portion of the study area, but would be concentrated in the southeastern portion of the Milwaukee County portion of the study area. A total of 217,300 people, or about 42 percent of the population of the urbanized area and about 47 percent of the population within the public transit service area, would reside in areas meeting this standard in the year 2000 under this plan.

Source: SEWRPC.

Map 199

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL MEDICAL FACILITIES WITHIN 30 MINUTES TRAVEL TIME BY PUBLIC TRANSIT YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

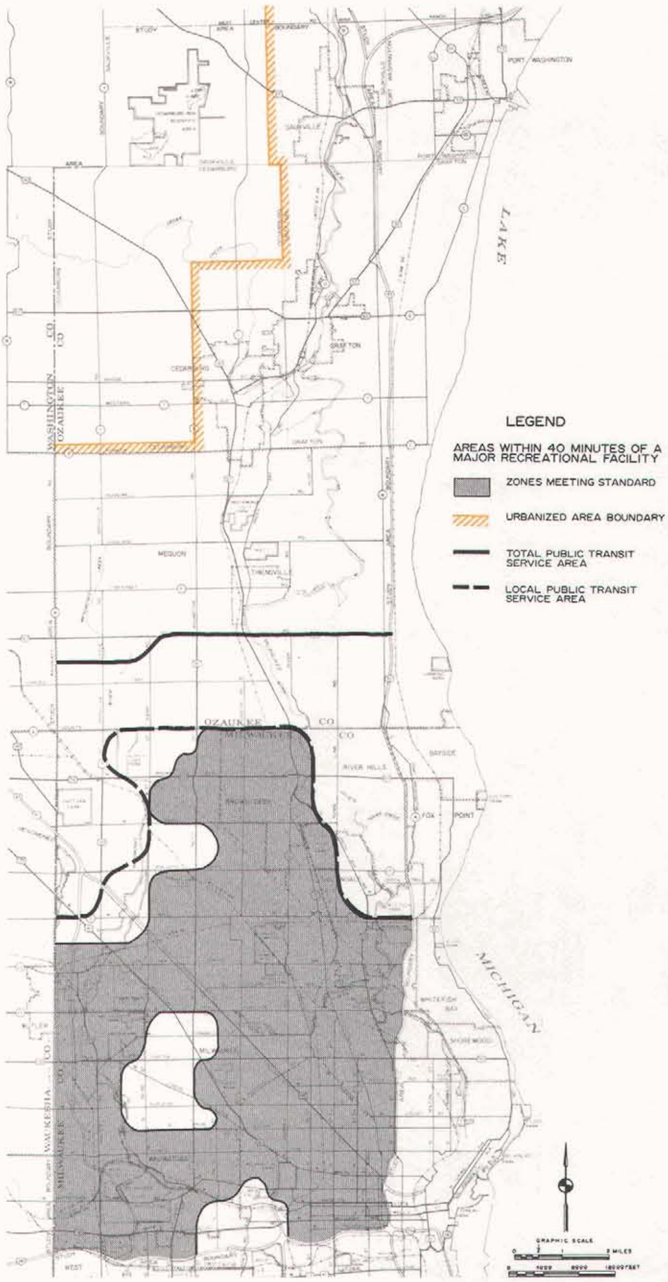


As shown on this map, under the "status quo" plan the southern one-half of the Milwaukee County portion of the study area would meet the transit accessibility standard for regional medical facilities—that is, that such facilities be within 30 minutes travel time by public transit. A total of 371,200 people, or about 71 percent of the urbanized area population and about 81 percent of the population of the public transit service area, would reside in areas meeting this standard in the year 2000 under this plan.

Source: SEWRPC.

Map 200

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL PARK AND RECREATIONAL FACILITIES WITHIN 40 MINUTES TRAVEL TIME BY PUBLIC TRANSIT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

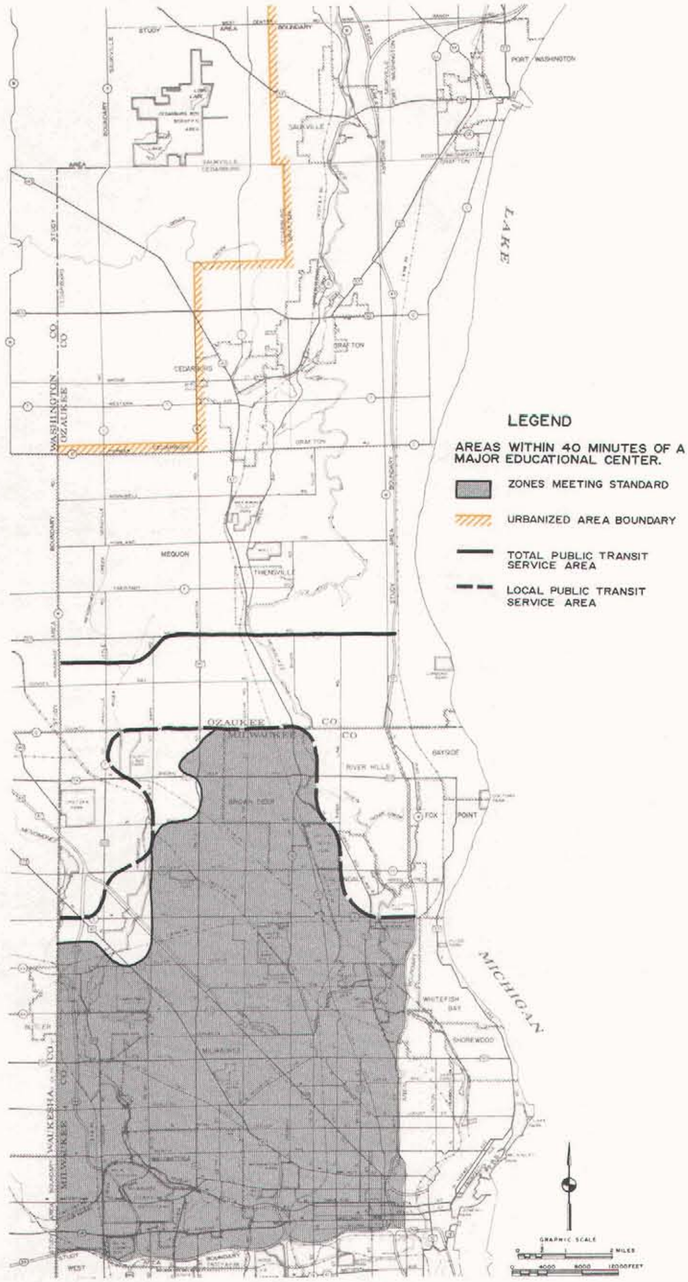


As shown on this map, a large portion of the Milwaukee County portion of the northwest side study area would meet the transit accessibility standard for regional park and recreational facilities under the "status quo" plan—that is, would be within 40 minutes travel time by transit of such facilities. A total of 369,700 people, or about 71 percent of the urbanized area population and about 80 percent of the transit service area population, would reside within areas meeting this standard in the year 2000 under this plan.

Source: SEWRPC.

Map 201

ACCESSIBILITY WITHIN THE STUDY AREA TO REGIONAL EDUCATIONAL CENTERS WITHIN 40 MINUTES TRAVEL TIME BY PUBLIC TRANSIT YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

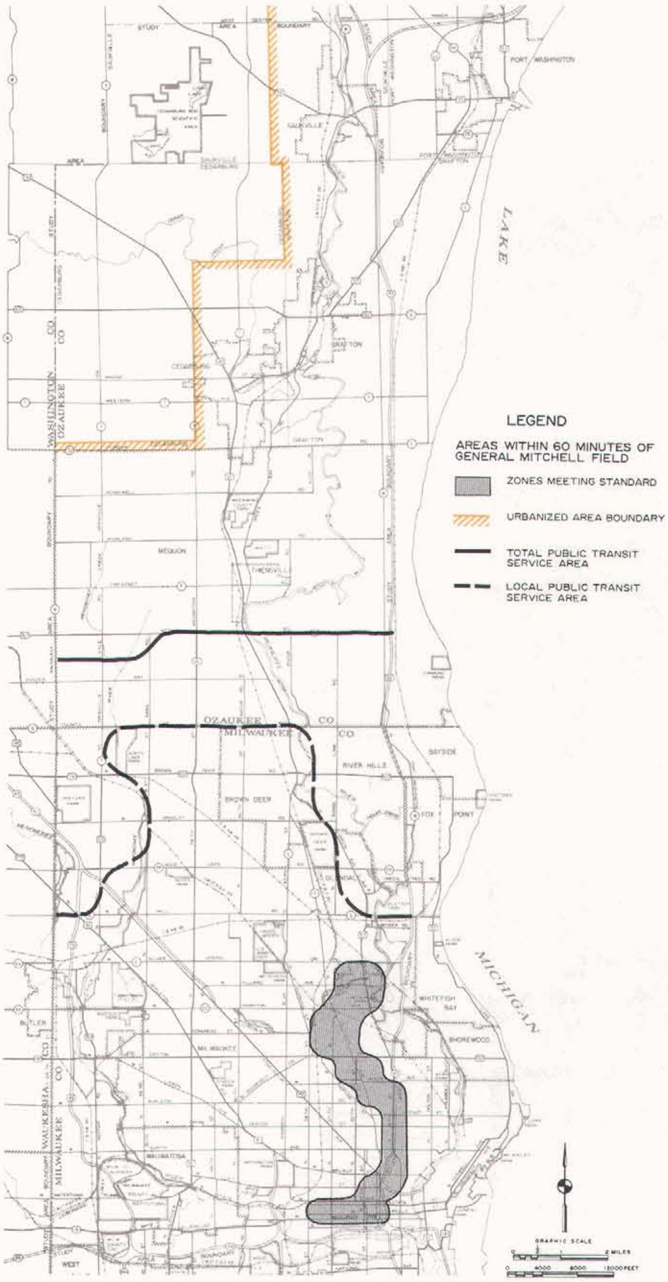


As shown on this map, an extensive portion of the Milwaukee County portion of the northwest side study area would meet the transit accessibility standard for regional educational centers—that is, would be within 40 minutes travel time of such centers by public transit—under the "status quo" plan. A total of 411,300 people, or about 79 percent of the urbanized area population and about 89 percent of the public transit service area population, would reside in areas meeting this standard in the year 2000 under this plan.

Source: SEWRPC.

Map 202

ACCESSIBILITY WITHIN THE STUDY AREA TO GENERAL MITCHELL FIELD WITHIN 60 MINUTES TRAVEL TIME BY PUBLIC TRANSIT YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

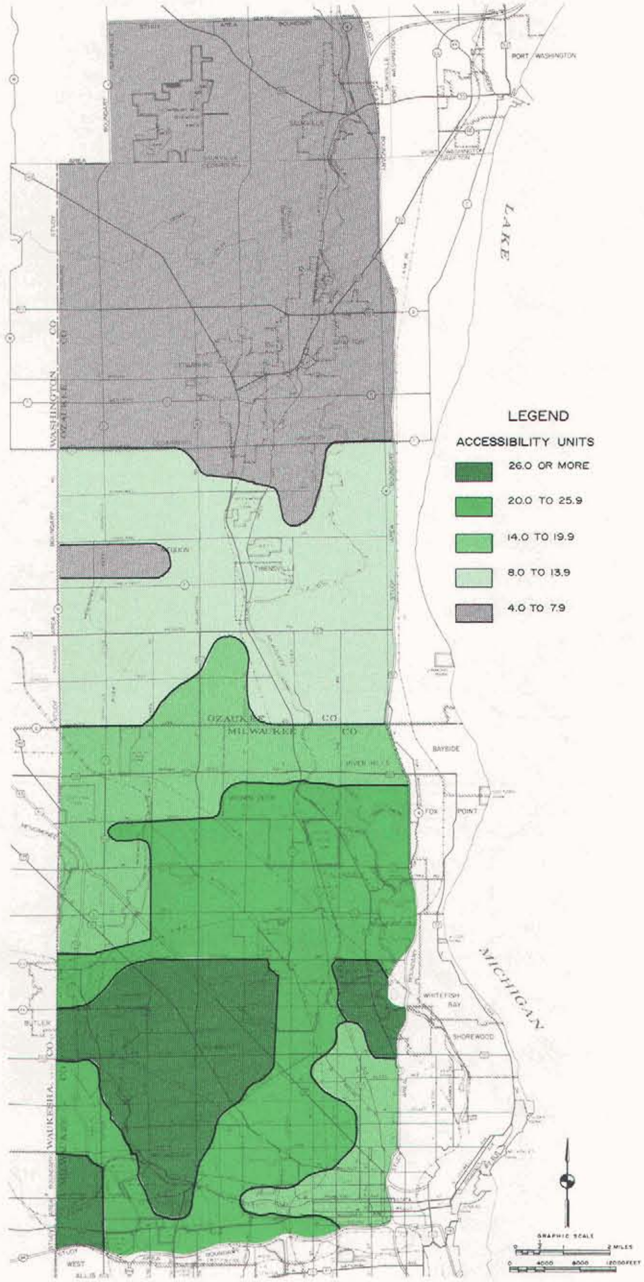


As shown on this map, only the extreme southeastern portion of the Milwaukee County portion of the northwest side study area would meet the transit accessibility standard for travel to General Mitchell Field—that is, would be within 60 minutes travel time by public transit of General Mitchell Field—under the "status quo" plan. A total of 59,200 people, or about 11 percent of the urbanized area population and about 13 percent of the population within the public transit service area, would reside in areas meeting this standard in the year 2000 under this plan.

Source: SEWRPC.

Map 203

ARTERIAL HIGHWAY ACCESSIBILITY TO LAND USE ACTIVITIES WITHIN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



As shown on this map, in the year 2000 under the "status quo" alternative plan, the arterial street and highway system within the northwest side study area would provide a greater degree of accessibility in the more highly developed Milwaukee County portion of the study area than in the largely rural Ozaukee County portion of the study area. The areas of greatest arterial highway accessibility in the study area under this plan would be located in the west-central, southwest, and east-central portions of the Milwaukee County portion of the study area. Accessibility levels by arterial highway would decline to the north as the study area becomes less urban, and also would decline to the southeast.

Source: SEWRPC.

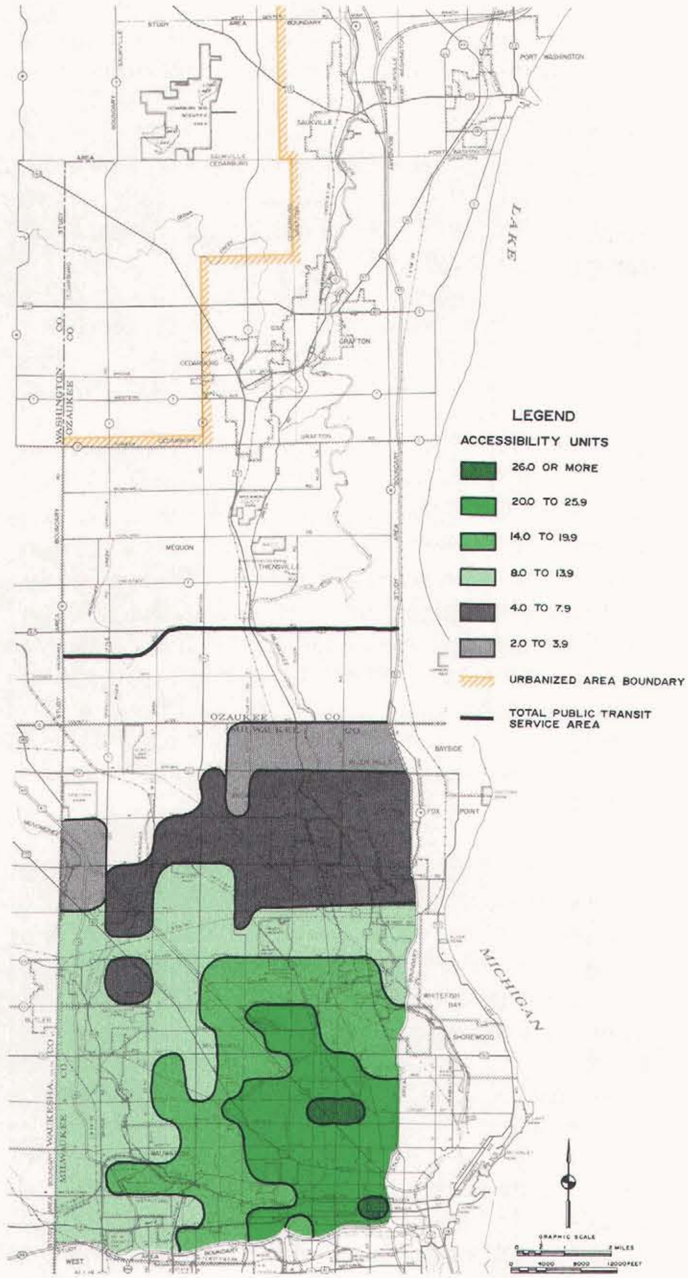
As shown on Map 204, the areas of highest public transit accessibility under this plan are located in the southeastern portion of the Milwaukee County portion of the study area. This level of accessibility would generally decrease in all directions with distance from the Milwaukee central business district.

Generally, the standard requiring that the accessibility provided by the transportation system be adjusted to the land use plan for the area would be met in the Milwaukee County portion of the study area, but not in the Ozaukee County portion of the study area. The high-density development within the Milwaukee County portion of the study area as recommended in the adopted land use plan would be located in areas which would be afforded the highest arterial street and highway accessibility level under the "status quo" plan. The only significant exceptions are the extreme southeastern corner of the study area, which is recommended for high-density development but is provided only the third highest arterial highway accessibility level in the study area, and the southwestern corner of the study area, which is provided the highest level of arterial accessibility but is recommended only for medium-density development. The southeastern corner of the Milwaukee County portion of the study area is, however, provided the highest level of transit accessibility in the study area. Some transit accessibility, although decreasing with distance from the Milwaukee central business district, would generally be supplied to all parts of the Milwaukee County portion of the study area, including, importantly, all those areas recommended for medium- and low-density development. The only exception is the northwestern corner of the Milwaukee County portion of the study area, part of which is recommended for high-density development and includes the Northridge Shopping Center and part of the Granville regional industrial center.

Within the Ozaukee County portion of the study area, medium-density development is recommended under the plan generally in and around the Villages of Thiensville, Grafton, and Saukville, and the City of Cedarburg, as well as between the Village of Thiensville and the Milwaukee/Ozaukee County line in the City of Mequon. Low- and suburban-density development is recommended principally in the eastern half of the City of Mequon. The level of arterial highway accessibility in the Ozaukee County portion of the study area is not strongly related to planned development densities under the "status quo" plan, as it varies

Map 204

PUBLIC TRANSIT ACCESSIBILITY TO LAND USE ACTIVITIES WITHIN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



As shown on this map, the areas within the northwest side study area that would be afforded the greatest accessibility by the public transit system under the "status quo" alternative plan would be located in the more intensively developed portions of the study area which would have closer spacing of public transit routes. Levels of transit accessibility would decrease in concentric rings outward from the most densely populated areas of the Milwaukee County portion of the study area under this plan.

Source: SEWRPC.

only in that it decreases with distance from the Milwaukee/Ozaukee County line. As a result, the medium-density development recommended in the Ozaukee County portion of the study area would be provided with a much lower accessibility than medium-density development in the Milwaukee County portion. Furthermore, areas around the recommended medium-density development in Ozaukee County which are recommended for only scattered low- or suburban-density development or for protection from development would be generally provided the same level of accessibility as the medium-density development by the "status quo" transportation system.

Summary and Conclusions: The first transportation system management and development objective formulated under the study sets forth the need for a transportation system which will serve the existing and anticipated future land uses of the study area, and promote the implementation of the adopted regional land use plan for the study area. The public transit element of this "status quo" plan is deficient in the attainment of this objective, principally with respect to the accessibility that it would provide to major land use activities. Only in small parts of the urbanized portion of the study area would the "status quo" public transit system supply the suggested accessibility to jobs, major retail and service centers, and a scheduled air transport facility.

Another deficiency identified in the transportation system of the "status quo" plan is that the relative accessibility provided by the plan would not always conform with the relative intensity of development recommended for the study area under the adopted regional land use plan. The southeastern portion of the study area, which currently is, and is recommended to continue to remain, in high-density development, would be provided with a lower level of overall accessibility by the automobile than would other areas recommended for high-density development. The accessibility level in this area would be about equal to those levels currently provided to outlying portions of Milwaukee County recommended for medium- or low-density development. In the northwestern portion of Milwaukee County, little or no public transit accessibility would be provided to areas recommended for high- and medium-density development, including the regional shopping center and industrial center in that part of the study area. In the Ozaukee County portion of the study area, recommended medium-density development would generally be provided the same level of highway accessibility as that provided to adjacent areas to be protected from development under the "status quo" plan.

Effectiveness of the "Status Quo" Transportation System Plan in Providing a Transportation System Which is Economical and Efficient, and Which Satisfies All Other Objectives at the Lowest Possible Cost

The second transportation development objective formulated under the study identifies the need for a transportation system which is economical and efficient, satisfying all other objectives at the lowest possible cost. This objective is supported by four standards. The first requires that total transportation system operating and capital costs be minimized. The second specifies that the direct benefits of transportation improvements should exceed the direct costs. The third proposes that full utilization of existing transportation facilities be made through low- and noncapital-intensive actions before capital-intensive measures are proposed as transportation alternatives. This standard is met because of the manner in which alternative plans are to be considered in this study. That is, prior to considering any arterial street improvement or expansion as a solution to anticipated transportation problems, a plan will first be prepared using traffic management and public transit actions to the greatest extent possible in an attempt to resolve those problems. The fourth standard specifies that energy use in the operation of the transportation system should be minimized.

System Operating and Capital Costs: The first standard indicates that the sum of the transportation system operating and capital investment costs should be minimized. The estimated costs of implementing the "status quo" transportation system plan are shown in Tables 213 and 214. These estimates were prepared by applying unit improvement costs to the estimated mileage of proposed facility improvements, including the cost of acquiring rights-of-way and constructing arterial street and highway facilities programmed for completion in 1980; by applying unit improvement costs to the estimated mileage of new collector and minor land access streets; and by preparing special estimates of the cost of constructing or purchasing, as appropriate, transit facilities or transit vehicles, also as programmed for 1980. In addition, the costs of operating and maintaining the existing and proposed arterial street and highway system, the collector and land access street system, and the transit

Table 213

TRANSPORTATION SYSTEM CAPITAL, OPERATION, AND MAINTENANCE COSTS, AND USER COSTS IN THE STUDY AREA OVER THE PERIOD 1980 TO 2000: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Cost Element	Cumulative Cost: 1980 to 2000
System Element Costs	
Arterial Streets and Highways	
Construction for Improvement and Expansion	$ 23,512,000
Construction for Preservation[a]	84,363,000
Operation and Maintenance	136,320,000
Subtotal	$ 244,195,000
Nonarterial Streets	
Construction for Expansion	$ 156,354,000
Construction for Preservation[a]	79,928,000
Operation and Maintenance[b]	191,416,000
Subtotal	$ 427,698,000
Public Transit	
Equipment	$ 79,500,000
Operation and Maintenance[c]	403,680,000
Subtotal	$ 483,180,000
Total Systems Element Costs	$ 1,155,073,000
User Costs[d]	
Arterial Streets and Highways	
Time	$23,626,987,000
Out-of-Pocket	12,536,035,000
Accident	1,620,245,000
Subtotal	$37,783,267,000
Public Transit	
Time	$ 1,600,177,000
Accident	13,400,000
Subtotal	$ 1,613,577,000
Total User Costs	$39,396,844,000
Total Cost	$40,551,917,000

[a] *Costs of construction for preservation include the cost of all projects required to maintain the structural adequacy and serviceability of the existing system without significantly increasing the capacity of that system. Generally, these are projects classified as resurfacing and reconstruction for the same capacity.*

[b] *Unit operation and maintenance cost data for collector and minor land access streets were developed from information provided by the local units of government in the Region.*

[c] *Unit operation and maintenance cost data for public transit facilities were developed from information provided by local transit agencies in the Region.*

[d] *User costs include the value of time spent in travel; the cost of accidents; and, in the case of auto and truck users, the out-of-pocket costs of vehicle operation and parking, including depreciation and that portion of insurance costs not represented in accident costs. Vehicle operating costs were developed on the basis of motor fuel used at $1.90 per gallon as a function of vehicle and facility types used, plus a cost of 11.8 cents per mile in 1980 dollars. Heavy-duty truck operating costs were developed to include estimates of the cost of fuel used plus 24.4 to 31.7 cents per mile, a function of vehicle speed. The value of time spent in automobile and public transit travel was estimated at $8.45 per hour, the average manufacturing hourly wage in the Region in 1980; the value of time spent in medium- and heavy-duty truck operations was estimated at $12.68 per hour, or the average hourly truck driver wage in the Region in 1980. Although transit fares are an out-of-pocket cost to the transit user, in an economic analysis, such fares represent revenue to offset transit operating and maintenance costs. Therefore, transit fares are not included as a transit user cost since inclusion would represent a double accounting of such dollars.*

Source: SEWRPC.

system were estimated. These operating costs include not only the costs to public implementing agencies having responsibilities for operating and maintaining the transportation system, but also the operating cost to system users in terms of time costs, vehicle operating costs, and accident costs. All cost estimates are in constant 1980 dollars.

The total cost estimates for the "status quo" transportation system plan alternative are shown in Table 213. The estimated total cost of the "status quo" alternative over the time period 1980 to 2000 is $40.6 billion. Of this total, about $423.7 million represents capital costs and $731.4 million represents operation and maintenance costs, of which user costs would represent about $34.4 billion. Under this plan, the equipment, operation, and maintenance costs of the public transit system would approximate $483.2 million over this period.

In the year 2000 the total operating subsidy on the public transit system within the study area would be about $6,786,000, expressed in 1980 dollars, or about $0.20 per passenger. This compares with a total operating subsidy of about $10,727,000, or about $0.44 per passenger, in

Table 214

TRANSPORTATION SYSTEM CAPITAL COSTS IN THE STUDY AREA OVER THE PERIOD 1980 TO 2000: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Transportation System Improvement	Cumulative Cost: 1980 to 2000
Arterial Street and Highway System	
Right-of-Way[a]	
Freeways	$ --
Surface Arterials	220,000
Total	$ 220,000
Construction[b]	
Freeways	$ --
Surface Arterials	23,292,000
Subtotal	$ 23,292,000
Nonarterials[c]	156,354,000
Total	$179,646,000
Resurfacing[d]	
Arterials	$ 84,363,000
Nonarterials	79,928,000
Total	$164,291,000
Total for Street and Highway System	$344,157,000
Public Transit System	
Right-of-Way Acquisition	$
Construction	--
Operating Equipment	79,500,000
Total for Public Transit System	$ 79,500,000
Total for Transportation System	$423,657,000

[a] Right-of-way costs include the cost to acquire the land and any residential and nonresidential structures necessary to provide a right-of-way capable of accommodating the required improvement cross-section, as well as the costs associated with relocation and assistance payments.

[b] Construction costs, which include engineering and utility relocation costs, reflect the capital cost experiences of highway agencies within southeastern Wisconsin.

[c] Unit improvement cost data for collector and minor land access street construction were developed from information provided by the local units of government in southeastern Wisconsin and the Wisconsin Department of Transportation. These costs were applied to mileage estimates for land to be developed under the adopted land use plan by applying an appropriate factor representing the proportion of land normally developed for streets and highways in urban areas under good subdivision design practices. The costs of initial collector and minor street construction were assumed to be borne by the developers of the land, and do not, therefore, represent a cost to the general public. The subsequent resurfacing and maintenance of such facilities, however, would be public costs.

[d] Resurfacing of all streets and highways not planned for construction or expansion was assumed during the plan implementation period, as well as the additional resurfacing of a proportion of all arterial facilities a second time to achieve adequate pavement life over the 20-year plan design period. The cost of resurfacing collector and minor streets during the plan implementation period was calculated on the basis of unit cost data for each cross-section type, and the amount of such mileage to be preserved.

Source: SEWRPC.

1980. In Table 214, arterial street and highway system right-of-way, construction, and resurfacing capital costs are delineated for the study area, as are the public transit system capital costs which would be incurred under this plan. Under the "status quo" plan, arterial street and highway system right-of-way costs would total $220,000, construction costs would total about $179.6 million, and resurfacing costs would total about $164.3 million. There would be no right-of-way acquisition or construction costs on the public transit system under this plan, but equipment costs would be $79.5 million.

Direct Benefit/Direct Cost Ratio: The second standard under this objective specifies that the direct benefits derived from transportation system improvements should exceed the direct costs of such improvements. By applying this standard, the worth of those alternatives that include transportation system improvements can be analyzed through comparison with the "status quo" alternative plan. However, it should be noted that the entire evaluation of the "status quo" plan—that is, how well that plan attains all of the study objectives and standards—is a comparison of its benefits to its costs more broadly defined, and of its benefits and costs to those of other plans. The benefit-cost ratio considered in this standard compares only some of those benefits and costs—specifically, those which are direct and can be measured or estimated in monetary terms. As a result, this ratio must be recognized as constituting only a comparative measure of partial, and not overall, worth of transportation system plans.

The direct benefits derived from transportation system improvements have been assumed to include reductions in the travel time cost, vehicle operation costs, and costs of accidents that are achieved through improvements to the transportation system. The direct costs of such improvements are the capital investments required to provide the improvements, and the cost to the public agencies of operating and maintaining the physical facilities and transportation services. In preparing the benefit-cost analysis, it should be noted that the benefits and costs were calculated as accruing from 1980 to 2025 in order to bring the salvage value of each staged facility recommended in the plans to zero.

Since there would be no improvements to the transportation system under the "status quo" plan, there would be no benefits accrued over the plan design period. Table 213 presents the total costs of the "status quo" plan. As there are no benefits under this plan, the cost-benefit ratio is equivalent to zero. However, because it is a benchmark alternative, the "status quo" plan was used as a basis for developing incremental benefit-cost ratios for those transportation system alternative plans for the study area which propose system improvement and/or expansion.

Energy Use: The fourth standard under this objective specifies that the amount of energy utilized in operating the transportation system, particularly petroleum-based motor fuels, should be minimized. Table 215 shows the amount of motor fuel estimated to be consumed on the arterial street and highway system and public transit system of the study area in the year 2000 under the "status quo" plan. The indicated motor fuel consumption reflects the anticipated use of automobiles and motor buses in passenger travel and trucks in freight traffic. As indicated in the table, total annual motor fuel consumption on the arterial street system of the Region would approximate 162.3 million gallons of gasoline or diesel fuel in the year 2000 under the "status quo" plan.

Table 215

MOTOR FUEL CONSUMPTION IN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Transportation System	Gallons of Annual Motor Fuel Consumption
Arterial Street and Highway[a]	
Gasoline	150,357,200
Diesel	9,221,700
Subtotal	159,578,900
Transit (diesel)	2,699,000
Total	162,277,900

[a] *Includes consumption on nonarterial streets.*

Source: SEWRPC.

Summary and Conclusions: Without the testing results of other alternative plans, no conclusion can be made as to whether or not the transportation system as set forth under the "status quo" plan is the most economical and efficient, satisfying all other objectives at the lowest possible cost and with minimal energy use. The "status quo" alternative is designed, however, to be the least-cost alternative, and, as such, costs and benefits incurred under this plan will be compared to similar costs and benefits incurred under each of the other alternative plans. The total cost of implementing the "status quo" plan would be about $40.6 billion, of which about $423.7 million would be capital costs and about $731.4 million would be operation and maintenance costs. The total operating subsidy in the year 2000 in the study area under this plan would amount to approximately $0.20 per passenger in the year 2000, as compared with about $0.44 per passenger in 1980. The total annual motor fuel consumption by automobiles and trucks and by public transit would be about 162.3 million gallons of gasoline or diesel fuel in the year 2000 under this plan.

Effectiveness of the "Status Quo" Transportation System Plan in Providing a Balanced Transportation System at an Adequate Level of Service

The third transportation system development and management objective formulated under the study specifies the need for the achievement of a flexible, balanced transportation system which provides the appropriate types of transportation needed by all residents of the northwestern portion of Milwaukee County and southern Ozaukee County at an adequate level of service. This objective is supported by 13 standards, all but the first of which are related to public transit service.

Arterial Street Spacing: The first standard under this third objective suggests that arterial streets and highways in the study area be provided at intervals of no more than one-half mile in each direction in urban high-density areas, at intervals of no more than one mile in each direction in urban medium-density areas, and at intervals of no more than two miles in urban low- and suburban-density areas, and in rural areas.

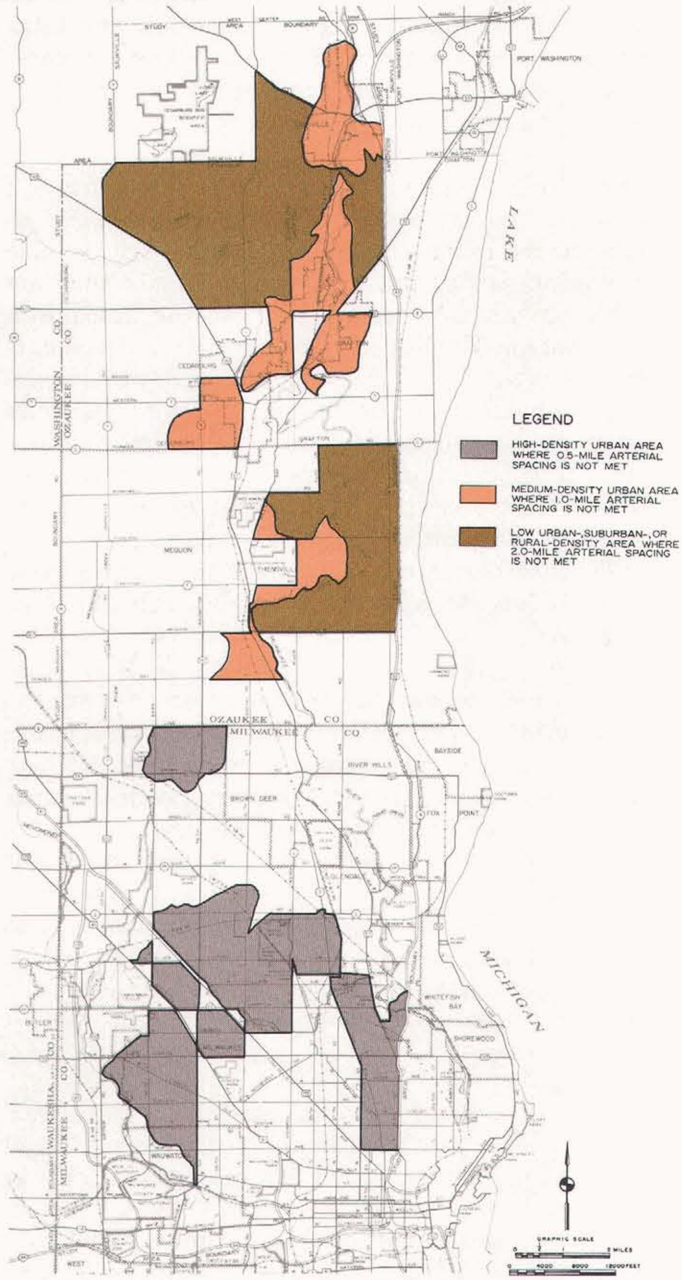
As shown on Map 205, under the "status quo" transportation system plan, most portions of the study area would meet this arterial street spacing standard in the year 2000. Under this plan, about 345,200 people, or about 65 percent of the total population of the study area, would reside within the area meeting this standard. In 1978, 362,200 people, or about 73 percent of the total population of the study area, resided in those parts of the study area which met this standard. Urban high-density areas of the study area not meeting this standard, principally because of one-mile-wide spacing of north-south arterials under this plan, are the west-central, central, and east-central parts of the Milwaukee County portion of the study area. There are also two parts of the Ozaukee County portion of the study area which do not meet this standard under the "status quo" plan, one in the northeastern portion of the City of Mequon, and the other in a larger area between and west of the Town of Grafton and the Town of Saukville.

Primary and Secondary Public Transit Service Provision: The second standard under this objective specifies that primary and secondary public transit routes in the study area should connect and serve areas of concentrated land use activities, including major retail and service centers; major industrial centers; major medical centers, hospitals, and/or medical clinics; major parks and outdoor recreational areas; major educational institutions, including accredited universities, colleges, and county technical or vocational schools; scheduled air transport facilities; and high-density residential areas.

As summarized earlier in this chapter, primary transit service within the study area would be provided by four motor bus routes operating in mixed traffic on freeways, designed to transport people nonstop between outlying suburban park-ride lots and the Milwaukee central business district, as

Map 205

PARTS OF THE STUDY AREA NOT MEETING SUGGESTED ARTERIAL STREET SPACING STANDARDS: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



Under the "status quo" plan, most of the northwest side study area would meet the arterial street spacing standard—that is, that arterial streets and highways be provided at intervals of no more than one-half mile in each direction in urban high-density areas, at intervals of no more than one mile in each direction in urban medium-density areas, and at intervals of no more than two miles in each direction in urban low-density areas, suburban density areas, and rural areas. Those high-density areas in the Milwaukee County portion of the study area which would not meet this standard in the year 2000 under the "status quo" plan would be concentrated in the central and north-central portions of the Milwaukee County portion of the study area. Medium-density urban areas not meeting this arterial street spacing standard would be located in and around the Villages of Grafton and Thiensville and the City of Cedarburg, and as well as in and around the City of Saukville. Low-density urban, suburban, or rural density areas would be located in the eastern portions of the City of Mequon, as well as in the Town of Saukville.

Source: SEWRPC.

Table 216

FACILITIES AND/OR POPULATION SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Land Use or Activity Center Type	Served by Secondary or Primary Service (within walking distance)			
	1978		2000	
	Number Served	Total Number	Number Served	Total Number
Major Retail and Service	2	3	2	3
Major Industrial	4	6	4	7
Major Medical	7	12	7	11
Major Recreational	1	5	1	5
Major Educational	2	3	3	4
	Population		Population	
High-Density Residential Development	--	--	95,400	--
	Served by Secondary or Primary (drive) Service			
	1978		2000	
High-Density Residential Development	--	--	184,200	--

Source: SEWRPC.

shown on Map 206. Secondary service would be provided by a single express route in the southeastern corner of the study area.[3] In order to be considered served by primary or secondary transit, major centers and areas other than high-density residential areas must be within walking distance of a park-ride lot or a stop on an express route, or a primary transit collector-distributor route extension on a standard arterial street.

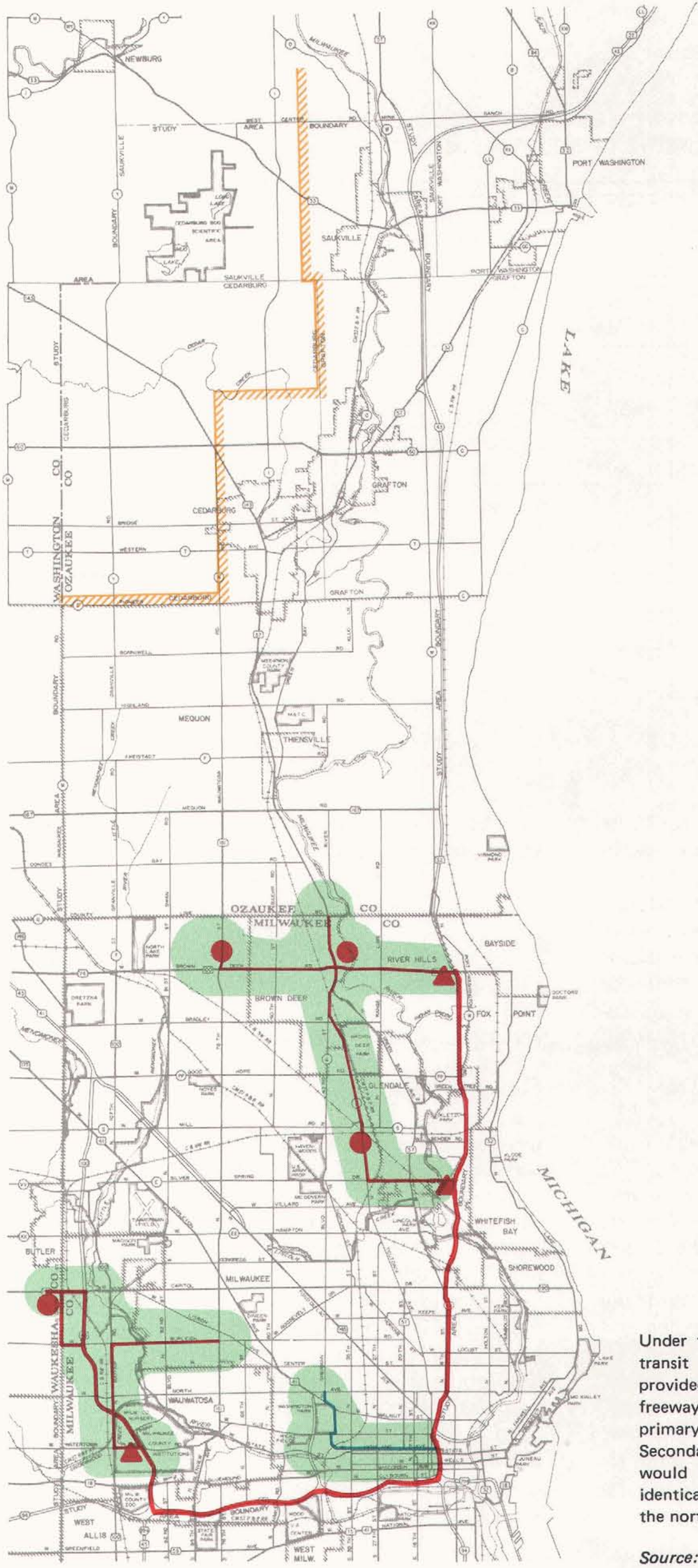
As shown in Table 216 and on Map 207, one of three major shopping centers in the study area, three of seven major industrial areas, four of 11 major medical centers or hospitals, four of five major parks or outdoor recreational areas, and one of four universities, accredited four-year colleges, or county-operated technical or vocational schools will not be served by primary or secondary transit service under the "status quo" plan.

Maps 208 and 209 show those portions of the study area planned for high-density residential development in the year 2000 which would be served by primary or secondary transit service under the "status quo" plan. Map 208 shows those high-density residential areas within walking distance of primary or secondary transit service and Map 209 shows those high-density residential areas within three miles driving distance of a primary transit park-ride lot. Under the "status quo" plan, much of the planned high-density residential development of the study area, about 212,200 people, or about 66 percent, is not within walking distance of primary or secondary transit. Some of the planned high-density residential development in the study area is not even within three miles of a primary transit park-ride lot or walking distance

[3] *For the purposes of this report, secondary public transit service is defined as express bus service over reserved lanes of arterial streets or in mixed traffic over such streets. Stops are generally located only at intersecting transit routes and major traffic generators. The operating speeds provided, and the length of the trips served, are usually lower and shorter, respectively, than those characteristic of primary transit service, but are higher and lower, respectively, than those characteristic of tertiary, or local, transit service. It should be noted that transit service may be provided over all or parts of a route, with the remainder of the route being operated in primary or tertiary service.*

Map 206

PRIMARY AND SECONDARY TRANSIT ROUTES AND SERVICE AREAS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

- AREAS INCLUDED IN WALKING DISTANCE SERVICE AREA OF PRIMARY AND SECONDARY SERVICE
- PRIMARY TRANSIT SERVICE ON FREEWAY
- PRIMARY TRANSIT ROUTE COLLECTION / DISTRIBUTION EXTENSION
- SECONDARY SERVICE ROUTE
- PARK-RIDE LOT
- TRANSIT STATION
- URBANIZED AREA BOUNDARY

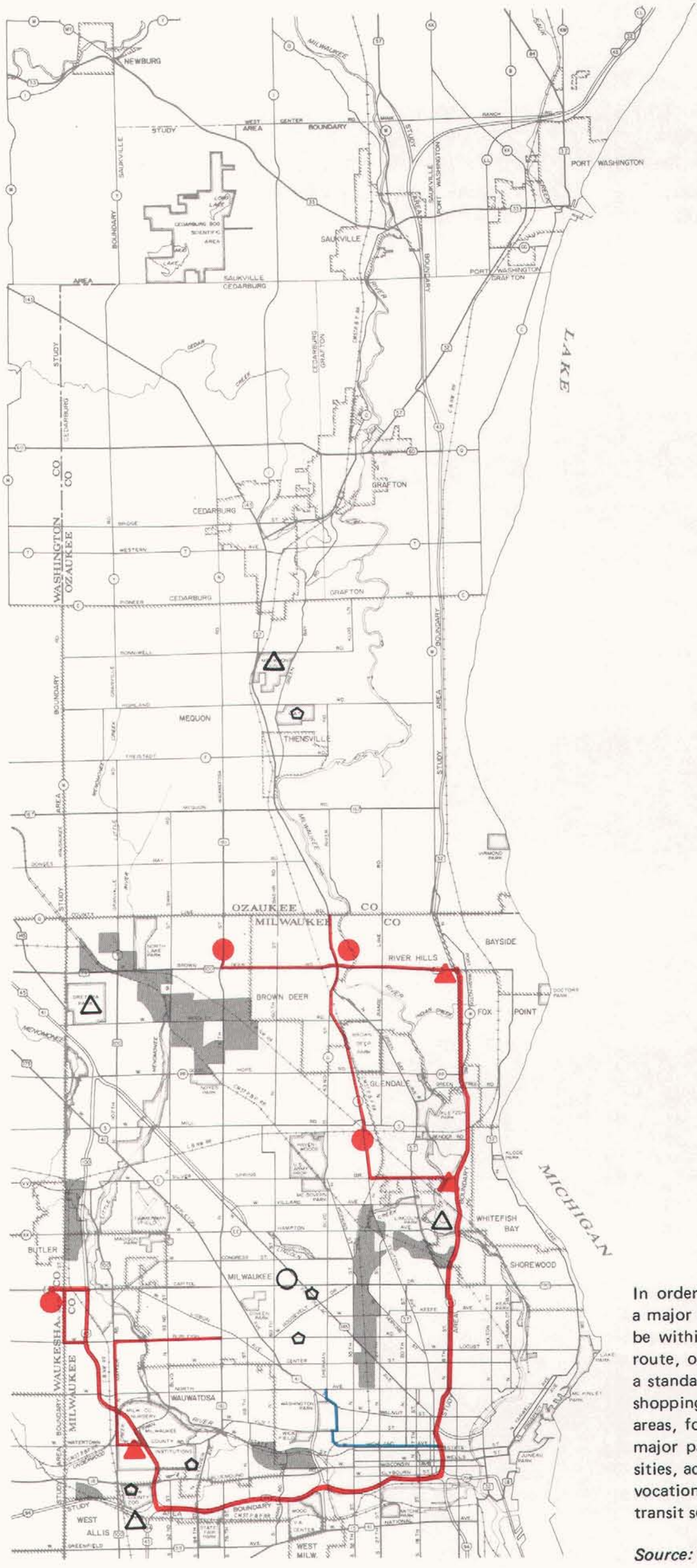
GRAPHIC SCALE
0 1 2 MILES
0 4000 8000 12000 FEET

Under the "status quo" plan for the year 2000, primary public transit service within the northwest side study area would be provided by four motor bus routes operating in mixed traffic on freeways. These four routes would provide service identical to the primary transit service provided in 1980 within the study area. Secondary, or express, public transit service within the study area would be limited to a single route. This service also would be identical to the secondary transit service provided in 1980 within the northwest side study area.

Source: SEWRPC.

Map 207

MAJOR LAND USE CENTERS AND AREAS WITHIN THE STUDY AREA NOT SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

PRIMARY SERVICE

- FREEWAY BUS LINE
- NONFREEWAY EXTENSION

SECONDARY SERVICE

- EXPRESS BUS LINE

PARK-RIDE LOTS

- PUBLIC TRANSIT STATION
- SHOPPING CENTER LOT

MAJOR LAND USE CENTERS NOT SERVED

- RETAIL AND SERVICE
- PUBLIC OUTDOOR RECREATIONAL
- MEDICAL AND EDUCATIONAL

MAJOR LAND USE AREAS NOT SERVED

- INDUSTRIAL

GRAPHIC SCALE

0 1 2 MILES

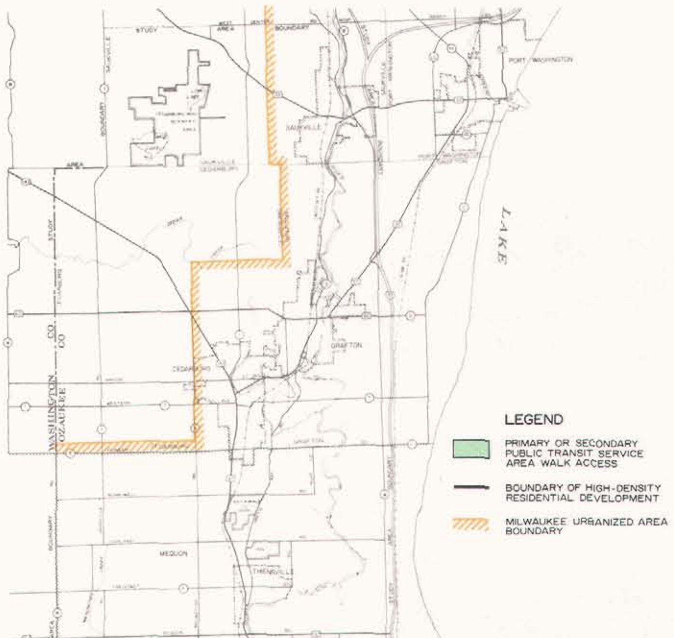
0 4000 8000 12000 FEET

In order to be considered served by primary or secondary transit, a major center or area other than high-density residential areas must be within walking distance of a park-ride lot, a stop on an express route, or a primary transit collector-distributor route extension on a standard arterial street. As shown on this map, one of three major shopping centers in the study area, three of seven major industrial areas, four of 11 major medical centers or hospitals, four of five major parks or outdoor recreational areas, and one of four universities, accredited four-year colleges, or county-operated technical or vocational schools would not be served by primary or secondary transit service under the "status quo" plan.

Source: SEWRPC.

Map 208

AREAS OF HIGH-DENSITY RESIDENTIAL DEVELOPMENT WITHIN THE STUDY AREA SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT (WALK ACCESS): YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

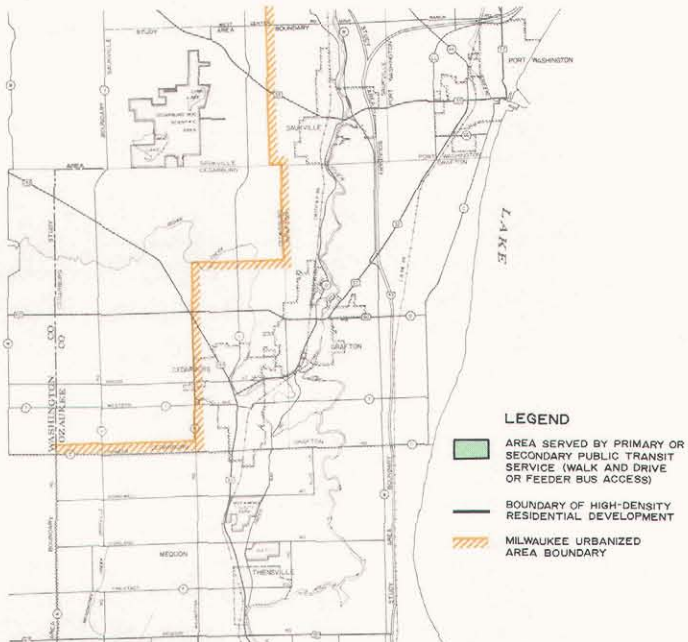


This map shows those high-density residential areas within the northwest side study area in the year 2000 which would be within walking distance of a primary or secondary transit service route *under the "status quo" plan*. As shown on this map, much of the planned high-density residential development of the study area—about 212,200 people, or about 66 percent—would not be within walking distance of primary or secondary transit.

Source: SEWRPC.

Map 209

AREAS OF HIGH-DENSITY RESIDENTIAL DEVELOPMENT IN THE STUDY AREA SERVED BY PRIMARY OR SECONDARY PUBLIC TRANSIT (WALK AND DRIVE OR FEEDER BUS ACCESS) YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



This map shows those high-density residential areas which would be within three miles driving distance of a primary transit park-ride lot or within walking distance of a secondary public transit route under the "status quo" plan. As shown on this map, the area which would not be served by primary or secondary transit service, even when driving access to the primary transit system is considered, would be substantial, as it would include about 91,000 people, or about 28 percent of the total population of the planned high-density residential area of the study area.

Source: SEWRPC.

of a secondary transit route stop. As shown on Map 209, this area, which would not be served by primary or secondary transit even when driving access to the primary transit system is considered, is substantial, as it includes about 91,000 people, or about 28 percent of the total population of the high-density residential areas of the study area.

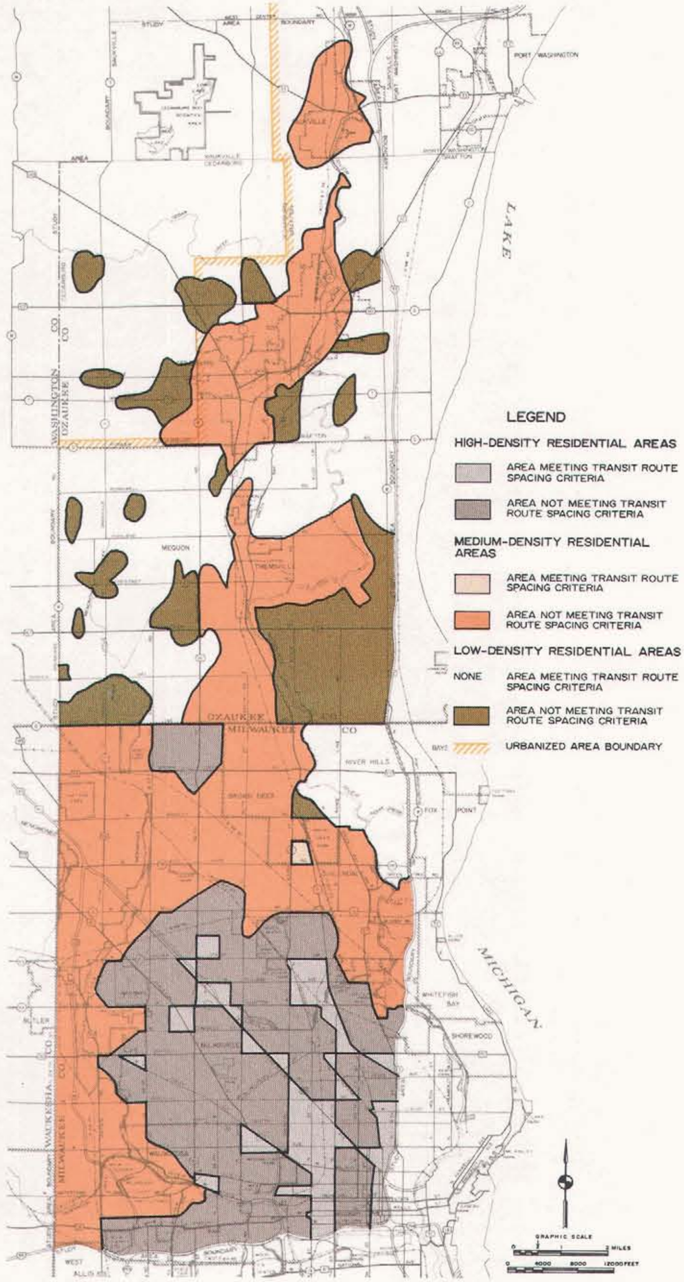
Local Transit Route Spacing: The third standard under the objective specifies that local public transit service should have route spacings not exceeding one mile in low-density areas and one-half mile in medium-density and high-density areas. As shown on Map 210, much of the high-, medium-, and low-density development in that area which is anticipated to be urbanized in the year 2000 would not meet this route spacing standard under the "status quo" plan. None of the low-density development would be considered to be served by one-mile transit route spacing. Within those areas of contiguous high- and medium-density residential development planned in the study area in the year 2000, one-half-mile local public transit route spacing would be met only along N. 35th Street, N. 12th Street, N. Green Bay Avenue, and W. Fond du Lac Avenue. The total population which would reside within areas not meeting this standard would be about 328,600 people, or about 63 percent of the total population of the urbanized portion of the study area.

Public Transit Route Alignment: The fourth standard under this objective specifies that public transit routes should be direct in alignment with a minimum number of turning movements, which cause circuitous paths or loops. As shown on Map 211, there would be seven routes within the study area in the year 2000 under the "status quo" plan, which would exhibit circuitous or loop routing over some part of their length, routing which would not directly or conveniently serve travel. The extent of such paths or loops, however, is limited, and it would appear that the routes have been designed so as to make service more available to parts of the Milwaukee area, or to utilize the existing arterial street alignment.

Duplication of Public Transit Service: The fifth standard under the objective asserts that public transit routes should be arranged to minimize duplication of service. Duplication in local service consists of service area overlap, not including the overlap which occurs at the meeting or crossing of routes. The largest amount of local service overlap, as shown on Map 212, would occur in the extreme southeastern portion of the study area,

Map 210

AREAS OF HIGH-, MEDIUM-, AND LOW-DENSITY RESIDENTIAL DEVELOPMENT NOT MEETING SUGGESTED TERTIARY PUBLIC TRANSIT ROUTE SPACING STANDARDS: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

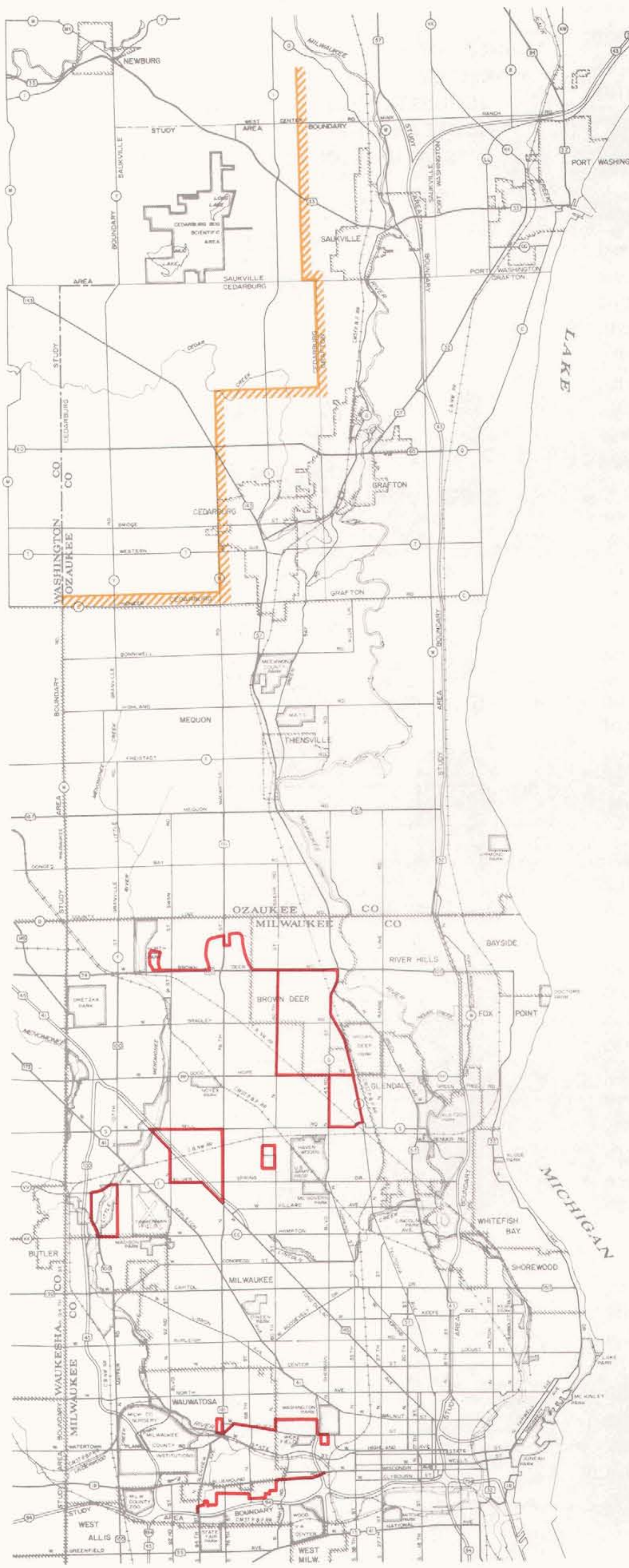


Under the "status quo" plan, much of the planned high-, medium-, and low-density residential development within the urbanized portion of the northwest side study area in the year 2000 would meet that transit route spacing standard which specifies that local public transit routes should be spaced no more than one mile apart in low-density areas and one-half mile apart in medium- and high-density areas. As shown on this map, much of the high-, medium-, and low-density development in the urbanized area in the year 2000 would not meet this route spacing standard under the "status quo" plan. None of the low-density development would be considered served by one-mile transit route spacing. Within those areas of contiguous high- and medium-density residential development in the northwest side study area in the year 2000, one-half-mile local public transit route spacing would be considered met only along corridors adjacent to N. 35th Street, N. 12th Street, N. Green Bay Avenue, and W. Fond du Lac Avenue. About 328,600 people, or about 63 percent of the total population of the urbanized portion of the study area, would reside within areas not meeting this standard.

Source: SEWRPC.

Map 211

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA NOT DIRECT IN ALIGNMENT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

TRANSIT ROUTES NOT DIRECT IN ALIGNMENT

MILWAUKEE URBANIZED AREA BOUNDARY

GRAPHIC SCALE

0 1 2 MILES

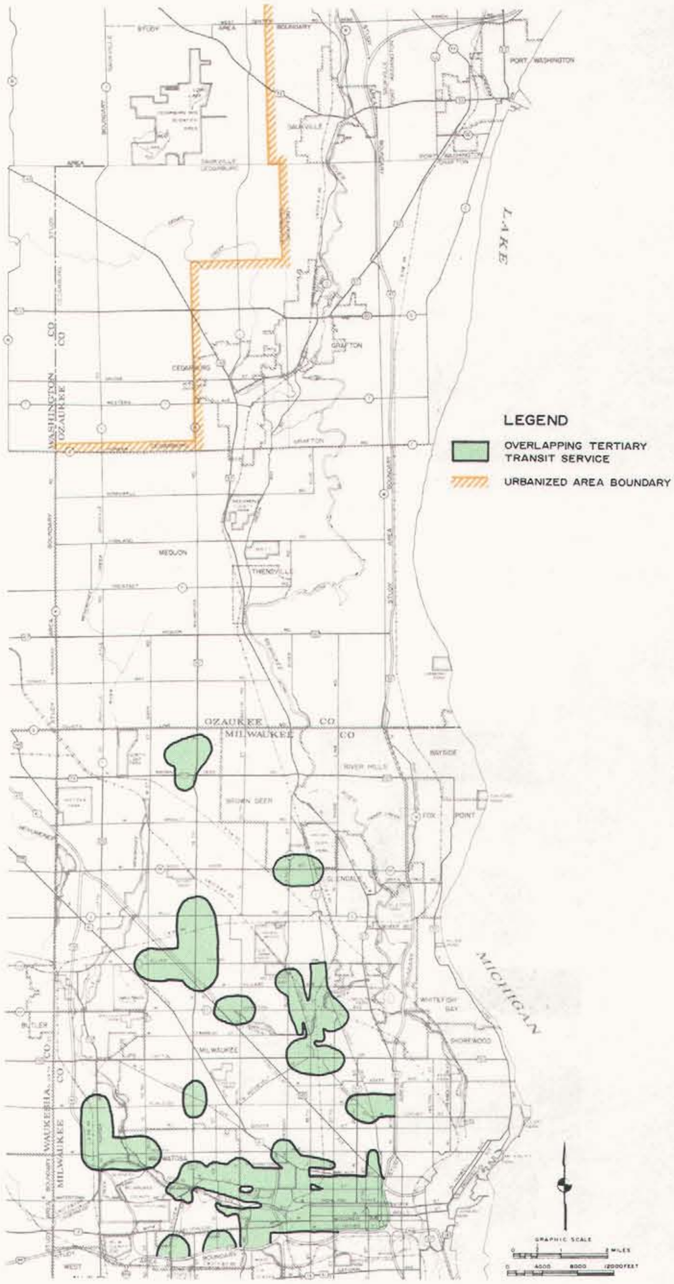
0 4000 8000 12000 FEET

Public transit routes should be direct in alignment with a minimum number of turning movements which cause transit vehicles to traverse circuitous paths or loops. As shown on this map, within the study area seven transit routes would exhibit circuitous or loop routing over part of their length in the year 2000 under the "status quo" plan—routing which would not directly or conveniently serve travel desire lines.

Source: SEWRPC.

Map 212

DUPLICATION OF PUBLIC TRANSIT SERVICE IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



Public transit routes should be arranged so as to minimize duplication of service. Local service duplication consists of service area overlap, not including the overlap which occurs at the meeting or crossing of routes. As shown on this map, the largest amount of local service overlap under the "status quo" plan would occur in the extreme southeastern portion of the northwest side study area, where routes would provide access to and from the Milwaukee central business district. Overlap of local service would occur sporadically throughout the remainder of the Milwaukee County portion of the study area.

Source: SEWRPC.

where routes provide access to and from the Milwaukee central business district. Overlap of local service occurs only sporadically throughout the remainder of the Milwaukee County portion of the study area.

There is some overlap in service at a three-mile driving access from park-ride lots and primary transit service in the study area. There is little overlap at a two-mile radius from park-ride lots, and none at a one-mile radius.

Transfer Utilization on Public Transit: The sixth standard under the objective requires that public transit routes be arranged so that the number of transfers required for system utilization is minimized. As shown on Map 213, under the "status quo" plan, less than 1.00 transfer is required per transit trip within the local transit service portion of the study area on an average weekday in nearly all parts of the local transit service area. Exceptions are parts of the west-central, north-central, and south-central portions of the local transit service area, where the average number of transfers per transit trip would approach or be greater than 1.50 transfers. Systemwide, the average number of transfers required per transit trip would be 0.36 under this alternative plan in the year 2000.

Transit Stop Spacing: The seventh, eighth, and ninth standards under the objective specify desirable locations for, and distances between, passenger stops along primary, secondary, and local transit routes. The seventh standard requires that passenger stop locations along primary transit routes be located at the termini or ends of the route, and at distances of at least one-half mile along the primary transit route. The eighth standard specifies that passenger stop locations along secondary public transit routes should be located at route termini and at intersections with other transit routes, or at intersections adjacent to major land use activities. The ninth standard specifies locational requirements for passenger stops along the remaining element of the public transit system, the tertiary, or local, service system. Stops along local service routes are to be spaced no more than 660 to 1,250 feet apart, but no more frequent that 12 per mile through commercial and residential areas, or at least 440 feet apart. Passenger-stop route spacing was analyzed for all three elements of the 1978 public transit system in Chapter IV of this report. In that analysis, it was found that the passenger-stop location standard was not met on the arterial street extensions of two primary routes and was not met on only one segment of the tertiary route system. With regard to long-range planning, such passenger-stop route spacing can be considered to be an element of route design, which, over the plan design period, can be altered to meet changes in transit travel demand. It therefore is reasonable to assume that under the "status quo" transportation system plan, all elements of the public transit route system, including those in violation of this standard in 1978, can be made to meet this standard by the year 2000.

Maximization of Residents Served by Public Transit: The tenth standard under the objective asserts that the number of residents of the study area served by public transit should be maximized. Under this transportation system plan, those parts of the study area which would be served by public transit—specifically, which would be within one-quarter-mile walking distance of a local service route, one-half-mile walking distance of a secondary service route, and one-half-mile walking distance, or three miles driving distance, of a primary transit park-ride lot—are shown on Maps 214, 215, and 216, respectively.

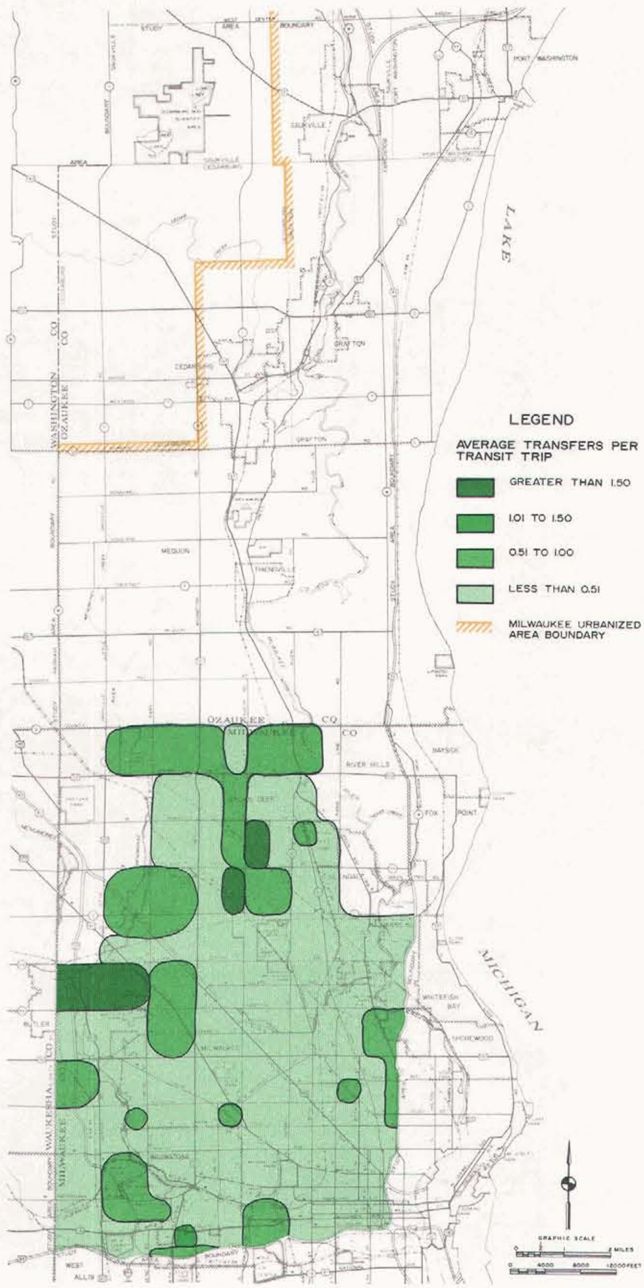
As shown on Map 214, only the Milwaukee County portion of the study area, in large part, would be served by local transit service. Based upon planned population allocations for the study area for the year 2000, about 82 percent of the population of the urbanized portion of the study area, or about 426,600 people, would be considered to be served by local transit under the "status quo" plan. As shown in Table 217, this compares with 86 percent of the total population of the urbanized area served by local public transit in 1978.

As shown on Map 215, only a small portion of the study area's urbanized area population—13 percent, or about 67,700 people in the extreme southeastern portion of the study area—would be served by secondary transit under this plan in the year 2000, as compared with about 11 percent in 1978.

As shown on Map 216, a considerable portion of the urbanized part of the study area—about 279,800 people, or about 54 percent—would be within a three-mile drive of a primary transit park-ride lot under the "status quo" plan. About 9 percent of the population of the urbanized portion of the study area, or 45,600 people, would be within a one-half-mile walking distance of a primary transit route under this plan.

Map 213

AVERAGE NUMBER OF TRANSFERS REQUIRED PER TRANSIT TRIP WITHIN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

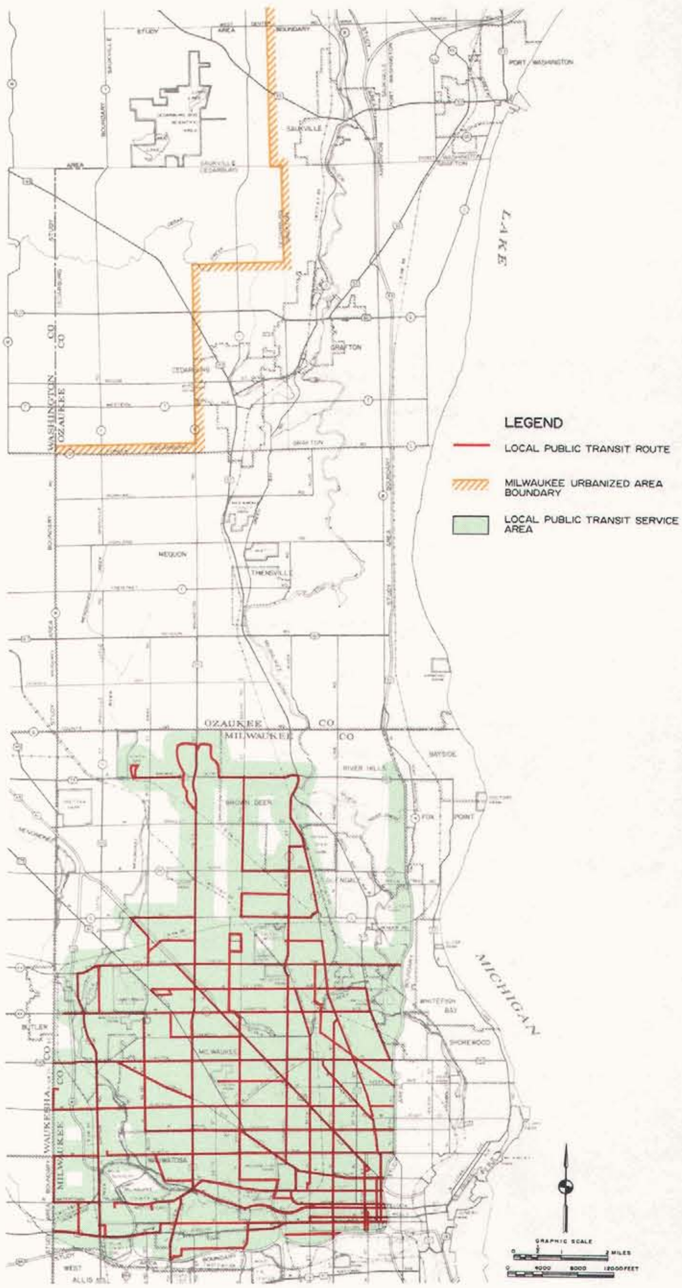


Public transit routes should be arranged so that the number of transfers required for system utilization is minimized. As shown on this map, under the "status quo" plan the average number of transfers required per transit trip within the local transit service portion of the study area would be less than 1.0 on an average weekday in nearly all parts of the area. However, in portions of the west-central, north-central, and south-central portions of the local transit service area, the average number of transfers per transit trip would approach or be greater than 1.5 under this plan.

Source: SEWRPC.

Map 214

AREAS WITHIN THE STUDY AREA SERVED BY LOCAL TRANSIT SERVICE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

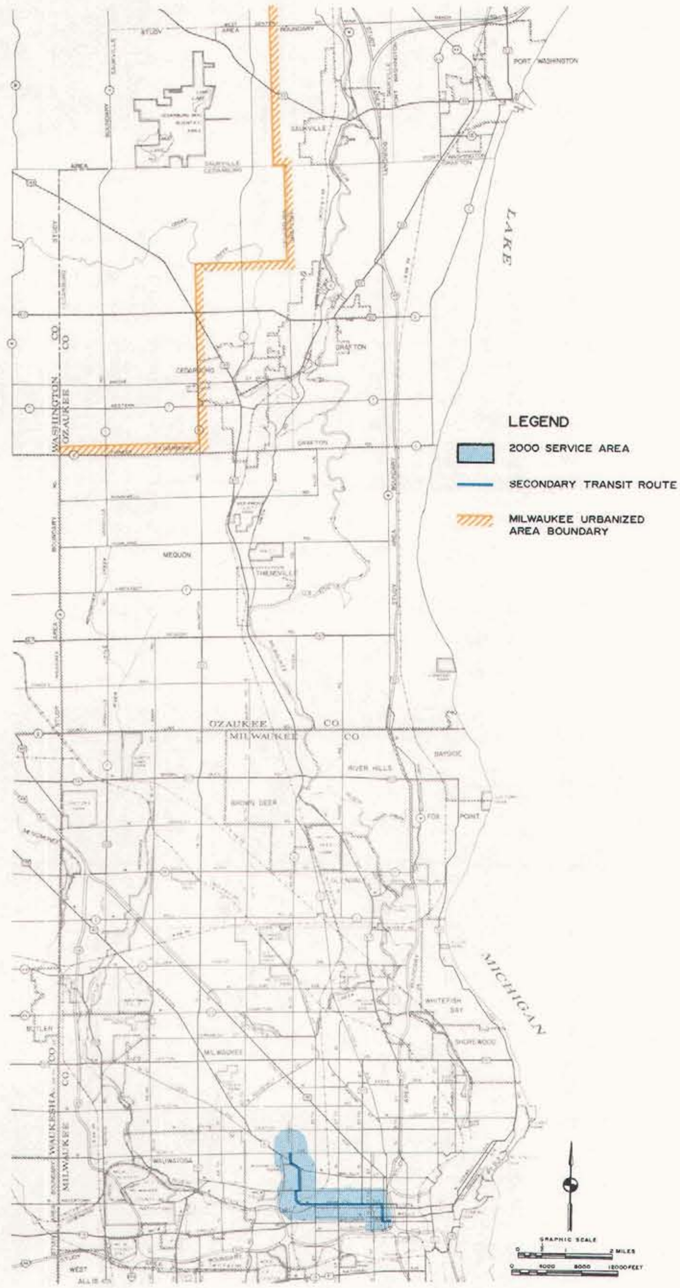


Those parts of the study area which would be served by local public transit under the "status quo" transportation system plan—that is, which would be within one-quarter-mile walking distance of a local transit route—are shown on this map. Only the Milwaukee County portion of the study area in large part would be served by local transit service. About 82 percent of the population of the urbanized portion of the study area, or about 426,600 people, would be considered served by local transit under this plan.

Source: SEWRPC.

Map 215

AREAS WITHIN THE STUDY AREA SERVED BY SECONDARY TRANSIT SERVICE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

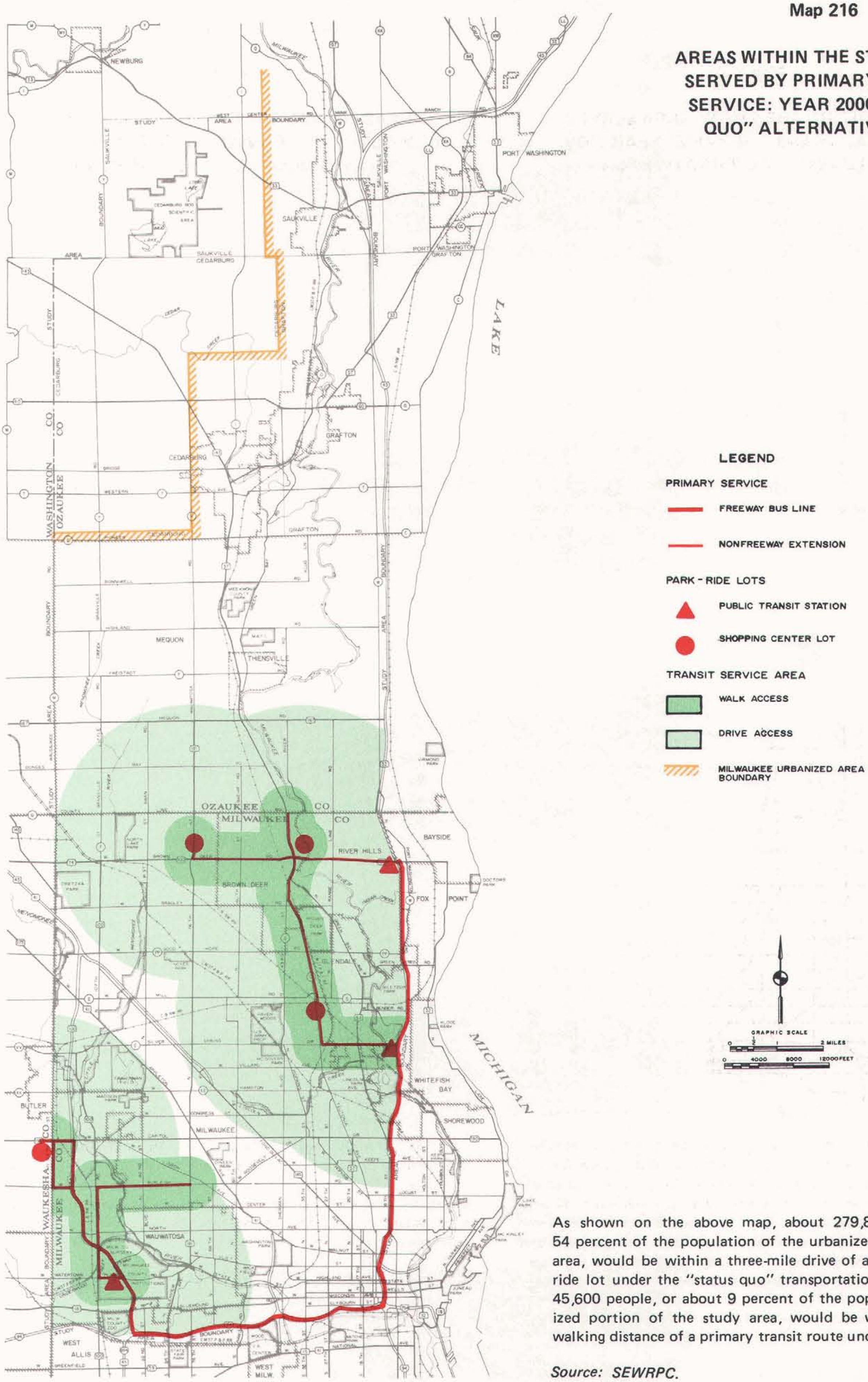


As shown on this map, only a small portion of the study area's urbanized area population—13 percent, or about 67,700 people in the extreme southeastern portion of the study area—would be served by secondary public transit or would be within one-half-mile walking distance of a secondary service route under the "status quo" plan.

Source: SEWRPC.

Map 216

AREAS WITHIN THE STUDY AREA SERVED BY PRIMARY TRANSIT SERVICE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



As shown on the above map, about 279,800 people, or about 54 percent of the population of the urbanized portion of the study area, would be within a three-mile drive of a primary transit park-ride lot under the "status quo" transportation system plan. About 45,600 people, or about 9 percent of the population of the urbanized portion of the study area, would be within a one-half-mile walking distance of a primary transit route under this plan.

Source: SEWRPC.

Considering the three elements of public transit service together as provided for under the "status quo" transportation system plan, about 436,000 people, or about 84 percent of the total population of the urbanized portion of the study area, would be considered to be served by public transit, as compared with 94 percent of the population of the urbanized area served by all forms of public transit in 1978, as shown in Table 217.

Maximization of Jobs Served by Public Transit: The eleventh standard under this objective specifies that the number of jobs served by public transit in the study area should be maximized. Jobs are considered to be served by public transit when they are within a one-half-mile walking distance of stops provided by primary and secondary service routes and within one-quarter-mile walking distance of stops provided by local service routes. Over 89 percent of the jobs in the urbanized portion of the study area, or about 224,800 jobs, would be served by public transit under the "status quo" plan in the year 2000. This compares with about 92 percent of all jobs in the urbanized area served by public transit in 1978. Table 218 summarizes the extent to which the components of the public transit system would serve jobs in the study area.

Table 217

POPULATION SERVED BY PUBLIC TRANSIT: 1978 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Type of Transit	Population Served by Public Transit			
	1978		2000	
	Number	Percent of Urbanized Area Population	Number	Percent of Urbanized Area Population
Primary				
Drive Access.	298,500	61.0	279,800	53.7
Walk Access	- -	- -	45,600	8.7
Secondary	55,200	11.3	67,700	13.0
Tertiary	419,900	86.3	426,600	81.8
Total	458,200	94.0	436,000	83.6

Source: SEWRPC.

Table 218

JOBS SERVED BY PUBLIC TRANSIT: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Type of Transit	Employment Opportunities Served by Public Transit			
	1978		2000 "Status Quo" Plan	
	Number	Percent of Total Opportunities in Urbanized Area	Number	Percent of Total Opportunities in Urbanized Area
Primary				
(walking access)	62,100	31.4	76,400	30.4
Secondary	24,100	12.2	43,300	17.2
Tertiary	177,200	89.7	214,100	85.1
Total	182,000	92.2	224,800	89.3

Source: SEWRPC.

Provision of Adequate Park-Ride Lot Capacity: The twelfth standard under this objective requires that sufficient off-street parking be provided at primary transit service park-ride lots to accommodate the total parking demand generated by trips which change from automobile to public transit at those lots. The forecast parking occupancy by transit passengers of the seven primary transit park-ride lots which would be provided under the "status quo" plan on an average weekday in the year 2000 is shown in Table 219. Five park-ride lots would not meet this standard: the Brown Deer Road public transit station, the Watertown Plank Road public transit station, the Northridge shopping center lot, the Treasure Island shopping center lot in Brookfield, and the North Shore public transit station.

Provision of Adequate Public Transit Seating Capacity: The thirteenth standard under this objective requires that public transit in the study area be operated so as to provide adequate vehicle capacity to meet travel demand. The provision of adequate vehicle capacity is determined by each route segment's average maximum load factor, which is the ratio of the number of passengers carried to the seating capacity provided. As indicated previously in this report, a load factor of 1.00 is considered the maximum desirable on primary, secondary, and tertiary public transit during off-peak periods. During peak periods, load factors of 1.00 in primary service, 1.25 in secondary service, and 1.33 in tertiary service are considered the maximum desirable. Load factors, based on forecast transit travel demand in the year 2000 under the "status quo" plan, would be exceeded on about 157 route miles in the year 2000, including about nine miles of primary, or Freeway Flyer, service and about 148 miles of tertiary, or local, service. In 1978, these maximum load factors were found not to be exceeded on tertiary or secondary transit routes in the study area.

Summary and Conclusions: The third transportation system development objective formulated under the study specifies that the transportation system of the northwest side study area should be balanced, providing the appropriate types of transportation service needed within the study area.

Standards for basic transportation facility and service provision would not be met in the year 2000 under the "status quo" plan principally within the Milwaukee County portion of the study area. Suggested arterial street spacing would not be met under this plan in high-density development areas in the central portions of this part of the study area. Primary and secondary transit service would generally not be provided to the central portions of the Milwaukee County portion of the study area, leaving significant areas of high-density development, a major retail and service center, parts of

Table 219

UTILIZATION OF PRIMARY PARK-RIDE LOTS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Lot	Type	Total Spaces Available	Forecast Utilization by Transit Passengers[a]
Brown Deer (River Hills)	Public transit station	250	Over capacity
North Shore (Glendale)	Public transit station	190	Over capacity
Watertown Plank Road	Public transit station	200	Over capacity
Northland	Shopping center lot	100	Under capacity
Northridge	Shopping center lot	100	Over capacity
Treasure Island (Brookfield)	Shopping center lot	250	Over capacity
Treasure Island (Brown Deer)	Shopping center lot	125	Under capacity

[a] *Forecast park-ride-lot utilization is a function of total forecast Freeway Flyer ridership, which is constrained by, among other factors, the amount and level of Freeway Flyer service offered. Forecast park-ride-lot utilization considers the extent to which Freeway Flyer users will both walk and carpool to the lot. Any comparisons of the forecast park-ride-lot utilization to current utilization must recognize that the forecast use includes use of the lot by transit passengers only, and not, for example, use by park-and-pool users.*

Source: SEWRPC.

three major industrial areas, three hospitals plus a major medical center, three major recreational centers, one major educational center, and General Mitchell Field not adequately served. Suggested local public transit route spacing would not be met in nearly all parts of the urbanized portion of the study area, largely because little or no public transit service would exist under this plan to serve medium- and low-density development in northern Milwaukee and the Ozaukee County portion of the study area. The number of residents and jobs which would be considered to be within walking distance of any service offered by the public transit system within the urbanized portion of the study area under this plan would be substantial, however—436,000 residents, representing about 84 percent of the population of the urbanized area, and 224,800 jobs, representing about 89 percent of all job opportunities in the urbanized portion of the study area.

Problems regarding the specific design and operation of public transit facilities and services within the study area would, under the "status quo" plan, be primarily limited to the capacity of the transit service to be provided. Under this plan, load factors would be exceeded on 157 route miles of the public transit system of the study area, compared with no miles in 1979, and the parking capacity of five of the seven primary transit park-ride lots provided in the study area would be exceeded, compared with only one such lot in 1979.

Effectiveness of the "Status Quo" Transportation System Plan in Minimizing Disruption of Community Development and the Natural Resource Base

The fourth transportation systems management and development objective formulated under the study asserts the need for a transportation system which minimizes the disruption of existing and future development in the study area, including adverse impacts on the natural resource base. This objective is supported by seven standards.

Dislocation: The first standard under this objective specifies that the dislocation of households, businesses, industries, and public and institutional buildings, as measured by the number and value of facilities to be displaced by the reconstruction of existing or the construction of new transportation facilities, should be minimized. On the basis of actions now underway or programmed to be underway this year, the "status quo" plan is estimated to dislocate no residential units or structures and no nonresidential structures, but to require acquisition of $220,000 worth of vacant cleared land, as shown in Table 220.[4]

Amount of Land Taken: The second standard indicates that the total amount of land used for transportation facilities should be minimized. For the "status quo" plan, the amount and cost of land required for construction of new transportation facilities was estimated. The total cost of land required for implementation of this plan would be approximately $220,000, representing 1.8 total acres, as shown in Table 220.

Table 220

LAND-TAKING REQUIREMENTS FOR TRANSPORTATION SYSTEM IMPROVEMENTS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Category	Requirement
Number of Residential Units	- -
Number of Nonresidential Structures	- -
Acquisition, Demolition, and Relocation Cost	$220,000
Acres of Land	1.8
Land Cost	$220,000

Source: SEWRPC.

Neighborhood Penetration: The third standard under this objective indicates that the penetration of neighborhood units by arterial streets and highways and primary transit routes should be minimized. As shown on Map 217, under the "status quo" plan for the study area, about 123 miles, or nearly 28 percent of the arterial street and highway system of the study area, would violate this standard by penetrating the neighborhood boundaries defined for the study area in Chapter VI of this report. A total of 86 neighborhoods, or about 52 percent of the total number of neighborhoods in the study area, would be divided by these arterial facilities.

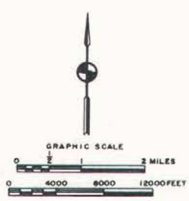
[4] *Land programmed to be acquired by the end of 1980 under this plan includes additional strips of right-of-way along N. 60th Street from W. Good Hope Road to W. Bradley Road to accommodate two additional lanes, and along W. Bradley Road from N. 87th Street to N. 66th Street to accommodate two additional parking lanes.*

Map 217

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA WHICH WOULD PENETRATE NEIGHBORHOOD BOUNDARIES: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

LEGEND

ARTERIAL STREETS AND HIGHWAYS PENETRATING NEIGHBORHOOD BOUNDARIES



The penetration of neighborhood units by arterial streets and highways and primary transit routes should be minimized. As shown on this map, under the "status quo" plan for the study area, about 123 miles, or nearly 28 percent of the arterial street and highway system of the study area, would violate this standard by penetrating the neighborhood boundaries of the northwest side study area as defined in this report. A total of 86 neighborhoods, or about 52 percent of the total number of neighborhoods in the study area, would be divided by these arterial facilities.

Source: SEWRPC.

Destruction of Historic or Cultural Sites: The fourth standard under this objective indicates that the destruction of historic buildings and of historic, scenic, scientific, archaeological, and cultural sites, as caused by the reconstruction of existing, or the construction of new, transportation facilities should be minimized. No such destruction is entailed under the "status quo" plan.

Noise from Arterial Street and Highway Use: The fifth standard under this objective requires that the transportation system of northwestern Milwaukee County and southern Ozaukee County be designed and located so as to minimize the exposure of the population to annoying, as well as possibly harmful, noise levels. Noise levels generated by transportation facilities must exceed 70 dBA at the exterior of buildings adjacent to the facility for at least 10 percent of an average weekday to be considered annoying. Map 218 shows the potential of the arterial street and highway facilities of the study area under the "status quo" plan to generate such annoying noise levels under year 2000 travel demand. As shown on Map 218 and indicated in Table 221, about 53 percent of the arterial streets in the study area, or 235 miles of arterial facilities, would have the potential to generate annoying noise levels, with the majority of those streets and highways being located in the Milwaukee County portion of the study area.

Ambient Air Quality: The sixth standard under this objective specifies that the transportation system should be located, designed, and operated to minimize the amount of air pollutants generated. As shown in Table 222, it is estimated under this plan that in the year 2000 annual particulate matter emissions by the study area transportation system will total about 980 tons, annual sulfur dioxide emissions about 560 tons, annual nitrogen dioxide emissions about 7,400 tons, annual carbon monoxide emissions about 46,810 tons, and annual hydrocarbon emissions about 4,960 tons. Also as shown in Table 222, in 1977 emissions from transportation-related sources in the Region accounted for nearly 87 percent of all regional carbon monoxide emissions, nearly 42 percent of all regional nitrogen dioxide emissions, over 36 percent of all regional hydrocarbon emissions, and about 15 percent of all regional particulate emissions. The table also indicates that in the year 2000, because of improved emission controls, transportation-related sources may be expected to account for lesser portions of these emissions, or about 64 percent of all regional carbon monoxide emissions, about 21 percent of all regional nitrogen dioxide emissions, about 16 percent of all regional hydrocarbon emissions, and about 12 percent of all regional particulate emissions.

Proper Use of Land Adjacent to Transportation Facilities: The seventh standard under this objective specifies that the proper use of land for and adjacent to transportation facilities should be maximized, and that the disruption of future development should be minimized through advance reservation of rights-of-way for transportation facilities. This standard could be met equally well under each alternative plan, but can be met effectively only through vigorous plan implementation by the units of government concerned.

Summary and Conclusions: The fourth adopted transportation system development objective specifies that the transportation system of the study area should minimize disruption of development, including adverse effects on the natural resource base. The degree to which this objective is met under this plan cannot be fully assessed without having designed and tested the other two alternative long-range transportation system plans. However, the environmental implications of doing nothing at all to improve the study area transportation system can be ascertained from the information presented in this section concerning the extent of air pollutant emissions, the extent to which noise standards would be violated, and the extent to which neighborhoods and the natural and cultural landscape would be penetrated under this plan. On the other hand, under the "status quo" plan, no households, businesses, industries, or public or institutional buildings would be displaced, and no cultural or historic sites would be destroyed.

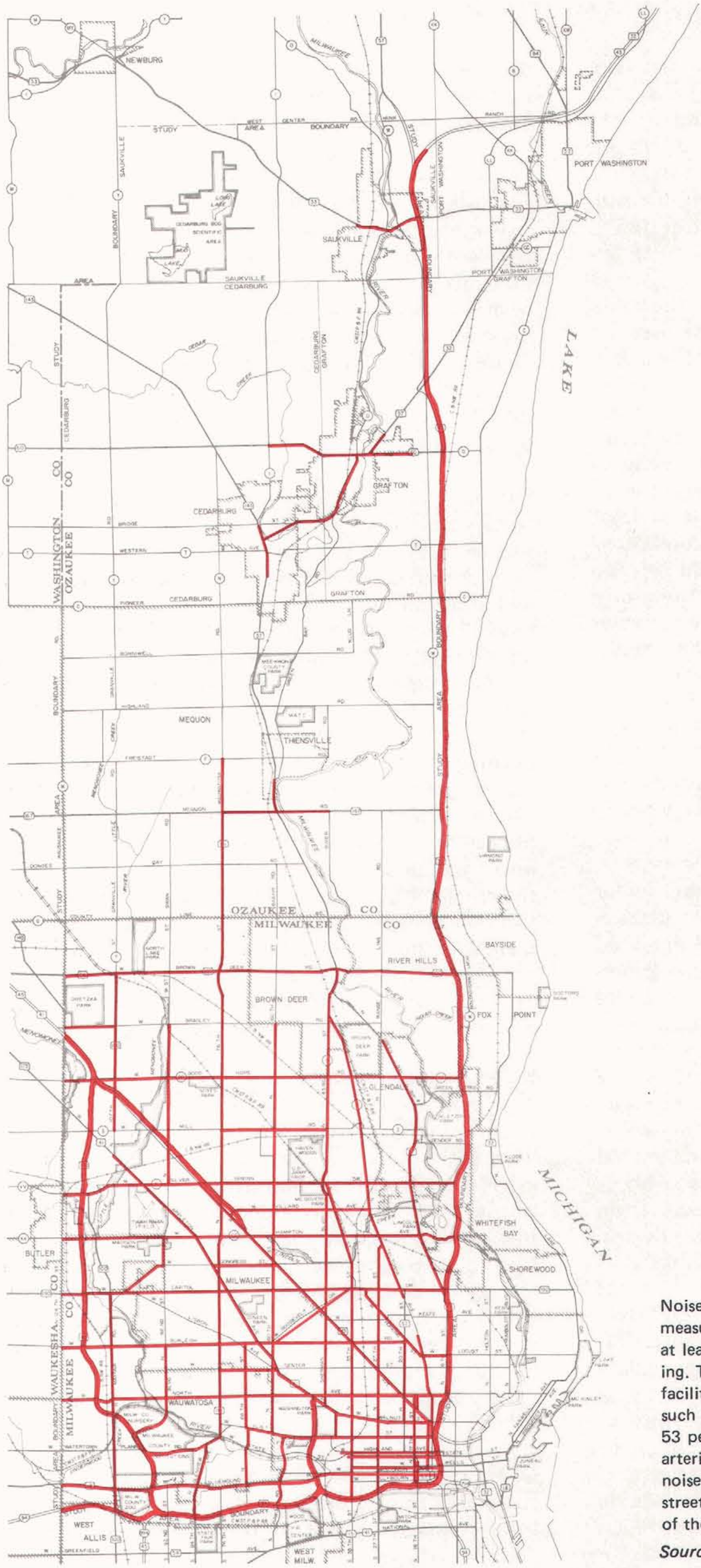
Effectiveness of the "Status Quo" Transportation System Plan in Facilitating Quick and Convenient Travel

The fifth objective formulated under the study asserts the need for the provision of a transportation system which, to support the everyday activities of business, shopping, and social intercourse, facilitates reasonably fast and convenient travel among component parts of northwestern Milwaukee County and southern Ozaukee County, and between this area and other component parts of the Southeastern Wisconsin Region. Ten standards support and quantify the achievement of this objective.

Quantity of Travel: The first, second, and third standards under this objective indicate that the total passenger hours of travel, the total vehicle

Map 218

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA HAVING THE POTENTIAL TO GENERATE ANNOYING NOISE LEVELS: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

FREEWAY

ARTERIAL STREET

NOTE: SEGMENTS SHOWN ARE FACILITIES WITH THE POTENTIAL FOR NOISE LEVELS EXCEEDING 70 dBA FOR AT LEAST 10 PERCENT OF AN AVERAGE WEEKDAY

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

Noise levels generated by arterial facilities must exceed 70 dBa, as measured at the exterior of buildings adjacent to the facility, for at least 10 percent of an average weekday to be considered annoying. This map shows the potential of the arterial street and highway facilities of the study area under the "status quo" plan to generate such annoying noise levels under year 2000 travel demand. About 53 percent of the arterial streets in the study area, or 235 miles of arterial facilities, would have the potential to generate annoying noise levels under this plan, with the majority of those arterial streets and highways being located in the Milwaukee County portion of the study area.

Source: SEWRPC.

hours of travel, and the total vehicle miles of travel, respectively, should be minimized within the study area.

As shown in Table 223, under the "status quo" transportation system plan there would be about 7.24 million vehicle miles of travel on an average weekday in the year 2000 on the arterial street and highway system, or about 4 percent more than in 1978; and about 220,600 vehicles hours of travel on an average weekday in the year 2000 on the arterial street and highway system.

The total vehicle miles of travel on an average weekday on the study area public transit system would total about 37,900 in the year 2000; and the total vehicle hours of travel would be about 2,400. The average speed of travel on the entire arterial street system of the study area will, therefore, be 33 miles per hour (mph), with an average

Table 221

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA HAVING THE POTENTIAL TO GENERATE ANNOYING NOISE LEVELS: 1978 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

dBA Level	Average Weekday dBA Emissions			
	1978		2000	
	Miles	Percent	Miles	Percent
Arterial Facilities Under 70 dBA. . . .	268.0	61.0	206.0	46.7
Arterial Facilities Over 70 dBA	171.0	39.0	235.0	53.3

Source: SEWRPC.

Table 223

COMPARISON OF THE AMOUNT OF TOTAL TRAVEL AND THE SPEED OF TRAVEL ON THE ARTERIAL STREET AND HIGHWAY AND PUBLIC TRANSIT SYSTEMS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Travel Characteristic	Average Weekday Year 2000 "Status Quo" Plan
Vehicle Miles of Travel	
Arterial Streets and Highways	
Freeways	3,518,000
Standard Arterials	3,720,600
Total	7,238,600
Total Public Transit System	37,500
Vehicle Hours of Travel	
Arterial Streets and Highways	
Freeways	84,100
Standard Arterials	136,500
Total	220,600
Total Public Transit System	2,400
Average Speed (mph)	
Arterial Streets and Highways	
Freeways	41.8
Standard Arterials	27.3
Total	32.8
Total Public Transit System	15.6
Passenger Hours of Travel	
Arterial Streets and Highways. . .	299,400
Public Transit	37,900

Source: SEWRPC.

Table 222

ANNUAL EMISSIONS FROM TRANSPORTATION-RELATED MOBILE SOURCES FOR PRIMARY POLLUTANTS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Primary Pollutant	Estimated Tons of Emission— Year 2000	Regional Percentage of Pollutant from Mobile Sources 1977[a]	Regional Percentage of Pollutant from Mobile Sources 2000[b]
Particulate Matter.	983.5	14.5	11.9
Sulfur Dioxide.	562.3	0.9	1.2
Nitrogen Dioxide	7,403.5	41.7	21.3
Carbon Monoxide.	46,807.5	86.8	64.3
Hydrocarbons	4,956.2	36.2	15.5

[a] *Based on 1977 regional emissions inventory.*

[b] *Based on forecast year 2000 regional emissions.*

Source: SEWRPC.

speed on the standard surface arterial street system of the study area of 27 mph and an average speed on the freeway system of 42 mph. The average speed of travel on the public transit system would be 16 mph in the year 2000 under this plan. As further shown in Table 223, under the "status quo" plan passenger hours of travel on the arterial street and highway system would total about 299,400, and on the public transit system, about 37,900.

Arterial Street and Highway Congestion: The fourth standard under this objective requires that the proportion of the arterial street and highway system of the study area that is subject to congestion as measured by a volume-to-design capacity ratio of 1.1 or greater be minimized. Those arterial facilities which would operate over design capacity on an average weekday under the "status quo" transportation system plan are shown on Map 219 and indicated in Table 224. This map and table also set forth those arterial facilities which would operate at or under design capacity. Under the "status quo" plan, about 101 miles of arterial streets, or 23 percent of the total arterial street and highway system of the study area, would operate over design capacity. A total of 48 miles of arterial streets and highways would operate at design capacity—about 11 percent of the arterial street system of the study area. In comparison, about 13 percent of the total arterial street and highway system was found to be operating over design capacity during the morning and evening peak hours in 1978, and about 8 percent of the total arterial street and highway system was found to be operating at design capacity during those hours. As shown on Map 219, those arterial facilities that would be operating over design capacity under the "status quo" plan in the year 2000 would be located largely in the southern and northwest and north-central parts of the Milwaukee County portion of the study area, and in the central part of the Ozaukee County portion of the study area, including nearly all freeways within this part of the study area.

Minimum Highway and Transit Overall Speeds: The fifth standard under this objective specifies minimum speeds for arterial streets and public transit by type and location of facility and service. Overall speed on the existing transportation system by specific facility and service is a direct measure of transportation system performance. Minimum overall travel speeds for the study area transportation system as specified by this standard are defined in Table 1 of Chapter II of this report. Those arterial streets and highways which would not attain the minimum overall average weekday speeds specified in this standard by facility type in the year 2000 under the "status quo" plan are shown on Map 220 and indicated in Table 225. About 24 percent of the standard arterial streets in the study area, or about 93 miles, and about 16 percent of the freeways in the study area, or eight miles, would not meet the minimum speed standards on an average weekday under this plan in the year 2000. Those arterial facilities not meeting this standard would be located principally in the southeastern quadrant of the Milwaukee County portion of the study area.

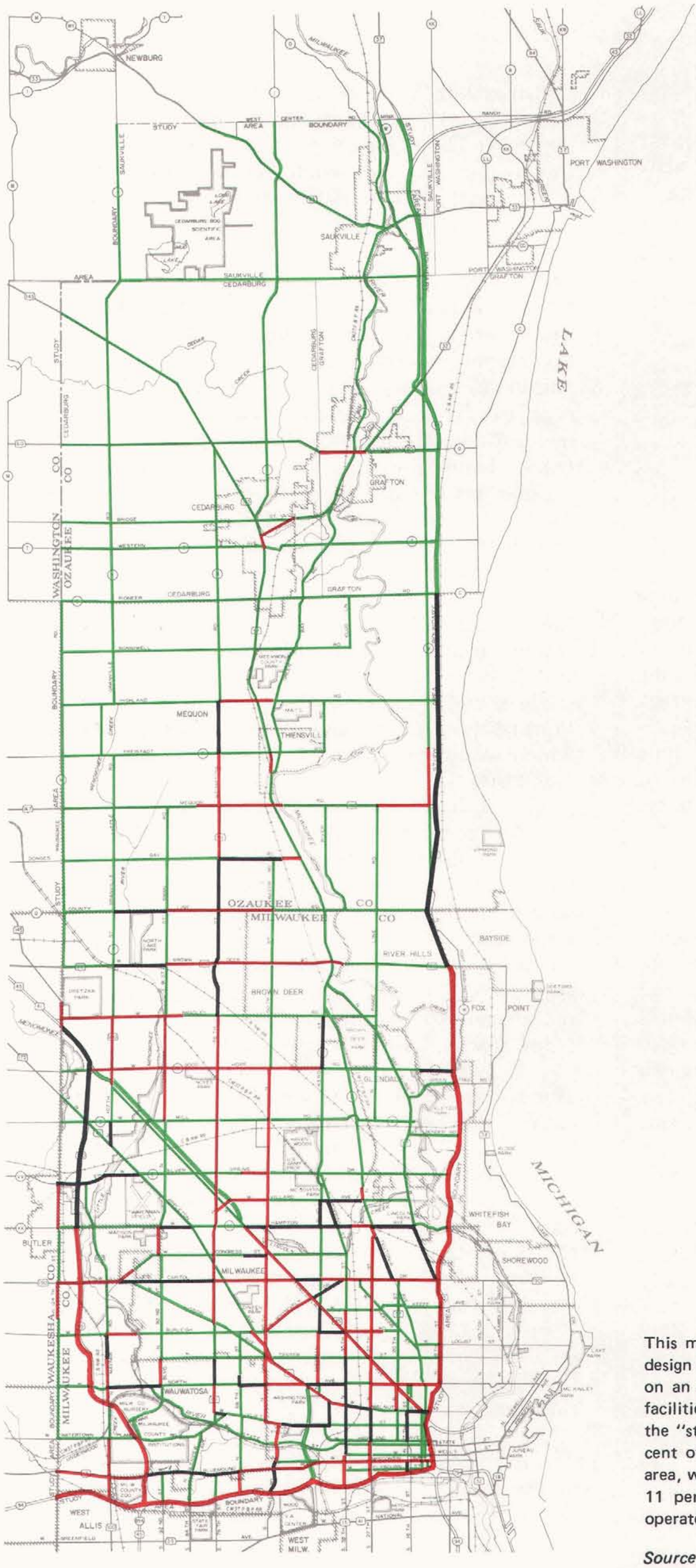
Those public transit routes which would not attain the minimum overall average weekday speeds specified in this standard under the "status quo" plan are shown on Map 221. All but four of these routes would be local transit routes, and would be located primarily in the southeastern portion of the study area. Portions of three primary transit routes and one secondary transit route would not meet this minimum speed standard. As shown on Map 221, two portions of these primary routes are located in the north-central and northeastern portions of the transit service area and one primary route portion is located in the southwestern portion of the study area. Each of these primary transit route portions operates along standard arterial streets as a feeder route. Nearly 86 route miles, or almost 18 percent of all round-trip public transit route miles, would not meet the specified minimum speed for public transit under this plan in the design year.

Arterial Street Surface Conditions: The sixth standard under this objective specifies that the surface condition of the arterial street and highway system should be of adequate quality, so as not to inhibit an otherwise safe and convenient travel speed. Because roadway maintenance costs have been included in the total costs of the "status quo" transportation system plan, it can be assumed that this standard would be met under this plan.

Comparability of Highway and Transit Travel Times: The seventh standard under this objective requires that public transit overall travel times be comparable to arterial street overall travel times among component parts of the study area and between parts of the area and the remainder of the Milwaukee transit service area. For each subarea of the study area served by public transit, the ratio between public transit sytem travel times and arterial street and highway system travel times to all

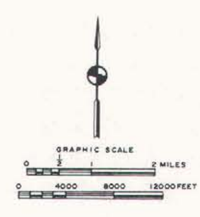
Map 219

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA OPERATING AT OR OVER DESIGN CAPACITY ON AN AVERAGE WEEKDAY: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



LEGEND

- FREEWAY VOLUME OVER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME OVER DESIGN CAPACITY
- FREEWAY VOLUME AT DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME AT DESIGN CAPACITY
- FREEWAY VOLUME UNDER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME UNDER DESIGN CAPACITY



This map shows those arterial facilities which would operate over design capacity under the "status quo" transportation system plan on an average weekday. Also shown on this map are those arterial facilities which would operate at or under design capacity. Under the "status quo" plan, about 101 miles of arterial streets, or 23 percent of the total arterial street and highway system of the study area, would operate over design capacity. About 48 miles, or about 11 percent of the total study area arterial street system, would operate at design capacity.

Source: SEWRPC.

Table 224

DISTRIBUTION OF MILES OF ARTERIAL STREET AND HIGHWAY FACILITIES OPERATING AT AND OVER DESIGN CAPACITY IN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Service Level	Miles of Arterial Facility	Percent
Under Design Capacity . . .	291.5	66.1
At Design Capacity	48.0	10.9
Over Design Capacity. . . .	101.4	23.0
Total	440.9	100.0

Source: SEWRPC.

other subareas of the study area served by public transit was calculated under the "status quo" plan, as shown on Map 222. From those parts of the northwest side study area served by public transit during the midday time period, the average midday travel time on public transit would generally be two to three times greater than travel time by automobile. The overall systemwide ratio of midday public transit travel time to highway travel time under this "status quo" plan would be 2.48.

Frequency of Public Transit Service: The eighth standard under this objective specifies that the frequency of public transit service should be sufficient to accommodate passenger volume while not exceeding specified maximum load factors, and should not, in any case, be less than one transit vehicle every 30 minutes during peak travel periods or one transit vehicle every 60 minutes during off-peak travel periods. Under the "status quo" plan, segments of two local transit routes and segments of two primary transit routes within the study area would not meet the frequency-of-transit service standard of at least two motor buses per hour during the peak travel period. During off-peak periods, however, no route segments would be in excess of one vehicle each 60 minutes (see Map 223).

Maximization of Public Transit Use: The ninth standard under this objective specifies that ridership on the public transit system should be maximized. An estimated 85,000 transit trips are forecast to be made on an average weekday under the "status quo" plan, as shown in Table 207. This would represent 6.0 percent of all tripmaking in the year 2000, as compared with 6.2 percent of all tripmaking in 1972, or 72,100 trips. The variation in transit use in the study area is shown on Map 224. The highest percentage of transit utilization under this plan would occur in the extreme southeastern corner of the study area adjacent to the City of Milwaukee central business district.

Travel-time Standards for Industrial Centers: The tenth standard under this objective requires that the transportation system provide such service that the number of industrial centers in the study area within 30 minutes overall travel time of 50 percent of the study area's resident population is maximized; 30 minutes overall travel time by truck of the Milwaukee port facility is maximized; 15 minutes overall travel time by truck of a railroad team track is maximized; and 10 minutes overall travel time by truck of a freeway exit and entrance is maximized.

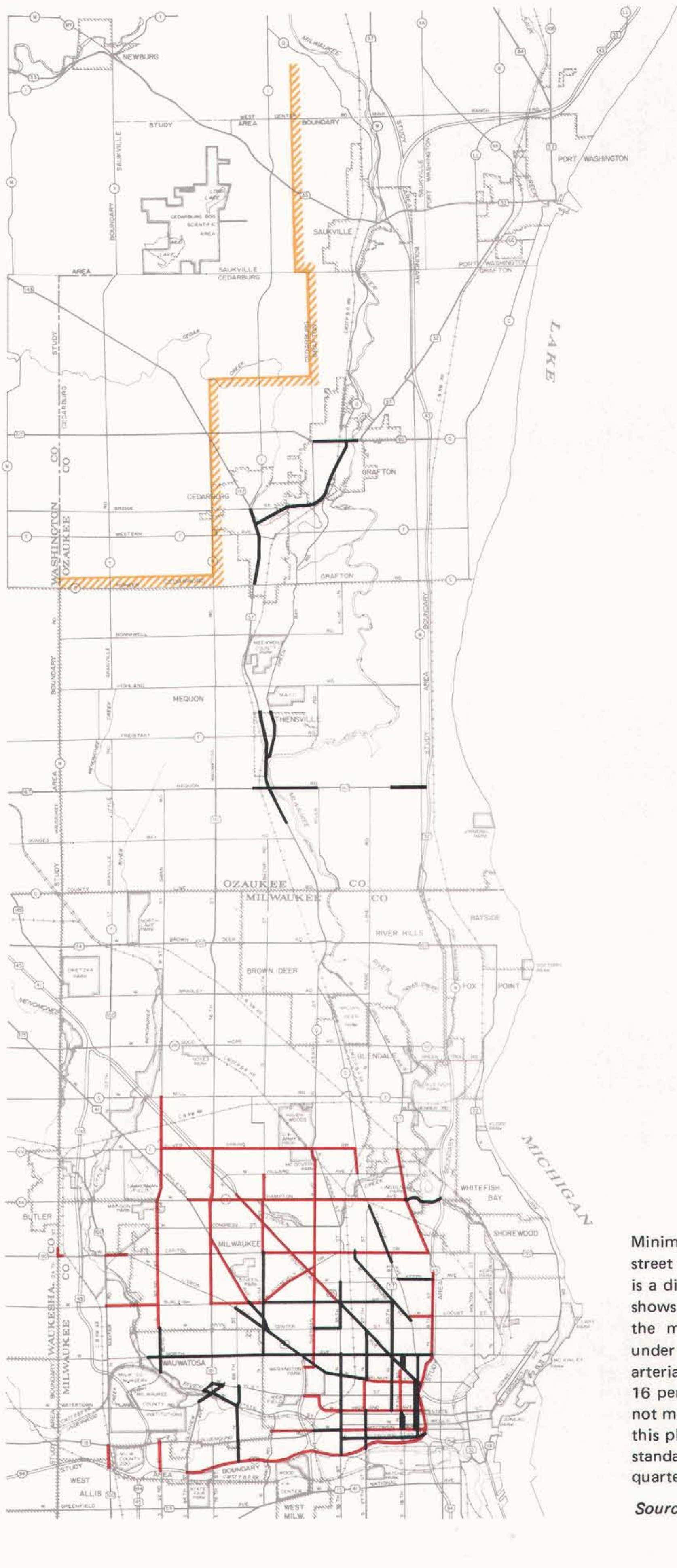
The locations of the seven major industrial centers which, according to the adopted land use plan, would be partially or wholly located within the study area are shown on Map 225, as are the locations of those 11 community-level industrial centers which would be located in the study area in the year 2000.

The first requirement of this standard is that each of the industrial centers within the study area be within 30 minutes overall travel time by automobile of 50 percent of the study area's resident population. As shown in Table 226, as in 1978, all major and community-level industrial centers would be within 30 minutes travel time by automobile of 50 percent of the population of the study area under the "status quo" plan.

The second requirement of the standard is that each of the industrial centers within the study area be within 30 minutes overall travel time by truck of the Port of Milwaukee. Under the "status quo" plan, this portion of the standard would be met by six of the seven major industrial centers—all but the Milwaukee Granville major industrial center—and four of the 11 community-level industrial centers, as shown on Map 226 and in Table 226. Because of the location of this industrial center, an overall travel speed of about 42 mph between it and the port would be required for it to meet this standard.

The third requirement of this standard is that each of the industrial centers within the study area be within 15 minutes overall travel time by truck of

ARTERIAL STREETS AND HIGHWAYS WITHIN THE STUDY AREA OPERATING BELOW SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

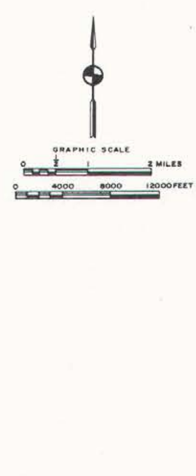


LEGEND

DIVIDED FACILITIES OPERATING AT SPEEDS BELOW STANDARD

UNDIVIDED FACILITIES OPERATING AT SPEEDS BELOW STANDARD

URBANIZED AREA BOUNDARY



Minimum overall travel speeds should be maintained on the arterial street system. Overall speed on the existing arterial street system is a direct measure of transportation system performance. This map shows those arterial streets and highways which would not attain the minimum overall average weekday speeds in the year 2000 under the "status quo" plan. About 24 percent of the standard arterial streets in the study area, or about 93 miles, and about 16 percent of the freeways in the study area, or eight miles, would not meet the minimum speed standard on an average weekday under this plan in the year 2000. Those arterial facilities not meeting this standard would be located principally in the southeastern one-quarter of the Milwaukee County portion of the study area.

Source: SEWRPC.

Table 225

ARTERIAL STREETS AND HIGHWAYS AND PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING AT LESS THAN MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Transportation Facility	Route Miles	Percent
Freeways Below Minimum Speed	8.0	15.8
Standard Arterials Below Minimum Speed	93.2	23.8
Total Arterials Below Minimum Speed	101.2	23.0
Transit Routes Below Minimum Speed	85.8	18.8

Source: SEWRPC.

a designated railroad team track. Given the existing distribution of railroad team tracks in the year 2000, this portion of the standard would be met by all major and community-level industrial centers under the "status quo" plan in that year, as in 1978.

The fourth requirement of this standard is that the industrial centers within the study area be within 10 minutes overall travel time by truck of a freeway entrance and exit. As shown in Table 226, this portion of the standard would be met by 100 percent of the regional and community-level industrial centers in the study area in the year 2000 under the "status quo" plan, as in 1978.

Summary and Conclusions: The fifth objective sets forth the need for a transportation system in the study area which will facilitate quick and convenient travel. The degree to which the first three standards under this objective are met by this plan—that is, that total passenger hours, total vehicle hours, and total vehicle miles of travel are minimized within the study area—cannot be assessed without having designed and tested the other alternative plans. However, it is apparent that a consequence of no long-range action would be an increase in arterial street and highway congestion, from about 13 percent of all arterial streets in the study area being over design capacity in 1978 to nearly 23 percent of all streets in the study area in the year 2000. Substantial portions of arterial streets in the southeastern one-quarter of the study area, about 24 percent, and several local public transit routes in the study area, segments of 16 of 30 total routes, will, as a result, operate under suggested minimum overall speeds on an average weekday.

Effectiveness of the "Status Quo" Transportation System Plan in the Provision of Travel Safety

The sixth objective formulated under the study asserts the need for the reduction of accident exposure and the provision of increased travel safety within the study area. This objective is supported by three standards relating to traffic congestion and vehicle conflicts.

Traffic Accident Exposure: The first standard under this objective specifies that travel on facilities exhibiting the lowest accident exposure be maximized so as to reduce the number of travel accidents in northwestern Milwaukee County and southern Ozaukee County. Freeways have been found to experience significantly lower accident rates than standard surface arterial facilities. In addition, travel on transit is safer than travel by automobile. From the foregoing it can be concluded that the transportation plan which would best meet this standard would provide the highest proportion of total future passenger miles of travel by transit, and the highest proportion of the travel by automobile on the freeway element of the arterial street system.

As shown in Table 227, under the "status quo" plan about 5 percent of the total passenger miles of travel would be made by transit and about 46 percent of the total passenger miles of travel would be made by automobiles on the freeway system. A total of 537,300 passenger miles of travel is forecast to be made on the public transit system, and 4,775,200 passenger miles of travel is forecast to be made on the freeway system, with the remaining 5,050,200 passenger miles of travel to be made on the standard arterial system.

Based upon historic traffic accident experience and this anticipated distribution of travel under the "status quo" plan, a forecast of accidents for the period 1980 to 2000 was made under the "status quo" plan, as shown in Table 228. Over this period, a total of 698,000 property damage accidents would be made in the study area, as would about 149,100 accidents resulting in injuries and about 1,470 accidents resulting in death.

Traffic Conflicts: The second standard under this objective specifies that the proportion of the total arterial street and highway system operating at or over design capacity, or at a volume-capacity ratio

Map 221

PUBLIC TRANSIT ROUTES WITHIN THE STUDY AREA OPERATING BELOW SUGGESTED MINIMUM OVERALL SPEEDS ON AN AVERAGE WEEKDAY: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

LEGEND

ROUTES OPERATING BELOW SUGGESTED MINIMUM STANDARD SPEEDS

PRIMARY TRANSIT ROUTE

TERTIARY TRANSIT ROUTE

GRAPHIC SCALE

0 1/2 1 2 MILES

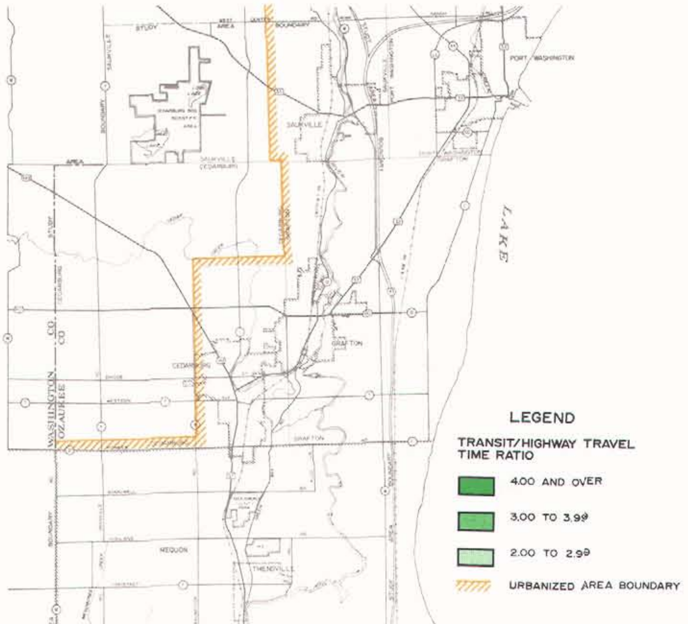
0 4000 8000 12000 FEET

Minimum speeds should be maintained on the public transit system of the study area. Measurement of such overall speed on the public transit system is one direct measure of transportation system performance. This map shows those public transit routes which would not attain minimum overall average weekday speeds in the year 2000 under the "status quo" plan. All but four of these routes would be local transit routes, and would be located primarily in the southeastern portion of the study area. Portions of three primary transit routes and one secondary transit route also would not meet this minimum speed standard. Two portions of these primary routes would be located in the north-central and northeastern portion of the transit service area, and one primary route portion would be located in the southwestern portion of the study area. Each of these primary transit route portions would operate along standard arterial streets as feeder routes. A total of nearly 86 routes or route miles, or almost 18 percent of all public transit route miles, would not meet the specified minimum speed for public transit under this plan in the design year.

Source: SEWRPC.

Map 222

COMPARISON OF AVERAGE PUBLIC TRANSIT SYSTEM TRAVEL TIMES AND ARTERIAL STREET AND HIGHWAY SYSTEM TRAVEL TIMES WITHIN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



Ideally, overall travel time on the public transit system should be similar to overall travel time by automobile between component parts of the study area and between component parts of the area and the remainder of the Milwaukee transit service area. As shown on this map, the average midday travel time on public transit from those parts of the northwest side study area served by public transit would generally be two to three times greater than travel time for equivalent trips by automobile.

Source: SEWRPC.

of 0.9 or more, should be minimized in order to minimize traffic conflicts and congestion, thereby reducing the accident potential. Map 219 shows those segments of the arterial street and highway system of the study area which, under the "status quo" plan, would be expected to operate at or over design capacity on an average weekday in the year 2000. As shown on Map 219 and indicated in Table 224, about one-third of the study area arterial street system, or about 148 miles, would operate at or over design capacity under this plan, and would thus experience traffic conflicts.

Pedestrian Conflicts: The third standard under this objective specifies that conflicts between pedestrian and vehicular traffic should be minimized. As shown in Table 207, due to an increase in the percentage of transit-related person trips in the study area internal to the Region from about 9 percent of all trips in 1972 to about 12 percent in the year 2000, automobile-related person trips within the study area and internal to the Region, or internal auto driver trips and internal auto passenger trips, would comprise about 88 percent of all trips in the year 2000 under the "status quo" plan, compared with about 91 percent of all such trips in 1972. Furthermore, as shown in Table 227, about 46 percent of all passenger miles of travel in the study area would occur on the freeway system under this plan, compared with about 49 percent of all passenger miles of travel on the surface arterial street system in the year 2000. Although this standard is comparative and can be applied adequately only through a comparison with the other alternative plans, it can be assumed that conflicts between pedestrian and vehicular traffic would be minimized because use of the public transit system and auto use on the freeway system would be maximized under this plan.

Summary and Conclusions: The sixth objective sets forth the need for a transportation system which reduces traffic accident exposure and provides for increased travel safety. Under the "status quo" plan, travel on the public transit and freeway systems—generally regarded as safer than travel on the standard arterial system—would constitute about 5 and 46 percent of all passenger miles of travel, respectively, within the study area in the year 2000. In addition, 698,000 property damage accidents, 149,100 accidents resulting in personal injury, and 1,470 accidents resulting in death are forecast to occur in the study area under the "status quo" plan over the period 1980 to 2000. Traffic safety problems and exposure to traffic

Map 223

PUBLIC TRANSIT ROUTES EXCEEDING SPECIFIED FREQUENCY-OF-SERVICE STANDARDS DURING THE PEAK HOUR: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

LEGEND

ROUTES EXCEEDING SPECIFIED FREQUENCIES

PRIMARY TRANSIT

TERTIARY TRANSIT

GRAPHIC SCALE

0 1 2 MILES

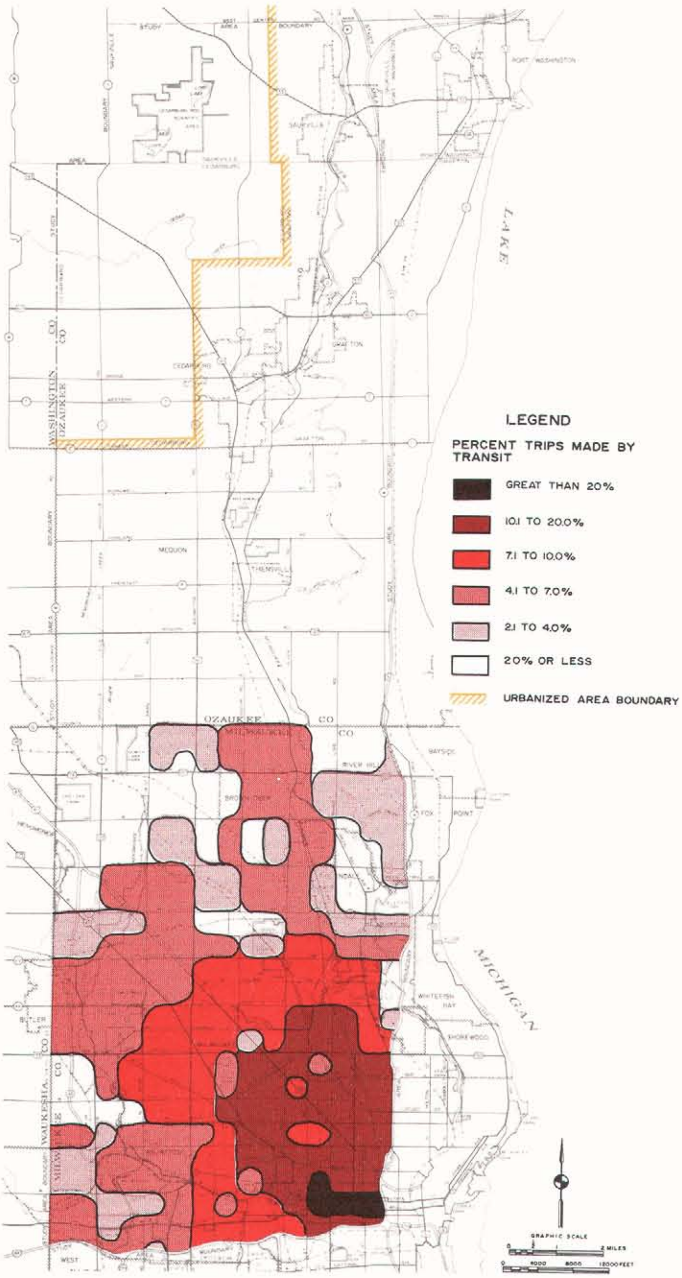
0 4000 8000 12000 FEET

The frequency of public transit service should be sufficient to accommodate the passenger volume while not exceeding specified maximum load factors, and should not, in any case, be less than one transit vehicle every 30 minutes during peak travel periods or one transit vehicle every 60 minutes during off-peak travel periods. As shown on this map, segments of two local transit routes and segments of two primary transit routes within the study area would not meet the frequency-of-transit service standard of at least two motor buses per hour during the peak travel period under the "status quo" plan.

Source: SEWRPC.

Map 224

PUBLIC TRANSIT USE WITHIN THE STUDY AREA YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

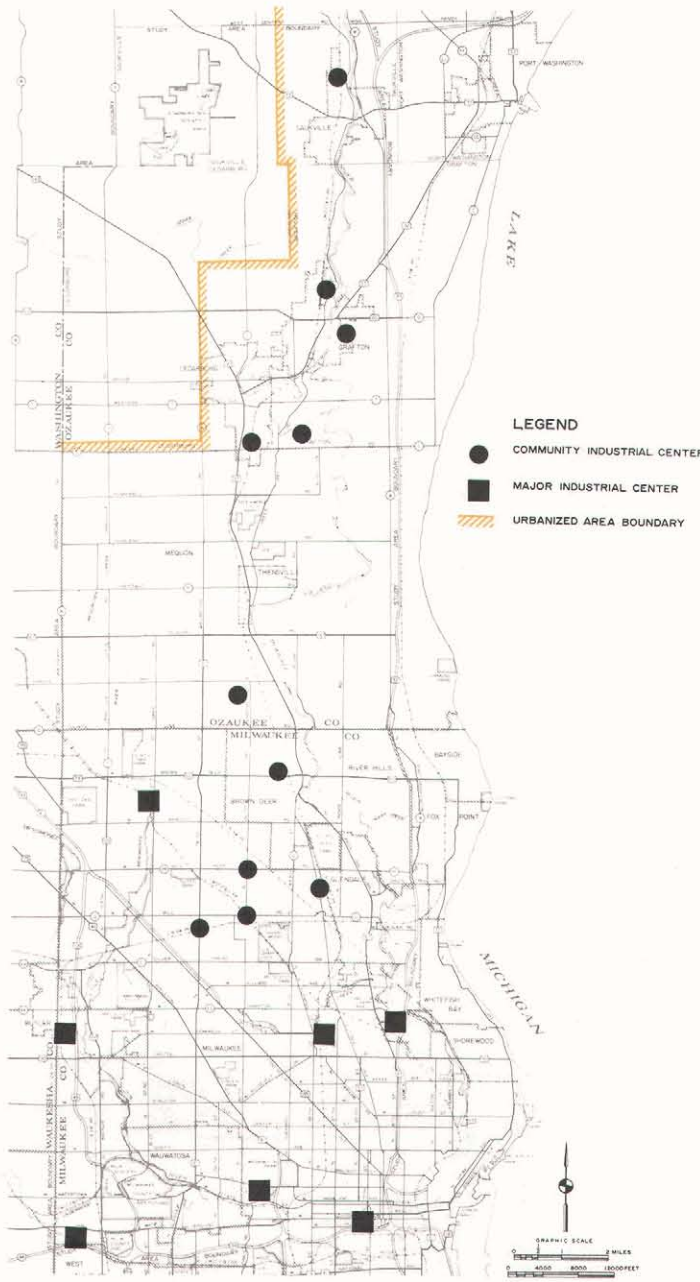


Ridership on the public transit system should be maximized. This map shows the variation in transit use in the study area. The highest percentage of transit utilization under this plan would be in the extreme southeastern corner of the study area adjacent to the City of Milwaukee central business district. Transit utilization would decrease with increasing distance from the central business district.

Source: SEWRPC.

Map 225

GENERALIZED PLANNED LOCATIONS OF MAJOR AND COMMUNITY LEVEL INDUSTRIAL CENTERS IN THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



This map shows the locations of the seven major industrial centers which, according to the adopted land use plan, would be partially or wholly located within the northwest side study area in the year 2000. The locations of those 11 community-level industrial centers which would be located in the study area in the year 2000 are also shown on this map.

Source: SEWRPC.

Table 226

INDUSTRIAL CENTERS WITHIN VARIOUS TIME PARAMETERS OF INDUSTRIAL SUPPORT FACILITIES: 1978 AND YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Time Parameter	Number Meeting Standard		Total Number in Study Area	
	Major	Community	Major	Community
Industrial Centers Within 30 Minutes of 50 Percent of Resident Population				
Existing 1978	6	5	6	5
Total 2000	7	11	7	11
Industrial Centers Within 30 Minutes by Truck of Milwaukee Port Facility				
Existing 1978	6	3	6	5
Total 2000	6	4	7	11
Industrial Centers Within 15 Minutes by Truck of Railroad Team Track				
Existing 1978	6	5	6	5
Total 2000	7	11	7	11
Industrial Centers Within 10 Minutes by Truck of a Freeway Entrance and Exit				
Existing 1978	6	5	6	5
Total 2000	7	11	7	11

Source: SEWRPC.

accidents—in terms of increased traffic conflicts resulting from congestion in the study area—would occur on about one-third of the study area arterial system under this plan. Conflicts between pedestrian and vehicular traffic, while unquantifiable, also were assumed to be minimized under this plan. As under the other objectives, an assessment of the degree to which this objective is met under this plan cannot be made without having designed and tested other alternative plans.

Effectiveness of the "Status Quo" Transportation System Plan in the Provision of Transportation Facilities With a High Aesthetic Quality

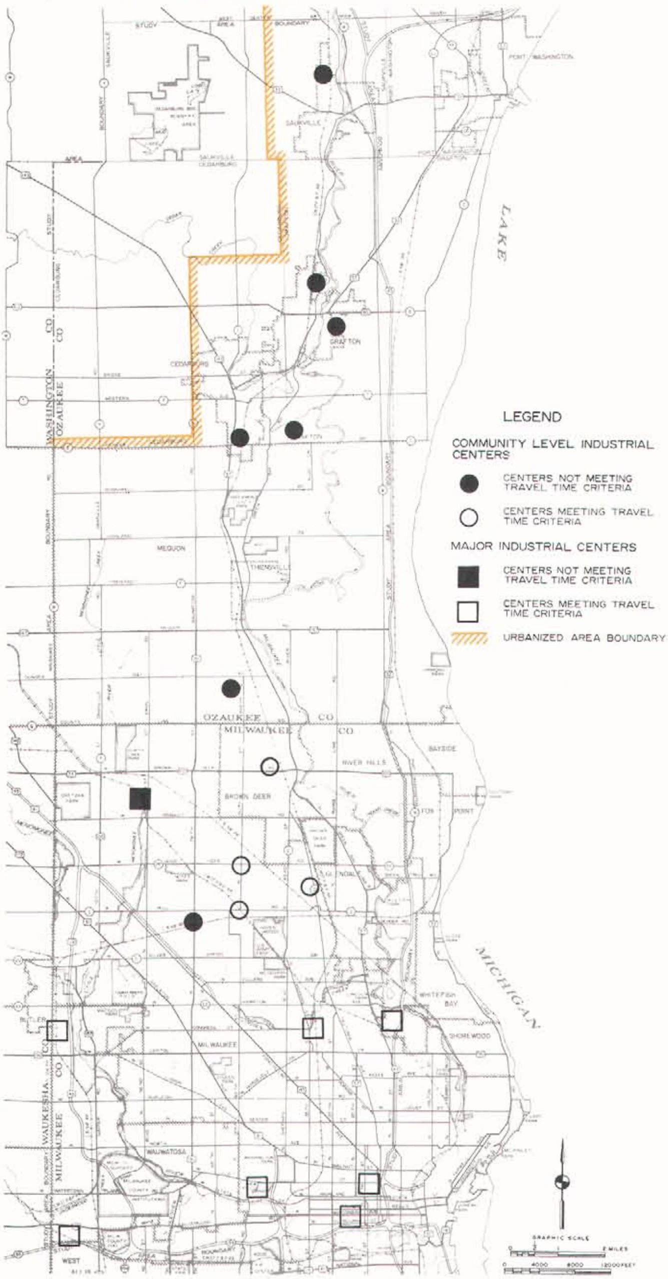
This seventh and last objective formulated under the study recognizes the need for beauty in the environment for the physical and mental health and well being of people in the study area. Transportation facilities are major and ubiquitous features of the land- and cityscape and therefore have a significant impact on the attractiveness of the environment. This objective is supported by two standards.

Aesthetic Facility Design: The first standard under this objective specifies that transportation facility construction plans should be developed using sound geometric, structural, and landscape design standards which consider the aesthetic quality of the transportation facilities and the areas through which they pass. Because no new facilities or major facility improvements, other than those programmed facilities included under the existing transportation system as defined herein, are proposed under the "status quo" plan, this standard can be considered to be met.

Proper Facility Location: The second standard under this objective specifies that transportation facilities should be located to avoid destruction of visually pleasing buildings, structures, and natural features and to avoid interference with vistas to such features. Like the first standard, this standard is met by the "status quo" plan because there are no new facilities or major facility improvements proposed under this plan.

Map 226

MAJOR AND COMMUNITY LEVEL INDUSTRIAL CENTERS IN THE STUDY AREA WITHIN 30 MINUTES TRAVEL TIME BY TRUCK OF THE PORT OF MILWAUKEE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN



Each of the industrial centers within the study area should be located within 30 minutes overall travel time by truck of the Port of Milwaukee. As shown on this map, six of the seven major industrial centers—all but the Milwaukee-Granville major industrial center—and four of the community-level industrial centers would be within 30 minutes overall travel time by truck of the Port of Milwaukee in the design year under the "status quo" transportation plan.

Source: SEWRPC.

Table 227

DISTRIBUTION OF PASSENGER MILES OF TRAVEL IN THE STUDY AREA BY MODE AND FACILITY TYPE: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Mode/Facility Type	Passenger Miles of Travel on an Average Weekday	
	Number	Percent
Public Transit	537,300	5.2
Freeways.	4,775,200	46.1
Standard Arterials. . .	5,050,200	48.7
Total	10,362,700	100.0

Source: SEWRPC.

Table 228

ESTIMATED TRAFFIC ACCIDENT EXPERIENCE ON THE TRANSPORTATION SYSTEM OF THE STUDY AREA: YEAR 2000 "STATUS QUO" ALTERNATIVE PLAN

Accident Characteristic	"Status Quo" Plan Alternative: 1980-2000		
	Arterial Street and Highway System	Public Transit System[a]	Total
Number of Property Damage Accidents. . . .	685,400	12,600	698,000
Number of Injuries	148,500	6,900	155,400
Number of Fatalities . . .	1,450	20	1,470

[a] *On the public transit system vehicle accidents are considered property damage accidents, and passenger accidents are considered injuries.*

Source: SEWRPC.

Summary and Conclusions: The seventh objective for transportation system management and development in the northwest side study recognizes the need for beauty in the environment for the physical and mental health and well being of the people in the study area. This objective is intended to provide a guide for the design and implementation of those facility construction projects included under each alternative plan. Because no facilities or facility improvements are proposed under the "status quo" plan, both standards under this objective may be considered to be met.

Summary and Conclusions of Evaluation of "Status Quo" Long-Range Course of Action for Northwestern Milwaukee and Southern Ozaukee Counties

The seven transportation system management and development objectives adopted under the Milwaukee Northwest Side/Ozaukee County transportation improvement study are intended to define the transportation needs of the study area. These seven objectives include: accessibility to land use; economic and energy efficiency; an appropriate range of transportation services; quick and convenient travel; minimum disruption of urban land uses and of the natural resource base; travel safety; and an aesthetically pleasing transportation system.

Perhaps the most important implication of such a "status quo" plan is the increased level of traffic congestion which may be expected. Under a "status quo" plan, about 23 percent of the arterial street and highway system of the study area may be expected to operate over design capacity and experience traffic congestion by the plan design year 2000. In 1978, only about 13 percent of the arterial streets and highways of the study area were operating over design capacity.

With respect to the public transit element of the transportation system, a problem in the study area which would result from a "status quo" course of action would be a lack of transit service accessible by walking in the outlying parts of the urbanized portion of the study area. The area not adequately served would include about 53,000 residents and about 27,000 jobs. Other portions of the outlying parts of the urbanized portion of the study area would not be served well by public transit, including contiguous areas of medium- and high-density development, the existing Northridge regional retail and service center, and the City of Milwaukee regional industrial center which is partially developed in the northwestern corner of Milwaukee County. This lack of good transit service is evidenced by the high transit travel times which would exist in the area and the number of transfers required in transit tripmaking. In addition, the transit system in the study area would have insufficient capacity to serve future demand. The system would not meet motor bus passenger load factor standards on nearly one-third of its routes by the year 2000 under a "status quo" plan. No such transit system congestion existed in 1978. Also, five "Freeway Flyer" park-ride lots would have insufficient capacity for transit passenger parking demand by the plan design year 2000. Only one park-ride lot was overcrowded in 1978.

It is important to note that the negative implications cited above are the consequences of "doing nothing" in transportation system improvement over the next 20 years, and that while there are important disadvantages to this course of action, there are also some advantages. There would be no displacement of homes, businesses, or industries for transportation purposes under this alternative course of action. Capital costs for transportation would be very small and include only those necessary for actions already underway in 1980, and for the maintenance of the existing transportation system, such maintenance being limited to street resurfacing and reconstruction and to the necessary purchase of replacement transit vehicles. Furthermore, because this alternative envisions no transit service extensions or service level improvements over the planning period—a time when ridership may be expected to increase as motor fuel prices increase and transit fares are held stable in constant dollars—this plan has the benefit of a reduced public subsidy of the transit system operating deficit in the study area. The total future subsidy for the study area would be about $6.8 million in the year 2000, as compared with about $10.7 million in 1980; the subsidy required per passenger would be $0.20 in the year 2000 as compared with about $0.44 in 1980, all costs being expressed in 1980 dollars.

The remainder of this chapter is devoted to evaluating alternatives to this "status quo" plan of action. These alternative plans will be directed toward minimizing the undesirable implications of the "status quo" alternative. The first such alternative to be examined will establish the degree to which these negative impacts can be reduced, along with air pollutant emissions, motor fuel consumption, and user costs, while retaining to the extent practicable the advantages of the "status quo" alternative in terms of capital costs and community disruption. This alternative plan will, consequently, propose only traffic management actions and public transit improvement and expansion over the next 20 years in the study area. The next alternative plan examined will, in addition, propose arterial street improvements and expansion. This plan will, as a consequence, provide for the further reduction of the negative impacts of the "status quo" plan, notably traffic congestion, although at an increase in capital cost and urban disruption.

A LONG-RANGE TRANSPORTATION SYSTEM PLAN FOR THE NORTHWEST SIDE STUDY AREA LIMITED TO TRANSPORTATION SYSTEMS MANAGEMENT AND PUBLIC TRANSIT IMPROVEMENT

The long-range transportation planning was conducted in a stepwise manner under the study. Each successive alternative plan was specifically designed to resolve any transportation system problems and deficiencies which the analyses indicated remain unresolved in the design year by the previous plan considered. The first long-range plan considered and documented in the preceding section of this chapter—the "status quo" alternative plan—represented a minimum capital cost plan, as it would entail no further capital investment in transportation system improvements of any kind. The second long-range plan considered, as documented in this section, consisted solely of traffic management and public transit improvement measures. Consideration of such a plan was intended to assure that relatively low capital cost transportation systems management and public transit improvement measures were considered prior to the consideration of more capital-intensive arterial street improvements. The third long-range plan considered was specifically designed to resolve the transportation system deficiencies which the analyses indicated would remain unresolved under the second, or combination, transportation systems management and transit improvement plan, and included proposed actions to expand the capacity of the existing arterial street and highway system of the study area.

Characteristics of the Combination Transportation Systems Management and Transit Improvement Plan

Under the combination transportation systems management and transit improvement long-range alternative plan, the "status quo" arterial street and highway system of the study area was assumed to be improved by implementation, to the maximum extent practicable over the plan design period, of transportation systems management measures on each segment of arterial street and highway in the study area. This assumption was intended to assure that under this plan, every attempt would be made to obtain the maximum capacity from each link in the existing arterial street and highway system of the study area. More specifically, it was assumed that all transportation systems management actions recommended for the signalized intersection approaches identified as having problems under the short-range element of the study, as documented in Chapter V, would be implemented. At all other signalized intersection approaches in the existing urban portions of the study area, a 10 percent increase in intersection approach capacity was assumed to be achieved by future transportation systems management actions, this increase being approximately equal to the average increase in capacity obtained from the short-range traffic management recommendations set forth in Chapter V. Major increases in signalized intersection approach capacity were also assumed for those facilities expected to be reconstructed from rural to urban cross-sections over the plan design period, the reconstruction including widened approach pavements with exclusive right- and left-turn lanes as may be found necessary. In addition, all of these intersections were assumed to have the potential for an increase in capacity of 10 percent through application of transportation system management measures.

All existing unsignalized intersections in the study area which were determined to warrant signalization over the plan design period were assumed to be signalized with the most efficient signal timing split practicable between the approaches to the intersection. And each such intersection approach was assumed to be provided with exclusive turn lanes. In addition, all of these intersections were assumed to have the potential for a 10 percent increase in capacity through application of transportation systems management measures.

As demonstrated in the prototype midblock analysis of N. 76th Street (STH 181) completed by the Wisconsin Department of Transportation, traffic problems at midblock locations may be expected to be related largely to traffic accidents rather than to traffic congestion and delay. Traffic management actions designed to abate midblock accident and congestion problems were, for long-range planning purposes, assumed to have been implemented as necessary under the short-range plan along the median-divided portions of each of the 20 problem arterial streets in the study area, according to the presented prototype. Since problems at midblock areas were assumed to be principally accident-related, and since it was assumed that any midblock traffic problem which would have been identified under the short-range plan would have been abated with an appropriate traffic management action, it was not assumed in the simulation of the transportation systems management and transit improvement plan that any midblock problems would significantly impact traffic flow.

The public transit system for the study area under this combination transportation systems management and transit improvement plan was defined to include the rapid, or primary, the express, or secondary, and the local, or tertiary, service as proposed to be provided in the study area under the newly adopted long-range primary transit system plan for the year 2000.[5] The system planning effort which resulted in this plan for the Region, and for the study area as a part of the Region, was conducted concurrently with the northwest side study and was coordinated with the northwest side study so that the findings of the primary transit system planning effort could be incorporated directly into the northwest side study recommendations. The Regional Planning Commission staff was the lead agency and staff for both planning efforts, and nine members of the northwest side study advisory committee, or about 60 percent of the members of that committee, were also members of the primary transit system study advisory committee, and represented about 40 percent of that committee. Finally, both planning efforts had similar transit development and operation objectives—specifically, to maximize the availability of a high level of transit to, and use of transit by, the urban residents of the Region/study area, while maintaining cost-effective transit facilities and services at minimum cost to the public.

As shown on Map 227, transit service would be extended under this plan to those parts of the study area expected to be developed at urban densities over the plan design period. The number of route miles operated in the study area would be increased from the 455 miles operated in 1980 to 868 miles under the plan, as shown in Table 229. Transit vehicle miles operated would increase by 20 percent, from 37,500 to 45,100; and the number of transit vehicles required during peak hours of service would increase by 23 percent, from 329 to 404, based on morning peak-hour requirements.

The rapid, or primary, service which would be implemented within the study area under the plan would consist of a light rail transit line and 14 routes of motor buses operating in mixed traffic on freeways and over connecting surface arterials. The freeways would be operationally controlled to permit the provision of a high level of transit service over the freeway system. The operational control system would use an areawide ramp-metering system to constrain access to the freeway system during peak hours, thereby seeking to ensure high rates of traffic flow at reasonable operating speeds on the freeway system. The system would consist of interconnected demand-responsive ramp meters, priority access for high-occupancy vehicles, improved driver information, and improved accident incident management procedures. Under the plan, primary transit service would be provided in the study area over 14 bus-on-freeway routes, totaling 324 route miles and serving 14 stations. This planned service represents an increase of nine routes, totaling 228 round-trip route miles, and six stations over the service provided in 1980.

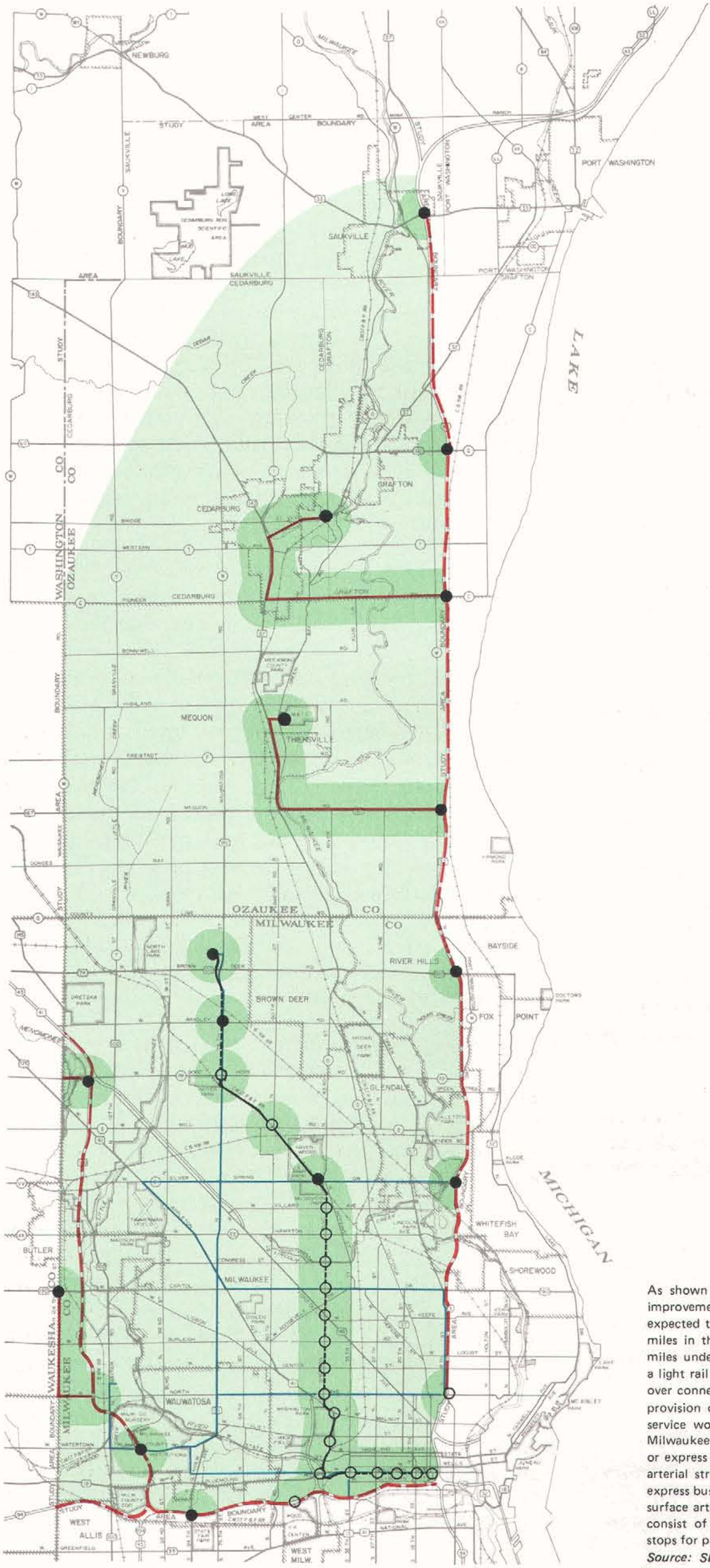
In addition to the improved bus service, a high level of transit service in the corridor would be provided by a light rail line, connecting the downtown Milwaukee central business district to the Northridge regional activity center, as shown on Map 228. The recommended light rail transit line would operate almost entirely at-grade in a transit mall, on street medians, and along railway rights-of-way. Twenty-seven stops would be provided along the 14.3-mile line, at distances of one-eighth, one-fourth, one-half, one, and one and one-half miles, depending on the density of adjacent development. Although a final alignment for the light rail line was not determined in the initial system planning effort, a preferred line was identified with two possible alternatives thereto, as shown on Map 228.

The express, or secondary, level of transit service would consist of express bus routes operated over surface arterial streets, with stops generally limited to intersecting transit routes. A total of seven express routes would be provided, totaling 80 route miles and operating over 41 miles of surface arterials in the study area. Exclusive transit lanes—that is, traffic lanes reserved for the operation of buses only during specified hours of the day—would be provided on one of these express routes over 1.3 miles of surface arterials. The exclusive lanes would be located on W. Wells Street from N. 10th Street to N. Prospect Avenue. In 1980, only one express route was operated in the study area, over four miles of surface arterials, and no exclusive lanes for such service were provided. In 1982, an additional express route was operated from N. 60th Street and W. Fond du Lac Avenue to N. 12th Street and W. Wisconsin Avenue.

[5] *See SEWRPC Planning Report No. 33, A Primary Transit System Plan for the Milwaukee Area, formally adopted by the Commission on June 6, 1982.*

Map 227

PUBLIC TRANSIT SYSTEM IN THE STUDY AREA: 2000 TSM/TRANSIT IMPROVEMENT TRANSPORTATION SYSTEM PLAN



LEGEND

TRANSIT SERVICE AREA

PRIMARY WITH WALK ACCESS

LOCAL, EXPRESS, OR PRIMARY WITH WALK, BUS, OR AUTO ACCESS

PRIMARY TRANSIT STATIONS

● WITH PARKING

○ WITHOUT PARKING

TRANSIT SERVICE ROUTES

LIGHT RAIL PRIMARY SERVICE

EXCLUSIVE RIGHT-OF-WAY

SHARED RIGHT-OF-WAY

BUS-ON-FREEWAY PRIMARY SERVICE

SHARED FREEWAY RIGHT-OF-WAY

SHARED SURFACE ARTERIAL STREET RIGHT-OF-WAY

EXPRESS SERVICE

GRAPHIC SCALE

0 ½ 1 2 MILES

0 4000 8000 12000 FEET

As shown on this map, under the year 2000 transportation systems management-transit improvement plan, transit service would be extended to those parts of the study area expected to be developed at urban densities by the plan design year. The number of route miles in the study area would be increased from the 455 miles operated in 1980 to 868 miles under the plan. The primary, or rapid transit, element of the plan would consist of a light rail transit line and 14 motor bus routes operating in mixed traffic on freeways and over connecting surface arterials. Freeways would be operationally controlled to permit the provision of a high level of transit service over the freeway system. A high level of transit service would be provided in the corridor by a light rail line connecting the downtown Milwaukee central business district to the Northridge regional activity center. The secondary or express bus element of the plan would consist of express bus routes operated over surface arterial streets, with stops generally limited to intersecting transit routes. A total of seven express bus routes would be provided, totaling 80 route miles and operating over 41 miles of surface arterials in the study area. The tertiary, or local, transit element of the plan would consist of local transit service provided over arterial and collector streets, with frequent stops for passenger boarding and alighting.

Source: SEWRPC.

Table 229

PUBLIC TRANSIT FACILITIES IN THE STUDY AREA: 1980 AND 2000 "STATUS QUO" AND TSM/TRANSIT IMPROVEMENT TRANSPORTATION SYSTEM PLANS

Transit Facilities Characteristic	Existing 1980		2000 "Status Quo" Plan		2000 TSM/Transit Improvement Transportation System Plan	
	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total
Total Study Area						
Average Weekday Route Miles						
Primary	96.3	21.1	96.3	21.1	352	40.6
Secondary	7.6	1.7	7.6	1.7	80	9.2
Tertiary	351.3	77.2	351.3	77.2	436	50.2
Total	455.2	100.0	455.2	100.0	868	100.0
	Miles		Miles		Miles	
Special Facilities						
Exclusive Rights-of-Way	- -		- -		5.4	
Exclusive Lanes on Streets	- -		- -		8.9	
	Number of Vehicles per Hour[a]		Number of Vehicles per Hour[a]		Number of Vehicles per Hour[a]	
Average Weekday Vehicle Requirements[a]						
Peak Period[b]	329		329		404	
Midday Period	210		210		256	
Bus Miles per Average Weekday	37,500		37,500		45,100	
Average Weekday Transit Ridership	77,000		85,000		131,000	

[a] *Vehicle requirements are for those routes serving the study area.*

[b] *Taken for morning peak period only.*

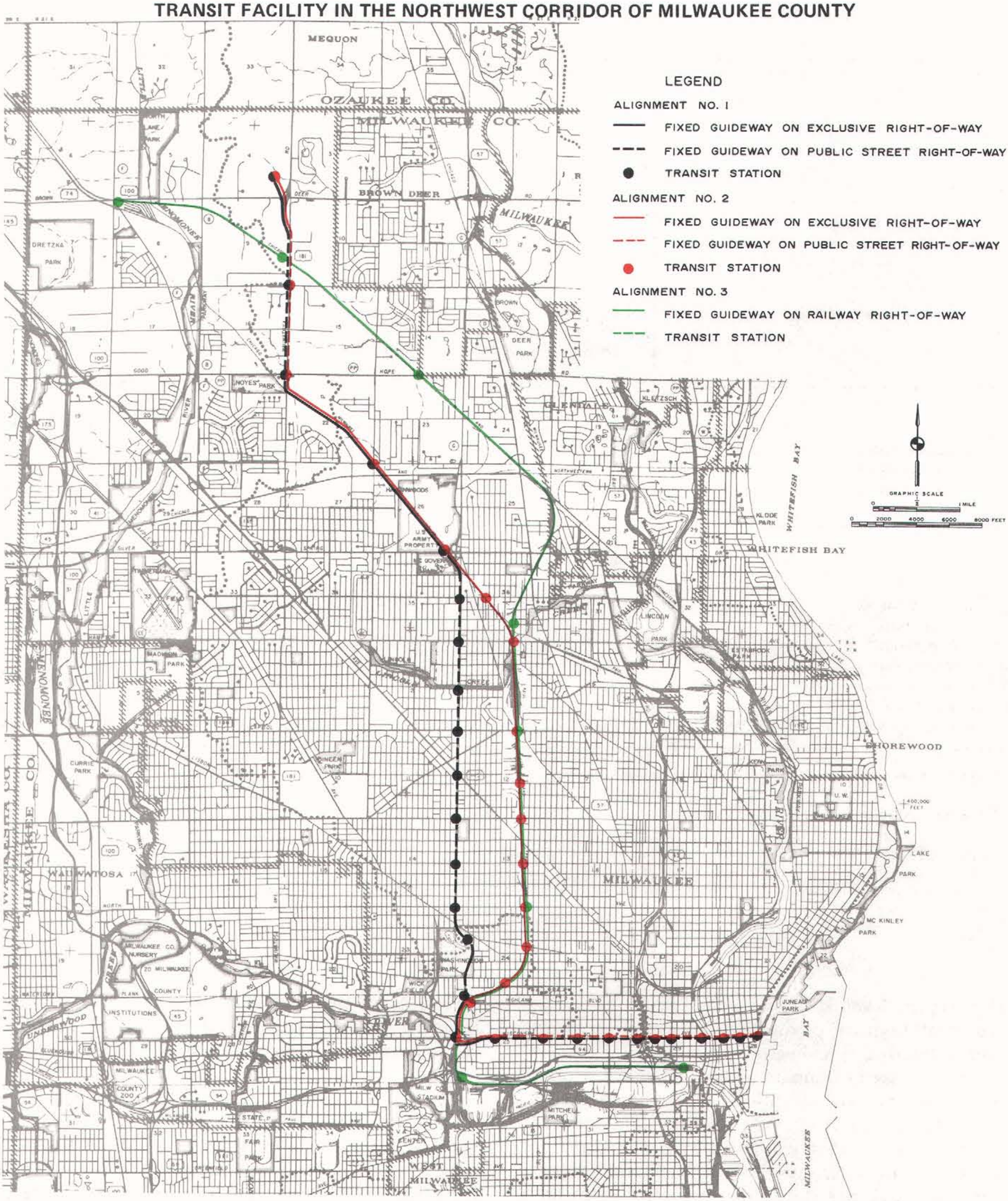
Source: SEWRPC.

The tertiary level of transit service included in the plan would consist of local transit service provided over arterial and collector streets with frequent stops for passenger boarding and alighting. Under the plan, extensive additions to the tertiary, or local, transit service routes would be provided where such services would recover a reasonable portion of operating costs from farebox revenues. The plan envisions the ultimate extension of tertiary transit service to most of the urbanized parts of the study area, including areas of urban development in the southern half of Ozaukee County and northwestern Milwaukee County not now served. More than 436 route miles of service would be provided under the plan, an increase of 24 route miles over the 351 route miles operated in 1980.

Under the plan, an estimated 131,000 transit trips would be made within the study area on an average weekday in the year 2000, or about 9.3 percent of the total number of person trips generated within the study area and internal to the Region on an average weekday in that year. As shown in Table 229, this level of tripmaking by public transit would represent a 54 percent increase in transit trips made under a "status quo" long-range

Map 228

THREE ALTERNATIVE ALIGNMENTS FOR THE RECOMMENDED LIGHT RAIL TRANSIT FACILITY IN THE NORTHWEST CORRIDOR OF MILWAUKEE COUNTY



The lower tier of the final recommended plan for the development of a primary transit system proposes that a single light rail transit facility be constructed in the northwest corridor of the greater Milwaukee area. While it was necessary to select a single preferred alignment for the purpose of testing alternative plans under the first phase of the alternatives analysis—shown as Alignment 1 above—the final selection of the best alignment is the subject of more detailed corridor analysis work. During preliminary engineering and environmental impact analysis, the three alignments shown here would be explicitly considered, along with other possible alternative alignments which may become evident.

Source: SEWRPC.

plan, and, as such, would mean that an estimated 33,800 fewer automobile trips would be generated within the study area in the year 2000. Correspondingly, on an average weekday 6,140 fewer gallons of motor fuel would be used by automobiles within the study area in that year.

Implications of the Transportation Systems Management and Transit Improvement Plan for Arterial Street Improvement and Expansion

The most important finding of the analyses conducted of the combination transportation systems management and transit improvement plan was the level of traffic congestion which may be expected in the study area under the plan under the levels of demand on the transportation facilities anticipated under the normative land use plan for the study area. This level of congestion was used to determine the degree to which further long-range arterial street and highway improvement and expansion measures would need to be considered under this study.

In 1978, about 57 miles, or 13 percent, of the arterial streets and highways of the study area were found to be operating over design capacity, with an additional 35 miles, or 8 percent, operating at design capacity. If no actions were taken over the next 20 years to increase the capacity of the existing transportation system area—through traffic management, street widening, or public transit improvements or combinations of such improvements—as is the assumption of the "status quo" plan, the mileage of arterial streets and highways operating under congested conditions would increase from 57 miles to about 101 miles, or from 13 percent to 23 percent of the arterial street and highway system of the study area. A total of 48 miles, or 11 percent, would operate at design capacity by the plan design year 2000, an increase of 13 miles, or 37 percent, over the existing system.

Under the transportation systems management and transit improvement plan, significant improvement and expansion of the study area public transit system, and the extension of traffic management actions throughout the entire study area arterial street and highway system, is assumed by the year 2000. These actions may be expected to abate the anticipated increase in traffic congestion, as shown on Map 229 and in Table 230. The total mileage of arterials operating over design capacity in the year 2000 may be expected to decline from the 101 miles that would result from no action, or 23 percent of the study area arterial system, to 57 miles, or 13 percent, or about the same level of over-design-capacity operation that currently exists in the study area. However, the total arterial mileage operating at design capacity would be expected to increase from 48 miles, or 11 percent of the study area arterial system, to 75 miles, or 17 percent, or over twice the level of at-design-capacity operation that currently exists in the study area.

A LONG-RANGE TRANSPORTATION SYSTEM PLAN FOR THE NORTHWEST SIDE STUDY AREA WHICH INCLUDES ARTERIAL STREET AND HIGHWAY SYSTEM IMPROVEMENT AND EXPANSION

To resolve the remaining transportation system congestion, the long-range plan was extended to include the widening of existing and construction

Table 230

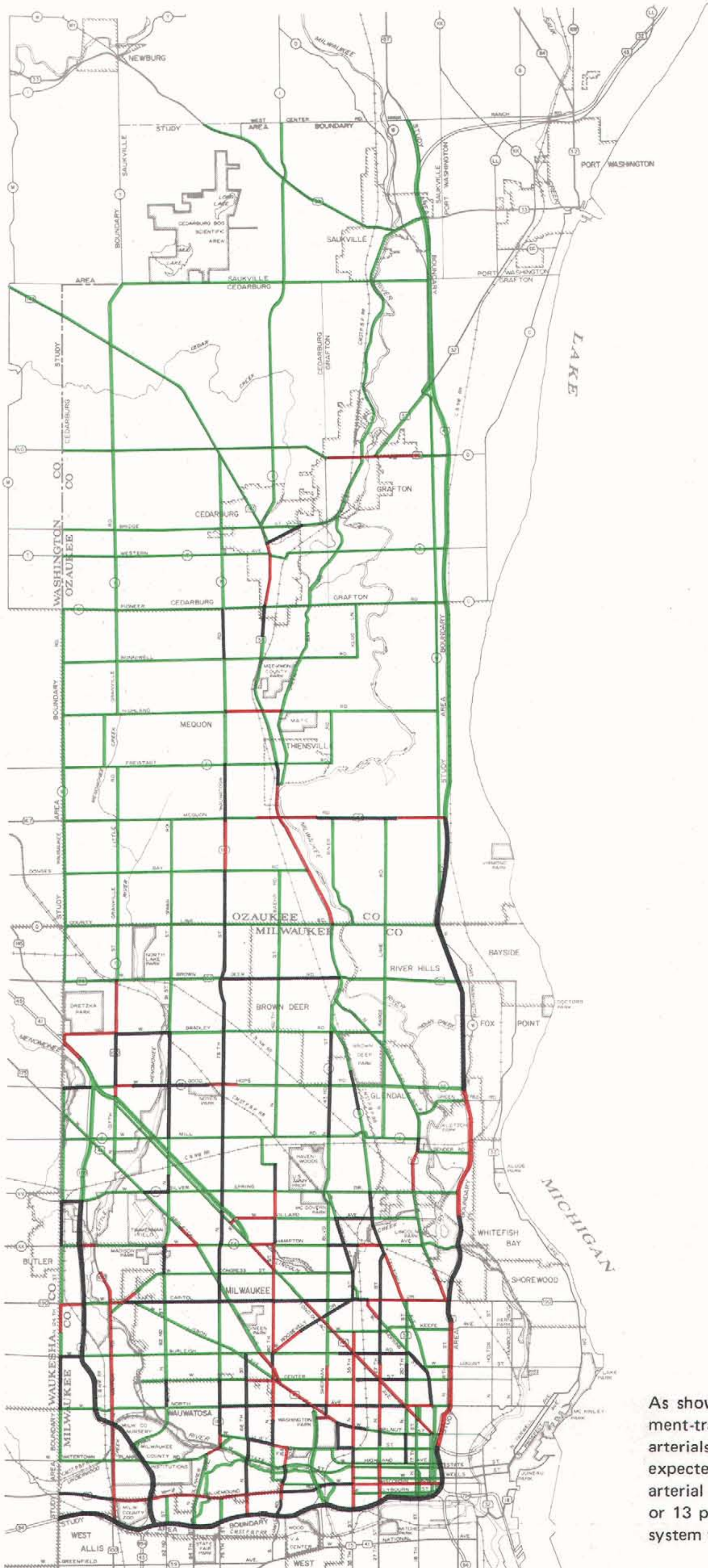
DISTRIBUTION OF MILES OF ARTERIAL STREET AND HIGHWAY FACILITIES OPERATING AT OR OVER DESIGN CAPACITY IN THE STUDY AREA: YEAR 2000 "STATUS QUO" AND TSM/TRANSIT IMPROVEMENT TRANSPORTATION SYSTEM PLANS

Service Level	TSM/Transit Improvement Plan		"Status Quo" Plan	
	Miles	Percent	Miles	Percent
Under Design Capacity	309.5	70.2	291.5	66.1
At Design Capacity	74.7	16.9	48.0	10.9
Over Design Capacity	56.7	12.9	101.4	23.0
Total	440.9	100.0	440.9	100.0

Source: SEWRPC.

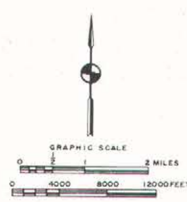
Map 229

ARTERIAL STREET AND HIGHWAY CONGESTION WITHIN THE NORTHWEST SIDE STUDY AREA UNDER THE TSM/ TRANSIT IMPROVEMENT TRANSPORTATION SYSTEM PLAN IN THE YEAR 2000



LEGEND

- FREEWAY VOLUME OVER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME OVER DESIGN CAPACITY
- FREEWAY VOLUME AT DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME AT DESIGN CAPACITY
- FREEWAY VOLUME UNDER DESIGN CAPACITY
- STANDARD ARTERIAL VOLUME UNDER DESIGN CAPACITY



As shown on this map, under the transportation systems management-transit improvement alternative plan, the total mileage of arterials operating over design capacity by the year 2000 may be expected to decline from 101 miles, or 23 percent of the study area arterial system under the "status quo" alternative plan, to 57 miles, or 13 percent, or to about the same proportion of the arterial street system that operated over design capacity in 1978.

Source: SEWRPC.

of new arterial streets and highways in the study area. In keeping with one of the objectives of the study—to resolve traffic congestion on arterial streets and highways in the study area—the arterial street and highway improvements proposed under this third long-range plan for the study area sought to eliminate operation of the over-design-capacity arterial streets and highways of the study area. Effort was also made under this plan to reduce, to the greatest extent possible, the number of miles of arterial streets and highways within the study area operating at design capacity.

A reduction in the proportion of the system operating at design-capacity operation was proposed as well because it was recognized that the forecast of the proportion of the arterial street and highway system which may be expected to operate at design capacity was based on analyses of average weekday operating conditions. No allowance was made in the forecast for the effect of such factors as adverse weather conditions including rain, but particularly snow; lane closures due to roadway or utility maintenance; street closures due to resurfacing or reconstruction; or traffic interference such as accidents and stalled or illegally parked vehicles, all of which are relatively common occurrences and all of which serve to reduce the traffic-carrying capacity of arterials and increase congestion. The occurrence of any of these conditions would be sufficient to result in over-design-capacity operation on any arterial forecast to operate at design capacity.

It must be recognized further that at-design-capacity arterial operation represents a situation in which the arterial streets and highways carry traffic volumes equal to their design capacity—that is, equal to the maximum traffic volume that the arterials can carry and still operate at level-of-service "C," as defined by the Transportation Research Board of the National Academy of Science in its Highway Capacity Manual. It is important not to misinterpret at-design-capacity arterial operation as arterial operation within the full range of level-of-service "C." Under the transportation system management and transit improvement plan, over 18 percent of the arterial system mileage within the study area is expected to operate within the full range of level-of-service "C"—that is, within a volume-to-capacity ratio of 0.84 to 1.10. About 94 percent of this arterial mileage, or about 17 percent of the entire study area arterial system, is expected to operate at the upper limit of level-of-service "C,"—that is, with a volume-to-capacity range of 0.90 to 1.10 Any further increase in traffic volumes or any reduction in capacity for this latter arterial mileage will result in over-design-capacity operation and attendant congestion.

The following sections of this chapter advance proposals for arterial street widening to resolve the traffic congestion which is forecast to remain on study area arterial streets and highways following the consideration of a transportation systems management and transit improvement plan. A section is presented for each of seven subareas of the study area shown on Map 229. In each case, the proposed widenings are designed to abate the traffic congestion associated with traffic flow movement along a travel corridor. This procedure permitted the widening of arterial streets and highways parallel to a congested arterial to be considered in those cases in which the widening of a particular congested arterial itself was not considered feasible. The first arterial street improvement considered—in all cases prior to arterial widening alternatives—was the prohibition of on-street parking along an entire stretch of congested arterial street or parallel arterial street so that, in effect, a full additional through lane of traffic would be provided in the direction of peak traffic flow. Implementation of this alternative would necessarily mean that all parking, standing, or stopping would need to be banned along the entire length of the arterial stretch at least during each of the two peak travel periods, or from 6:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 6:00 p.m. Parking prohibition was the first alternative considered because it would in all cases be the lowest cost alternative, and would entail no land acquisition. On-street parking prohibition, however, was not recommended where it was considered to be impractical. On-street parking prohibition was considered to be an impractical alternative along those arterial streets where available on-street parking spaces were currently in heavy use, where off-street parking was not otherwise provided, and where alternative on-street parking was not available. This exercise of judgment applied to arterials abutted by various land uses, but particularly to arterials abutted by commercial land uses. It was considered essential to carefully assess the feasibility of prohibiting on-street parking before considering additional measures to expand the traffic-carrying capacity of a street. If actions to prohibit on-street parking were recommended which would, as a practical matter, never be implemented, then the recommendations could only contribute to a continuation of the traffic congestion problems. And, more importantly, whether or not these problems should remain unresolved or should be resolved through street widening, and identification of the attendant costs, would not be considered under the study.

Alternative widenings of the entire stretch of a congested arterial street or highway or parallel arterial street were next considered. Two basic types of widenings each were considered in urban and urban fringe areas. The first type of widening considered in urban areas was the improvement of an arterial street or highway to a "minimum" urban cross-section, with curb and gutter and sidewalks, in order to provide for two lanes of through traffic with parking permitted, or for four through lanes of moving traffic with parking prohibited, in each case with no median. The second type of widening considered in urban areas was the improvement of the arterial street or highway to a "desirable" urban cross-section in order to provide for either four through lanes of moving traffic with parking permitted, or six through lanes of moving traffic with parking prohibited, in each case with a median. Minimum and desirable widening alternatives were also considered in suburban and rural-urban fringe areas. Both types of alternatives provided for four through lanes of traffic with shoulders, with no median being provided under the minimum cross-section alternative, and a median being provided under the desirable cross-section alternative. In those cases in which additional rights-of-way were required to accommodate the widening of an arterial street or highway, the right-of-way costs and displacements presented represent the least expensive and least disruptive alternative for the proposed widening. Although consideration was given to the most cost-effective location of needed additional right-of-way, further consideration, and perhaps variation in the right-of-way acquisition requirements along a roadway, will be necessary during the preliminary and final engineering phases of project development. Typical cross-sections for the types of widenings considered are shown in Figure 96. It is important to note that the cross-sections shown are typical, and that in all cases arterial widening proposals were applied with judgment and with consideration of the need for additional right-of-way and of the effect on adjacent land uses.

Arterial street improvement and expansion projects, other than those required to resolve specific problems which the analyses identified, were also proposed in the study area under this final long-range alternative plan. Although these other projects would increase study area arterial capacity and would abate congestion problems, the principal reason for these proposals was to provide an integrated system of urban arterials, with a proper spacing and with proper cross-sections to serve those parts of the study area expected to be converted from rural to urban use over the two-decade plan design period. The arterial spacing proposed, as specified in one of the standards supporting the agreed-upon transportation system development objectives, was no more than two miles apart in low-density urban areas, no more than one mile apart in medium-density urban areas, and no more than one-half mile apart in high-density urban areas. In the conversion of arterials from rural to urban cross-sections, it was typically proposed to convert a 24-foot-wide rural pavement to a 48-foot-wide urban pavement, the latter with two traffic lanes and two parking lanes, curb and gutter, and sidewalks. Such conversion was assumed to occur only in areas expected to be converted from rural to urban use over the two-decade plan design period. In those areas of fringe urban or suburban development, however, where development would only back onto arterials, a 24-foot-wide pavement with six-foot-wide shoulders was used as a minimum suburban cross-section.

Ozaukee County Area

One area identified as having unresolved arterial street and highway congestion problems was the southern portion of Ozaukee County. The analyses indicated that in this area, three congestion problems may be expected to remain after consideration of a transportation systems management and transit improvement plan under future land use and travel demand conditions: one along STH 60 and Washington Street west of and through the Village of Grafton; one along a north-south corridor through the central portion of Ozaukee County from the Milwaukee-Ozaukee County line to the Village of Grafton; and one along an east-west corridor centered on Mequon Road (STH 167) through the southern portion of the County.

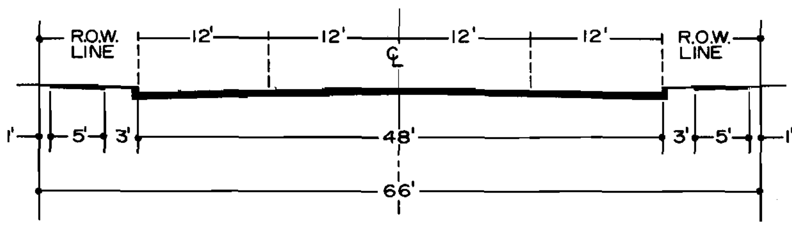
Wauwatosa Road (STH 181, CTH N, and STH 143) and STH 57: To resolve the congestion which may be expected to remain in the plan design year on Wauwatosa Road, STH 57, and Highland Road within the north-south corridor through the central portion of Ozaukee County from the Milwaukee/Ozaukee County line to the Village of Grafton, consideration was given to improving two arterials through the area—Wauwatosa Road (STH 181, CTH N, and STH 143) from W. County Line Road

Figure 96

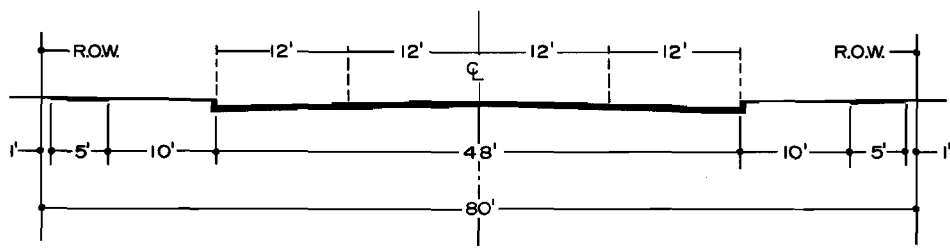
TYPICAL ARTERIAL STREET CROSS-SECTIONS FOR CONSIDERATION OF ROADWAY WIDENINGS UNDER THE NORTHWEST SIDE STUDY[a]

TYPICAL URBAN CROSS-SECTIONS

Range of Desirable Undivided Urban Cross-Sections for Two or Four Traffic Lanes

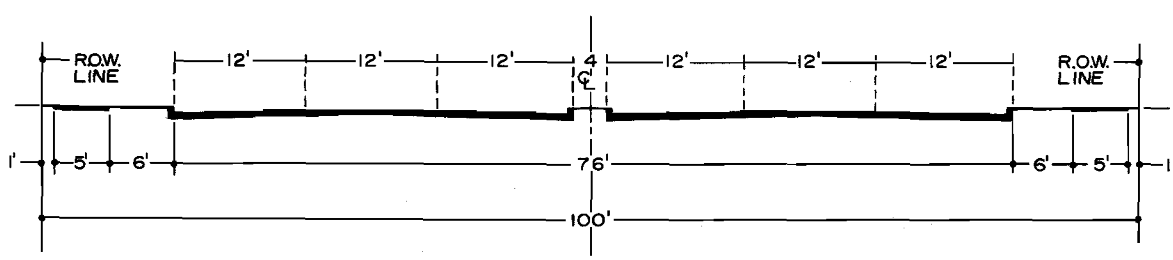


Minimum Desirable

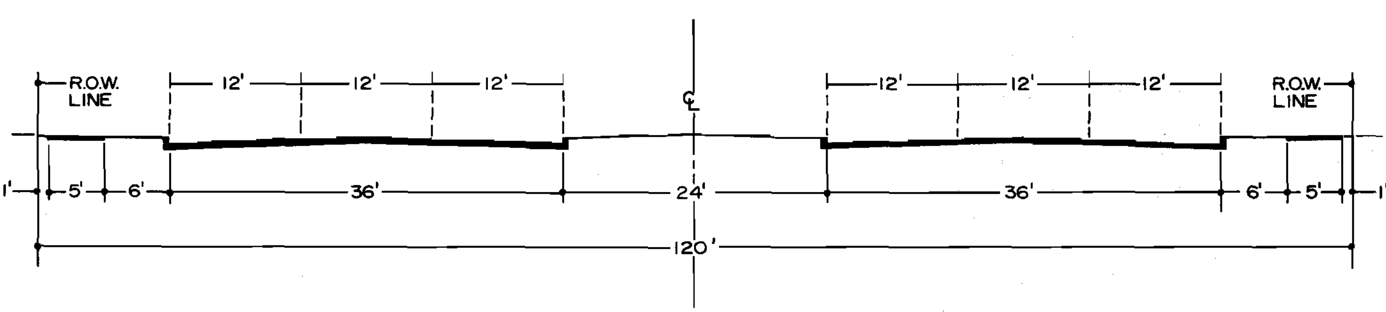


Typical Desirable

Range of Desirable Divided Urban Cross-Sections for Four or Six Traffic Lanes



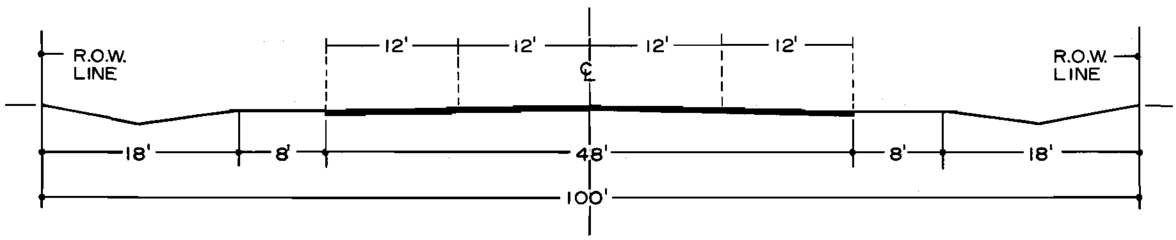
Minimum Desirable



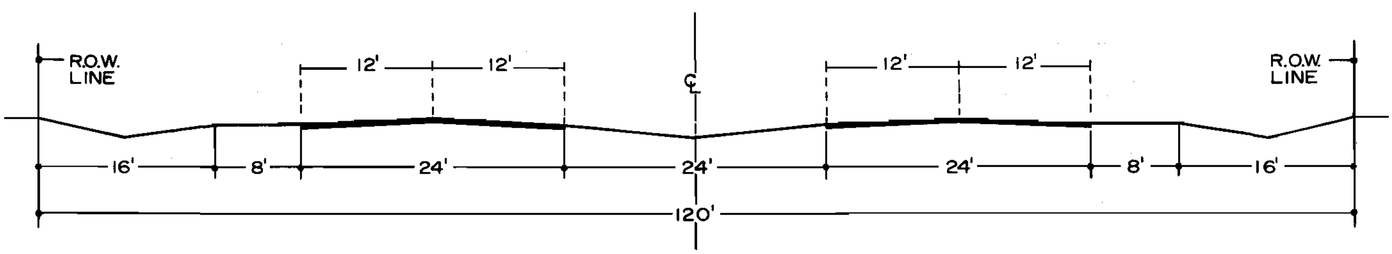
Typical Desirable

Figure 96 (continued)

TYPICAL URBAN FRINGE OR SUBURBAN CROSS-SECTIONS FOR FOUR TRAFFIC LANES



Minimum Desirable



Typical Desirable

[a] *The cross-sections shown in this figure are, in all cases, typical, and are subject to variations with regard to a number of considerations, including traffic and parking lane widths, right-of-way widths, and relation to adjacent land uses, such variations appropriately being the subject of further consideration under subsequent preliminary engineering studies. These cross-sections are provided as a necessary basis for cost and capacity analyses at the systems planning level, and in order to provide the appropriate jurisdictional agencies and local officials with an indication both of the amount of right-of-way which should be considered for reservation to accommodate the required number of traffic lanes, and of what pavement widths are being suggested as a point of departure for the preliminary engineering studies.*

Source: SEWRPC.

to STH 60, and STH 57 from W. County Line Road to Bridge Street in the City of Cedarburg. An increase in the number of moving traffic lanes provided on one or more of these arterials may be expected to abate the congestion in this portion of Ozaukee County.

Wauwatosa Road currently has a rural cross-section along the entire length of the problem corridor from W. County Line Road to STH 60, with a 22-foot-wide pavement adequate to provide for two moving lanes of traffic. The cross-section has six- to eight-foot-wide gravel shoulders within a right-of-way which varies in width from 66 to 120 feet. The problem segment of STH 57 from W. County Line Road to Bridge Street in the City of Cedarburg has a pavement varying in width from 22 to 40 feet, adequate to provide for two moving lanes of traffic throughout, and alternates between a rural and urban cross-section. The right-of-way width along this entire segment of STH 57 is 66 feet. From W. County Line Road to Mequon Road (STH 167), with the exception of that portion at the intersection with Mequon Road which has a 48-foot-wide urban cross-section with right-turn lanes, STH 57 consists of a 24- to 30-foot-wide pavement with 5- to 10-foot-wide shoulders. From Mequon Road (STH 167) to the Village of Thiensville, STH 57 has a 46-foot-wide pavement with 10-foot-wide shoulders. Through the Village of Thiensville, STH 57 has a 22- to 36-foot-wide pavement with curb and gutter. Between the Village of Thiensville and the City of Cedarburg, the arterial has a 22-foot-wide pavement with six-foot shoulders. And, through the City of Cedarburg, STH 57 has a 30- to 40-foot-wide pavement with a rural cross-section, with limited segments having eight-foot parking lanes.

The congestion within this central portion of Ozaukee County, including congestion along Highland Road, could be alleviated through the provision of four lanes for moving traffic on either STH 57 or Wauwatosa Road (STH 181, CTH N, and STH 143). However, the only practical alternative for the provision of these additional lanes is to improve Wauwatosa Road. The improvement of STH 57 was dismissed as impractical because this arterial traverses the historic central business districts of both the Village of Thiensville and the City of Cedarburg. The widening of STH 57 through these two central business districts to provide two additional through lanes of traffic would involve considerable disruption of existing development through the taking of the necessary right-of-way. The prohibition of on-street parking in those areas where it currently exists along STH 57—specifically in the these historic central business districts—was also not considered feasible, as no off-street parking or convenient replacement on-street parking would be available to serve commercial land uses in these areas.

Two roadway improvement alternatives were developed for Wauwatosa Road from W. County Line Road to STH 60. The first alternative considered widening the arterial to a minimum suburban cross-section, and involved the provision of a 48-foot-wide four-lane undivided roadway with eight-foot-wide shoulders and 18-foot-wide ditch areas on a 100-foot right-of-way along the entire length of Wauwatosa Road from W. County Line Road to STH 60. A typical cross-section for this alternative is shown in Figure 97. No parking lanes would be provided under this alternative, and, in order to maintain four through lanes of traffic, on-street parking would be prohibited. The location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing roadway for its entire length. This conclusion was dictated in part by the fact that considerable right-of-way has previously been dedicated during the subdivision and development of land adjacent to Wauwatosa Road.

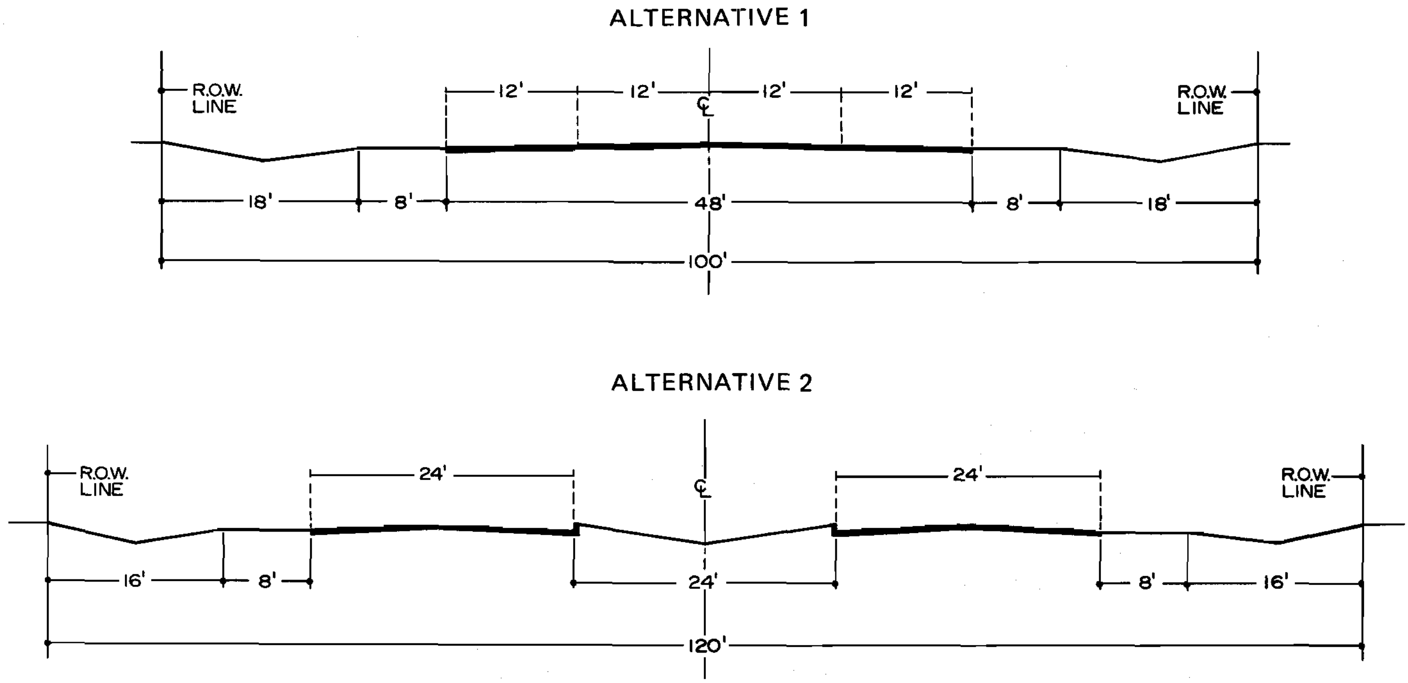
The prohibition of all on-street parking along Wauwatosa Road under this first widening alternative holds certain implications for future land use development along Wauwatosa Road in Ozaukee County. In order to negate any future need for on-street parking, future residential development should be encouraged to back onto facilities like Wauwatosa Road. Residential development which directly fronts Wauwatosa Road will need to be discouraged. Traffic generated by future developments which necessarily will front Wauwatosa Road should be collected by frontage roads wherever possible. Excessive direct access to Wauwatosa Road may be expected to cause the traffic lanes of the arterial to be used as deceleration and storage lanes for left and right turns at midblock locations, thereby reducing its ability to carry through traffic. Assuming such restriction of future land use development, this alternative could be expected to eliminate all remaining over-design-capacity operation, and most of the at-design-capacity operation, along the arterials in this central north-south corridor.

The second alternative considered along Wauwatosa Road, widening the arterial to a desirable suburban cross-section, involved the provision of a pair of 24-foot roadways divided by a 24-foot-wide median, eight-foot-wide shoulders, and 16-foot-wide ditch areas to be constructed on a 120-foot right-of-way. A typical cross-section for this alternative is shown in Figure 97. As in the first alternative, no parking lanes would be provided under this alternative and on-street parking would be prohibited. Also like the first alternative, the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing roadway for the entire length of the project. Given the same constraints on future land use development as those described under the first alternative, this alternative could also be expected to eliminate all remaining over-design-capacity operation and most of the at-design-capacity operation in this central portion of Ozaukee County. The provision of the 24-foot-wide median under this second alternative would result in the separation of opposing traffic flows to improve travel safety and would supply refuge and deceleration area for left-turning vehicles at median openings and intersections, thus further increasing the level of service on Wauwatosa Road.

The negative impacts of each of these two widening alternatives are indicated in Table 231. The negative impacts of a "do nothing" alternative, which would provide that the physical features of the roadway would remain unchanged except for future renewal of the pavement surface, are also included in Table 231. Under the "do nothing" alternative, only required general summer and winter maintenance work and two major resurfacings, including base patching, would be accomplished between 1980 and 2000. It should be pointed out that the implementation of such a "do nothing" alternative would not serve to abate any remaining congestion along this north-

Figure 97

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR WAUWATOSA ROAD (STH 181, CTH N, AND STH 143) FROM W. COUNTY LINE ROAD TO STH 60



Source: Wisconsin Department of Transportation

south corridor. Also, under each of the alternative plans, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. No such actions were recommended under the short-range plan along this segment of Wauwatosa Road. Cost impacts shown in Table 231 for each of the three alternatives are expressed in 1980 dollars, and include estimates of the construction costs; the real estate, relocation, and demolition costs; and the maintenance costs associated with each alternative. Indicated also in Table 231 are the disruption impacts associated with each of the two widening alternatives plus the "do nothing" alternative, including the number of single-family, two-family, and multiple-family residential units taken by type, as well as the number of commercial units required to be taken. As shown in Table 231, the second widening alternative would have the highest estimated capital and maintenance cost, $17,281,000, compared with an estimated $13,467,000 for the first widening alternative, and an estimated $4,628,000 for the "do nothing" alternative. As also shown in this table, the second widening alternative would also result in the greatest disruption, taking seven residential units and one commercial unit, compared with three residential units and one commercial unit taken under the first widening alternative and no displacement required under the "do nothing" alternative.

The special arterial street improvement study conducted by the Wisconsin Department of Transportation also assessed the impacts of widening alternatives as well as of the "do nothing" alternative on noise levels and air pollutant emissions. In this analysis, it was found that there would be no significant differences between the noise levels generated by the two widening alternatives or between the noise levels generated by the two widening alternatives and the "do nothing" alternative. Although greater traffic volumes can be expected under each of the two widening alternatives, and the outside moving traffic lane under each alternative would be located closer to the affected land use development, noise levels between the two widening alternatives and the

Table 231

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR WAUWATOSA ROAD (STH 181, CTH N, AND STH 143) FROM W. COUNTY LINE ROAD TO STH 60

Impact	"Do Nothing" Alternative	Alternative 1 (48-foot roadway)	Alternative 2 (24-foot roadway pairs with median)
Cost (in 1980 dollars)[a]			
Construction	$3,483,000	$10,450,000	$13,775,000
Real Estate Acquisition, Relocation, and Demolition	- -	731,000	1,220,000
Maintenance	1,145,000	2,286,000	2,286,000
Total	$4,628,000	$13,467,000	$17,281,000
Disruption			
Residential Units Taken			
Single Family	- -	3	7
Two Family	- -	- -	- -
Multiple Family	- -	- -	- -
Total	- -	3	7
Commercial Units Taken	- -	1	1

[a]Construction costs for each alternative include estimates of the roadway construction, attendant traffic signalization, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.

Source: Wisconsin Department of Transportation and SEWRPC.

"do nothing" alternative were found to be about equal due to the fact that traffic congestion would still occur under the "do nothing" alternative and would not occur under each of the widening alternatives. It was also found in this analysis that there would be no significant differences in air pollutants emitted between the two widening alternatives or between the two widening alternatives and the "do nothing" alternative. It is important to recognize that, although the "do nothing" alternative was shown to have similar noise and air pollutant impacts to the two widening alternatives along Wauwatosa Road, the "do nothing" alternative, unlike the widening alternative, would have additional negative impacts on arterial streets located adjacent and parallel to Wauwatosa Road. The additional traffic volume carried on Wauwatosa Road under the widening alternatives would necessarily have to be diverted to either STH 57 or Highland Road, thereby increasing noise levels and air pollutant emissions on these arterials.

Based upon consideration of the additional capacity afforded and congestion abated by each alternative, and the impacts in terms of the cost, disruption, and environmental effects of each alternative, it is recommended that the second widening alternative—that is, the provision of two 24-foot-wide roadway pairs, in addition to a 24-foot-wide median and eight-foot-wide shoulders—proposed for Wauwatosa Road be implemented. While both the minimal and desirable cross-section widening alternatives would serve to eliminate the remaining traffic congestion along this north-south corridor, and the impacts of each would be similar and minimal, widening to a desirable cross-section is recommended principally because the provision of a 24-foot-wide median under this alternative would effect a separation of opposing traffic flows, thereby improving travel safety, and would provide room for refuge and deceleration lanes for left-turning vehicles at median openings and intersections.

STH 60 (Washington Street) West of and Through the Village of Grafton: To resolve the congestion which may be expected to remain in the plan design year in the east-west travel corridor through the northern portion of the Village of Grafton and to provide arterial street and highway system network continuity between the north-south Wauwatosa Road corridor (STH 181, CTH N, and STH 143) and the east-west STH 60 corridor, consideration was given to improving one arterial through the area—STH 60 (Washington Street within the Village of Grafton)—from STH 143 to Grafton Avenue (STH 57) in the Village of Grafton. An increase in the number of moving traffic lanes provided on this arterial would abate the traffic flow problems in this portion of Ozaukee County.

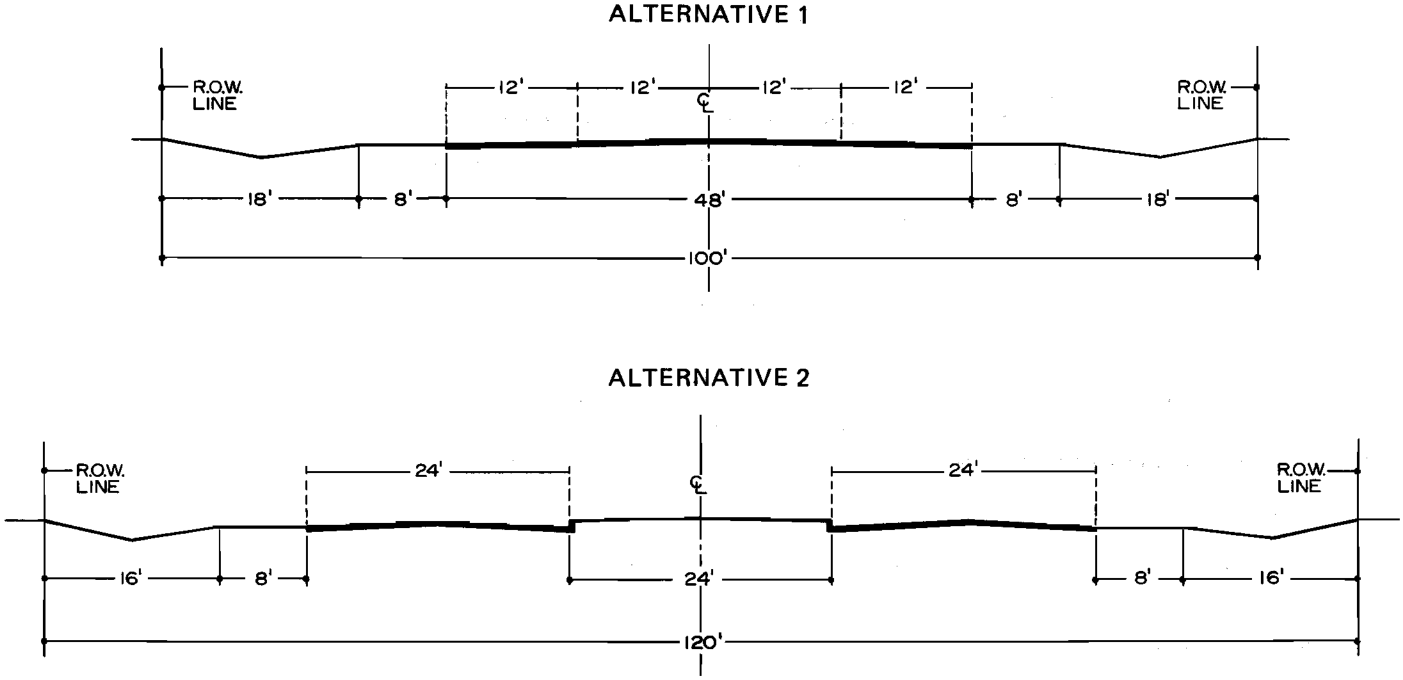
From STH 143 to 1st Avenue in the Village of Grafton, STH 60 has a rural cross-section with a 22-foot-wide pavement, adequate to provide for two moving lanes of traffic. This cross-section has six-foot-wide gravel shoulders within a 100-foot-wide right-of-way. From 1st Avenue to 13th Avenue in the Village of Grafton, STH 60 (Washington Street) has an urban cross-section with curbs and gutters and sidewalks within a 66-foot-wide right-of-way, with a pavement width of 42 to 44 feet curb-to-curb from 1st Avenue to 11th Avenue, and a pavement width of 52 feet curb-to-curb from 11th Avenue to 13th Avenue, adequate to provide two lanes for moving traffic and two parking lanes. Between 13th Avenue and 15th Avenue, STH 60 crosses over the Milwaukee River on a bridge which has sidewalks and a pavement width of 27 feet curb-to-curb, adequate to provide two moving lanes for traffic. Between 15th Avenue and STH 57 (Grafton Avenue), STH 60 also has an urban cross-section with curbs and gutters and sidewalks. Along this final portion of the problem segment of STH 60, however, the right-of-way width expands to 80 feet to accommodate dual 24-foot-wide roadways and a four-foot-wide median at the intersection of STH 60 (Washington Street) with STH 57 (Grafton Avenue), adequate to provide four lanes for moving traffic with parking prohibited. Along STH 60 (Washington Street) in the Village of Grafton, parking is permitted from 1st Avenue to 13th Avenue, but is prohibited on the bridge over the Milwaukee River and between that bridge and the intersection of STH 60 (Washington Street) and Grafton Avenue (STH 57).

In the consideration of roadway improvement alternatives for STH 60, the western segment of the arterial—from STH 143 to 1st Avenue—and the eastern segment of the arterial—from 1st Avenue to Grafton Avenue (STH 57) through the Village of Grafton—were examined separately. Two alternatives for the provision of minimum and desirable suburban roadway cross-sections on STH 60 were developed for the western segment of STH 60 from STH 143 to 1st Avenue in the Village of Grafton; and two alternatives for the provision of minimum and desirable urban roadway cross-sections on STH 60 (Washington Street) were developed for the eastern segment of STH 60 from 1st Avenue to Grafton Avenue (STH 57). Separate improvement alternatives were designed for each of these two segments of STH 60 because of the disparity of land uses adjacent to each segment. Thus, separate recommended improvement alternatives were selected for the western and eastern segments of STH 60, with due consideration being given to the type of land use adjacent to each.

The first alternative considered for the western segment of the arterial called for widening STH 60 to a minimum suburban cross-section from STH 143 to 1st Avenue. This alternative would entail the provision of a 48-foot-wide four-lane undivided roadway with eight-foot-wide shoulders and 18-foot-wide ditch areas on a 100-foot-wide right-of-way. The second alternative considered called for widening to a desirable suburban cross-section. This alternative would entail the provision of a pair of 24-foot-wide roadways divided by a 24-foot-wide median, having eight-foot-wide shoulders and 16-foot-wide ditch areas on a 120-foot-wide right-of-way. This would require the acquisition of an additional 10 feet of right-of-way along the segment. The typical cross-sections for these two alternatives are shown in Figure 98. No parking lanes would be provided under these alternatives and, in order to maintain four through lanes for traffic movement, on-street parking would be prohibited. As in the widening alternatives proposed for the Wauwatosa Road corridor, future development should be encouraged to back onto STH 60 in order to negate any future need for on-street parking along this segment of STH 60. Encouragement of this type of development would minimize direct access and, as such, minimize the need for the traffic lanes to also serve as deceleration and storage lanes for left and right turns at midblock locations, which would reduce the ability

Figure 98

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR STH 60 FROM STH 143 TO 1ST AVENUE



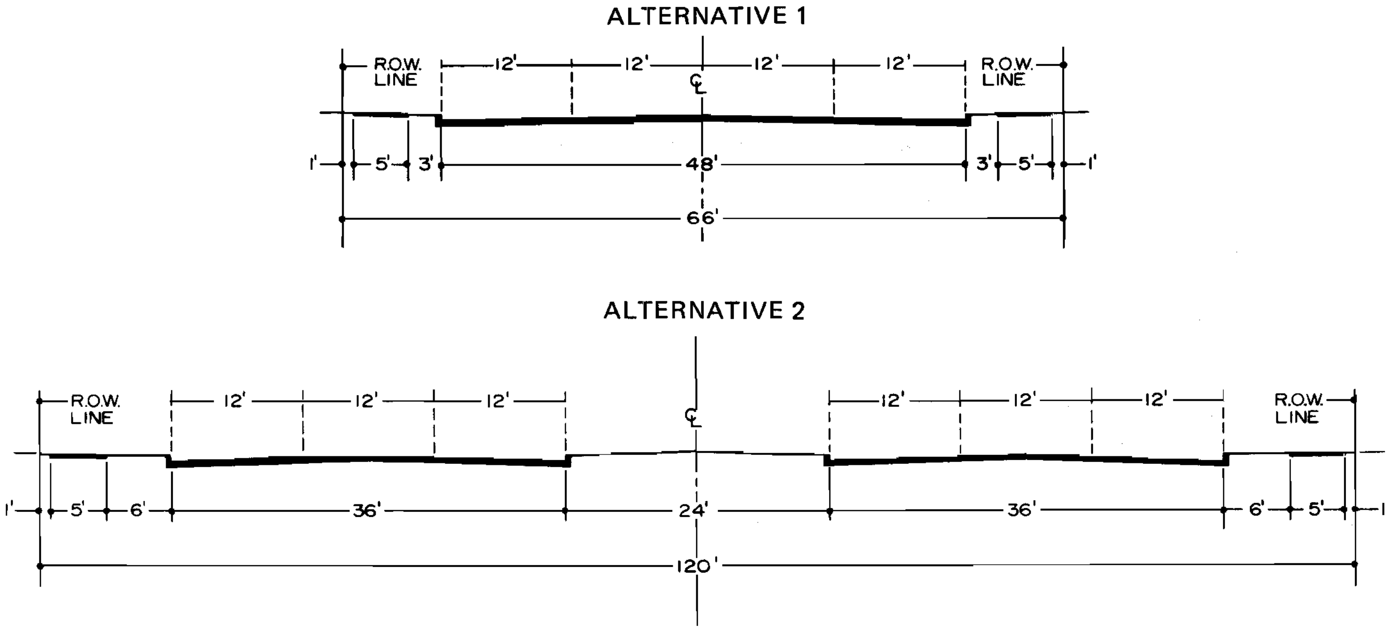
Source: Wisconsin Department of Transportation and SEWRPC.

of STH 60 to carry through traffic safely. The best location for the new right-of-way required under the second alternative—the location which would result in the least cost and disruption—was determined to be centered on the existing roadway for this entire segment. Assuming this restriction of future land use development, both of these alternatives could be expected to provide highway system network continuity along this segment of STH 60.

The first alternative considered for the eastern segment of the arterial called for widening STH 60 (Washington Street) to a minimum urban cross-section from 1st Avenue to 15th Avenue and involved the provision of a four-lane undivided roadway with a curb-to-curb pavement width of 48 feet, with sidewalks within the existing 66-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 99. Under this alternative, no expansion would be necessary from 11th Avenue to 13th Avenue, or at the intersection of STH 60 (Washington Street) and STH 57 (Grafton Avenue) within the Village of Grafton. In order to maintain two through lanes for moving traffic in the peak direction during peak periods along this segment, on-street parking, standing, or stopping would necessarily be prohibited in the direction of peak traffic flow during peak periods. Vehicles accessing businesses or residences during peak hours which front STH 60 (Washington Street) in the Village of Grafton would have to park along nearby intersecting streets or in off-street locations. Such widening would permit four lanes for moving traffic along the entire length of this problem segment, with the exception of that segment of STH 60 carried on the bridge over the Milwaukee River. This bridge, originally constructed in 1928, is recommended for reconstruction by 1985. At that time, it is recommended that the structure be reconstructed to provide four lanes for moving traffic plus sidewalks. Reconstruction of the surface of this bridge would also need to provide for pedestrian access across the Milwaukee River. Under this alternative, no exclusive turn-lane channelization would be provided at the intersection of STH 60 (Washington Street) with STH 57

Figure 99

TYPICAL CROSS-SECTIONS FOR IMPROVEMENT ALTERNATIVES 1 AND 2 FOR STH 60 (WASHINGTON STREET) FROM 1ST AVENUE TO STH 57 (GRAFTON AVENUE) (EASTERN SEGMENT OF STH 60)



Source: Wisconsin Department of Transportation and SEWRPC.

(Wisconsin Avenue), and the existing left-turn channelization would be provided at the intersection of STH 60 (Washington Street) and STH 57 (Grafton Avenue). This alternative could be expected to eliminate all remaining over-design-capacity operation and most of the at-design-capacity operation in this portion of Ozaukee County.

The second alternative considered for the eastern segment of the arterial called for widening STH 60 (Washington Street) to a desirable urban cross-section from 1st Avenue to STH 57 (Grafton Avenue). This would entail the provision of dual 36-foot roadways separated by a 24-foot-wide median with curb and gutter and sidewalks within a 120-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 99. Such widening would permit four lanes for moving traffic in addition to two parking lanes on STH 60 (Washington Street) within the Village of Grafton from 1st Avenue to STH 57 (Grafton Avenue), with the exception of that segment of STH 60 carried on the bridge over the Milwaukee River. The bridge would be reconstructed, as under the first alternative, to provide four lanes for moving traffic plus sidewalks. This alternative could also be expected to eliminate all remaining over-design-capacity operation and most of the at-design-capacity operation in this portion of Ozaukee County. Under this alternative, the provision of a median along STH 60 (Washington Street) from 1st Avenue to STH 57 (Grafton Avenue) would permit the construction of any necessary left-turn lanes at median openings along this arterial segment, and would provide adequate separation of opposing traffic flows, thereby further increasing the level of safety and service on STH 60 (Washington Street). The location for the widened right-of-way required under this second alternative which would result in the least cost and disruption is centered on the existing roadway from 1st Avenue to STH 57 (Grafton Avenue).

The negative impacts of the two widening alternatives for both the western and eastern segments of STH 60 and Washington Street are indicated in Table 232. The negative impacts of a "do nothing" alternative for each of these segments, under which the physical features of the roadway would remain unchanged except for renewal of the pavement surface, are also indicated in Table 232. In each case under the "do nothing" alternative, only

Table 232

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR STH 60 (WASHINGTON STREET FROM STH 143 TO STH 57—GRAFTON AVENUE)

Impact	Western Segment of STH 60 from STH 143 to 1st Avenue			Eastern Segment of STH 60 (Washington Street) from 1st Avenue to STH 57 (Grafton Avenue)		
	"Do Nothing" Alternative	Alternative 1 (48-foot-wide suburban roadway)	Alternative 2 (24-foot-wide suburban roadway pairs with median)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (36-foot-wide urban roadway pairs with median)
Cost (in 1980 dollars)[a]						
Construction	$ 756,000	$1,575,000	$1,785,000	$400,000	$1,520,000	$1,945,000
Real Estate Acquisition, Relocation, and Demolition	- -	- -	14,000	- -	- -	2,900,000
Maintenance	269,000	538,000	538,000	230,000	230,000	346,000
Total	$1,025,000	$2,113,000	$2,337,000	$630,000	$1,750,000	$5,191,000
Disruption						
Residential Units Taken	- -	- -	- -	- -	- -	20
Commercial Units Taken	- -	- -	- -	- -	- -	6

[a]*Construction costs for each alternative include estimates of the roadway construction, utility relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

required general summer and winter maintenance work, and two major resurfacings, including base patching, would be accomplished on each segment of STH 60 between 1980 and 2000. Also, under each of the alternative plans any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. In the case of STH 60, no recommendations were made for either the western segment of STH 60 from STH 143 to 1st Avenue, or the eastern segment of STH 60 from 1st Avenue to Grafton Avenue (STH 57) northbound. It should be pointed out that the implementation of a "do nothing" alternative would neither serve to abate any remaining congestion along this east-west corridor nor provide for any additional traffic flow network continuity between the Wauwatosa Road corridor, STH 60, and STH 57.

The cost estimates shown in Table 232 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate, relocation, and demolition costs; and the maintenance costs associated with each alternative. Also indicated in Table 232 is the disruption which may be expected to be associated with each of the two widening alternatives plus the "do nothing" alternative for each segment of STH 60, including the number of residential and commercial units required to be taken. As shown in Table 232, of the alternatives proposed for the western segment of STH 60 from STH 143 to 1st Avenue, the second widening alternative would have the highest estimated capital and maintenance cost, $2,337,000, compared with an estimated $1,025,000 for the "do nothing" alternative and an estimated $2,113,000 for the first widening alternative. As also shown in this table, neither of the widening alternatives proposed for the western segment of STH 60 would require the acquisition of any residential or commercial units. Of the alternatives proposed for the eastern segment of STH 60 (Washington Street) from 1st Avenue to STH 57 (Grafton Avenue), the second widening alternative would have the highest estimated capital and maintenance cost, $5,191,000, compared with an estimated $630,000 for the "do nothing" alternative and an estimated $1,750,000 for the first widening alternative. Table 232 shows that of the widening alternatives proposed for this eastern segment, only the second would involve disruption, taking 20 residential units and six commercial units.

There would be no significant differences in the environmental impact in terms of air quality and noise levels between the two widening alternatives and between the "do nothing" alternative and the two widening alternatives considered for each segment of STH 60. However, under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving on the eastern segment of STH 60 would result in increased air pollutant emissions along that segment.

Based upon consideration of the additional continuity afforded the arterial street and highway system by each alternative, and the impacts of each alternative in terms of cost, disruption, and environmental factors, it is recommended that the second widening alternative—that is, a suburban cross-section with two 24-foot-wide roadway pairs, in addition to a 24-foot-wide median and eight-foot-wide shoulders on a 120-foot-wide right-of-way—be implemented along the western segment of STH 60 from STH 143 to 1st Avenue in the Village of Grafton. Both the minimum and desirable cross-section widening alternatives would serve to provide the necessary arterial street and highway system network continuity between the north-south Wauwatosa Road corridor and the east-west STH 60 and STH 57 corridor, and the impacts of each would be similar and minimal. Nevertheless, widening to a desirable cross-section is recommended along this segment principally because the provision of a 24-foot-wide median under this alternative would effect a separation of opposing traffic flows, thereby improving travel safety as well as providing room for refuge and deceleration lanes for left-turning vehicles at median openings.

Based upon consideration of the additional capacity afforded and congestion abated by each alternative, and the impacts of each alternative in terms of cost, disruption, and environmental factors, the first widening alternative is recommended for the eastern segment of STH 60 (Washington Street) from 1st Avenue to STH 57 (Grafton Avenue) in the Village of Grafton—that is, a four-lane undivided 48-foot-wide roadway with sidewalks within the existing right-of-way. This alternative will require the prohibition of parking in the direction of the peak traffic flow during peak travel periods. Both the minimum and desirable cross-section widening alternatives would serve to eliminate the remaining traffic congestion along the east-west corridor, and definite benefits would be derived from the desirable cross-section widening both in terms of increased travel safety and level of service by the provision of a median under that alternative, and in terms of increased access to local businesses and residences by the provision of on-street parking under that alternative. However, the severe disruption attendant to the second widening alternative in terms of displaced residential and commercial units would probably outweigh the additional benefits derived. Because on-street parking would not be permitted during peak periods under this recommended alternative, vehicles accessing businesses or residences which front STH 60 (Washington Street) would have to seek alternative parking along intersecting streets or in off-street locations during peak periods.

Mequon Road (STH 167): To resolve the congestion which may be expected to remain in the plan design year in the east-west corridor through the southern portion of Ozaukee County from Wauwatosa Road (STH 181) to the North-South Freeway (IH 43), consideration was given to improving one arterial through the area—Mequon Road (STH 167)—from the Ozaukee/Washington County line (Wausaukee Road) to the North-South Freeway (IH 43) within the City of Mequon. This improvement would also provide arterial street and highway system network continuity between STH 167 west of the Ozaukee/Washington County line (Wausaukee Road), which is recommended for improvement to four lanes under the adopted long-range regional transportation plan, and Wauwatosa Road (STH 181). An increase in the number of moving traffic lanes provided on this arterial may be expected to abate the traffic flow problems in this portion of Ozaukee County.

With the exception of the intersections of Mequon Road with Wauwatosa Road, STH 57 (Cedarburg Road), the paired driveways to Homestead High School, and Port Washington Road (CTH W), Mequon Road currently has a rural cross-section, with four-foot-wide gravels shoulders and with a 22-foot-wide pavement, adequate to provide for two moving lanes of traffic. The right-of-way width along this segment of Mequon Road is 66 feet from Wausaukee Road to Swan Road, varies from 66 to 88 feet from Swan Road to Meadowbrook Drive, is 66 feet from Meadowbrook Drive to Wauwatosa Road, varies from 66 to 98 feet between Wauwatosa Road and Industrial Drive, and is 120 feet from Industrial Drive to the North-South Freeway (IH 43). The pavement width of Mequon Road expands to 42 feet at its intersection with Wauwatosa Road; to 48 feet with curbs and gutters at its intersection with STH 57; to 42 feet at its intersection with the driveway pairs to Homestead High School; and to 46 feet with curbs and gutters at its intersection with Port Washington Road, in each case to accommodate right-turn lanes. West of its intersection with Swan Road, Mequon Road crosses over the Little Menomonee River on a bridge which provides for distress lanes on either side and has a pavement width of 22 feet, adequate to provide for two moving lanes of traffic; and between STH 57 and Parkview Drive, Mequon Road crosses over the Milwaukee River on a bridge which has a sidewalk on one side and a curb-to-curb pavement width of 27 feet, adequate to provide two lanes for moving traffic. The Milwaukee Road railroad intersects Mequon Road at-grade between Industrial Road and STH 57. No parking lanes are provided along this problem segment of Mequon Road.

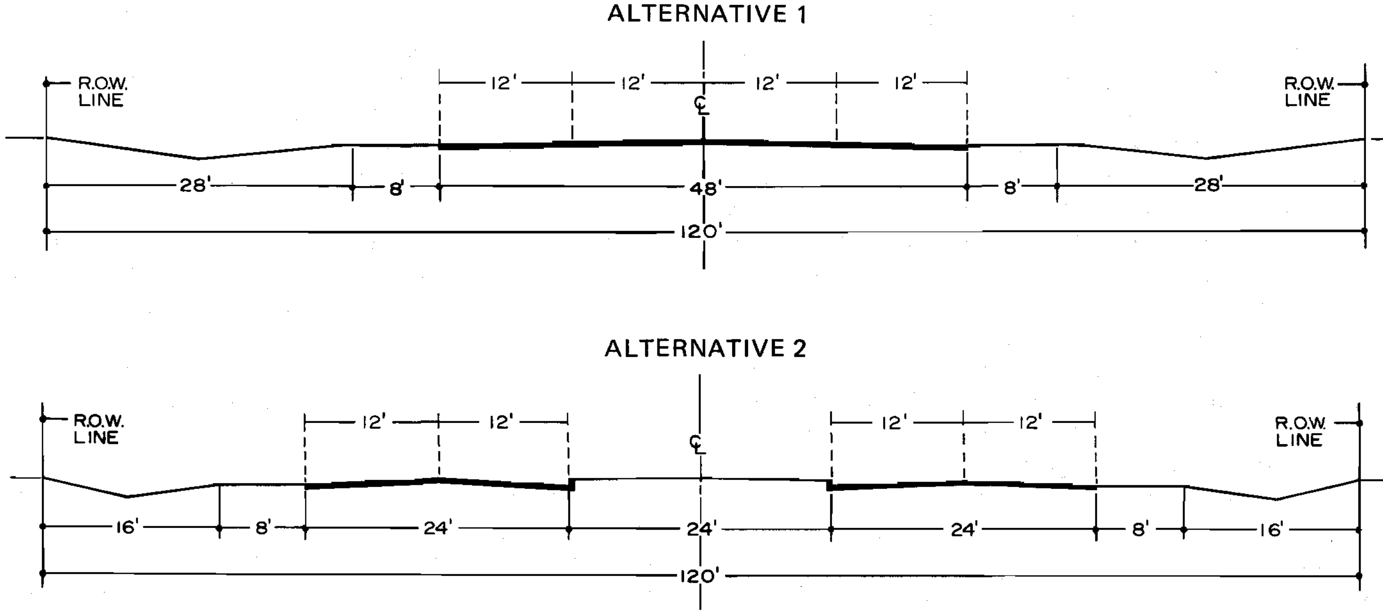
In the consideration of improvement alternatives for Mequon Road, the western segment of the arterial—from Wausaukee Road to Swan Road—and the eastern segment of the arterial—from Swan Road to the North-South Freeway (IH 43)—were examined separately. Two alternatives for the provision of minimum and desirable suburban roadway cross-sections on Mequon Road were developed for the western segment of the arterial, and two alternatives for the provision of minimum and desirable urban roadway cross-sections on Mequon Road were developed for the eastern segment of the arterial. Separate improvement alternatives were developed for these two segments of Mequon Road because of the disparity in the existing and anticipated land uses adjacent to each segment. Thus, separate recommended improvement alternatives were selected for the western and eastern segments of Mequon Road, with due consideration being given to the type of land use adjacent to each.

The first alternative considered for the western segment of the arterial involved widening Mequon Road to a minimum suburban cross-section from Wausaukee Road to Swan Road. This alternative would entail the provision of a 48-foot-wide, four-lane, undivided roadway with eight-foot-wide shoulders and 18-foot-wide ditch areas on a 100-foot-wide right-of-way, adequate to provide for two moving lanes of traffic in each direction. The second alternative considered involved widening to a desirable suburban cross-section. This alternative would entail the provision of a pair of 24-foot-wide roadways divided by a 24-foot-wide median, having eight-foot-wide shoulders and 16-foot-wide ditch areas on a 120-foot-wide right-of-way, adequate to provide for two lanes of moving traffic in each direction. The first alternative would require the acquisition of 34 feet of additional right-of-way, and the second alternative would require the acquisition of an additional 54 feet of right-of-way along the segment. Under each alternative, the existing bridge over the Little Menomonee River would be replaced by a new structure. Under the first alternative, this bridge would be a single four-lane structure with sidewalks. Under the second alternative, this bridge would be a dual structure, providing two lanes and a sidewalk on each structure. The typical cross-sections for these two alternatives are shown in Figure 100. No parking lanes would be provided under these two alternatives, and in order to maintain four through lanes for moving traffic, on-street parking would have to be prohibited along this segment of Mequon Road. Also, in order to negate any future need for on-street parking along this segment of Mequon Road, future development should be oriented to access interior streets rather than Mequon Road. Encouragement of this type of development would minimize direct access to Mequon Road and, as such, minimize the need for the traffic lanes to also serve as deceleration and storage lanes for left and right turns at midblock locations, which would impair the capacity and safety of Mequon Road. The best location for the new right-of-way required under these two alternatives—the location which would result in the least cost and disruption—was determined to be centered on the existing roadway. Assuming this restriction of future land use development, both of these alternatives could be expected to provide highway system network continuity along this segment of Mequon Road.

Two roadway improvement alternatives were also developed for Mequon Road from Swan Road to the North-South Freeway (IH 43). The first alternative considered widening this segment of Mequon Road to a minimum urban cross-section. This alternative would entail the provision of a four-lane undivided roadway with a curb-to-curb pavement

Figure 100

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR MEQUON ROAD (STH 167) FROM WAUSAUKEE ROAD TO SWAN ROAD (WESTERN SEGMENT OF MEQUON ROAD)



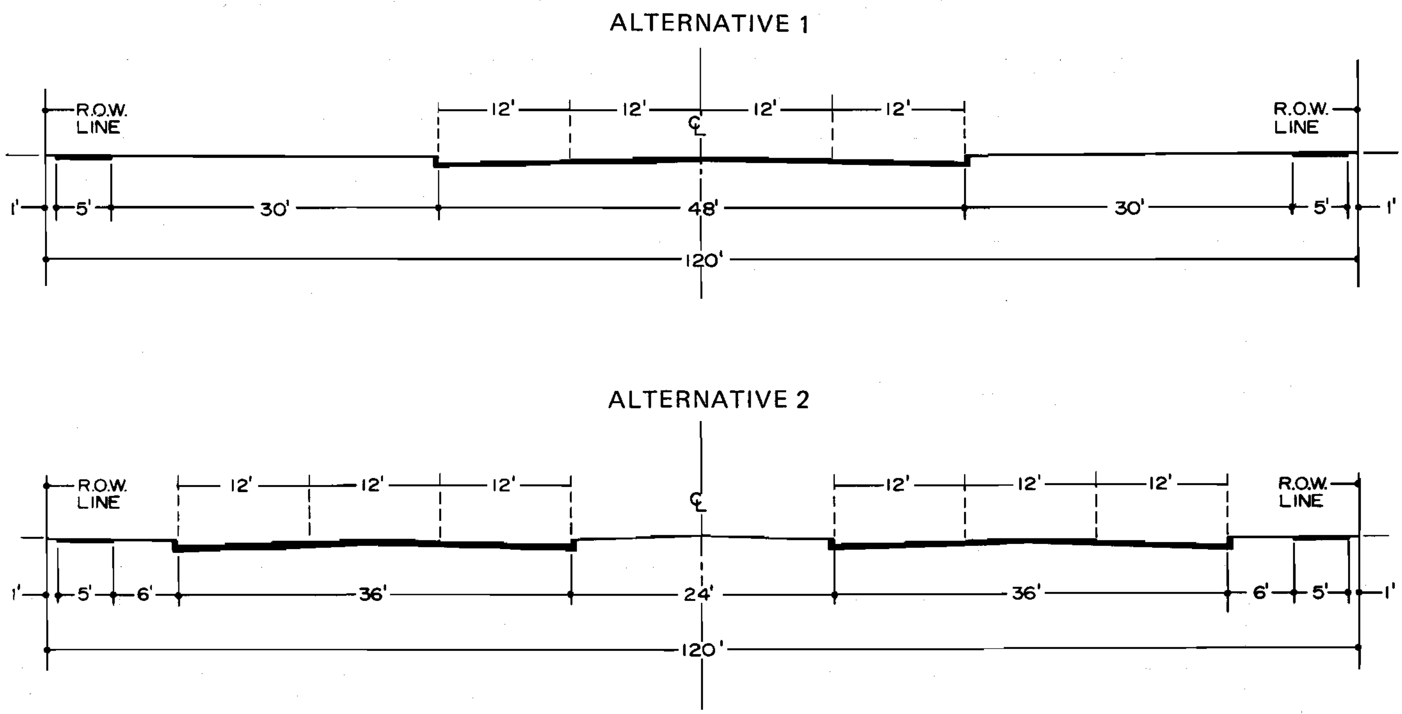
Source: Wisconsin Department of Transportation and SEWRPC.

width of 48 feet and with sidewalks within the existing right-of-way. A typical cross-section for this alternative is shown in Figure 101. In order to maintain two lanes for moving traffic along this segment of Mequon Road in the peak direction during peak periods, on-street parking, standing, or stopping would be prohibited during peak periods in the direction of peak traffic flow. Such widening would permit four lanes for moving traffic on the entire length of this problem segment, with the exception of that segment of Mequon Road carried on the bridge over the Milwaukee River. Under this alternative, this structure, constructed in 1927, would be replaced, and a new structure would be built which would provide for four moving lanes of traffic plus pedestrian access across the Milwaukee River. Also under this alternative, future development should be oriented to access interior streets rather than Mequon Road in order to negate any future need for on-street parking along this segment of Mequon Road. Encouragement of this type of development would minimize direct access to Mequon Road and, as such, minimize the need for traffic lanes to also serve as deceleration and storage lanes for left and right turns at midblock locations, which would reduce the ability of Mequon Road to carry through traffic. Assuming such restriction of future land use development, this alternative could be expected to eliminate all remaining over-design-capacity operation and most of the at-design-capacity operation, and provide necessary highway system continuity, in this southern portion of Ozaukee County.

The second alternative considered along Mequon Road (STH 167) called for widening the arterial to a desirable urban cross-section from Swan Road to the North-South Freeway (IH 43). Design plans for such a cross-section have been completed by the Wisconsin Department of Transportation in cooperation with the City of Mequon for that segment of Mequon Road from Industrial Drive to the North-South Freeway (IH 43). Under this second widening alternative, the type of roadway cross-section proposed under these design plans—dual 36-foot-wide roadways separated by a 24-foot-wide median with curbs and gutters on a 120-foot-wide right-of-way—would be implemented and would be extended west to Swan Road. All of the right-of-way required to accommodate this roadway design from the North-South Freeway (IH 43) to Industrial Drive has been acquired. The purchase of this right-of-way was made alternately to the north and south of the existing centerline of Mequon Road in order to minimize cost and disruption. This alternative

Figure 101

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR MEQUON ROAD (STH 167) FROM SWAN ROAD TO THE NORTH-SOUTH FREEWAY (IH 43)



Source: Wisconsin Department of Transportation and SEWRPC.

would require the acquisition of between 22 and 54 feet of additional right-of-way, however, between Industrial Drive and Swan Road. The acquisition of this additional right-of-way would necessarily be made alternately to the north and south of the existing centerline of Mequon Road along this segment in order to minimize cost and disruption, but would still require the acquisition of five industrial buildings and one residential unit. Sidewalks would not be provided from Swan Road to Wauwatosa Road under this alternative, but would be provided on one side of the roadway only from Wauwatosa Road to STH 57 and on both sides of the roadway from STH 57 to the North-South Freeway (IH 43). A typical cross-section for this alternative is shown in Figure 101. Such widening would permit four lanes for moving traffic in addition to two parking lanes on Mequon Road through the City of Mequon from Swan Road to the North-South Freeway (IH 43), with the exception of that segment of Mequon Road (STH 167) carried on the bridge over the Milwaukee River. Under this alternative, the Milwaukee River bridge would be reconstructed as a dual structure, with each structure carrying two lanes of moving traffic and providing a sidewalk. This alternative could also be expected to eliminate all remaining over-design-capacity operation and most of the at-design-capacity operation, and to provide necessary highway system continuity, in this portion of Ozaukee County. Under this alternative, the provision of a median along Mequon Road from Swan Road to the North-South Freeway (IH 43) would permit the construction of any necessary left-turn lanes at median openings along this arterial segment, and would provide adequate separation of opposing traffic flows, thereby further increasing the safety and level of service on Mequon Road.

The negative impacts of the two widening alternatives for both the western and eastern segments of Mequon Road are indicated in Table 233. The negative impacts of a "do nothing" alternative for each of these segments, under which the physical features of the roadway would remain unchanged except for renewal of the pavement surface, are also indicated in Table 233. In each case under the "do nothing" alternative, only required general summer and winter maintenance work, and two

Table 233

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR MEQUON ROAD (STH 167) FROM THE OZAUKEE/WASHINGTON COUNTY LINE TO THE NORTH-SOUTH FREEWAY (IH 43)

Impact	Western Segment of Mequon Road from the Ozaukee/Washington County Line to Swan Road			Eastern Segment of Mequon Road from Swan Road to the North-South Freeway (IH 43)		
	"Do Nothing" Alternative	Alternative 1 (48-foot-wide suburban roadway)	Alternative 2 (24-foot-wide suburban roadway pairs with median)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (36-foot-wide urban roadway pairs with median)
Cost (in 1980 dollars)[a]						
Construction	$360,000	$1,600,000	$1,850,000	$ 941,000	$4,755,000	$ 7,686,000
Real Estate Acquisition, Relocation, and Demolition	--	318,000	505,000	--	--	845,000
Maintenance	256,000	512,000	512,000	666,000	1,332,000	1,998,000
Total	$616,000	$2,430,000	$2,867,000	$1,607,000	$6,087,000	$10,529,000
Disruption						
Residential Units Taken	--	--	--	--	--	1
Commercial Units Taken	--	--	--	--	--	--
Industrial Units Taken	--	--	--	--	--	5

[a]Construction costs for each alternative include estimates of the roadway construction, utility relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.

Source: Wisconsin Department of Transportation and SEWRPC.

major resurfacings, including base patching, would be accomplished on Mequon Road between 1980 and 2000. Also, under each of the alternative plans any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway expansion are assumed to have been implemented. In the case of Mequon Road, the interconnection of the traffic signal at the intersection of Mequon Road and STH 57 was recommended under the short-range plan. The cost of this improvement is accordingly also included in the cost of each plan for this segment of Mequon Road. This action was found to be ineffective, however, in resolving the long-range problem. It should be pointed out that the implementation of a "do nothing" alternative would neither serve to abate any congestion nor provide for any additional highway network continuity along this important east-west corridor in southern Ozaukee County.

The costs shown in Table 233 for each of the three alternatives for each of the western and eastern segments of Mequon Road are expressed in 1980 dollars and include estimates of the construction costs, including utility and sewer relocation costs; the real estate, relocation, and demolition costs; and the maintenance costs associated with each alternative. Also indicated in Table 233 is the disruption which may be expected to be associated with each of the two widening alternatives, plus the "do nothing" alternative for each segment of Mequon Road, including the number of residential and commercial units required to be taken. As shown in Table 233, of the alternatives proposed for the western segment of Mequon Road from Wausaukee Road to Swan Road, the second widening alternative would have the highest estimated capital and maintenance cost, $2,867,000, compared with an estimated $2,430,000 for the first widening alternative and an estimated $616,000 for the "do nothing" alternative. As also shown in this table, neither of the alternatives proposed for the western segment of Mequon Road would require the acquisition of any residential or commercial units. Of the alternatives proposed for the eastern segment of Mequon Road from Swan Road to the North-South Freeway (IH 43), the second widening alternative would have the highest estimated capital and maintenance cost, $10,529,000, compared with $6,087,000 for the first widening alternative and $1,607,000 for the "do nothing" alternative. Only the second alternative plan would involve disruption, requiring the taking of one residential and five industrial units.

There would be no significant differences in the environmental impacts in terms of air quality and noise levels between the two widening alternatives proposed for each segment of Mequon Road. However, the difference in environmental impact between the two widening alternatives and the "do nothing" alternative would be significant along each segment. Under the "do nothing" alternative in each case, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

For the western segment of Mequon Road from Wausaukee Road to Swan Road, it is recommended that the second widening alternative—that is, a suburban cross-section with two 24-foot-wide roadway pairs, in addition to a 24-foot-wide median and eight-foot-wide shoulders on a 120-foot-wide right-of-way—be implemented. While both the minimum and desirable cross-section widening alternatives would serve to provide the necessary arterial street and highway system network continuity along Mequon Road, and the impacts of each would be similar and minimal, widening to a desirable suburban cross-section is recommended along this segment because the provision of a 24-foot-wide median under this alternative would effect a separation of opposing traffic flows, thereby improving travel safety as well as providing room for refuge and deceleration lanes for left-turning vehicles at median openings.

Based upon consideration of the additional capacity afforded and congestion abated, and additional highway system continuity provided, by each alternative, and the costs and environmental impacts of each alternative, it is recommended that the second widening alternative be implemented along the eastern section of Mequon Road from Swan Road to the North-South Freeway (IH 43) in the City of Mequon. This widening alternative is consistent with the Wisconsin Department of Transportation design plans for Mequon Road from Industrial Drive to the North-South Freeway (IH 43) and provides for dual 36-foot-wide roadways separated by a 24-foot-wide median, with curbs and gutters and sidewalks and parking lanes within a 120-foot right-of-way. Both the minimum and desirable cross-section widening alternatives would serve to provide additional roadway continuity and eliminate the remaining traffic congestion along this eastern segment of the east-west corridor, and it is true that this alternative would involve the highest capital cost, as well as some disruption. However, widening to a desirable urban cross-section is recommended because the provision of a 24-foot-wide median under this alternative would effect a separation of opposing traffic flows, thereby improving travel safety as well as providing room for refuge and deceleration lanes for left-turning vehicles at median openings. This alternative was also recommended because of its provision of parking lanes along this entire segment of Mequon Road.

Additional Improvement and Expansion Projects: In addition to the three arterial street widening projects proposed for the southern portion of Ozaukee County after consideration of the second long-range alternative plan, five other arterial street improvement and expansion projects were recommended for this area under this final long-range plan. Although these additional projects would increase arterial capacity in Ozaukee County, and in some cases would help abate existing and probable future congestion problems, the principal reason for recommending these segments for improvement was to provide continuity of facility cross-sections, thereby minimizing safety and operational problems; to minimize circuity of travel and attendant motor fuel utilization and air pollutant emissions; and to provide a proper spacing of arterials, adequately improved to good municipal engineering standards, to promote the sound coordinated development of land and arterial street facilities. Each of these additional five projects is described below. Because the precise alignment and design for each project has not been included in this study, cost estimates for each project are general. More detailed cost estimates and precise location for the facility would be determined by subsequent preliminary engineering studies.

Granville Road from Friestadt Road to Highland Road: As it currently exists, the otherwise direct north-south alignment of Granville Road is interrupted by a shift in alignment of about one-quarter mile to the west between Friestadt Road and Highland Road, resulting in discontinuity in that travel corridor. To provide arterial and highway system network continuity on Granville Road and to meet adequate arterial street and highway spacing requirements in this section of Ozaukee County, it is recommended that a new arterial segment of Granville Road be constructed between Friestadt Road and Highland Road, and that the current segment of Granville Road between Friestadt Road and Highland Road revert to collector street status. This new arterial segment provides for a direct north-south travel corridor along the entire length of the roadway in Ozaukee County.

This recommendation would entail the provision of a 24-foot-wide rural roadway with 10-foot-wide gravel shoulders on a 100-foot-wide right-of-way between Friestadt Road and Highland Road to provide for two lanes of moving traffic with no parking lanes. Such a rural roadway cross-section would represent a direct north-south continuation of the type of roadway cross-sections which are proposed for the year 2000 on those segments of Granville Road immediately north and south of the proposed new segment. To avoid an existing wetland area, this new segment of Granville Road would need to follow a reverse curve alignment.

The cost estimates for this recommendation shown in Table 234 are in 1980 dollars, and include estimates of the construction costs, including any utility relocation costs; the real estate and relocation costs; and the maintenance costs which would be associated with this proposal over the 1980 to 2000 design period. Also indicated in Table 234 is the disruption which may be expected to be associated with this alternative, including the number of residential structures required to be taken. As shown in Table 234, the capital and maintenance costs of this alternative are estimated at $1,059,000. Two residential structures and one combination residential and commercial structure would need to be acquired under this alternative.

The only alternative to the construction of this additional segment of Granville Road would be a "do nothing" alternative, under which the physical features of the roadway would remain unchanged. The principal negative impact of such a plan would be that the circuity of travel which would exist in this section of Ozaukee County as a result of the misalignment of Granville Road would not be resolved.

River Road from Mequon Road (STH 167) to Friestadt Road: As it currently exists, River Road continues along a north-south corridor through the southeastern portion of Ozaukee County until it is interrupted between Mequon Road (STH 167) and Friestadt Road in the City of Mequon because there is no bridge to carry the arterial over the Milwaukee River, resulting in discontinuity in that travel corridor. River Road currently extends to Grace Avenue south of the Milwaukee River and up to the bank of the river on the north. To provide arterial street and highway system network continuity and to meet adequate arterial street and highway spacing requirements in this section of Ozaukee County, it is recommended that a new segment of River Road, including a bridge over the Milwaukee River, be constructed between Grace Avenue and the existing roadway on the north side of the river, which would provide for a direct north-south travel corridor along this segment of the arterial.

This recommendation would entail the provision of a 48-foot-wide urban roadway with curbs and gutters and sidewalks on a 66-foot-wide right-of-way between Grace Avenue and the south bank of the Milwaukee River, providing two lanes for moving traffic and two parking lanes and a continuation of that roadway cross-section over the river on a structure. Such an urban roadway cross-section would represent a continuation of the type of cross-sections which are proposed to exist in the year 2000 on those segments of River Road north and south of the proposed new roadway segment and bridge. This bridge would provide the Village of Thiensville and the City of Mequon with an additional crossing of the Milwaukee River for the provision vital emergency services under those circumstances when the existing crossway at Mequon Road (STH 167) is unusable. In addition to providing arterial street and highway system network continuity within this portion of Ozaukee County, the additional roadway capacity provided by this additional segment of River Road could relieve congestion on adjacent portions of Mequon Road (STH 167) and STH 57.

The cost estimates for this recommendation shown in Table 234 are in 1980 dollars, and include estimates of the construction costs, including any utility relocation costs; the real estate and relocation costs; and the maintenance costs which would be associated with this proposal over the 1980 to 2000 design period. Also indicated in Table 234 is the disruption which may be expected to be associated with this alternative. As shown in Table 234,

Table 234

COST AND DISRUPTION IMPACTS OF RECOMMENDED IMPROVEMENT AND EXPANSION PLANS FOR ADDITIONAL ROADWAY SEGMENTS WITHIN THE OZAUKEE COUNTY PORTION OF THE STUDY AREA

Impact	Granville Road from Friestadt Road to Highland Road	River Road from Mequon Road (STH 167) to Friestadt Road	River Road from Highland Road to Bonniwell Road	1st Avenue from Rose Street to Cedar Creek Road	Interchange at Highland Road and the North-South Freeway (IH 43)
Cost (in 1980 dollars)[a]					
Construction	$ 528,000	$ 968,000	$576,000	$ 855,000	$3,750,000
Real Estate Acquisition, Relocation, and Demolition	390,000	164,000	44,000	348,000	20,000
Maintenance	141,000	51,000	153,000	230,000	44,000
Total	$1,059,000	$1,183,000	$773,000	$1,433,000	$3,814,000
Disruption					
Residential Units Taken	2	1	--	--	--
Residential/Commercial Units Taken	1	--	--	--	--

[a]Construction costs for each plan include estimates of the roadway construction, utility relocation, and engineering costs. Right-of-way acquisition costs include estimates of the value of the required real property, the cost of relocation and demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.

Source: Wisconsin Department of Transportation and SEWRPC.

the capital and maintenance costs of this alternative are estimated at $1,183,000. One residential structure would be required under this alternative.

The only alternative to the construction of this additional segment of River Road would be a "do nothing" alternative, under which the physical features of the existing facilities would remain unchanged. The principal negative impact of such a plan would be that the circuity of travel which currently exists within this portion of Ozaukee County as a result of the interruption of River Road would not be resolved.

River Road from Highland Road to Bonniwell Road: As it currently exists, the continuation of River Road along its north-south corridor through the southeastern portion of Ozaukee County is further interrupted between Highland Road and Bonniwell Road in the City of Mequon because River Road does not continue between these two arterials. To provide network continuity and meet adequate arterial street and highway spacing requirements in this section of Ozaukee County, it is recommended that a new segment of River Road be constructed between Highland Road and Bonniwell Road, which would complete the north-south travel corridor along the entire length of the roadway in Ozaukee County.

This recommendation would entail the provision of a 24-foot-wide rural roadway with 10-foot-wide gravel shoulders on a 100-foot-wide right-of-way between Highland Road and Bonniwell Road, providing two lanes for moving traffic with no parking lanes. Such a rural roadway cross-section would represent a south-to-north continuation of the urban roadway cross-section of River Road which would exist south of the new roadway segment and the rural roadway cross-section of the arterial which would exist north of the new roadway segment in the year 2000. In order to avoid an existing wetland and align properly with the segment of River Road north of Bonniwell Road, this new segment would need to be curved to the east from Highland Road to Bonniwell Road. In addition to providing arterial street and highway system network continuity within this portion of Ozaukee County, the additional roadway capacity provided by this additional segment of River Road, particularly in conjunction with the recommended completion of that segment of River Road over the Milwaukee River between Mequon Road (STH 167) and Friestadt Road, could also help to relieve the congestion which is expected to occur on adjacent portions of Mequon Road (STH 167), STH 57, and Highland Road.

The cost estimates for this recommendation shown in Table 234 are in 1980 dollars, and include estimates of the construction costs, including any utility costs; the real estate and relocation costs; and the maintenance costs which would be associated with this proposal over the 1980 to 2000 design period. Also indicated in Table 234 is the disruption which may be expected to be associated with this alternative. As shown in Table 234, the capital and maintenance costs of this alternative are estimated at $773,000. No structures would be required to be taken under this alternative.

The only alternative to the construction of this additional segment of River Road would be a "do nothing" alternative, under which the physical features of the roadway would remain unchanged. The principal negative impact of such a plan would be that the circuity of travel which would exist in this section of Ozaukee County as a result of the discontinuation of River Road would not be resolved.

1st Avenue from Rose Street to Cedar Creek Road: To provide adequate arterial street spacing, as well as adequate access to the arterial street and highway system, under the land use densities for the residential development anticipated in the Village of Grafton by the year 2000, it is recommended that a continuous facility be provided to the west and north of the Village of Grafton on two arterials—1st Avenue from STH 57 (Wisconsin Avenue) to Cedar Creek Road and Cedar Creek Road from 1st Avenue to CTH O. In the year 2000, 1st Avenue in the Village of Grafton would operate as a continuous north-south arterial from STH 57 (Wisconsin Avenue) to Cedar Creek Road, and Cedar Creek Road would operate as an east-west arterial from 1st Avenue to CTH O north of the Village of Grafton. To meet adequate arterial street and highway system spacing requirements and provide sufficient access and a proper framework for the land use development planned for in this area of Ozaukee County, it is recommended that 1st Avenue be extended as a new north-south arterial roadway to its intersection with Cedar Creek Road.

This recommendation would entail the provision of dual 24-foot-wide urban roadways with curbs and gutters and sidewalks and parking lanes separated by a 16-foot-wide median on an 80-foot-wide right-of-way between Rose Street and Cedar Creek Road. Such a cross-section would represent a direct north-south continuation of the type of urban roadway cross-section which currently exists and would exist in the year 2000 on that segment of 1st Avenue immediately south of the proposed new segment.

The cost estimates for this recommendation shown in Table 234 are in 1980 dollars and include estimates of the construction costs, including any utility costs; the real estate and relocation costs; and the maintenance costs which would be associated with this proposal over the 1980 to 2000 design period. Also indicated in Table 234 is the disruption which may be expected to be associated with this alternative. As shown in Table 234, the capital and maintenance costs of this alternative are estimated at $1,433,000. There would be no disruption associated with this alternative.

The only alternative to the construction of this additional segment of 1st Avenue would be a "do nothing" alternative, under which the physical features of the existing facilities would remain unchanged. The principal negative impacts of such a plan would be that adequate arterial street and highway access and adequate arterial street and highway spacing would not be provided in this section of Ozaukee County, and that this continuous arterial facility would not be provided.

Interchange at Highland Road and the North-South Freeway (IH 43): Currently, no freeway interchange to the North-South Freeway (IH 43) is provided between Pioneer Road (CTH C) and Mequon Road (STH 167) in Ozaukee County, a distance of four miles. As a result, no direct access would be provided to the North-South Freeway (IH 43) from proposed development in the northeastern portion of the City of Mequon. To provide the desirable access, it is recommended under the third long-range plan alternative that an interchange be provided between the North-South Freeway (IH 43) and Highland Road.

This recommendation would entail the provision of southbound and northbound on- and off-ramp connections between the North-South Freeway (IH 43) and Highland Road. To avoid interference with the existing right-of-way of the Chicago & North Western Railway east of the freeway, special provision would be made in the design of the northbound on- and off-ramps.

The cost estimates for this recommendation shown in Table 234 are in 1980 dollars, and include estimates of the construction costs, including any utility costs; the real estate and relocation costs; and the maintenance costs which would be associated with this proposal over the 1980 to 2000 period. Also indicated in Table 234 is the disruption which may be expected to be associated with this alternative. As shown in Table 234, the capital and maintenance costs of this alternative are estimated at $3,814,000.

The only alternative to the construction of this interchange would be a "do nothing" alternative, under which physical features of Highland Road and the North-South Freeway (IH 43) would remain unchanged. The principal negative effects of such a plan would be circuity in travel and inadequate accessibility for proposed development.

Milwaukee County

The analysis indicated that several arterial street and highway system congestion problems may be expected to remain within the Milwaukee County portion of the study area after consideration of a transportation systems management and transit improvement plan under future land use and travel demand conditions. Each of these congested travel corridors is considered separately in the discussion below.

W. Bradley Road from N. 124th Street to N. 91st Street: To resolve the congestion which may be expected to remain in the plan design year in the east-west travel corridor along W. Bradley Road, consideration was given to improving the segment of W. Bradley from N. 124th Street to N. 91st Street. An increase in the number of traffic lanes provided on this segment of W. Bradley Road may be expected to abate the traffic congestion problems in this east-west travel corridor.

A factor bearing on the consideration of alternative improvements for this east-west travel corridor was the proposed Trammell Crow development of the vacant lands located to the northwest of the intersection of W. Good Hope Road and N. 107th Street, and bordered on the far northwest by W. Bradley Road immediately east of STH 145. This proposed development would involve the creation of a large commercial complex in this portion of northwest Milwaukee County and, as such, could result in increased truck traffic through residential development located along W. Bradley Road and N. 107th Street. Because of this anticipated truck traffic, it is the desire of the City of Milwaukee to prohibit trucks from both of these arterials by removing the state trunk highway designation from N. 107th Street and routing all truck traffic through this area over STH 145. Such realignment of the state trunk highway system would be consistent with the adopted Milwaukee County jurisdictional highway system plan.

With the exception of its intersection with N. 91st Street, the existing segment of W. Bradley Road from N. 124th Street to N. 91st Street currently has a rural cross-section with a 20-foot-wide pavement and narrow gravel shoulders, adequate to provide for two lanes of traffic. The cross-section of this portion of the arterial has a 50-foot-wide right-of-way between N. 124th Street and N. 107th Street, with the exception of one very short segment which has an 80-foot-wide right-of-way; and has a right-of-way width which varies between 50 and 110 feet from N. 107th Street to N. 91st Street. On the westbound approach to N. 91st Street, W. Bradley Road is channelized, providing for dual 32-foot-wide pavements and a 22-foot-wide median within a 110-foot-wide right-of-way. W. Bradley Road crosses over the county line branch of the Little Menomonee River on a concrete culvert at a point immediately east of its intersection with N. 124th Street, crosses over the main branch of the Little Menomonee River on a concrete culvert west of its intersection with N. 91st Street, and intersects the tracks of the Wisconsin & Southern Railroad Company at-grade immediately west of its intersection with N. 91st Street.

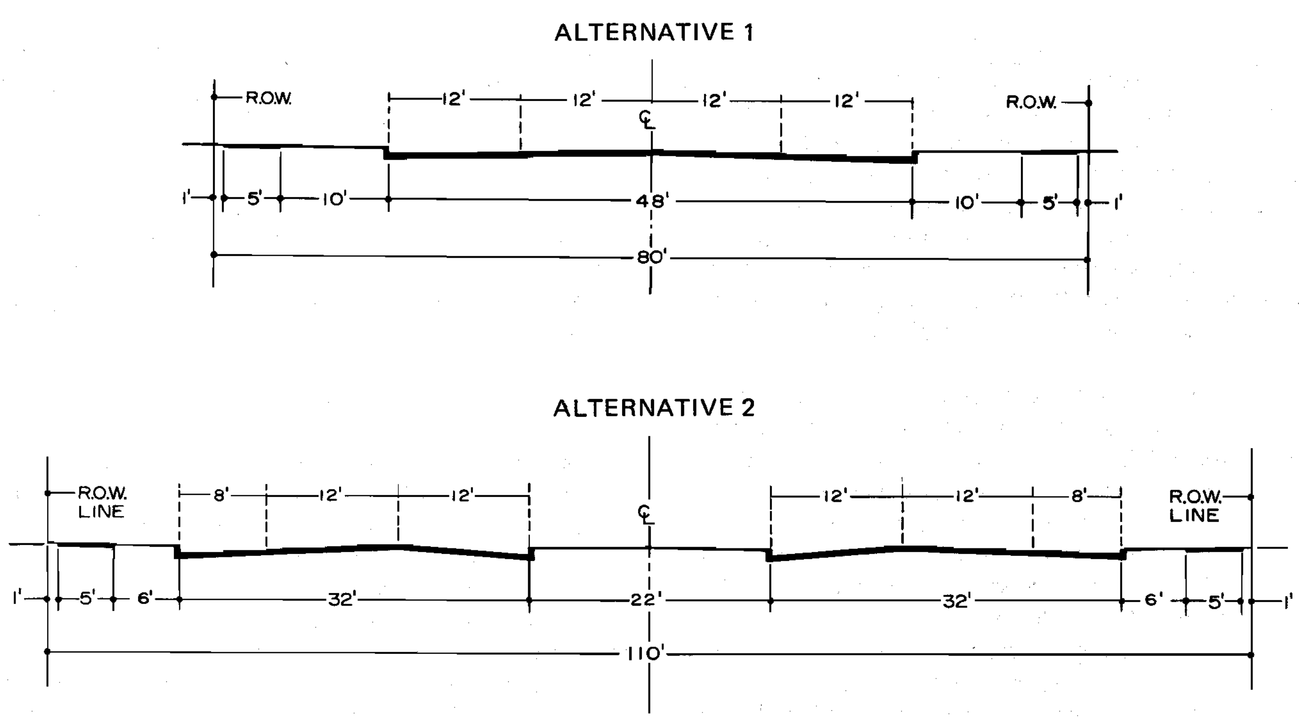
Two alternatives were developed to increase the capacity of W. Bradley Road between N. 124th Street and N. 91st Street. The first alternative called for widening W. Bradley Road to a minimum urban cross-section with sidewalks, and the second alternative called for widening W. Bradley Road to a desirable urban cross-section with sidewalks.

The first alternative would entail the provision of a four-lane, undivided roadway with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way. Under this alternative, the intersection of W. Bradley Road with N. 91st Street would be channelized to provide for dual 32-foot-wide roadways separated by a 22-foot-wide median on a 110-foot-wide right-of-way, and the intersection of W. Bradley Road with N. 124th Street and N. 107th Street would be channelized within the 80-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 102. Under this alternative, the at-grade crossing of the Wisconsin & Southern Railroad Company tracks would be provided with crossing protection gates. New concrete box culverts would be provided at the locations at which W. Bradley Road crosses over the county line branch and the main branch of the Little Menomonee River. While this roadway cross-section could be accommodated within the existing right-of-way for much of the length of W. Bradley Road between N. 107th Street and N. 91st Street, an additional 30 feet of right-of-way would be required along much of that segment between N. 124th Street and N. 107th Street. The location for this additional right-of-way which would result in the least cost and disruption would result in the centerline of the new roadway being offset to the south of the existing centerline of W. Bradley Road.

Between N. 107th Street and N. 91st Street, except for that portion of W. Bradley Road which would be widened to accommodate a 110-foot-wide right-of-way at the eastbound approach to the intersection of W. Bradley Road with N. 91st Street, the roadway cross-section could be accommodated within the existing right-of-way under this alternative and would be offset slightly to the north of the existing centerline of W. Bradley Road. To utilize the existing right-of-way while minimizing disruption to existing properties, the new roadway would be oriented on the existing centerline at the eastbound approach to the intersection of W. Bradley Road and N. 91st Street. The transition from the offset of W. Bradley Road to the south of the existing roadway centerline west of N. 107th Street to the north of the existing centerline east of N. 107th Street would occur immediately west of N. 107th Street under this alternative. In order to accommodate this transition, a right-of-way width of 110 feet would be necessary over a short segment. In order to maintain two lanes of traffic in the direction of peak flow during the peak travel periods, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening peak travel periods.

Figure 102

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR W. BRADLEY ROAD BETWEEN N. 124TH STREET AND N. 91ST STREET



Source: City of Milwaukee and SEWRPC.

Because of these restrictions, vehicles accessing any businesses or residences which front this segment of W. Bradley Road during the periods of parking restriction would have to use off-street space in the area. This alternative may be expected to abate all remaining traffic congestion along this segment of W. Bradley Road.

The second alternative considered for the improvement of this segment of W. Bradley Road would entail the provision of dual 32-foot-wide urban roadways separated by a 22-foot-wide landscaped median within a 110-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 102. Such widening would provide for four lanes of traffic in addition to two parking lanes. Under this alternative, turn-lane channelization would be provided at the intersections of W. Bradley Road with N. 124th Street, N. 107th Street, and N. 91st Street; the at-grade crossing of the tracks of the Wisconsin & Southern Railroad Company would be provided with crossing protection gates; and new concrete box culverts would be provided at the crossings of the main and county line branches of the Little Menomonee River. Under this alternative it would be necessary to acquire an additional 60 feet of right-of-way between N. 124th Street and N. 107th Street, with the exception of the short segment immediately west of N. 107th Street where 30 feet is necessary on the south side only. The location for this additional right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of W. Bradley Road. This alternative would also require the acquisition of 30 feet of additional right-of-way along certain segments of W. Bradley Road from N. 107th Street to N. 91st Street. The best location for this additional 30 feet of right-of-way was determined to be to the south of the centerline of W. Bradley Road except with regard to that segment immediately to the west of N. 91st Street, where 30 feet of right-of-way would be acquired both to the north and to the south of the existing centerline of W. Bradley Road. The provision of a 22-foot-wide median along W. Bradley Road would permit the provision of necessary left-turn lanes at median openings, and would provide adequate separation of opposing traffic flows, thereby increasing the level of service and safety on W. Bradley Road. This alternative may also be expected to abate all remaining traffic congestion along this segment of W. Bradley Road.

The impacts of each of the two alternatives considered for the improvement of W. Bradley Road are set forth in Table 235. The impact of a "do nothing" alternative, under which the physical dimensions of the existing roadway surface would remain essentially unchanged, are also provided in Table 235. Under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along the arterial over the next two decades. Under each of the alternative plans, any traffic management actions considered along W. Bradley Road under the short-range plan for the northwest side study area which would not be precluded by physical dimensions were assumed to have been implemented. In the case of W. Bradley Road, no such recommendations were made under the short-range plan. It should be pointed out that implementation of the "do nothing" alternative would not serve to abate the probable future traffic congestion along W. Bradley Road.

The costs shown in Table 235 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the right-of-way acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 235 is the urban disruption which may be expected to be associated with each of the alternatives, as measured by the number of residential and commercial properties required to be taken.

As shown in Table 235, of the alternatives proposed for W. Bradley Road, the second improvement alternative—the widening of W. Bradley Road to a desirable urban cross-section—would have the highest capital and maintenance cost, estimated at $5,310,000; while the first widening alternative—the improvement of W. Bradley Road to a minimum urban cross-section having a 48-foot-wide pavement from curb to curb—would have estimated capital and maintenance costs of $3,680,000. The capital and maintenance costs of the "do nothing" alternative were estimated at $590,000. One residential structure would need to be acquired under the second widening alternative. Both widening alternatives would involve the acquisition of parkland from the Little Menomonee River Parkway, and the second widening alternative would require the acquisition of parkland from the Little Menomonee River Parkway and Dretzka Park.

There should be no significant difference in the environmental impacts in terms of air quality and noise levels between the two widening alternatives considered. However, the difference in environmental impacts between the widening alternatives

Table 235

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. BRADLEY ROAD FROM N. 124TH STREET TO N. 91ST STREET

Impact	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (32-foot-wide roadway pairs with median)
Cost (in 1980 dollars)[a]			
Construction	$290,000	$2,730,000	$3,670,000
Real Estate Acquisition, Relocation, and Demolition	--	350,000	790,000
Maintenance	300,000	600,000	850,000
Total	$590,000	$3,680,000	$5,310,000
Disruption			
Residential Units Taken	--	--	1
Commercial Units Taken	--	--	--
Recreational Land Required (value in 1980 dollars)	--	($40,000)	($180,000)

[a] *Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sewers, sidewalks, driveways, traffic signals, and lighting; engineering costs; and the cost of railroad grade crossing modifications and two concrete box culverts. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

and the "do nothing" alternative for W. Bradley Road may be expected to be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions.

Because it offers additional capacity and could abate future congestion, the first widening alternative proposed for the segment of W. Bradley Road from N. 124th Street to N. 91st Street—the provision of a 48-foot-wide minimum urban roadway with parking prohibited during the peak periods—is recommended for implementation. This alternative also calls for widening W. Bradley Road at principal intersections, including widening to dual 32-foot-wide roadways separated by a 22-foot-wide median at its intersection with N. 91st Street. While both widening alternatives proposed for this segment of W. Bradley Road may be expected to eliminate traffic congestion along this segment, the first alternative is recommended principally because, given the costs estimated, the provision of on-street parking during peak travel hours is not considered warranted, and because this cross-section would represent a continuation of the existing roadway cross-section of W. Bradley Road to the east of N. 91st Street.

<u>W. Brown Deer Road (STH 100) from N. 76th Street (STH 181) to N. Green Bay Avenue (STH 57):</u> To resolve the congestion which may be expected to remain in the plan design year in the east-west travel corridor along W. Brown Deer Road, improving that segment of W. Brown Deer Road (STH 100) from N. 76th Street (STH 181) to N. Green Bay Avenue (STH 57) was considered. An increase in the number of traffic lanes provided on this arterial segment may be expected to abate the traffic congestion in this corridor.

W. Brown Deer Road is improved to a desirable urban cross-section from the Waukesha/Milwaukee County line to IH 43, the North-South Freeway. Because congestion is expected to occur under the transportation systems management and transit improvement plan only along that segment of W. Brown Deer Road between N. 76th Street and W. Green Bay Avenue, improvement alternatives were considered only for this segment of the arterial. From the point at which the on- and off-ramps to and from the northbound lanes of N. 76th Street intersect with W. Brown Deer Road to the point at which the on- and off-ramps to and from the southbound lanes of N. Green Bay Avenue intersect with the arterial, W. Brown Deer Road has an urban cross-section with curbs and gutters. This segment consists of dual 40-foot-wide roadways separated by a 30-foot-wide median, all within a 150-foot-wide right-of-way, adequate to provide two lanes for moving traffic in each direction, with parking permitted. On-street parking is currently permitted along this segment of W. Brown Deer Road except along the north side of two segments of the arterial; the first, for a distance of 350 feet east of the northbound on-ramp entrance to N. 76th Street, and the second, for a distance of 550 feet east of the intersection of W. Brown Deer Road with N. 60th Street. The tracks of the Chicago, Milwaukee, St. Paul & Pacific Railroad Company intersect W. Brown Deer Road at-grade at a point about 600 feet west of its intersection with W. Green Bay Avenue.

Only one alternative—the prohibition of on-street parking—was considered for this segment of W. Brown Deer Road. Because W. Brown Deer Road is already widened to a desirable urban cross-section, any further widening of the arterial would jeopardize safe pedestrian movement and result in excessive neighborhood disruption. On-street parking prohibition along W. Brown Deer Road would mean that vehicles accessing commercial and residential land uses along the arterial would have to seek parking space on nearby intersecting streets, or use off-street parking space in the area.

The existing development along W. Brown Deer Road between N. 76th Street and W. Green Bay Avenue consists of a combination of commercial and residential land uses. Because adequate off-street parking locations are provided along this segment of W. Brown Deer Road, on-street parking is currently not used regularly along this segment, and the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods to alleviate the remaining traffic congestion is considered an implementable alternative. This prohibition may be expected to eliminate all remaining traffic congestion along this segment.

The impacts of the alternatives considered for W. Brown Deer Road are set forth in Table 236. The impacts of a "do nothing" alternative for this arterial segment, under which the physical dimensions of the roadway surface and the existing parking regulations would remain essentially unchanged, are also provided in Table 236. In each case under the "do nothing" alternatives, only summer and winter maintenance work and two major resurfacings would be accomplished where necessary along both of these arterial segments between 1980 and 2000. Because the segment of W. Brown Deer Road between N. 76th Street and W. Green Bay Avenue was fully reconstructed in 1969, only one resurfacing would be required along this segment during the design period. Also, any traffic management actions previously recommended for this segment of W. Brown Deer Road under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. No recommendations were made for W. Brown Deer Road under the short-range plan. Implementation of the "do nothing" alternative would not serve to abate any of the remaining congestion along this arterial corridor.

The costs shown in Table 236 for each of the alternatives are expressed in 1980 dollars and include estimates of any construction costs, including utility relocation costs; the real estate acquisition, relocation, or demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 236 is any urban disruption which may be expected to be associated with each of the alternatives.

As shown in Table 236, the alternative which calls for prohibiting all on-street parking in the direction of peak traffic flow during the morning and evening peak hours on the segment of W. Brown Deer Road between N. 76th Street and W. Green Bay Avenue would have a capital and maintenance cost of about $2,052,000, while the estimated capital and maintenance cost of the "do nothing" alternative is $2,046,000. The difference in these costs represents the estimated capital cost of the signing

Table 236

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. BROWN DEER ROAD (STH 100) FROM N. 76TH STREET (STH 181) TO N. GREEN BAY AVENUE (STH 57)

Impact	W. Brown Deer Road (STH 100) from N. 76th Street (STH 181) to N. Green Bay Avenue (STH 57)	
	"Do Nothing" Alternative	On-Street Parking Prohibition Alternative
Cost (in 1980 dollars)[a]		
Construction	$1,054,000	$1,060,000
Real Estate Acquisition, Relocation, and Demolition	--	--
Maintenance	992,000	992,000
Total	$2,046,000	$2,052,000
Disruption		
Residential Units Taken	--	--
Commercial Units Taken	--	--

[a] *Construction costs for each alternative include estimates of the roadway construction costs and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Because W. Brown Deer Road from N. 76th Street to N. Green Bay Avenue was reconstructed in 1969, only one resurfacing would be required under each of the alternatives for that segment during the design period. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

necessary to regulate parking. Neither of the alternatives proposed for this segment of W. Brown Deer Road would involve any urban disruption.

The difference in environmental impacts between the improvement alternative and the "do nothing" alternative for W. Brown Deer Road would be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

Based upon the additional capacity afforded and congestion abated by each alternative, and the cost of environmental impacts of the alternatives, it is recommended that the alternative which provides for the prohibition of all on-street parking in the direction of peak traffic flow during both peak periods along this segment of W. Brown Deer Road be implemented. While such prohibition would mean that vehicles accessing residences along this segment would have to seek parking space on nearby intersecting streets or use off-street parking space, the availability of such alternative parking makes this recommendation implementable. This action was also recommended because it would involve little additional capital and maintenance costs.

W. Good Hope Road from the Milwaukee/Waukesha County Line to N. 76th Street (STH 181): To resolve the congestion which may be expected to remain in the plan design year in the east-west travel corridor along W. Good Hope Road between the Milwaukee/Waukesha County line and N. 76th Street (STH 181), consideration was given to improving that segment of W. Good Hope Road from N. 124th Street to N. 76th Street (STH 181). Such improvement would also provide appropriate continuity along the arterial with the segment of

W. Good Hope Road west of the Milwaukee/ Waukesha County line—N. 124th Street—which is recommended for improvement to four lanes under the adopted long-range regional transportation plan. An increase in the number of moving traffic lanes provided on this arterial segment may be expected to abate the traffic congestion in this corridor, and provide necessary arterial street and highway system continuity.

As in the consideration of the problem segment of W. Bradley Road, a factor bearing on the consideration of alternative improvements for this east-west travel corridor was the proposed Trammell Crow development of the vacant land located to the northwest of the intersection of W. Good Hope Road and N. 107th Street. Although this project would have an impact on each arterial facility adjacent to it, it would particularly affect the segments of W. Good Hope Road, STH 145, and N. 107th Street as ingress to and egress from the proposed development would be provided on each of these arterials. Major driveway access to the development would be provided on W. Good Hope Road between STH 145 and N. 107th Street.

From N. 124th Street to N. 115th Street, W. Good Hope Road currently has a rural cross-section with a 22-foot-wide pavement and six-foot-wide gravel shoulders, adequate to provide two lanes for moving traffic. The right-of way width along this segment of W. Good Hope Road is 66 feet. Between N. 115th Street and its intersection with the southbound on- and off-ramps to and from the Zoo Freeway (USH 45), W. Good Hope Road widens into a median-divided desirable urban roadway cross-section with curbs and gutters. From this transitional point to N. 107th Street, W. Good Hope Road consists of dual roadways, which vary in width from 28 to 36 feet curb-to-curb, separated by a 30-foot-wide median. This entire segment can accommodate only two moving lanes of traffic, as merge lanes onto USH 45 and STH 145 are provided within the 36-foot-wide sections. The right-of-way width along this segment is 160-feet with the exception of those portions of W. Good Hope Road which are accommodated on structures. From N. 107th Street to N. 76th Street, W. Good Hope Road consists of dual 40-foot-wide roadways separated by a 28-foot-wide median, adequate to provide three lanes for moving traffic in each direction with parking prohibited. The right-of-way width along this segment is 160 feet. On-street parking is currently permitted along this segment of W. Good Hope Road from 107th Street to N. 76th Street, except on the approaches to the intersection of W. Good Hope Road and N. 76th Street during the evening peak hour. This segment of W. Good Hope Road intersects the tracks of the Wisconsin & Southern Railroad Company at-grade approximately 950 feet west of its intersection with N. 76th Street; crosses over the Menomonee River on a bridge which has a pavement width of 22 feet at a point approximately 900 feet east of its intersection with N. 124th Street; and crosses over both the Zoo Freeway and the Fond du Lac Freeway (STH 145) on dual structures between N. 115th Street and N. 107th Street. These structures have dual pavement widths of 40 feet each.

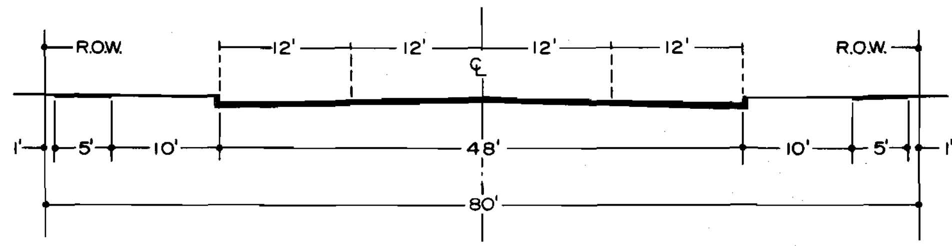
In the consideration of improvement alternatives for W. Good Hope Road, the western segment of the arterial—from N. 124th Street to N. 115th Street—and the eastern segment of the arterial—from N. 115th Street to N. 76th Street—were examined separately. Two alternatives for the improvement of W. Good Hope Road to minimum and desirable urban cross-sections were developed for the western segment of W. Good Hope Road, and two alternatives—the prohibition of on-street parking and the prohibition of on-street parking in addition to traffic lane reconstruction—were developed for the eastern segment of the arterial. Separate improvement alternatives were developed for each of these two segments of W. Good Hope Road because of the disparity in existing roadway cross-sections between the two segments. Thus, separate recommended improvement alternatives were selected for the western and eastern segments of W. Good Hope Road.

The first alternative considered for the western segment of W. Good Hope Road called for widening the arterial to a minimum urban cross-section. This alternative would entail the provision of a four-lane, undivided roadway with sidewalks with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way. Under this alternative, right-turn and left-turn lanes could be provided as necessary at the intersections of W. Good Hope Road with N. 124th Street and N. 115th Street. A typical cross-section for this alternative is shown in Figure 103. This alternative would require the acquisition of an additional 14 feet of right-of-way along W. Good Hope Road between N. 124th Street and the point at which W. Good Hope Road crosses over the Menomonee River. To utilize the existing right-of-way while minimizing disruption to existing properties, the widened right-of-way would be centered on the existing centerline of

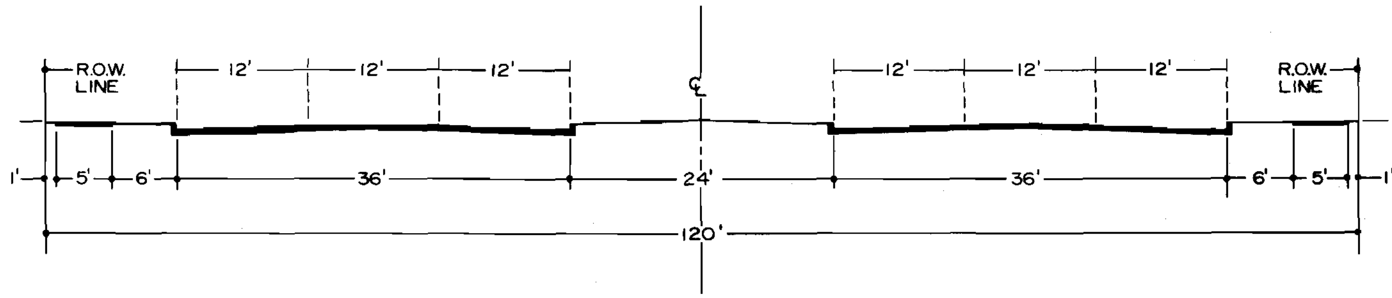
Figure 103

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR THE SEGMENT OF W. GOOD HOPE ROAD FROM THE MILWAUKEE/WAUKESHA COUNTY LINE TO N. 115TH STREET

ALTERNATIVE 1



ALTERNATIVE 2



Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

W. Good Hope Road from N. 124th Street to the point at which W. Good Hope Road crosses over the Menomonee River, and then veered south of the existing roadway centerline of W. Good Hope Road to the point at which W. Good Hope Road merges with the existing divided section—or at about N. 115th Street. This southbound shift in the alignment of W. Good Hope Road is necessary in order to eliminate a sharp curve in the roadway which currently exists immediately west of N. 115th Street.

In order to maintain two lanes of traffic in the direction of peak flow during the peak travel periods, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening travel periods under this alternative. Because of these restrictions, vehicles accessing any residences which front this segment of W. Good Hope Road during the period of parking restriction would have to use off-street parking space in the area. Assuming such on-street parking restriction, such widening of this segment of W. Good Hope Road would permit four lanes of moving traffic on the entire length of this problem segment, with the exception of the segment of W. Good Hope Road carried on the bridge over the Menomonee River. Under this alternative plan, this structure would be replaced with a new structure which would provide four lanes for moving traffic plus pedestrian ways across the Menomonee River. Also under this alternative, in order to negate any future need for on-street parking along this segment of W. Good Hope Road, future development should be encouraged to access interior streets rather than W. Good Hope Road. Encouragement of this type of development would minimize direct access to W. Good Hope Road and, as such, minimize the need for traffic lanes to also serve as deceleration and storage lanes. Assuming such restriction of on-street parking and future land use development, this alternative could be expected to abate any remaining congestion and provide necessary highway system continuity in this portion of northwest Milwaukee County.

The second alternative considered for the western segment of W. Good Hope Road called for widening the arterial to a desirable urban cross-section. This alternative would entail the provision of dual 36-foot-wide urban roadways with sidewalks, separated by a 24-foot-wide landscaped median within a 120-foot-wide right-of-way. Such widening would provide four lanes for moving traffic and two parking lanes. A typical cross-section for this alternative is shown in Figure 103. Under this alternative, turn-lane channelization would be provided at the intersections with N. 124th Street and N. 115th Street. An additional 54 feet of right-of-way would be required between N. 124th Street and the point at which W. Good Hope Road crosses over the Menomonee River, and minor additional rights-of-way would also be required to merge this proposed desirable urban cross-section with the existing desirable urban cross-section east of N. 115th Street. The location for this additional right-of-way which would result in the least cost and disruption was determined to be centered on the existing right-of-way from N. 124th Street to the point at which W. Good Hope Road crosses over the Menomonee River, and then veered south of the existing roadway centerline of the arterial to the point at which W. Good Hope Road intersects with the existing desirable urban cross-section. As under the first alternative, this southbound shift in the alignment of W. Good Hope Road is necessary in order to eliminate a sharp curve in the roadway immediately west of N. 115th Street. Such widening would permit four lanes of moving traffic in addition to two parking lanes on this western segment of W. Good Hope Road, with the exception of that segment of the arterial which is carried on the bridge over the Menomonee River.

Under this alternative, the Menomonee River bridge would be reconstructed as a dual structure, with each structure carrying two lanes of moving traffic, a refuge lane, and a sidewalk. This alternative could also be expected to eliminate all remaining congestion and provide necessary highway system continuity in this portion of northwest Milwaukee County. Under this alternative, the provision of a median on this western segment of W. Good Hope Road would permit the adequate separation of opposing traffic flows, thereby further increasing safety and level of service on the arterial.

As already noted, the first alternative called for the prohibition of on-street parking where it currently exists along this segment of W. Good Hope Road, or from N. 107th Street to N. 76th Street. On-street parking prohibition along this segment would mean that vehicles accessing commercial and residential land uses along the segment would have to seek parking space on nearby intersecting streets, or use off-street parking in the area. The existing development along W. Good Hope Road between N. 107th Street and N. 76th Street consists primarily of residential and industrial land uses except for that portion of the segment adjacent to the east- and westbound approaches to the intersection of W. Good Hope Road with N. 76th Street, where the existing land uses are principally commercial. Because adequate off-street parking is provided along this segment of W. Good Hope Road, on-street parking is currently not used regularly along the majority of this segment and is only infrequently utilized along that portion of W. Good Hope Road adjacent to its intersection with N. 76th Street. The prohibition of all remaining on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along this eastern segment of W. Good Hope Road, or from approximately N. 107th Street to N. 76th Street, is an implementable alternative for alleviating the remaining traffic congestion along this segment. Such prohibition, however, may be expected to eliminate those remaining traffic congestion problems only along W. Good Hope Road between N. 107th Street and N. 76th Street. Along those segments of W. Good Hope Road between N. 115th Street and N. 107th Street, where the pavement width would permit only two traffic lanes in each direction with parking prohibited, traffic congestion could not be abated.

The second alternative considered called for the prohibition of all on-street parking, in addition to traffic lane reconstruction, along segments of the arterial. Under this alternative, on-street parking where it is currently permitted along W. Good Hope Road, or from N. 107th Street to N. 76th Street, would be prohibited, as in the first alternative. Also, under this alternative the east- and westbound roadways between the point at which W. Good Hope Road passes over USH 45 and a point approximately 400 feet west of N. 107th Street would be reconstructed to a pavement width adequate to provide for three traffic lanes in each direction with on-street parking prohibited. Such widening would be necessary to accommodate the additional traffic volumes and serve the anticipated increases in traffic flow and variations in traffic flow patterns associated with a new driveway entrance to the Trammell Crow development to the north of W. Good Hope Road. Under this alternative, the portion of W. Good Hope Road which crosses over USH 45 on a structure would need to be widened. This reconstruction, in conjunction with the prohibition of all on-street parking along this segment of W. Good Hope Road, may be expected to eliminate all remaining traffic congestion along this segment of the arterial. The physical widening of this segment of W. Good Hope Road to provide three traffic lanes and a parking lane in each direction was not considered, as any further widening of the arterial would jeopardize safe pedestrian movement and result in excessive neighborhood disruption.

The impacts of the alternatives considered for each of the segments of W. Good Hope Road are set forth in Table 237. The impacts of a "do nothing" alternative for each of these segments, under which the physical dimensions of the roadway surface and any existing parking regulations would remain essentially unchanged, are also provided in Table 237. In each case under the "do nothing" alternatives, only summer and winter maintenance work and necessary resurfacings would be accomplished along both of these arterial segments between 1980 and 2000. Because a portion of the eastern segment of W. Good Hope Road between N. 107th Street and N. 76th Street was fully reconstructed in 1975, no resurfacings would be required along this portion of W. Good Hope Road during the design period. One resurfacing would be required along the eastern segment of W. Good Hope Road from N. 115th Street to N. 107th Street because this segment was reconstructed in 1967. Also, under each of the

Table 237

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. GOOD HOPE ROAD FROM N. 124TH STREET TO N. 76TH STREET (STH 181)

Impact	Segment of W. Good Hope Road from N. 124th Street to N. 115th Street			Segment of W. Good Hope Road from N. 115th Street to N. 76th Street (STH 181)		
	"Do Nothing" Alternative	Alternative 1 (48-foot-wide roadway with widened intersections)	Alternative 2 (36-foot-wide roadway pairs with median)	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)	Alternative 2 (on-street parking prohibition and traffic lane reconstruction)
Costs (in 1980 dollars)[a]						
Construction	$ 76,000	$636,000	$ 842,000	$ 526,000	$ 532,000	$1,277,000
Real Estate Acquisition, Relocation, and Demolition	- -	115,000	438,000	150,000	150,000	150,000
Maintenance	61,000	121,000	182,000	1,093,000	1,093,000	1,238,000
Total	$137,000	$872,000	$1,426,000	$1,769,000	$1,775,000	$2,665,000
Disruption						
Residential Units Taken	- -	- -	2	- -	- -	- -
Commercial Units Taken	- -	- -	- -	1	1	- -
Recreational Land Taken (value in 1980 dollars)	- -	($87,000)	($131,000)	- -	- -	- -

[a]Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sewers, sidewalks, driveways, and lighting; utility relocation costs; and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Because much of W. Good Hope Road between N. 107th Street and N. 76th Street was reconstructed in 1975, there would be no construction costs for roadway resurfacings under any alternative for that segment; and because the interchange at W. Good Hope Road and the Zoo Freeway (USH 45) was reconstructed in 1967, only one resurfacing would be required under each of the alternatives for that segment during the design period. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Right-of-way costs indicated for the segment of W. Good Hope Road between N. 115th Street and N. 76th Street include those right-of-way costs which would be incurred at the intersection of W. Good Hope Road and N. 76th Street under recommended actions of the short-range plan for the study area. The indicated cost of $150,000 represents the upper limit of the right-of-way cost range given under that plan. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.

Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

alternative plans for these two segments of W. Good Hope Road, any traffic management actions previously recommended for either of the segments under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented.

In the case of the eastern portion of W. Good Hope Road, it was recommended that, at the intersection of W. Good Hope Road and N. 107th Street, a double left-turn lane on the eastbound approach be lengthened at a cost of $15,000; and that at the intersection of W. Good Hope Road and N. 76th Street, six additional signal phases and a separate red indication be added, that parking be prohibited during the evening peak period on all approaches, that exclusive right-turn lanes be constructed on the north- and southbound approaches, that the existing right lane on the westbound approach be reconstructed to provide an exclusive right-turn lane, and that double left-turn lanes be constructed on the south-, east-, and westbound approaches at an estimated cost of $122,500. Additional rights-of-way required under the recommendations at N. 76th Street could add $150,000 to this cost. The cost of these improvements are accordingly also included in the cost of each plan for the eastern segment of W. Good Hope Road. These actions, while effective in the short term, were found to be ineffective as a means of resolving the long-term problems along this segment. The remaining congestion along this travel corridor would not be abated by the implementation of either of the "do nothing" alternatives.

The costs shown in Table 237 are expressed in 1980 dollars and include estimates of any construction costs, including engineering and utility relocation costs; any real estate acquisition, relocation, or demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 237 is any urban disruption which may be expected to be associated with each of the alternatives for each of the arterial segments.

As shown in Table 237, of the alternatives proposed for the western segment of W. Good Hope Road, the second widening alternative—the widening of this segment of W. Good Hope Road to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $1,426,000. The widening of this segment of W. Good Hope Road to a minimum urban cross-section would have capital and maintenance costs of about $872,000. The capital and maintenance costs of a "do nothing" alternative for this segment were estimated at $137,000. As also shown in Table 237, the second alternative, which provides for the widening of this western segment of W. Good Hope Road to a desirable urban cross-section, would be the most disruptive of the alternatives considered, requiring the taking of two residential units. Both widening alternatives would involve the taking of land from the Menomonee River Parkway.

As shown in Table 237, the second alternative—the prohibition of all remaining on-street parking in the direction of peak traffic flow during the morning and evening peak hours where it exists on the eastern segment of W. Good Hope Road, or between N. 107th Street and N. 76th Street, as well as the reconstruction of segments of W. Good Hope Road between N. 115th Street and N. 107th Street in order to provide for three traffic lanes in each direction with on-street parking prohibited—would have the highest estimated capital and maintenance costs, $2,665,000, compared with an estimated $1,775,000 for the first alternative—the prohibition of all remaining on-steet parking in the direction of peak traffic flow during both the morning and evening peak periods—and an estimated $1,769,000 for the "do nothing" alternative for this segment. The difference in cost between the "do nothing" alternative and the first alternative represents the capital cost of the signing required to prohibit parking. Under each of the alternatives for the eastern segment of W. Good Hope Road under the short-range plan for the study area, one commercial unit would need to be acquired at the intersection of W. Good Hope Road and N. 76th Street.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the improvement alternatives considered for each segment of W. Good Hope Road. However, the difference in these impacts between the improvement alternatives and the "do nothing" alternative for each of these segments would be significant. Along each of the segments under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

For the western segment of W. Good Hope Road, based upon the additional capacity afforded and congestion abated by each alternative, the continuity afforded the arterial street system, and the cost and environmental impacts of each of the alternatives, it is recommended that the first alternative be implemented—the widening of this segment of W. Good Hope Road to a minimum urban cross-section having a 48-foot-wide pavement, with additional widening at principal intersections and with parking prohibited during peak periods in the direction of peak traffic flow. Both widening alternatives would serve to eliminate the remaining congestion along this east-west corridor and both would provide arterial street and highway system continuity along this corridor, and the second alternative would provide definite additional benefits in terms of travel safety and level of service by the provision of a median. However, the cost and disruption of the second widening alternative would outweigh the additional benefits to be derived from this alternative. Furthermore, the benefits that would be derived from the provision of on-street parking during the peak hour along this segment, which would be provided only under the second widening alternative, would not be significant enough to outweigh the cost and disruption of that alternative, as adequate off-street parking space would be available along this segment of W. Good Hope Road.

For the easternmost segment of W. Good Hope Road from N. 115th Street to N. 76th Street, based upon the additional capacity afforded and congestion abated by each alternative, and the cost and environmental impacts of the alternatives proposed for this segment, it is recommended that the second alternative be implemented—the prohibition of on-street parking in the direction of peak traffic flow during both peak periods along those segments where it is not currently prohibited, as well as the reconstruction of segments of W. Good Hope Road between N. 115th Street and N. 107th Street in order to provide for three lanes of traffic in each direction with on-street parking prohibited. While such prohibition of on-street parking would mean that vehicles accessing businesses and residences along W. Good Hope Road, particularly between N. 107th Street and N. 76th Street, would have to seek parking space in off-street parking locations in the area, the availability of such alternative parking makes this recommendation implementable. This action was also recommended because it would accommodate the additional traffic volumes and serve the traffic flow patterns associated with a new driveway entrance to the Trammell Crow development.

<u>N. 124th Street Extension from W. Fond du Lac Avenue (STH 145) to W. County Line Road</u>: To resolve the congestion which may be expected to remain in the plan design year along STH 145 in northwest Milwaukee County, and to provide north-south arterial street and highway system network continuity, consideration was given to improving the existing segments of both STH 145 and N. 124th Street and to providing a new north-south arterial segment connecting the existing segments of STH 145 and N. 124th Street. Such improvement would also provide an adequate framework for access to the arterial street and highway system for planned urban development in the area between W. Fond du Lac Avenue and W. County Line Road in this portion of Milwaukee County. The resulting north-south facility, from W. Fond du Lac Avenue to W. County Line Road, will be referred to herein as the N. 124th Street extension. This improvement and expansion in the arterial street and highway system may be expected to abate the traffic problems in this portion of northwestern Milwaukee County.

As in the consideration of the problem segments of W. Bradley Road and W. Good Hope Road, a factor bearing on the consideration of alternative improvements for this north-south corridor was the proposed Trammell Crow development. As indicated previously, in order to avoid an increase in truck traffic on segments of W. Bradley Road and N. 107th Street, it is the desire of the City of Milwaukee to route all traffic through this area over STH 145. Driveway access to the Trammell Crow Development would be provided from STH 145 to W. Leon Terrace.

Except at its intersection with W. Fond du Lac Avenue, the existing segment of STH 145 currently has a rural cross-section with a 22-foot-wide pavement, adequate to provide two lanes for moving traffic with no parking lanes from W. Fond du Lac Avenue to the point at which the arterial curves northwesterly into Waukesha County. The cross-section of this portion of the arterial has four-foot-wide shoulders within a 100-foot-wide right-of-way from W. Fond du Lac Avenue to W. Leon Terrace with the exception of the horizontal clearance under the three structures which carry USH 41 over this segment of STH 145, which is only 43 feet wide; is 130 feet wide from W. Leon Terrace to W. Bradley Road; and is 66 feet wide between W. Bradley Road to the point at which the arterial curves northwesterly. At its intersection with W. Fond du Lac Avenue, STH 145 is channelized to accommodate both northwest-to-northbound and southeast-to-northbound merge lanes from W. Fond du Lac Avenue to STH 145, and to accommodate a separate lane for south-to southeast-bound traffic movements. From W. Brown Deer Road to W. County Line Road, N. 124th Street currently also has a rural cross-section with a 22-foot-wide pavement, adequate to provide two lanes for moving traffic. The cross-section of N. 124th Street has two-foot-wide gravel shoulders within a 50-foot-wide right-of-way for the entire length of the segment. At its intersection with USH 41 (the Fond du Lac Freeway), between W. Fond du Lac Avenue and W. Bradley Road, STH 145 passes under three structures. N. 124th Street intersects the Wisconsin & Southern Railroad Company tracks at-grade midway between W. Brown Deer Road and W. County Line Road, and intersects the Wisconsin & Southern and the Chicago & North Western Transportation Company tracks at a point immediately south of W. County Line Road.

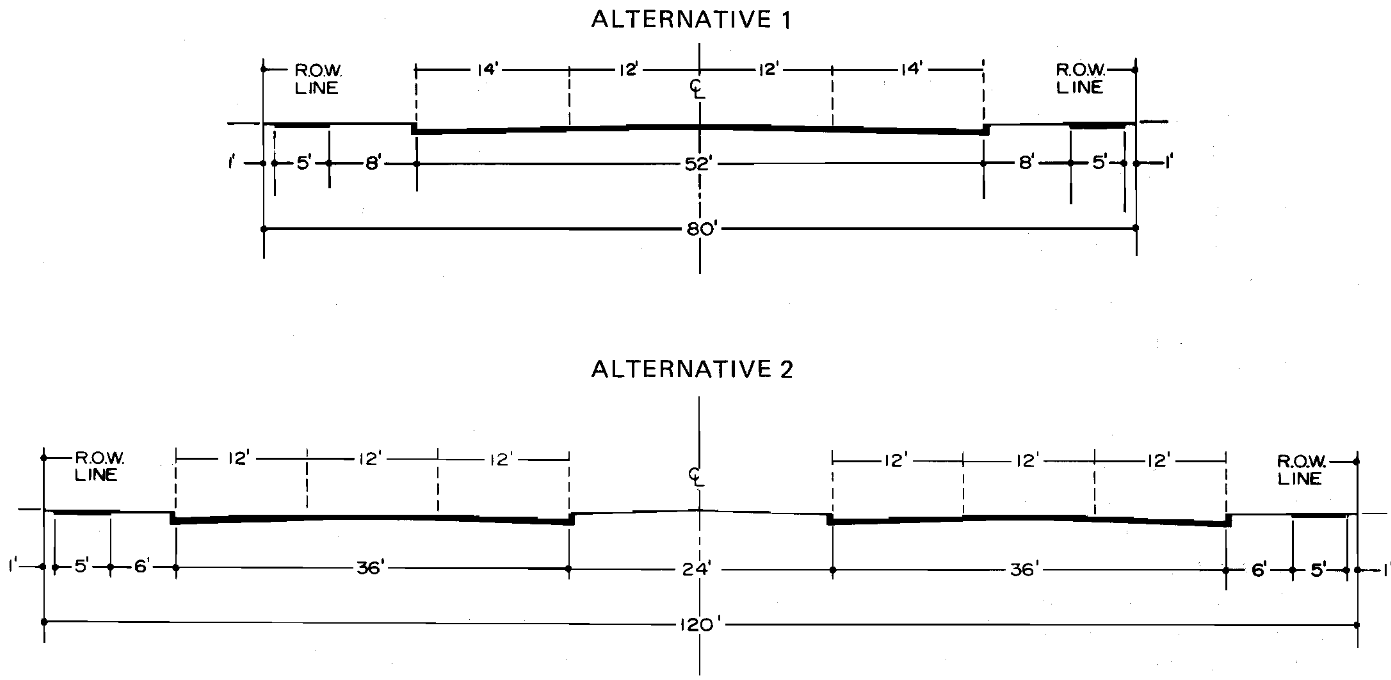
In the consideration of roadway improvement and expansion alternatives for the N. 124th Street extension, the arterial was divided into two segments: a southerly segment from W. Fond du Lac Avenue to the point at which STH 145 curves northwesterly into Waukesha County, and a northerly segment between the point at which STH 145 curves northwesterly into Waukesha County and W. County Line Road. Two alternatives were developed for the southerly segment of the extension, one with a minimum and one with a desirable urban roadway cross-section. One alternative was developed for the expansion or improvement of the northerly segment to a minimum urban cross-section. Separate improvement and expansion alternatives were considered for each of these two segments because of the differing traffic flow problems and arterial functions associated with each segment. Thus, a separate recommended alternative was selected for each of these segments.

The first alternative considered for the southerly segment of the N. 124th Street extension called for widening this segment of STH 145 to a minimum urban cross-section, and would entail the provision of a four-lane, undivided roadway with sidewalks with a curb-to-curb pavement width of 52 feet within an 80-foot-wide right-of-way. While this roadway cross-section could be accommodated within the existing right-of-way from W. Fond du Lac Avenue to W. Bradley Road, an additional 12 feet of right-of-way would be required between W. Bradley Road and the point at which STH 145 curves northwesterly. The location for the additional right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of STH 145. Because of the provision of an 80-foot-wide right-of-way under this alternative, left- and/or right-turn lanes could be provided as necessary along this segment of STH 145, and the intersections of STH 145 with W. Fond du Lac Avenue, with W. Leon Terrace, and with W. Bradley Road could be widened. Right-turn channelization would be necessary on the northbound approach at the intersection of STH 145 and W. Leon Terrace in order to accommodate the use of W. Leon Terrace as an access road to the proposed Trammell Crow development. A typical cross-section for this alternative is shown in Figure 104. In order to maintain two lanes of traffic in the direction of the peak traffic flow during peak travel periods under this alternative, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing any businesses or residences which front this segment of STH 145 during the periods of parking restrictions would have to use off-street parking space in the area. This alternative would require the replacement of each of the three structures provided to carry USH 41 over STH 145. This alternative may be expected to abate all remaining traffic congestion along this segment of STH 145.

A second alternative considered for the southerly segment of the N. 124th Street extension called for widening STH 145 to a desirable urban cross-section. This alternative would entail the provision of dual 36-foot-wide urban roadways with sidewalks separated by a 24-foot-wide landscaped median within a 120-foot-wide right-of-way. Such widening would provide for four lanes of moving traffic in addition to two parking lanes on this segment of STH 145. A typical cross-section for this alternative is shown in Figure 104. Under this alternative, the provision of a 24-foot-wide median along STH 145 would permit the construction of any necessary left-turn lanes at median openings, and would provide adequate separation of opposing traffic flows, thereby increasing the level of service and safety on STH 145. Also, under this alternative, turn-lane channelization could be provided as necessary at the intersections of STH 145 with W. Fond du Lac Avenue, W. Leon Terrace, and W. Bradley Road. At the intersection of STH 145 with W. Leon Terrace, right- and left-turn channelization could be provided to access the Trammell Crow development. On those sections of STH 145 where it would be necessary to acquire additional rights-of-way—or between W. Fond du

Figure 104

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2
FOR STH 145 FROM W. FOND DU LAC AVENUE TO THE MILWAUKEE/WAUKESHA
COUNTY LINE (SOUTHERN SEGMENT OF THE N. 124TH STREET EXTENSION)



Source: Wisconsin Department of Transportation and SEWRPC.

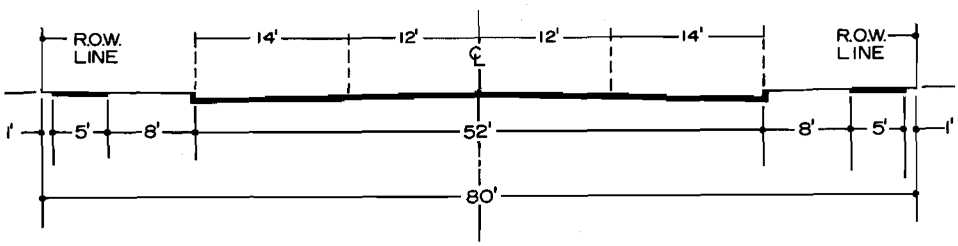
Lac Avenue and W. Leon Terrace, and between W. Bradley Road and the point at which STH 145 curves northwesterly—the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of STH 145. This alternative would also require the replacement of each of the three structures provided to carry USH 41 over STH 145. This alternative may also be expected to eliminate all remaining traffic congestion along this segment of STH 145.

In order to provide arterial street and highway system network continuity along the entire length of the N. 124th Street extension in this portion of Milwaukee County, and adequate access to the arterial street and highway system from planned urban development in the area, consideration was given to providing a new arterial segment between STH 145 and W. Brown Deer Road along a direct north-south alignment along the Milwaukee/ Waukesha County line, and to improving the existing segment of N. 124th Street between W. Brown Deer Road and W. County Line Road. These expansion and improvement projects were considered in conjunction with one another so that a continuous, similar roadway cross-section would be provided along the length of this northerly segment of the N. 124th Street extension.

As previously mentioned, one alternative was considered for the expansion and improvement of the northerly segment of the N. 124th Street extension, and called for the provision of a four-lane, undivided, minimum urban cross-section with sidewalks, with a curb-to-curb pavement width of 52 feet within an 80-foot-wide right-of-way. Because of the provision of an 80-foot-wide right-of-way under this alternative, left- or right-turn lanes could be provided as necessary along this expanded and improved arterial segment, and the intersections of the new segment of N. 124th Street with STH 145 and W. Brown Deer Road could be widened, as could the intersection of N. Boundary Road with W. County Line Road. A typical cross-section for this alternative is shown in Figure 105. Under this alternative on-street parking could be permitted on both sides of the arterial facility.

Figure 105

TYPICAL CROSS-SECTION OF IMPROVEMENT ALTERNATIVE FOR THE NORTHERN SEGMENT OF THE N. 124TH STREET EXTENSION (NEW N. 124TH STREET AND N. BOUNDARY ROAD FROM STH 145 TO W. COUNTY LINE ROAD)



Source: Wisconsin Department of Transportation and SEWRPC.

This alternative would require the acquisition of an 80-foot-wide right-of-way between that point at which STH 145 curves northwesterly and W. Brown Deer Road, and would require the acquisition of 30 feet of additional right-of-way—15 feet on both sides of the roadway—between W. Brown Deer Road and N. 124th Street. In those locations where it would be necessary to acquire additional right-of-way, the location for the right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of N. 124th Street extended between STH 145 and W. Brown Deer Road, and on the existing centerline of N. 124th Street between W. Brown Deer Road and W. County Line Road. Because of the provision of an 80-foot-wide right-of-way under this alternative, left- and/or right-turn lanes could be provided at the intersections of N. 124th Street with W. Brown Deer Road and W. County Line Road.

An alternative which would provide for a desirable urban cross-section with dual 36-foot-wide urban roadways and a median on a 120-foot-wide right-of-way, adequate to provide two through lanes in each direction with parking permitted, was not considered for this northern segment of the N. 124th Street extension because the additional roadway capacity and the provision of on-street parking which would be afforded under such an alternative were not considered warranted along this segment.

The impacts of each of the alternatives considered for both the northerly and southerly segments of the N. 124th Street extension are set forth in Table 238. The impact of a "do nothing" alternative for each of these segments, under which the physical dimensions of the existing roadway surface or the landscape would remain essentially unchanged, are also provided in Table 238. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along the existing arterials within the N. 124th Street extension between 1980 and 2000. Under each of the alternative plans, any traffic management actions previously recommended for the existing arterial segments within this extension under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. In the case of this arterial extension, no recommendations were made for either STH 145 or N. 124th Street. It should be pointed out that the implementation of the "do nothing" alternative would neither serve to abate any remaining traffic congestion along STH 145 nor provide any additional arterial street and highway system network continuity along the N. 124th Street extension in this portion of Milwaukee County.

The costs shown in Table 238 for each of the alternatives for the northerly and southerly segments of the N. 124th Street extension are expressed in 1980 dollars and include estimates of the construction costs, including utility and relocation costs; the right-of-way acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 238 is the urban disruption which may be expected to be associated with each of the alternatives as measured by the number of residential or commercial properties required to be taken.

As shown in Table 238, of the alternatives proposed for the segment of STH 145 between W. Fond du Lac Avenue and the point at which the arterial

Table 238

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT AND EXPANSION PLANS FOR THE N. 124TH STREET EXTENSION (STH 145 AND EXPANDED 124TH STREET, AND N. BOUNDARY ROAD) FROM W. FOND DU LAC AVENUE (STH 145) TO W. COUNTY LINE ROAD

Impact	Southerly Segment of N. 124th Street Extension (improved STH 145 from W. Fond du Lac Avenue to Waukesha County Line)			Northerly Segment of N. 124th Street Extension (extended N. 124th Street and N. 124th Street from STH 145 to W. County Line Road)	
	"Do Nothing" Alternative	Alternative 1 (52-foot-wide urban roadway)	Alternative 2 (36-foot-wide urban roadway pairs with median)	"Do Nothing" Alternative	Alternative 1 (52-foot-wide urban roadway)
Cost (in 1980 dollars)[a]					
Construction	$118,000	$2,275,000	$2,836,000	$196,000	$2,268,000
Real Estate Acquisition, Relocation, and Demolition	--	24,000	64,000	--	99,000
Maintenance	93,000	186,000	279,000	155,000	515,000
Total	$211,000	$2,390,000	$3,179,000	$351,000	$2,882,000
Disruption					
Residential Units Taken	--	--	--	--	--
Commercial Units Taken	--	--	--	--	--

[a] *Construction costs for each alternative include estimates of the roadway construction costs, including the cost of driveways, sidewalks, lighting, and traffic signals; utility relocation costs; and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

curves northwesterly, the second widening alternative—the widening of STH 145 to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $3,179,000. The widening of STH 145 to a minimum urban cross-section having a 52-foot-wide pavement from curb-to-curb would have estimated capital and maintenance costs of $2,390,000; and the capital and maintenance costs of the "do nothing" alternative were estimated at $211,000. Neither of the two alternatives proposed for this segment of STH 145 would require the acquisition of any residential or commercial units.

As also shown in Table 238, the alternative proposed for the northerly segment of the N. 124th Street extension from STH 145 to W. County Line Road—the provision of a new roadway from STH 145 to W. Brown Deer Road having a 52-foot-wide urban cross-section, and the improvement of N. 124th Street to a similar urban cross-section—would have capital and maintenance costs of about $2,882,000. The capital and maintenance costs of the "do nothing" alternative for this segment of the N. 124th Street extension are estimated at $351,000. Neither of these alternatives would involve any disruption.

Although there would be no significant difference in the environmental impacts in terms of air quality and noise levels between the two widening alternatives considered for this segment of the N. 124th Street extension, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative would be significant. In the case of the southerly segment of this arterial extension, the unresolved congestion along STH 145 under the "do nothing" alternative may be expected to result in increased stop-and-go driving and interrupted traffic flow, and attendant increased air pollutant emissions and noise levels. Air pollution and noise levels may be expected to increase under the recommended improvement and expansion alternative for the northerly segment of this arterial corridor since, under the "do nothing" alternative, no roadway at all would exist along a portion of the corridor. A principal negative impact of a "do nothing" alternative for the northerly segment of the N. 124th Street extension would be the lack of arterial street and highway system network continuity in the area, and the attendant lack of an arterial framework for planned urban development in this portion of Milwaukee County.

For the southerly segment of the N. 124th Street extension, based upon consideration of the additional capacity afforded and congestion abated by each alternative, and the cost and environmental impacts of each of the alternatives, it is recommended that the second alternative be implemented—the widening of this segment of STH 145 to a desirable urban cross-section having dual 36-foot-wide roadways separated by a 24-foot-wide median. While both widening proposals for this segment of STH 145 may be expected to eliminate the remaining traffic congestion along this segment, the second widening alternative would offer increased travel safety and improved traffic flow by providing a median, and under this alternative all necessary turn-lane channelization could be provided at the intersection of STH 145 and W. Leon Terrace in order to better accommodate access to the proposed Trammell Crow development.

For the northerly portion of the N. 124th Street extension between STH 145 and W. County Line Road, based upon the additional continuity of the arterial street and highway system offered by each alternative and the cost and environmental impacts of the alternatives, it is recommended that the widening and expansion alternative proposed for this segment be implemented—that is, the provision of a new 52-foot-wide minimum urban roadway from STH 145 to W. Brown Deer Road and the improvement of the existing segment of N. 124th Street to a similar urban roadway cross-section from W. Brown Deer Road to W. County Line Road, both with peak-period parking permitted. This alternative would also provide for the additional widening of this arterial segment at principal intersections. The recommended provision of a new arterial roadway along a direct north-south alignment between STH 145 and W. Brown Deer Road is consistent with the adopted long-range regional transportation plan.

N. 91st Street from W. Mill Road to W. Bradley Road: To resolve the congestion which may be expected to remain in the plan design year in the north-south travel corridor along N. 91st Street, consideration was given to improving N. 91st Street from W. Mill Road to W. Bradley Road. By increasing the number of moving traffic lanes provided along this segment of N. 91st Street, the traffic congestion problems along this travel corridor could be abated.

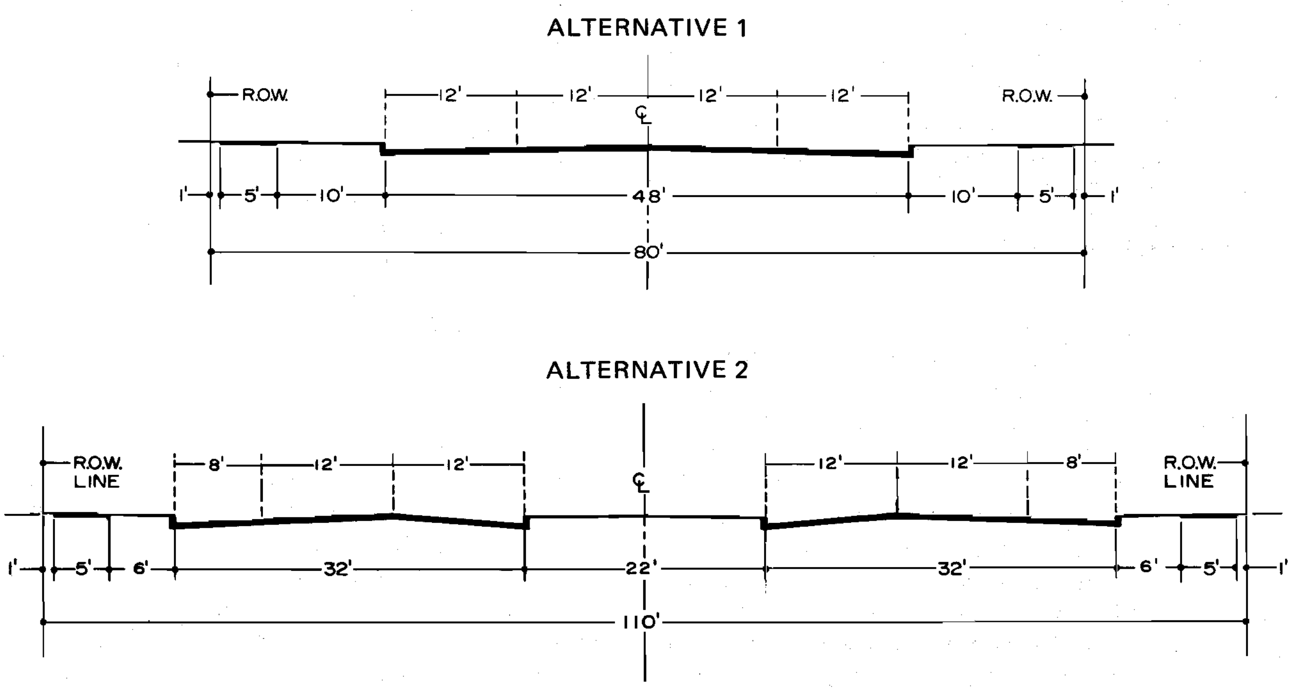
From W. Mill Road to W. Bradley Road, N. 91st Street currently has two different roadway cross-sections. That segment of N. 91st Street between W. Mill Road and W. Good Hope Road was improved in 1981 to an urban cross-section having dual 32-foot-wide pavements curb-to-curb separated by a 22-foot-wide median within a 110-foot-wide right-of-way, adequate to provide four lanes for moving traffic and two parking lanes with sidewalks. Because this improvement was not programmed for completion in the 1980 annual element of the regional transportation improvement program, it was not included in the design year 2000 simulation of the traffic flows under the transportation systems management/transit improvement plan for the northwest side study area. Instead, N. 91st Street between W. Mill Road and W. Good Hope Road was simulated as providing two lanes for moving traffic plus two parking lanes. The 1981 improvement of this section of N. 91st Street to a desirable urban cross-section, and the consequent addition of two additional lanes for moving traffic, may be expected to abate existing and probable future traffic congestion problems along this segment of N. 91st Street. On-street parking is currently permitted along that segment of N. 91st Street between W. Mill Road and W. Good Hope Road. Except for its intersection with W. Good Hope Road, N. 91st Street currently has a rural cross-section with gravel shoulders between W. Good Hope Road and W. Bradley Road. The pavement is 20 feet wide within a right-of-way which varies in width from 66 to 88 feet, adequate to provide two traffic lanes. At its intersection with W. Good Hope Road, N. 91st Street is channelized to provide right- and left-turn lanes at the southbound W. Good Hope Road approach. This channelization is extended north from the intersection to also provide a left-turn lane on the northbound approach of the intersection of N. 91st Street and W. Granville Road. Parking is currently permitted along the segment of N. 91st Street between W. Mill Road and W. Good Hope Road. Immediately south of its intersection with W. Bradley Road, N. 91st Street intersects the tracks of the Wisconsin & Southern Railroad Company.

Since the segment of N. 91st Street between W. Mill Road and W. Good Hope Road was improved in 1981, improvement alternatives designed to increase the capacity of this segment were developed only for that segment of N. 91st Street from W. Good Hope Road to W. Bradley Road. Two alternatives were developed for increasing the arterial street capacity of this segment. The first alternative called for improving this segment to a minimum urban cross-section. The second alternative called for improving this segment to a desirable urban cross-section.

The first alternative would provide for a four-lane undivided urban roadway with a curb-to-curb pavement width of 48 feet, with sidewalks within an 80-foot-wide right-of-way. This cross-section would be adequate to provide for two traffic lanes and two parking lanes. A typical cross-section for this alternative is shown in Figure 106. Under this alternative, the right-of-way width would be expanded to 110 feet at the intersection of N. 91st Street and W. Good Hope Road to provide dual 32-foot-wide roadways in addition to a 22-foot-wide median, and the intersections of N. 91st Street with W. Calumet Road and W. Bradley Road would be channelized within the 80-foot-wide right-of-way. At the intersection of N. 91st Street and the tracks of the Wisconsin & Southern Railroad Company, crossing protection gates would be provided. In those locations along N. 91st Street between W. Good Hope Road and W. Bradley Road

Figure 106

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR N. 91ST STREET FROM W. MILL ROAD TO W. BRADLEY ROAD



Source: City of Milwaukee and SEWRPC.

where it would be necessary to acquire up to 14 feet of additional right-of-way, the location for the widened right-of-way which would result in the least cost and disruption was determined to be along the east side of the roadway. Immediately north of the intersection of N. 91st Street and W. Good Hope Road, however, where it would be necessary to acquire an additional 44 feet of right-of-way, the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of N. 91st Street. In order to maintain two lanes for moving traffic along this segment of N. 91st Street in the direction of peak flow during the peak periods, on-street parking would have to be prohibited during both the morning and evening peak periods in the direction of peak flow. In order to negate any future need for on-street parking along this segment of N. 91st Street under this alternative, future development would need to be oriented to access interior streets rather than to N. 91st Street. Encouragement of this type of development would eliminate, or minimize, the need for direct access to this segment of N. 91st Street and, as such, minimize the need for traffic lanes to also serve as deceleration and storage lanes for left and right turns at midblock locations, which would reduce the ability of this segment of N. 91st Street to carry through traffic. Assuming such orientation of future land use development and the elimination of on-street parking, this alternative may be expected to eliminate all remaining traffic congestion problems along this segment.

The second alternative considered for this segment of N. 91st Street would involve widening N. 91st Street to a desirable urban cross-section. This alternative would entail the provision of dual 32-foot-wide roadways separated by a 22-foot-wide landscaped median within a 110-foot-wide right-of-way with sidewalks. Such widening would provide four traffic lanes and two parking lanes and would provide a cross-section identical to that along N. 91st Street between W. Mill Road and W. Good Hope Road, constructed in 1981. A typical cross-section for this alternative is shown in Figure 106.

Under this alternative, it would be necessary to acquire between 22 and 44 feet of additional right-of-way along N. 91st Street between W. Good Hope Road and W. Bradley Road. For the entire length of this segment, the new roadway would be centered on the existing roadway. The location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing roadway from W. Good Hope Road to a point south of W. Dogwood Street; to the west side of the arterial from south of W. Dogwood Street to a point north of W. Calumet Street; centered on the existing roadway from a point north of W. Calumet Street to the intersection of N. 91st Street with the Wisconsin & Southern Railroad Company tracks; and to the west side of the arterial from the railroad tracks to W. Bradley Road. Under this alternative, the provision of a 22-foot-wide median along N. 91st Street would permit the construction of necessary left-turn lanes at median openings and would provide adequate separation of opposing traffic flow, thereby further increasing the level of service and safety on N. 91st Street. This alternative would also eliminate all remaining traffic congestion along this segment of N. 91st Street.

The impacts of each of the two alternatives considered for the improvement of N. 91st Street are set forth in Table 239. The impact of a "do nothing" alternative, under which the physical dimensions of the roadway surface would remain essentially unchanged, are also provided in Table 239. Under the "do nothing" alternative, only summer and winter maintenance work would be accomplished along N. 91st Street between W. Mill Road and W. Bradley Road between 1980 and the year 2000. Under this alternative, two major resurfacings would be accomplished on that segment of N. 91st Street between W. Good Hope Road and W. Bradley Road. No major resurfacing work would be required on that segment of N. 91st Street between W. Mill Road and W. Good Hope Road during this period because this roadway surface was newly constructed in 1981 and should have an adequate life of about 25 years. Also, under each of the alternative plans, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. No such actions were recommended under the short-range plan for this segment of N. 91st Street. Implementation of the "do nothing" alternative would not serve to abate the existing or probable future traffic congestion along N. 91st Street between W. Good Hope Road and W. Bradley Road.

The costs shown in Table 239 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs, and the real estate acquisition, relocation, and demoli-

Table 239

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 91ST STREET FROM W. MILL ROAD TO W. BRADLEY ROAD

Impact	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (32-foot-wide roadway pairs with median)
Cost (in 1980 dollars)[a]			
Construction	$185,000	$1,420,000	$1,785,000
Real Estate Aquisition, Relocation, and Demolition	--	86,000	273,000
Maintenance	610,000	765,000	890,000
Total	$795,000	$2,271,000	$2,948,000
Disruption			
Residential Units Taken	--	--	--
Commercial Units Taken	--	--	--

[a] *Construction costs for each alternative include estimates of the cost of roadway construction, including the cost of sewers, sidewalks, driveways, traffic signals, and lighting; engineering costs; and the cost of railroad grade crossing modifications. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Because N. 91st Street between W. Mill Road and W. Good Hope Road was reconstructed in 1981, construction costs under the "do nothing" alternative include resurfacing costs only for that segment of N. 91st Street between W. Good Hope Road and W. Bradley Road. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

tion costs for that segment of N. 91st Street between W. Good Hope Road and W. Bradley Road. These costs also include the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 239 is the urban disruption which may be expected to be associated with each of the alternatives, as measured by the number of residential and commercial properties required to be taken. The construction-related and displacement costs entailed in the 1981 improvement of that segment of N. 91st Street from W. Mill Road to W. Good Hope Road to a desirable urban cross-section totaled about $1,200,000.

As shown in Table 239, of the alternatives proposed for the improvement of N. 91st Street, the second alternative, which proposes widening the segment of N. 91st Street between W. Good Hope Road and W. Bradley Road to a desirable urban cross-section with a dual 32-foot-wide roadway and a 22-foot-wide median, would have the highest capital and maintenance cost, $2,948,000; while the first widening alternative, which proposes widening the segment of N. 91st Street from W. Good Hope Road to W. Bradley Road to a minimum urban cross-section with a 48-foot-wide pavement curb-to-curb, would have the second highest capital and maintenance cost, $2,271,000. The capital and maintenance cost of a "do nothing" alternative was estimated at $795,000. None of the alternatives would involve any urban disruption.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the two widening alternatives considered. However, the environmental impacts between the widening alternatives and the "do nothing" alternative may be expected to be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

Because of the additional capacity afforded and congestion abated, and the cost and environmental impacts entailed, it is recommended that the second alternative, which provides for the widening of N. 91st Street from W. Mill Road to W. Bradley Road to a desirable urban cross-section with dual 32-foot-wide roadways separated by a 22-foot-wide median, be implemented. This action is recommended because it provides for a continuation of the existing roadway cross-section on N. 91st Street south of W. Good Hope Road, and because the provision of a 22-foot-wide median under this alternative would increase the safety and operating efficiency of this segment of N. 91st Street.

N. 43rd Street from W. Mill Road to W. Bradley Road: To resolve the congestion which may be expected to remain in the plan design year in the north-south travel corridor along N. 43rd Street, consideration was given to improving the segment of N. 43rd Street from W. Mill Road to W. Bradley Road. An increase in the number of traffic lanes provided on this segment of N. 43rd Street may be expected to abate the traffic congestion problems in this travel corridor.

With the exception of its intersections with W. Mill Road, W. Good Hope Road, and W. Bradley Road, the existing segment of N. 43rd Street from W. Mill Road to W. Bradley Road has a rural cross-section with a 20-foot-wide pavement and narrow gravel shoulders, adequate to provide for two lanes of traffic. This segment has a right-of-way which is 120 feet wide at the widened southbound approach to W. Mill Road; is between 66 and 105 feet wide between the widened southbound approach to W. Mill Road and the widened northbound approach to W. Good Hope Road; is 120 feet wide at the north- and southbound approaches to W. Good Hope Road; is between 66 and 93 feet wide between the southbound approach to W. Good Hope Road and W. Calumet Road; and is 120 feet wide between W. Calumet Road and W. Bradley Road. At its intersection with W. Mill Road, N. 43rd Street is channelized to provide for dual 34-foot-wide roadways, with a median and a right-turn bypass on the southbound approach; at its intersection with W. Good Hope Road, N. 43rd Street is channelized to provide for dual 36-foot-wide roadways with a median and a southbound right-turn bypass; and at its intersection with W. Bradley Road, N. 43rd Street is channelized to provide for dual 36-foot-wide roadways with a median. On-street parking is prohibited on these improved sections of N. 43rd Street. N. 43rd Street intersects the tracks of the Chicago & North Western Transportation Company at-grade approximately 300 feet north of W. Green Tree Road.

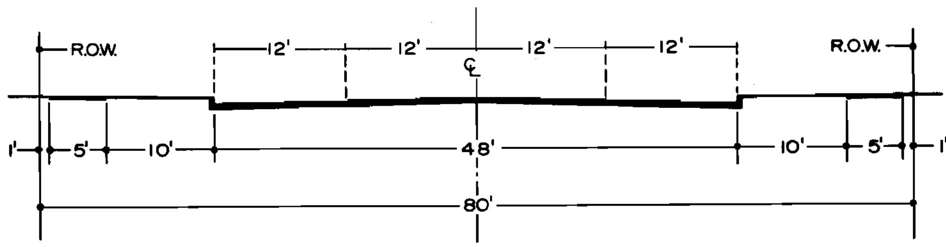
Two alternatives were developed for increasing the capacity of N. 43rd Street between W. Mill Road and W. Bradley Road. The first alternative consists of widening N. 43rd Street to a minimum urban cross-section, and the second alternative involves widening N. 43rd Street to a desirable urban cross-section.

The first alternative considered for the improvement of this segment of N. 43rd Street involved widening the arterial to a minimum urban cross-section with sidewalks, and would entail the provision of a four-lane undivided roadway with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way. Under this alternative, the existing channelization would be retained at the intersections of N. 43rd Street with W. Mill Road, W. Good Hope Road, and W. Bradley Road, and new channelization would be provided at the intersection of N. 43rd Street and W. Green Tree Road. Also under this alternative, the at-grade crossing of the Chicago & North Western Transportation Company tracks would be provided with crossing protection gates. A typical cross-section for this alternative is shown in Figure 107. This roadway cross-section could be accommodated within the existing right-of-way for much of the length of this segment of N. 43rd Street, with no additional right-of-way being required along N. 43rd Street between W. Mill Road and W. Green Tree Road and between two and 14 feet of additional right-of-way being required between W. Green Tree Road and W. Bradley Road. In order to utilize the existing right-of-way and minimize disruption under this alternative, the location for the new roadway would be centered on N. 43rd Street between W. Mill Road and W. Green Tree Road; would be offset five feet to the west of the existing centerline of N. 43rd Street between W. Green Tree Road and W. Good Hope Road; and would be offset seven feet to the east of the existing centerline of N. 43rd Street between W. Good Hope Road and W. Bradley Road. In order to maintain two lanes of moving traffic in the direction of peak flow during peak travel periods, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both morning and evening travel periods under this alternative. Because of these restrictions, vehicles accessing any businesses or residences which front this segment of N. 43rd Street during the periods of parking

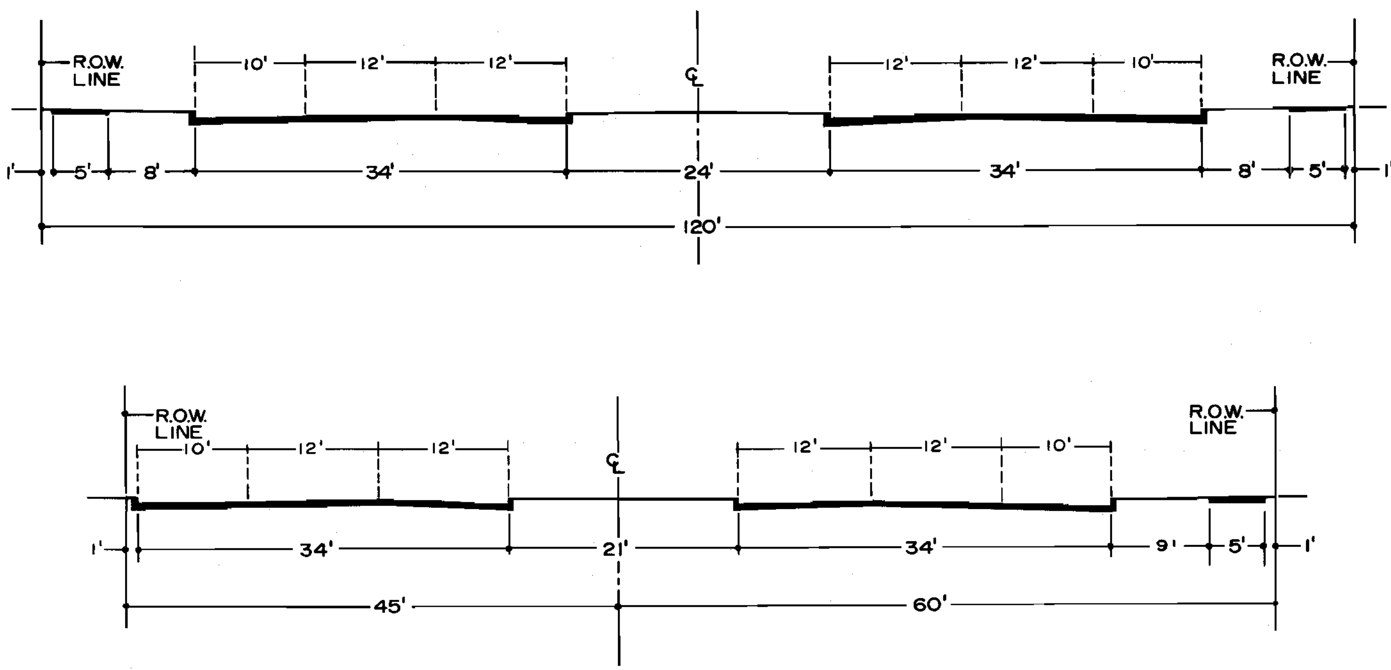
Figure 107

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR N. 43RD STREET FROM W. MILL ROAD TO W. BRADLEY ROAD

ALTERNATIVE 1



ALTERNATIVE 2



Source: City of Milwaukee and SEWRPC.

restriction would have to use off-street parking space in the area. This alternative may be expected to abate any remaining traffic congestion along this segment of N. 43rd Street.

The second alternative considered for the improvement of this segment of N. 43rd Street involves widening the arterial to a desirable urban cross-section with sidewalks. This alternative would provide dual 34-foot-wide urban roadways separated by a 21-foot-wide median within a 105-foot-wide right-of-way between W. Mill Road and W. Green Tree Road and between W. Good Hope Road and W. Calumet Road; and would provide dual 34-foot-wide urban roadways separated by a 24-foot-wide median within a 120-foot-wide right-of-way between W. Green Tree Road and W. Good Hope Road and between W. Calumet Road and W. Bradley Road. On those segments of the new roadway with a 105-foot-wide right-of-way between W. Mill Road and W. Green Tree Road and between W. Good Hope Road and W. Calumet Road, no sidewalks would be constructed on the west side of the roadway in order to avoid taking land from three cemeteries and from the Tripoli Country Club. Under this alternative, an additional 15 to 27 feet of right-of-way would be required between W. Mill Road and W. Good Hope Road; an addi-

Table 240

COST AND DISRUPTION IMPACTS OF ALTERNATIVE PLANS FOR N. 43RD STREET FROM W. MILL ROAD TO W. BRADLEY ROAD

Impact	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (34-foot-wide roadway pairs with median)
Cost (in 1980 dollars)[a]			
Construction	$589,000	$2,230,000	$3,160,000
Real Estate Acquisition, Relocation, and Demolition	- -	11,000	247,000
Maintenance	400,000	639,000	873,000
Total	$989,000	$2,880,000	$4,280,000
Disruption			
Residential Units Taken	- -	- -	- -
Commercial Units Taken	- -	- -	- -

[a] *Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sewers, sidewalks, driveways, traffic signals, and lighting; utility relocation and engineering costs; and the cost of railroad grade crossing modifications. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

tional 39 feet of right-of-way would be required between W. Good Hope Road and W. Calumet Road; and up to 12 feet of additional right-of-way would be required between W. Calumet Road and W. Bradley Road. The location for the new roadway which would result in the least cost and disruption was determined to be centered on the existing centerline of N. 43rd Street between W. Mill Road and W. Good Hope Road; to be offset 15 feet to the east of the centerline of N. 43rd Street between W. Good Hope Road and W. Calumet Road; and to be centered on the existing centerline of N. 43rd Street between W. Calumet Road and W. Good Hope Road. Under this alternative, the existing channelization would be retained at the intersections of N. 43rd Street with W. Mill Road, W. Good Hope Road, and W. Bradley Road, and new channelization would be provided at W. Green Tree Road. The at-grade crossing of the Chicago & North Western Transportation Company tracks would be provided with new crossing protection gates. The provision of a 21- to 24-foot-wide median along N. 43rd Street under this alternative would permit the provision of necessary left-turn lanes at median openings and would provide adequate separation of opposing traffic flows, thereby increasing the level of service and safety on N. 43rd Street. This alternative may also be expected to abate all remaining traffic congestion along this segment of N. 43rd Street.

The impacts of each of the two alternatives considered for the improvement of N. 43rd Street are set forth in Table 240. The impact of a "do nothing" alternative, under which the physical dimensions of the existing roadway surface would remain essentially unchanged, are also provided in Table 240. Under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along the arterial in the next two decades. Under each of the alternatives, any traffic management actions previously recommended for N. 43rd Street in the short-range plan for the northwest side study area which would not be precluded by physical dimensions were assumed to have been implemented. No such actions were recommended under the short-range plan for this segment of N. 43rd Street. Implementation of the "do nothing" alternative would not serve to abate the probable future traffic congestion along N. 43rd Street.

The costs shown in Table 240 for each of the alternatives for N. 43rd Street are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the right-of-way acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 240 is the urban disruption which may be expected to be associated with each of the alternatives as measured by the number of residential and commercial properties required to be taken.

As shown in Table 240, of the alternatives for N. 43rd Street, the second improvement alternative—which provides for the widening of N. 43rd Street to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $4,280,00; while the first widening alternative—which provides for the improvement of N. 43rd Street to a minimum urban cross-section—would have an estimated capital and maintenance cost of $2,880,000. The capital and maintenance costs of the "do nothing" alternative were estimated at $989,000. No structures would be required to be taken under either of the improvement alternatives for N. 43rd Street.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the widening alternatives considered. However, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative may be expected to be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions.

Based upon the additional capacity afforded and congestion abated by the second widening alternative proposed for the segment of N. 43rd Street from W. Mill Road to W. Bradley Road—that is, the provision of dual 34-foot-wide urban roadways separated by a median which ranges in width from 21 to 24 feet with on-street parking permitted—it is recommended that this alternative be implemented. While both the first and the second widening alternatives proposed for this segment of N. 43rd Street may be expected to eliminate congestion along this segment, the second widening alternative is recommended principally because of the enhanced safety provided by the median, and because the desirable urban cross-section would represent a continuation of the existing roadway cross-section to the south of this section of N. 43rd Street.

<u>N. Green Bay Avenue (STH 57) from W. Capitol Drive (STH 190) to N. Teutonia Avenue</u>: It is anticipated that two segments of N. Green Bay Avenue (STH 57), the first between W. Capitol Drive (STH 190) and W. Congress Street, and the second between W. Silver Spring Drive and W. Mill Road, will remain congested in the plan design year. To abate this congestion and to provide appropriate continuity along the entire length of N. Green Bay Avenue between W. Capitol Drive and N. Teutonia Avenue within the northeastern portion of Milwaukee County, consideration was given to improving N. Green Bay Avenue (STH 57) from W. Capitol Drive to N. Teutonia Avenue through the City of Milwaukee, the City of Glendale, the Village of River Hills, and the Village of Brown Deer. An increase in the number of moving traffic lanes provided along these segments of N. Green Bay Avenue may be expected to abate the congestion and traffic flow problems in this portion of Milwaukee County.

From W. Capitol Drive (STH 190) to W. Silver Spring Drive in the City of Milwaukee, N. Green Bay Avenue (STH 57) has an urban cross-section with curbs and gutters and sidewalks. This segment consists of dual 34-foot-wide roadways separated by a 26-foot-wide median all within a 120-foot-wide right-of-way, adequate to provide two lanes for moving traffic in each direction with parking permitted. With the exception of its intersection with W. Silver Spring Drive, N. Green Bay Avenue from W. Silver Spring Drive to W. Westview Drive in the City of Glendale has an urban cross-section with curbs and gutters. The pavement is 40 feet wide from curb to curb along this segment within a right-of-way which varies in width from 70 to 100 feet, generally adequate to provide two lanes for moving traffic and two parking lanes. With the exception of at its intersections with W. Good Hope Road and with N. Teutonia Avenue, between W. Westview Drive and N. Teutonia Avenue, N. Green Bay Avenue currently has a rural cross-section through the City of Glendale, the Village of River Hills, and the Village of Brown Deer. The pavement along this segment is 30 feet wide with six-foot-wide gravel shoulders, generally adequate to provide two lanes for moving traffic. The right-of-way width along this segment varies from 70 to 100 feet from W. Westview Drive to W. Green Tree Road and from 90 to 120 feet between W. Green Tree Road and W. Good Hope Road, and is 120 feet between W. Good Hope Road and N. Teutonia Avenue.

N. Green Bay Avenue passes over W. Silver Spring Drive on a grade separation structure which provides for dual 36-foot-wide roadways separated by a six-foot-wide median. On- and off-ramps are provided to accommodate traffic movement between the two arterials at this structure. At its intersection with W. Good Hope Road, N. Green Bay Avenue has dual 36-foot-wide urban roadways separated by a 36-foot-wide median. South of its intersection with N. Teutonia Avenue, the roadway cross-section of N. Green Bay Avenue has dual 36-foot-wide urban roadways which merge at-grade with the north- and southbound lanes of N. Teutonia Avenue. The Milwaukee Road Railroad tracks intersect N. Green Bay Avenue at-grade between W. Cornell Street and W. Ruby Street, and the Chicago & North Western Transportation Company tracks cross over N. Green Bay Avenue on structures between W. Silver Spring Drive and W. Westview Drive and between W. Bender Road and W. Mill Road. Currently, only minimal parking restrictions are in effect along this length of N. Green Bay Avenue, and no peak-hour parking restrictions exist along the segment except at the intersections of N. Green Bay Avenue with W. Capitol Drive, W. Silver Spring Drive, W. Good Hope Road, and N. Teutonia Avenue.

Separate roadway improvement alternatives were designed for each of three segments of N. Green Bay Avenue because of the variation in cross-section between the segments and because traffic congestion may be expected to occur only on two segments of N. Green Bay Avenue, one between W. Capitol Drive and W. Congress Street and the other between W. Silver Spring Drive and W. Mill Road. The first segment considered extends from W. Capitol Drive to W. Silver Spring Drive, the second from W. Silver Spring Drive to W. Mill Road, and the third from W. Mill Road to N. Teutonia Avenue. Only one improvement alternative—the removal of on-street parking—was considered for the first segment between W. Capitol Drive and W. Silver Spring Drive. A total of three alternatives, two for the improvement of N. Green Bay Avenue to minimum and intermediate urban cross-sections and one for the improvement of N. Green Bay Avenue to a desirable urban cross-section, were developed for the second segment of N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road. Two alternatives were developed for the improvement of the remaining segment of N. Green Bay Avenue, one for a minimum urban cross-section and one for an intermediate cross-section. Thus, a separate recommended improvement alternative was selected for each of these segments of N. Green Bay Avenue.

As already noted, only one alternative—the prohibition of on-street parking—was considered for the segment of N. Green Bay Avenue between W. Capitol Drive and W. Silver Spring Drive. This alternative would entail the prohibition of on-street parking along the portion of this segment of N. Green Bay Avenue from W. Capitol Drive to W. Hampton Avenue in the direction of peak traffic flow during both the morning and evening peak periods. Such parking prohibition would mean that vehicles accessing commercial and residential land uses along N. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue would have to seek parking space on nearby intersecting streets, or use off-street parking space in the area.

The existing development along N. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue consists principally of commercial land uses interspersed with residential land uses. Development on the segment of N. Green Bay Avenue between W. Hampton Avenue and W. Silver Spring Drive consists principally of residential, recreational, and institutional land uses. Although on-street parking is currently used regularly along N. Green Bay Avenue only between W. Capitol Drive and W. Congress Street, the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along N. Green Bay Avenue from W. Capitol Drive to W. Hampton Avenue to alleviate the remaining traffic congestion along that segment is considered implementable because of the availability of alternate parking space on both nearby intersecting streets and in off-street locations along this segment. It would not be necessary to prohibit on-street parking between W. Hampton Street and W. Silver Spring Drive under this alternative because an increase in roadway capacity is not required along this segment. The physical widening of

N. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue to provide three traffic lanes and a parking lane in each direction was not considered. The roadway is already widened to a desirable urban cross-section, and any further widening could jeopardize safe pedestrian movement and result in excessive neighborhood disruption. Such prohibition of on-street parking during the peak periods in the direction of peak traffic flow along the segment of W. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue could be expected to eliminate all remaining traffic congestion along this segment. Efficient highway system network continuity would be provided along the segment of N. Green Bay Avenue between W. Capitol Drive and W. Silver Spring Drive by the existing roadway cross-section.

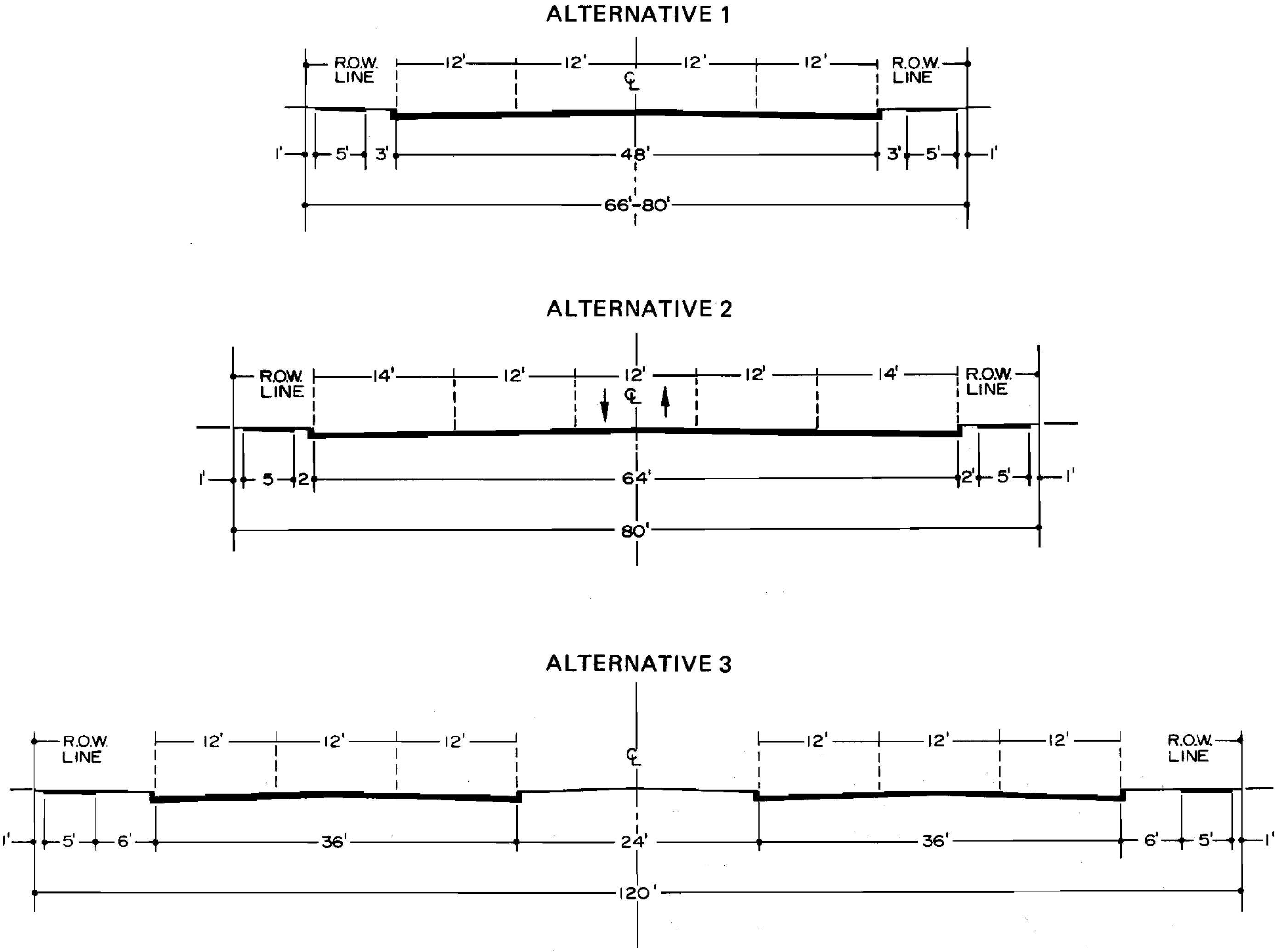
The first alternative action considered for the segment of N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road called for widening this segment to a minimum urban cross-section. This alternative would entail the provision of a four-lane undivided roadway with a curb-to-curb pavement width of 48 feet within the existing right-of-way. Under this alternative, the right-of-way would be expanded to 80 feet at the intersections of N. Green Bay Avenue with W. Florist Avenue, W. Bender Road, and W. Mill Road to accommodate the addition of exclusive left-turn lanes. A typical cross-section for this alternative is shown in Figure 108. In order to maintain two through lanes of traffic in the peak direction during peak periods under this alternative, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing businesses and residences which front N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road during the periods of parking restrictions would have to seek parking space on nearby intersecting streets or use off-street parking space in the area. This alternative could be expected to eliminate all remaining traffic congestion along this segment of N. Green Bay Avenue.

The second alternative considered for the segment of N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road called for widening N. Green Bay Avenue to an urban cross-section consisting of a five-lane undivided urban roadway with a curb-to-curb pavement width of 64 feet within an 80-foot-wide right-of-way. Such widening would provide four lanes for moving traffic in addition to a center lane, which would be used as a continuous left-turn lane for both directions of traffic flow along N. Green Bay Avenue. A typical cross-section for this alternative is shown in Figure 108. On those segments of N. Green Bay Avenue where it would be necessary to acquire additional right-of-way, the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing right-of-way. Under the provisions of a 1926 zoned-width law, an effort has been made to reserve sufficient land adjacent to this segment of N. Green Bay Avenue for the provision of a 120-foot-wide right-of-way. Accordingly, considerable land has been reserved along the arterial to provide such a right-of-way during land subdivision and development and/or redevelopment. In order to maintain two through lanes of traffic in the direction of peak traffic flow during peak periods under this alternative, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening peak hours. Because of these restrictions, vehicles accessing businesses and residences which front N. Green Bay Avenue during periods of parking restriction would have to seek parking space along nearby intersecting streets or use off-street parking space in the area. Under this alternative, both structures along N. Green Bay Avenue which provide overpasses for the Chicago & North Western Railway would have to be reconstructed. This alternative could be expected to eliminate all remaining traffic congestion along this segment of N. Green Bay Avenue.

The third alternative considered for the segment of N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road involved widening N. Green Bay Avenue to a desirable urban cross-section. This alternative would entail the provision of dual 36-foot-wide urban roadways separated by a 24-foot landscaped median within a 120-foot-wide right-of-way. Such widening would provide four lanes for moving traffic in addition to parking lanes on N. Green Bay Avenue within the City of Glendale from W. Silver Spring Drive to W. Mill Road. A typical cross-section for this alternative is shown in Figure 108. Under this alternative, the provision of a 24-foot-wide median along N. Green Bay Avenue would permit the construction of any necessary left-turn lanes at median openings and would provide adequate separation of opposing traffic flows, thereby further increasing the level of service and safety on N. Green Bay Avenue. On those segments of N. Green Bay Avenue where it

Figure 108

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1, 2, AND 3 FOR THE SEGMENT OF N. GREEN BAY AVENUE (STH 57) FROM W. SILVER SPRING DRIVE TO W. MILL ROAD



Source: Wisconsin Department of Transportation and SEWRPC.

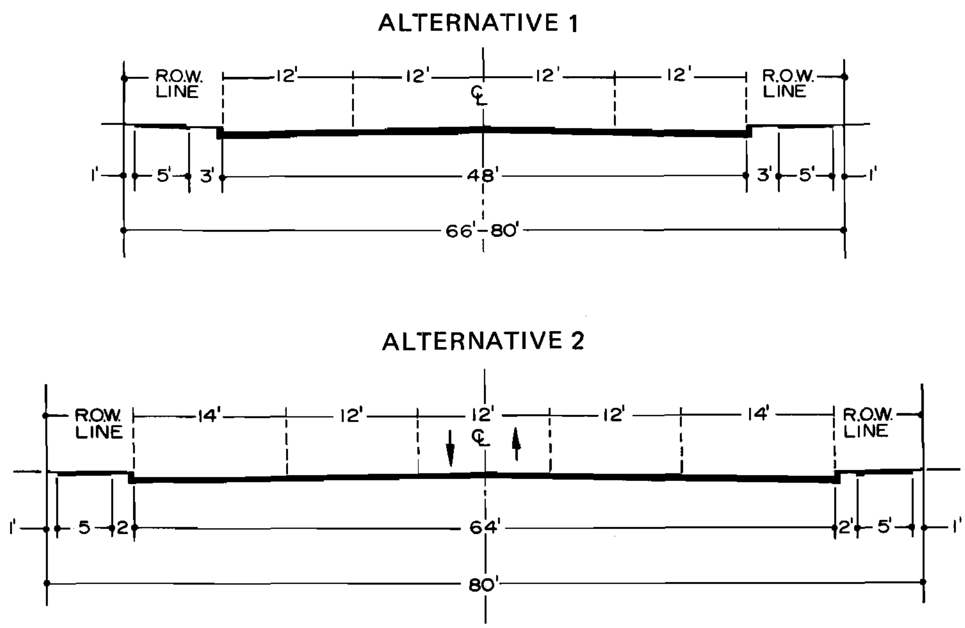
would be necessary to acquire additional right-of-way, the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing right-of-way from W. Silver Spring Drive to W. Mill Road. This alternative would also require the replacement of both Chicago & North Western Railway structures over this segment of the arterial. This alternative would eliminate all remaining traffic congestion along this segment of W. Green Bay Avenue.

The prohibition of all on-street parking along the urban cross-section of N. Green Bay Avenue from W. Silver Spring Drive to W. Mill Road was not considered to be a viable alternative for this segment because the existing curb-to-curb pavement width of 40 feet would not be adequate to safely provide four lanes for moving traffic.

The first alternative considered for the segment of N. Green Bay Avenue between W. Mill Road and N. Teutonia Avenue called for widening N. Green Bay Avenue to a minimum urban cross-section. This alternative would entail the provision of a four-lane undivided urban roadway with a curb-to-curb pavement width of 48 feet. Under this alternative, the right-of-way would be expanded to 80 feet to accommodate the addition of left-turn lanes at the intersections of N. Green Bay Avenue with

Figure 109

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2
FOR THE NORTHERN SEGMENT OF N. GREEN BAY AVENUE (STH 57)
FROM W. MILL ROAD TO N. TEUTONIA AVENUE



Source: Wisconsin Department of Transportation and SEWRPC.

W. Green Tree Road, N. Range Line Road, and W. Bradley Road. A typical cross-section for this alternative is shown in Figure 109. Since this segment of N. Green Bay Avenue is not anticipated to be congested, it would be necessary to provide only one through lane of traffic in each direction under this alternative. Consequently, on both sides of the arterial facility, on-street parking can be permitted along this segment. This alternative could be expected to provide the necessary highway system network continuity along this segment of N. Green Bay Avenue.

The second alternative considered for the segment of N. Green Bay Avenue between W. Mill Road and W. Teutonia Avenue called for widening N. Green Bay Avenue to an intermediate urban cross-section. This alternative would entail the provision of a five-lane undivided urban roadway with a curb-to-curb pavement width of 64 feet within an 80-foot-wide right-of-way. Such widening would provide for a center lane which would be used as a continuous left-turn lane for both directions of traffic flow along this segment of the N. Green Bay Avenue corridor. A typical cross-section for this alternative is shown in Figure 109. On those segments of N. Green Bay Avenue where it would be necessary to acquire additional right-of-way, the location for the widened right-of-way which would result in the least cost and disruption was determined to be centered on the existing right-of-way. Like the first alternative improvement considered for this segment, this alternative would be designed to provide roadway cross-section continuity rather than to provide additional capacity. Accordingly, it would be necessary to maintain only one through lane of traffic in each direction under this alternative, and on-street parking could be permitted on both sides of the facility.

As already indicated, the right-of-way width along the segment of N. Green Bay Avenue from W. Mill Road to N. Teutonia Avenue varies from 70 to 120 feet, and land adjacent to this segment of N. Green Bay Avenue has been reserved to provide for a 120-foot-wide right-of-way. Nevertheless, an alternative which would improve this segment of N. Green Bay Avenue to a desirable urban cross-section with dual 36-foot-wide urban roadway pairs and a median on a 120-foot-wide right-of-

Table 241

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. GREEN BAY AVENUE (STH 57) FROM W. CAPITOL DRIVE (STH 190) TO N. TEUTONIA AVENUE

Impact	Segment of N. Green Bay Avenue (STH 57) from W. Capitol Drive (STH 190) to W. Silver Spring Drive		Segment of N. Green Bay Avenue (STH 57) from W. Silver Spring Drive to W. Mill Road				Segment of N. Green Bay Avenue (STH 57) from W. Mill Road to N. Teutonia Avenue		
				Minimum Urban Cross-Section		Desirable Urban Cross-Section		Minimum Urban Cross-Section	
	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway with widened intersections)	Alternative 2 (64-foot-wide urban roadway with continuous left-turn lane)	Alternative 3 (36-foot-wide roadway pairs with median)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway with widened intersections)	Alternative 2 (64-foot-wide urban roadway with continuous left-turn lane)
Cost (in 1980 dollars)[a]									
Construction	$1,995,000	$2,001,000	$653,000	$1,519,000	$4,530,000	$6,172,000	$1,520,000	$3,496,000	$4,560,000
Real Estate Acquisition, Relocation, and Demolition	--	--	--	450,000	509,000	787,000	--	10,000	240,000
Maintenance	931,000	931,000	177,000	236,000	295,000	354,000	366,000	733,000	915,000
Total	$2,926,000	$2,932,000	$830,000	$2,205,000	$5,334,000	$7,313,000	$1,886,000	$4,239,000	$5,715,000
Disruption									
Residential Units Taken	--	--	--	--	1	3	--	--	--
Commercial Units Taken	--	--	--	2	2	2	--	--	1
Recreational Properties (value in 1980 dollars)	--	--	--	--	--	--	--	--	2 ($43,000)

[a]*Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sewers, sidewalks, and driveways; lighting costs; traffic signal costs; and utility relocation and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first years four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

way, adequate to provide two through lanes in each direction with parking permitted, was not considered. Because of the comparatively low traffic volumes anticipated along this segment of N. Green Bay Avenue, the additional roadway capacity which would be afforded by two through lanes in each direction was not considered warranted. Also, in order to obtain a continuous 120-foot-wide right-of-way along this segment of the arterial, it would be necessary to acquire significant segments of additional park and industrial land for highway purposes.

The impacts of each of the alternatives considered for each of the segments of N. Green Bay Avenue are set forth in Table 241. The impact of a "do nothing" alternative for each of these segments, under which the physical dimensions of the roadway surface would remain essentially unchanged, are also provided in Table 241. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along N. Green Bay Avenue between 1980 and 2000. Also under each of the alternative plans, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. In the case of N. Green Bay Avenue, it was recommended that the exclusive northwest- to westbound left-turn lane at the intersection of N. Green Bay Avenue and W. Hampton Avenue be reconstructed to a double left-turn lane. The cost of this improvement is accordingly included in the cost of each plan for the southern segment of N. Green Bay Avenue. While effective in abating the short-range problem at this intersection, this action was found to be ineffective as a means of resolving the long-range problem along this segment. It should be pointed out that implementation of the "do nothing" alternative would neither serve to abate any remaining congestion along the first and second segments of this north-south corridor, nor provide for continuity of roadway section along N. Green Bay Avenue from W. Capitol Drive to N. Teutonia Avenue.

The costs shown in Table 241 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 241 is the urban disruption which may be expected to be associated with each of the alternatives as measured by the number of residential or commercial properties and the quantities of recreational land required to be taken.

As shown in Table 241, the alternative which proposed prohibition of all on-street parking in the direction of peak traffic flow during the morning and evening peak hours on that segment of N. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue would have capital and maintenance costs of about $2,932,000, while the total cost of a "do nothing" alternative for this segment of N. Green Bay Avenue would be about $2,926,000, the additional costs representing the regulatory signing necessary to prohibit on-street parking. Neither of these alternatives would involve any urban disruption.

As shown in Table 241, of the alternatives proposed for the segment of N. Green Bay Avenue between W. Silver Spring Drive and W. Mill Road, the third widening alternative—which provides for the widening of N. Green Bay Avenue to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $7,313,000. The widening of N. Green Bay Avenue to an intermediate urban cross-section having a 64-foot-wide pavement and a continuous left-turn lane would involve capital and maintenance costs of about $5,334,000, while the widening of this segment of N. Green Bay Avenue to a minimum urban cross-section having a 48-foot-wide pavement with additional widening at principal intersections would involve capital and maintenance costs of about $2,205,000. The capital and maintenance costs of a "do nothing" alternative were estimated at $830,000. As also shown in Table 241, the alternative which provides for the widening of this segment of N. Green Bay Avenue to a desirable urban cross-section would be the most disruptive of the alternatives considered, requiring the taking of three residential units and two commercial units. Some disruption would also be entailed in implementing those two alternatives which provide for the improvement of this segment of N. Green Bay Avenue to minimum and intermediate urban cross-sections. Of these two alternatives, that which provides for improving the arterial facility to a 64-foot-wide pavement and a continuous left-turn lane would be the second most disruptive, requiring the taking of one residential and two commercial units; and that alternative which provides for the widening of this segment of N. Green Bay Avenue to a 48-foot-wide pavement with additional widenings at principal intersections along the arterial would require the taking of only two commercial units.

As shown in Table 241, of the alternatives proposed for the northern segment of N. Green Bay Avenue from W. Mill Road to N. Teutonia Avenue, that alternative which would provide for the widening of the arterial to an intermediate urban cross-section having a 64-foot-wide pavement and a continuous left-turn lane would have the highest capital and maintenance cost, estimated at $5,715,000, while the alternative which would provide for the widening of the arterial to a minimum urban cross-section having a 48-foot-wide pavement with additional widenings at principal intersections would have capital and maintenance costs of about $4,239,000. The capital and maintenance costs of the "do nothing" alternative are estimated at $1,886,000. As also indicated in Table 241, of the alternatives proposed for the northern segment of N. Green Bay Avenue, only that alternative which would provide for the widening of N. Green Bay Avenue to a 64-foot-wide pavement with a continuous left-turn lane would involve any disruption. This alternative would involve the taking of one commercial unit together with land from two parks, that land being valued at $43,000.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the widening alternatives considered for each of the segments of N. Green Bay Avenue. However, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative for each segment of N. Green Bay Avenue would be significant. Under the "do nothing" alternatives, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

For the southernmost segment of N. Green Bay Avenue from W. Capitol Drive to W. Silver Spring Drive through the City of Milwaukee, based upon the additional capacity afforded and congestion abated by the alternatives, the additional continuity afforded the arterial street and highway system by the alternatives, and the cost and environmental impacts of the two alternatives proposed for this segment, it is recommended that that alternative which provides for the prohibition of all on-street parking in the direction of peak traffic flow during both peak periods along that segment between W. Capitol Drive and W. Hampton Avenue be implemented. While such prohibition would mean that vehicles accessing businesses and residences along W. Green Bay Avenue between W. Capitol Drive and W. Hampton Avenue would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking makes this recommendation implementable. This action was also recommended because it would involve little additional capital and maintenance costs.

For the segment of N. Green Bay Avenue from W. Silver Spring Drive to W. Mill Road in the City of Glendale, it is recommended that the first widening alternative be implemented. This alternative would provide for the widening of this segment of N. Green Bay Avenue to a minimum urban cross-section having a 48-foot-wide pavement with sidewalks, with additional widening at principal intersections with parking prohibited during peak periods. All three widening alternatives for this segment of N. Green Bay Avenue would serve to eliminate the remaining traffic congestion along this north-south corridor, and additional benefits would be derived under the second alternative by the provision of the continuous left-turn lane, and under the third alternative by the provision of a median, which would offer increased travel safety and level of service. However, even though portions of the land adjacent to N. Green Bay Avenue have been reserved to provide for a 120-foot-wide right-of-way, the cost and disruption of both the second and third widening proposals, especially regarding the reconstruction of both of the Chicago & North Western Railway overpasses, would probably outweigh the additional benefits derived from each alternative. The benefits derived from the provision of on-street parking during peak periods along this segment, which would be provided only under the third widening alternative, would not be significant enough to outweigh the cost and disruption of that alternative.

For the third segment of N. Green Bay Avenue from W. Mill Road to N. Teutonia Avenue through the City of Glendale, the Village of Brown Deer, and the Village of River Hills, it is recommended that the first widening alternative be implemented—that is, the widening of N. Green Bay Avenue to a 48-foot-wide urban roadway with additional widening at principal intersections along the arterial and parking permitted during peak periods. While both of the minimum urban cross-section alternatives proposed for this segment of N. Green Bay Avenue would provide the necessary arterial street and highway system network continuity along this north-south corridor, the first alternative is recommended principally because it would involve less disruption and because it would provide a continuation of the type of roadway cross-section recommended along that segment of N. Green Bay Avenue immediately south of W. Mill Road.

<u>N. 107th Street (STH 100) Between W. Fond du Lac Avenue and W. Brown Deer Road (STH 100) and Related Segments of W. Fond du Lac Avenue:</u> To resolve the congestion which may be expected to remain in the plan design year in the north-south travel corridor along N. 107th Street, consideration was given to improving the segment of N. 107th Street from W. Fond du Lac Avenue to W. Brown Deer Road. STH 100 is routed on that part of this segment between W. Good Hope Road and W. Brown Deer Road. Also considered as a part of this segment was a 600-foot-long segment of W. Fond du Lac Avenue between its intersection with N. 107th Street and the southeast-bound on- and off-ramps to and from the Fond du Lac Freeway (STH 145). An increase in the number of traffic lanes provided on these arterial segments may be expected to abate the traffic congestion in this north-south travel corridor.

As in the consideration of the problem segments of W. Bradley Road, W. Good Hope Road, and N. 124th Street, a factor bearing on the consideration of alternative improvements for this north-south travel corridor was the proposed Trammell Crow development. As indicated previously, this development would result in increased traffic volumes on N. 107th Street, as well as increased truck traffic through residential development adjacent to N. 107th Street north of W. Calumet Road. As discussed previously, because of this, it is the desire of the City of Milwaukee to prohibit trucks from this segment of N. 107th Street, and, by designation of this segment of N. 107th Street from state trunk highway status, to route all truck traffic through this area onto STH 145. In order to accommodate the increased volume of traffic on N. 107th Street, changes in the current configuration of the interchange between the Zoo Freeway (USH 45), W. Good Hope Road, and the Fond du Lac Freeway (STH 145) have also been proposed—specifically, that the existing eastbound on-ramp from W. Good Hope Road to the Fond du Lac Freeway be closed and that the existing westbound off-ramp from the Fond du Lac Freeway to W. Good Hope Road be reconstructed to divert traffic into the proposed Trammell Crow project and then onto W. Good Hope Road. The proposed changes to these interchange ramps may be expected to affect access patterns to and from the Fond du Lac Freeway in that vicinity, and may be expected, in particular, to increase traffic volumes on the northwest-bound off-ramp from the Fond du Lac Freeway to N. 107th Street, and on the on- and off-ramps to and from the southeast-bound lanes of the freeway to W. Fond du Lac Avenue. Because of these expected changes in traffic volumes, it was necessary to consider the additional segment of W. Fond du Lac Avenue between its intersection with N. 107th Street and the southeast-bound ramps to and from the Fond du Lac Freeway in conjunction with the improvement alternatives proposed for N. 107th Street.

N. 107th Street from W. Fond du Lac Avenue to W. Good Hope Road currently has a rural cross-section with a 24-foot-wide pavement, adequate to provide for two lanes of traffic, except at its intersection with W. Fond du Lac Avenue, on that section of the arterial carried on a structure over the Fond du Lac Freeway, and at its intersection with W. Good Hope Road. At its intersection with W. Fond du Lac Avenue, N. 107th Street has a pavement width of 44 feet. This pavement width continues northward on the structure which carries N. 107th Street over the Fond du Lac Freeway. At its intersection with W. Good Hope Road, N. 107th Street is widened to an urban cross-section with a 48-foot-wide pavement curb to curb, with a right-turn bypass lane provided on the southbound approach. N. 107th Street from W. Good Hope Road to N. Granville Road consists of a rural roadway with a 30-foot-wide pavement, adequate to provide for two lanes of traffic, except on that segment of N. 107th Street between W. Good Hope Road and W. Juniper Street, which has a 30-foot-wide urban roadway with curbs and gutters. North of its intersection with N. Granville Road, N. 107th Street consists of dual 24-foot-wide urban roadways separated by an 18-foot-wide median; and the intersection of N. 107th Street with W. Brown Deer Road is channelized to provide for a left-turn lane and a right-turn bypass on the northbound approach. Between the ramps to and from the southeast-bound lanes of the Fond du Lac Freeway and N. 107th Street, W. Fond du Lac Avenue consists of a 24-foot-wide rural cross-section. N. 107th Street intersects the tracks of the Wisconsin & Southern Railroad Company and the Chicago & North Western Transportation Company at-grade immediately south of its intersection with W. Brown Deer Road. Curb parking is currently prohibited on all urban roadway segments along N. 107th Street.

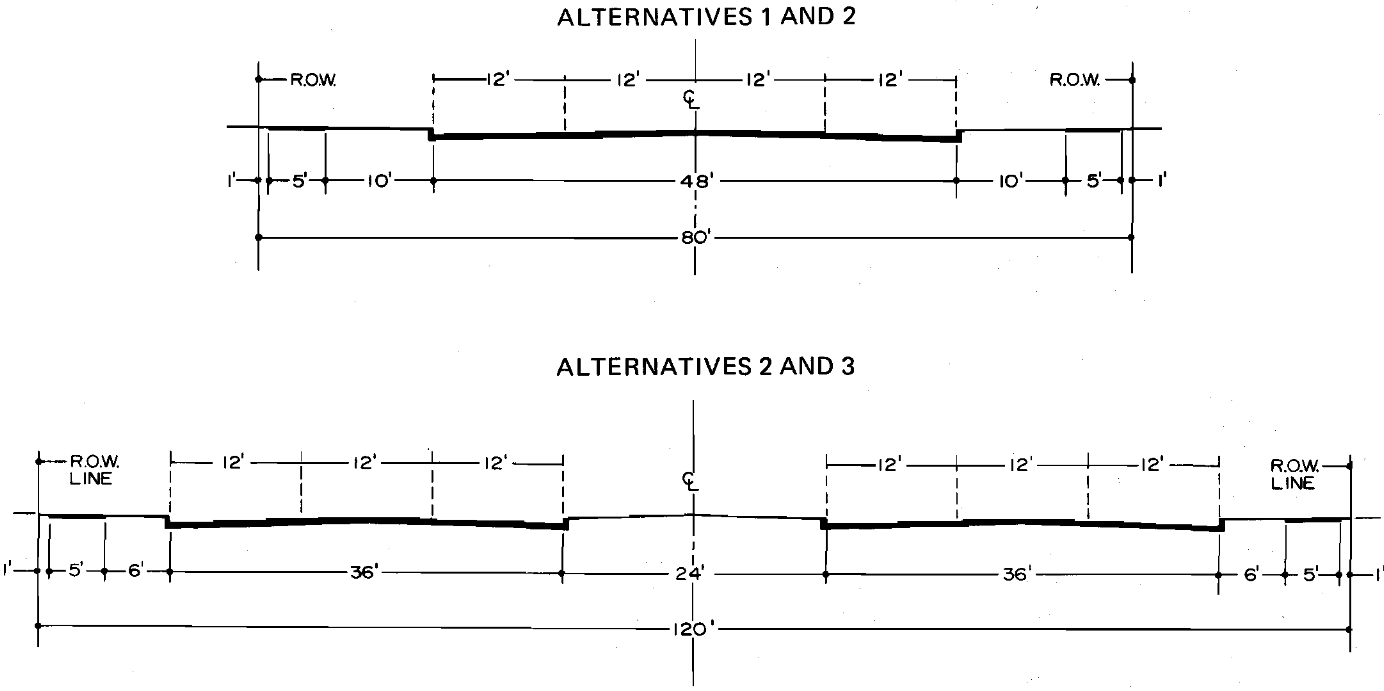
The cross-section for this portion of N. 107th Street has a right-of-way which is 66 feet wide between W. Fond du Lac Avenue and the structure over the Fond du Lac Freeway, and varies between 93 and 120 feet wide between that structure and W. Good Hope Road; is between 93 and 120 feet wide between W. Good Hope Road and W. Calumet Road; is 66 feet wide for a distance of 200 feet north of W. Calumet Road; is between 93 and 120 feet wide from a point 200 feet north of W. Calumet Road to a point 240 feet north of W. Fountain Avenue; is 58 to 69 feet wide from a point 240 feet north of W. Fountain Avenue to W. Bradley Road; is between 85 and 120 feet wide from W. Bradley Road to W. Heather Avenue; is between 50 and 93 feet wide from W. Heather Avenue to a point 150 feet north of the tracks of the Wisconsin & Southern Railroad Company; and is 130 feet wide from a point 150 feet north of the tracks of the Wisconsin & Southern railroad to W. Brown Deer Road. The right-of-way width along the segment of W. Fond du Lac Avenue varies from 93 feet at its intersection with N. 107th Street to 120 feet at its intersection with the on- and off-ramps to and from the Fond du Lac Freeway.

In the consideration of alternatives for these segments of W. Fond du Lac Avenue and N. 107th Street, a southern segment was considered separately from a northern segment. The southern segment is comprised of W. Fond du Lac Avenue between the ramps to and from the southeast-bound lanes of the Fond du Lac Freeway and N. 107th Street, and the segment of N. 107th Street from W. Fond du Lac Avenue to W. Good Hope Road. The northern segment is comprised of N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road. Three alternatives were considered for the improvement of the southern segment, and two alternatives were considered for the improvement of the northern segment. Separate improvement alternatives were developed for each of these two segments because of the differing land use and traffic flow characteristics adjacent to and associated with each.

The first alternative considered for the two arterial segments which constitute the southern segment called for widening these arterials to minimum urban cross-sections. This alternative would entail the provision of a four-lane, undivided urban roadway, with a curb-to-curb pavement width of 48 feet and sidewalks within an 80-foot-wide right-of-way except on that portion of N. 107th Street which is carried on the bridge over the Fond du Lac Freeway, which would have a pavement

Figure 110

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1, 2, AND 3 FOR THE SOUTHERN SEGMENT OF THE PROBLEM ARTERIAL REACH OF N. 107TH STREET AND W. FOND DU LAC AVENUE



Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

width of 44 feet. Under this alternative, the intersection of W. Fond du Lac Avenue with the ramps to and from the Fond du Lac Freeway and the intersection of N. 107th Street with W. Good Hope Road would be channelized. No channelization would be provided under this alternative at the intersection of N. 107th Street and W. Fond du Lac Avenue because of the proximity to the north of the structure over the Fond du Lac Freeway. A typical cross-section for this alternative is shown in Figure 110. This alternative would require the acquisition of seven-foot-wide strips of right-of-way along the north side of W. Fond du Lac Avenue; on both sides of the southbound N. 107th Street approach to W. Fond du Lac Avenue; and along the west side of N. 107th Street at its intersection with W. Good Hope Road.

In order to maintain two lanes of traffic in the direction of peak traffic flow during the peak travel periods, it would be necessary under this alternative to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening travel periods. Because of these restrictions, vehicles accessing any residences which front these segments of W. Fond du Lac Avenue or N. 107th Street during the period of parking restriction would have to use off-street space in the area. Assuming such on-street parking restrictions, such widening of these segments of W. Fond du Lac Avenue and N. 107th Street would permit four lanes of moving traffic along the entire length of this segment. An analysis of this segment revealed, however, that, even assuming such restriction of on-street parking during both peak periods, the segment of N. 107th Street north of the structure over the Fond du Lac Freeway to W. Good Hope Road would remain congested in the northbound direction during the evening peak period under this alternative.

The second alternative considered for the southern segment called for widening to urban cross-sections W. Fond du Lac Avenue between the on- and off-ramps to and from the southeast-bound lanes of the Fond du Lac Freeway and N. 107th Street, as well as N. 107th Street between its intersection with W. Fond du Lac Avenue and its intersection with the northwest-bound off-ramp from the Fond du Lac Freeway; and widening to a desirable urban cross-section N. 107th Street between its intersection with this northwest-bound off-ramp and W. Good Hope Road. This alternative would involve the provision of a four-lane, undivided roadway with a curb-to-curb pavement width of 48 feet and sidewalks within an 80-foot-wide right-of-way along the segment of W. Fond du Lac Avenue concerned, as well as along the segment of N. 107th Street between W. Fond du Lac Avenue and its intersection with the northwest-bound off-ramp from the Fond du Lac Freeway to N. 107th Street. This alternative would also involve the provision of dual 36-foot-wide urban roadways separated by a 24-foot-wide median and sidewalks within a 120-foot-wide right-of-way along N. 107th Street between its intersection with the northwest-bound off-ramp from the Fond du Lac Freeway and W. Good Hope Road. At a point approximately 175 feet north of the intersection of N. 107th Street with the northwest-bound off-ramp from the Fond du Lac Freeway, the desirable urban roadway cross-section would taper from dual 36-foot-wide pavements on a 120-foot-wide right-of-way to the 44-foot-wide urban roadway pavement carried on the bridge over the Fond du Lac Freeway. Under this alternative, right-turn and left-turn lanes would be provided as necessary at the intersection of W. Fond du Lac Avenue and the ramps to and from the southeast-bound lanes of the Fond du Lac Freeway, at the intersection of N. 107th Street with W. Good Hope Road, and at the intersection of N. 107th Street with the northwest-bound off-ramp from the Fond du Lac Freeway. A typical cross-section for this alternative is shown in Figure 110.

Under this alternative, the new roadway would be centered on the existing roadway. This alternative would require the acquisition of seven-foot-wide strips of new right-of-way in the vicinity of the intersection of N. 107th Street and W. Fond du Lac Avenue, as well as a strip of right-of-way varying in width from seven to 27 feet in the area north of the intersection of N. 107th Street with the northwest-bound off-ramp from the Fond du Lac Freeway. To utilize the existing rights-of-way while minimizing disruption to existing properties, the widened right-of-way would be acquired on the north side of W. Fond du Lac Avenue in the vicinity of the intersection of N. 107th Street and W. Fond du Lac Avenue; would be taken equally on both sides of N. 107th Street immediately north of its intersection with W. Fond du Lac Avenue; and would be taken from the west side of the arterial north of its intersection with the northwest-bound off-ramp from the Fond du Lac Freeway.

In order to maintain two lanes of traffic in the direction of peak flow during the peak travel periods, it would be necessary under this alternative to prohibit on-street parking in the direction of peak traffic flow during both the morning and the evening travel periods along those portions of this southern segment of the problem reach which would be widened to minimum urban roadway cross-sections. Parking could be permitted on the segment of N. 107th Street north of the northwest-bound freeway off-ramp to W. Good Hope Road. Because of these restrictions, vehicles accessing any residences which front the segments of W. Fond du Lac Avenue and N. 107th Street which would have on-street parking restrictions would have to use off-street space in the area during the periods of on-street parking prohibition. Assuming these on-street parking restrictions, such widening of these segments of W. Fond du Lac Avenue and N. 107th Street would permit four lanes of moving traffic along this entire segment, and could be expected to abate any remaining congestion in this portion of northwest Milwaukee County. Also, the provision of a median on a portion of this segment under this alternative would permit the adequate separation of opposing traffic flows, as well as provide room for refuge and deceleration lanes for left-turning vehicles at median openings, thereby increasing safety and level of service on the arterial.

The third alternative considered for the southern segment called for widening both W. Fond du Lac Avenue and N. 107th Street over the length of this segment to a desirable urban cross-section. This alternative would entail the provision of dual 36-foot-wide urban roadways, separated by a 24-foot-wide median and sidewalks within a 120-foot-wide right-of-way. Such widening would provide for four lanes of traffic and two parking lanes along the entire length of this segment. A typical cross-section for this alternative is shown in Figure 110. Under this alternative, turn-lane channelization would be provided at the intersection of W. Fond du Lac Avenue and the southeast-bound ramps to and from the Fond du Lac Freeway, at the intersection of N. 107th Street and W. Fond du Lac Avenue, at the intersection of N. 107th Street and W. Good Hope Road, and at the intersection of N. 107th Street with the northwest-bound off-ramp from the Fond du Lac Freeway.

The new roadway under this alternative would again be centered on the existing roadway. Under this alternative, it would be necessary to acquire an additional seven to 27 feet of right-of-way along

W. Fond du Lac Avenue, including its approaches to N. 107th Street; and to acquire between seven and 27 feet of additional right-of-way along N. 107th Street from W. Fond du Lac Avenue to W. Good Hope Road, except at the intersection of N. 107th Street and W. Fond du Lac Avenue, where it would be necessary to acquire an additional 54 feet of right-of-way. The locations for the additional right-of-way which would result in the least cost and disruption were determined to be along the north side of the segment of W. Fond du Lac Avenue; to be centered on the existing right-of-way of N. 107th Street at its intersection with W. Fond du Lac Avenue; and to be the west side of N. 107th Street between W. Fond du Lac Avenue and W. Good Hope Road. Such widening would provide four lanes for moving traffic in addition to two parking lanes along the southern segment of the W. Fond du Lac Avenue and N. 107th Street problem reach, with the exception of on that segment of the arterial which is carried on the bridge over the W. Fond du Lac Freeway. Under this alternative, the bridge would be reconstructed as a dual structure, with each structure carrying two lanes of moving traffic, a refuge lane, and a sidewalk. This alternative could also be expected to eliminate all remaining congestion along this southern segment. Also, the provision of a median on this segment would permit the adequate separation of opposing traffic flows under this alternative, as well as provide room for refuge and deceleration lanes for left-turning vehicles at median openings, thereby further increasing safety and level of service on the arterial.

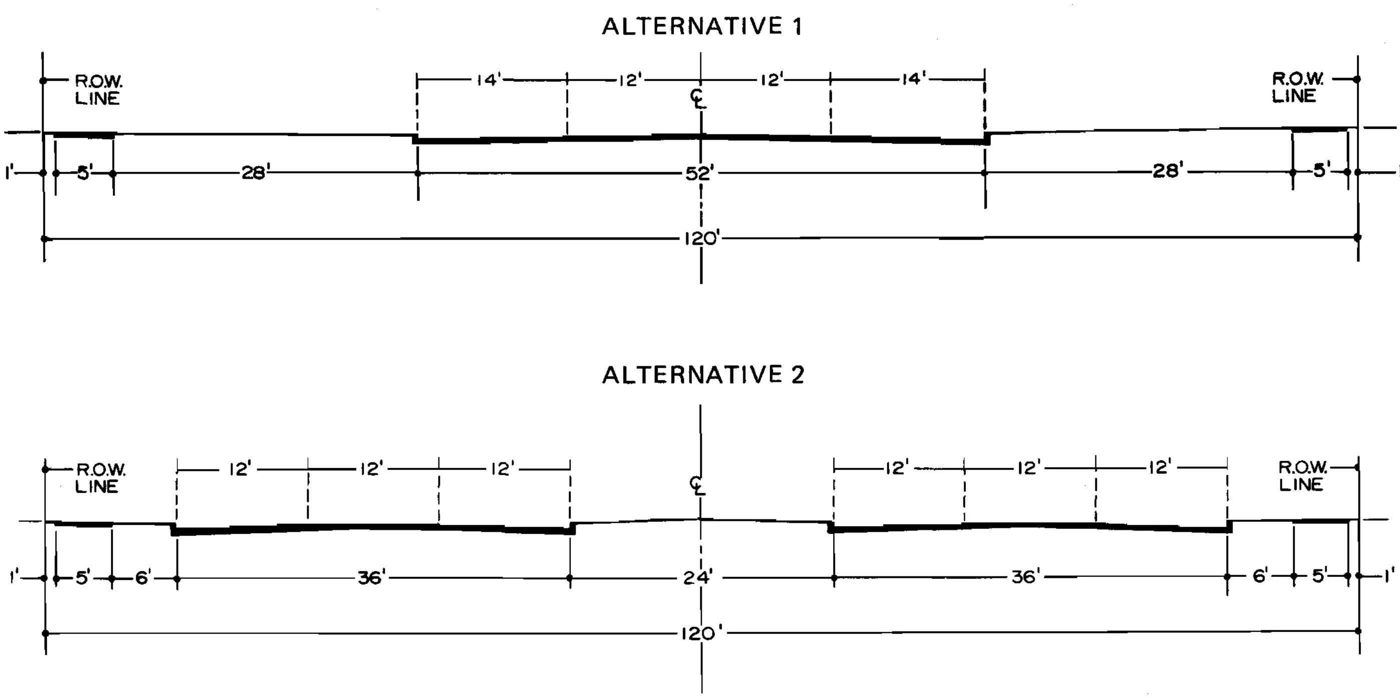
Two alternatives were developed for increasing the capacity of N. 107th Street between W. Good Hope Road and W. Brown Deer Road. The first alternative considered would widen this segment to a minimum urban cross-section consisting of a four-lane, undivided roadway with sidewalks having a curb-to-curb pavement width of 52 feet within a 120-foot-wide right-of-way. Under this alternative, right-turn and left-turn lanes could be provided as necessary within the right-of-way at the intersections with W. Calumet Road and W. Bradley Road, and the existing widening of the intersection with W. Good Hope Road and W. Brown Deer Road could be retained. Under this alternative, N. 107th Street would be channelized north of its intersection with W. Good Hope Road to provide for dual 36-foot-wide roadways divided by a 24-foot-wide median, with the added provision of any necessary left- and right-turn lanes. This channelization would be extended northward for a distance of approximately one-quarter mile in order to accommodate anticipated traffic flow from a proposed driveway entrance to the Trammell Crow development, located to the northwest of the intersection of N. 107th Street and W. Good Hope Road. A typical cross-section for this alternative is shown in Figure 111. Under this alternative, the at-grade crossings of the Wisconsin & Southern Railroad Company and Chicago & North Western Transportation Company tracks would be provided with crossing protection gates.

The new roadway would be centered on the existing roadway under this alternative. The segment of N. 107th Street (STH 100) from W. Good Hope Road to W. Brown Deer Road has a building setback adequate to provide 120 feet of right-of-way. As such, much of the required right-of-way has been reserved during the land subdivision and development process. Therefore, under this alternative, the Wisconsin Department of Transportation currently proposes to acquire the full 120-foot-wide right-of-way from W. Good Hope Road to W. Brown Deer Road. In order to provide this right-of-way width, it would be necessary to acquire only an additional 15 to 20 feet of right-of-way along much of this segment of N. 107th Street. However, it would be necessary to acquire an additional 54 feet of right-of-way along a short segment of N. 107th Street north of W. Calumet Road, an additional 62 feet of right-of-way between W. Fountain Avenue and W. Bradley Road, and between 54 and 70 feet of additional right-of-way along that segment of N. 107th Street which traverses the residential and commercial area south of its intersection with W. Granville Road. The location for the additional right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline along the entire segment. If the additional parcels required to provide the full 120-foot-wide right-of-way were not taken and an 80-foot-wide right-of-way, adequate to accommodate this roadway cross-section, were utilized instead, right-of-way costs would be reduced from an estimated $691,000 to minimal costs, and no structures would be taken.

In order to maintain two lanes of traffic in the direction of peak flow during the peak travel periods, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and the evening travel periods along the length of this segment. Because of these

Figure 111

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 1 AND 2 FOR THE NORTHERN SEGMENT OF THE PROBLEM ARTERIAL REACH OF N. 107TH STREET (STH 100) FROM W. GOOD HOPE ROAD TO W. BROWN DEER ROAD (STH 100)



Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

restrictions, vehicles accessing any businesses or residences which front this segment of N. 107th Street during the periods of parking restriction would have to use off-street space in the area. This alternative may be expected to abate all remaining traffic congestion on this segment of N. 107th Street.

The second alternative considered for the improvement of this segment of N. 107th Street called for widening the arterial to a desirable urban cross-section with sidewalks. This alternative would entail the provision of dual 36-foot-wide urban roadways separated by a 24-foot-wide landscaped median within a 120-foot-wide right-of-way. Such widening would provide for four lanes of traffic in addition to two parking lanes. A typical cross-section for this alternative is shown in Figure 111. Under this alternative, turn-lane channelization would be provided at the intersections of N. 107th Street with W. Good Hope Road, W. Calumet Road, and W. Bradley Road, and would be retained at the intersection of N. 107th Street with W. Brown Deer Road. Necessary channelization could also be provided at the proposed driveway entrance to the Trammell Crow development. The at-grade crossings of N. 107th Street with the Wisconsin & Southern Railroad Company and the Chicago & North Western Transportation Company tracks would be provided with crossing protection gates.

This alternative would have the same right-of-way requirements as the first alternative. The provision of a 24-foot-wide median along N. 107th Street under this alternative would permit the provision of left-turn lanes, as necessary, at median openings and would provide adequate separation of opposing traffic flows, thereby increasing the level of service and safety provided by the arterial. This alternative may be expected to abate all remaining traffic congestion along this segment of N. 107th Street.

The impacts of each of the two alternatives considered for improving the southern and northern segments of N. 107th Street and W. Fond du Lac Avenue are summarized in Table 242. The impact of a "do nothing" alternative, under which the

Table 242

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 107TH STREET AND RELATED SEGMENTS OF W. FOND DU LAC AVENUE FROM W. FOND DU LAC AVENUE TO W. BROWN DEER ROAD (STH 100)

Impact	Southern Segment of Arterial Problem Reach: W. Fond du Lac Avenue and N. 107th Street; Fond du Lac Freeway Interchange to W. Good Hope Road				Northern Segment of Arterial Problem Reach: N. 107th Street from W. Good Hope Road to W. Brown Deer Road		
	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (48-foot-wide and dual 36-foot-wide urban roadways)	Alternative 3 (36-foot-wide urban roadways)	"Do Nothing" Alternative	Alternative 1 (52-foot-wide urban roadway)	Alternative 2 (36-foot-wide urban roadways)
Cost (in 1980 dollars)[a]							
Construction	$136,000	$610,000	$700,000	$2,650,000	$488,000	$2,747,000	$3,649,000
Real Estate Acquisition, Relocation, and Demolition	- -	11,000	34,000	84,000	- -	691,000	691,000
Maintenance	88,000	134,000	159,000	223,000	310,000	620,000	930,000
Total	$224,000	$755,000	$893,000	$2,957,000	$798,000	$4,058,000	$5,270,000
Disruption							
Residential Units Taken	- -	- -	- -	- -	- -	1	1
Commercial Units Taken	- -	- -	- -	- -	- -	2	2
Transportation, Communication, and Utility Structures Taken	- -	- -	- -	- -	- -	1	1

[a] *Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sewers, sidewalks, driveways, traffic signals, and lighting; and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

physical dimensions of the existing roadway surface would remain essentially unchanged, are also provided in Table 242. Under the "do nothing" alternative, only summer and winter maintenance and two major resurfacings would be accomplished along the arterial over the next two decades. Under each of the alternative plans, any traffic management actions considered for N. 107th Street under the short-range plan for the northwest side study area which would not be precluded by the physical dimensions of the improvement, and which were not accounted for under the long-range improvement alternatives for any other arterial segment, were assumed to have been implemented. In the case of N. 107th Street, the reconstruction of the existing west- to southbound left-turn lane to a double lane at the intersection of N. 107th Street and W. Brown Deer Road was recommended, at an estimated capital cost of $20,000. The cost of this action is accordingly included in the cost of each plan for the northern segment. This action, while effective in the short term, was found to be ineffective in abating the long-range problems along this segment. Implementation of the "do nothing" alternative would not serve to abate the probable future traffic congestion along either the southern or the northern segment.

The costs shown in Table 242 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the right-of-way acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 242 is the urban disruption which may be expected to be associated with each of the alternatives, as measured by the number of structures and properties required to be taken.

As shown in Table 242, of the alternatives considered for the southern segment of this problem arterial reach the third improvement alternative—the widening of this entire segment to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $2,957,000. The second widening alternative—the improvement of the segment of W. Fond du Lac Avenue, as well as the segment of N. 107th Street between W. Fond du Lac Avenue and the northwest-bound off-ramp from the Fond du Lac Freeway, to a minimum urban cross-section, and the improvement of the segment of N. 107th Street from the northwest-bound off-ramp from the Fond du Lac Freeway to W. Good Hope Road—would have a capital and maintenance cost of about $893,000. The first widening alternative for the southern segment, which would provide for the widening of the entire segment to a minimum urban cross-section, would have capital and maintenance costs of about $755,000. The capital and maintenance costs of the "do nothing" alternative were estimated at $224,000. No disruption would be incurred under any of the alternatives considered for the southern segment.

As shown in Table 242, of the alternatives proposed for the northern segment, the second improvement alternative—the widening of N. 107th Street to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $5,270,000. The first widening alternative—the improvement of N. 107th Street to a minimum urban cross-section—would have capital and maintenance costs of about $4,058,000. The capital and maintenance costs of the "do nothing" alternative for this segment were estimated at $798,000. While no disruption would be incurred under the "do nothing" alternative, one residential structure, two commercial units, and one transportation, communication, and/or utility-related structure would need to be acquired under both the first and second widening alternatives.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the widening alternatives considered for each segment. However, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative for each of these segments may be expected to be significant. In each case under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions.

As previously noted, an important factor to be considered in the recommendation of improvement plans for the northern and southern segments of N. 107th Street and W. Fond du Lac Avenue is the proposed Trammell Crow development northwest of the intersection of W. Good Hope Road and N. 107th Street. The Wisconsin Department of Transportation is concerned that the high volume of traffic expected to be generated by this development would adversely impact those arterials which would provide ingress to and egress from the proposed development, including particularly N. 107th Street and W. Good Hope Road. In order to accommodate this anticipated increase in traffic, it was recommended by the Department that consideration be given to improving N. 107th Street. In particular, it was recommended by the Department that the segment of N. 107th Street north of its intersection with W. Good Hope Road be widened to provide a minimum of four traffic lanes, separated by a median, in order to serve, in effect, as a major driveway access from N. 107th Street to the proposed development. As also previously noted, changes in the geometrics of the freeway interchange between the Zoo Freeway (USH 45) and the Fond du Lac Freeway (STH 145), proposed to be made in conjunction with this new project, will have important implications for the southeast-bound off- and on-ramps between the Fond du Lac Freeway and W. Fond du Lac Avenue and the northwest-bound off-ramp between the freeway and N. 107th Street.

Based on the additional capacity afforded and future congestion abated by each alternative, and the cost and environmental impacts of each alternative, it is recommended that the second widening alternative considered for the southern segment of the W. Fond du Lac Avenue and N. 107th Street problem arterial reach be implemented—that is, the provision of a minimum urban cross-section with on-street parking prohibited during peak periods along the segment of W. Fond du Lac Avenue from the on- and off-ramps to and from the southeast-bound lanes of the Fond du Lac Freeway to N. 107th Street, and along the segment of N. 107th Street between W. Fond du Lac Avenue and the northwest-bound off-ramp from the Fond du Lac Freeway; and the provision of dual 36-foot-wide urban roadways separated by a median with on-street parking permitted along the segment of N. 107th Street between the northwest-bound off-ramp from the Fond du Lac Freeway to W. Good Hope Road. While both the second and the third widening alternatives proposed for this southern segment may be expected to abate remaining traffic congestion along this segment, and to provide adequate roadway cross-sections to accommodate the anticipated increase in traffic flow, the second alternative was recommended principally because it does not require the reconstruction of the overpass structure on N. 107th Street over the Fond du Lac Freeway, and thereby has comparatively less capital and maintenance cost.

For the northern segment of N. 107th Street from W. Good Hope Road to W. Brown Deer Road, based upon the additional capacity afforded and future congestion abated by each alternative, and the costs and environmental impacts of each alternative, it is recommended that the first widening alternative be implemented—that is, the provision of a four-lane undivided urban roadway having a curb-to-curb pavement width of 52 feet, with on-street parking prohibited during the peak periods. This alternative would provide for additional channelization at the intersections of N. 107th Street with W. Calumet Road and W. Bradley Road, extended channelization at W. Good Hope Road, and the retention of the existing channelization at W. Brown Deer Road. While both the first and the second widening alternatives proposed for this segment may be expected to abate anticipated traffic congestion, the first widening alternative is recommended because it would serve and accommodate the traffic anticipated to be generated by the proposed Trammell Crow industrial and commercial development, and would, by means of the extended channelized intersection of N. 107th Street and W. Good Hope Road, provide continuity with the roadway cross-section recommended for the southern segment of N. 107th Street and W. Fond du Lac Avenue at comparatively less cost than would the second widening alternative proposed for this segment.

The proposed improvement of N. 107th Street was considered at an interagency staff meeting held on April 23, 1982, and attended by representatives of the Wisconsin Department of Transportation, the Regional Planning Commission, and the City of Milwaukee Departments of City Development and Public Works. It was the consensus of the agencies concerned that, although the staff-recommended improvement to a 52-foot-wide roadway would provide adequate capacity on that segment of N. 107th Street between W. Good Hope Road and W. Greenwood Terrace in the design year, the 52-foot-wide roadway should be considered the minimum section to be provided, and the specific roadway cross-section should be reconsidered at the time of implementation by the implementing agency. A final determination with respect to the cross-section to be provided should be made at that time on the basis of whether the provision of on-street parking during peak periods, as well as the improved safety characteristics and enhanced aesthetics which would be provided by the construction of dual 36-foot-wide urban roadways separated by a 24-foot-wide median within a 120-foot-wide right-of-way along the entire length of the segment of N. 107th Street from W. Good Hope Road to W. Brown Deer Road, would warrant the additional construction cost. Such determination would also be made in view of the types and probable interaction of adjacent land uses along this segment of N. 107th Street in the design year, as well as the characteristics of marginal access control to be afforded these land uses.

<u>N. 76th Street and Wauwatosa Avenue and Related Segments of Harmonee Avenue and W. Harwood Avenue—STH 181—from W. Glenview Avenue to W. Brown Deer Road (STH 100):</u> To resolve the congestion which may be expected to remain in the plan design year in the north-south travel corridor along the routing of STH 181 through central Milwaukee County, consideration was given to improving the four arterial street segments which comprise the routing of STH 181 through this corridor—namely, the segments of W. Harwood Avenue, Harmonee Avenue, and Wauwatosa Avenue in the City of Wauwatosa, and the segment of N. 76th Street in the City of Milwaukee from Glenview Avenue to W. Brown Deer Road. An increase in the number of traffic lanes provided on these arterial segments may be expected to abate the remaining traffic congestion in this north-south travel corridor.

From Glenview Avenue to Harmonee Avenue in the central business district of the City of Wauwatosa, W. Harwood Avenue has an urban cross-section with curb and gutters and sidewalks. This segment has a 44-foot-wide pavement curb-to-curb within a 66-foot-wide right-of-way, adequate to provide for one traffic lane in each direction with parking permitted. From W. Harwood Avenue to Wauwatosa Avenue, Harmonee Avenue also has an urban cross-section with curbs and gutters and sidewalks. This arterial segment, constructed in 1981, has a 48-foot-wide pavement curb-to-curb, and is comprised, in part, of a bridge over the tracks of the Chicago, Milwaukee, St. Paul & Pacific Railroad Company and the Menomonee River. This segment is adequate to provide for two traffic lanes in each direction with parking prohibited. Except at its intersection with W. North Avenue, the segment of Wauwatosa Avenue between Harmonee Avenue and W. North Avenue has an urban cross-section with curbs and gutters and sidewalks, and has a pavement which ranges in width from 34 to 36 feet curb-to-curb, adequate to safely provide only one traffic lane in each direction, even with parking prohibited. Immediately south of its intersection with W. North Avenue for a distance of about 200 feet, Wauwatosa Avenue consists of dual 34-foot-wide roadways separated by a 12-foot-wide median, adequate to provide for two traffic lanes in each direction with parking permitted. Except at its intersections with W. North Avenue and W. Center Street, the segment of Wauwatosa Avenue between W. North Avenue and W. Center Street also has an urban cross-section with curbs and gutters and sidewalks. The pavement width along this segment is 52 feet from curb-to-curb, adequate to provide for two traffic lanes in each direction with parking prohibited. Immediately north of its intersection with W. North Avenue for a distance of about 250 feet and immediately south of its intersection with W. Center Street for a distance of about 200 feet, Wauwatosa Avenue consists of dual 34-foot-wide pavements separated by a 14-foot-wide median. The right-of-way width along these segments of W. Harwood Avenue, Harmonee Avenue, and Wauwatosa Avenue in the City of Wauwatosa is 66 feet except at the intersections of Wauwatosa Avenue with W. North Avenue and W. Center Street, where the right-of-way expands to 120 feet to accommodate the median-divided dual pavements. From W. Center Street to W. Brown Deer Road (STH 100), N. 76th Street—the extension of Wauwatosa Avenue—has a desirable urban cross-section with curbs and gutters and sidewalks. With the exception of one 300-foot-long segment of the northbound roadway, this segment of N. 76th Street consists of dual 34- to 36-foot-wide roadways separated by a median which varies in width from 18 to 24 feet, adequate to provide two lanes for moving traffic in each direction with parking permitted. On the 300-foot-long segment of the northbound roadway of N. 76th Street between the on and off-ramps to and from the Fond du Lac Freeway (STH 145) westbound, the pavement is only 28 feet wide, adequate to provide only two lanes for moving traffic with parking prohibited. The right-of-way along the segment of N. 76th Street from W. Center Street to W. Brown Deer Road is 120 feet wide.

Along these segments of STH 181, parking is currently permitted on W. Harwood Avenue from Glenview Avenue to Harmonee Avenue; is prohibited on Harmonee Avenue from W. Harwood Avenue to the Menomonee River Parkway; is permitted on Harmonee Avenue between the Menomonee River Parkway and Wauwatosa Avenue; is prohibited on Wauwatosa Avenue between Harmonee Avenue and W. North Avenue; is permitted on Wauwatosa Avenue between W. North Avenue and W. Center Street; and is permitted on N. 76th Street between W. Center Street and W. Brown Deer Road, except on the structures which carry N. 76th Street over STH 145 and W. Silver Spring Drive, along the segment of N. 76th Street from W. Mill Road to W. Acacia Street, on the structures which carry N. 76th Street over the tracks of the Chicago & North Western Transportation Company between W. Florist Avenue and W. Mill Road, and on the structure which carries N. 76th Street over W. Brown Deer Road.[6]

As noted previously, Harmonee Avenue passes over the tracks of the Milwaukee Road Railroad and the Menomonee River on a single structure; and N. 76th Street passes over STH 145, W. Silver Spring Drive, and the tracks of the Chicago & North Western Railroad Company on structures, and passes under the tracks of the Wisconsin & Southern Railroad Company immediately south of its intersection with W. Good Hope Road.

Separate roadway improvement alternatives were designed for each of the four segments of this north-south corridor because of the variation in cross-section between the segments and the varying land uses adjacent to each segment. The first segment considered is comprised of the segments of W. Harwood Avenue and Harmonee Avenue between Glenview Avenue and Wauwatosa Avenue; the second segment consists of Wauwatosa Avenue from Harmonee Avenue to W. North Avenue; the third segment consists of Wauwatosa Avenue from W. North Avenue to W. Center Street; and the fourth segment consists of N. 76th Street from W. Center Street to W. Brown Deer Road. Only one improvement alternative was considered for each of these segments. The removal of on-street parking was considered for three of these segments, and widening the roadway to a minimum urban

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[6] *The on-street parking restrictions indicated above reflect base year inventories conducted by the Wisconsin Department of Transportation. Current parking restrictions prohibit on-street parking during both peak periods on the segment of W. Harwood Avenue between Glenview Avenue and Harmonee Avenue and on the segment of Harmonee Avenue between the Menomonee River Parkway and Wauwatosa Avenue.*

cross-section was considered for the improvement of the other segment. Thus, a separate recommended improvement alternative was selected for each of these segments.

Only one alternative—the prohibition of on-street parking—was considered for the segments of W. Harwood and Harmonee Avenues between Glenview Avenue and Wauwatosa Avenue. This alternative would entail the prohibition of all on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along that segment of W. Harwood Avenue between Glenview Avenue and its intersection with Harmonee Avenue, and along that segment of Harmonee Avenue between the Menomonee River Parkway and Wauwatosa Avenue. Such parking prohibition may be politically sensitive and may be difficult to implement based on local opposition because it would mean that vehicles accessing commercial and residential land uses along these segments of W. Harwood Avenue and Harmonee Avenue would have to seek parking space on nearby intersecting streets or use off-street parking in the area. These segments of W. Harwood Avenue and Harmonee Avenue traverse the central business district of the City of Wauwatosa, and the development adjacent to the arterial therefore consists principally of commercial land uses interspersed with residential land uses. The prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods where it exists along this segment, as an alternative for alleviating the remaining traffic congestion along this segment, is considered implementable because parking space is available on nearby intersecting streets and in off-street locations. Such prohibition of on-street parking may be expected to eliminate all remaining traffic congestion along the entire segment of W. Harwood and Harmonee Avenues between Glenview Avenue and Wauwatosa Avenue, as four traffic lanes are already provided on Harmonee Avenue between W. Harwood Avenue and the Menomonee River Parkway through the prohibition of on-street parking.

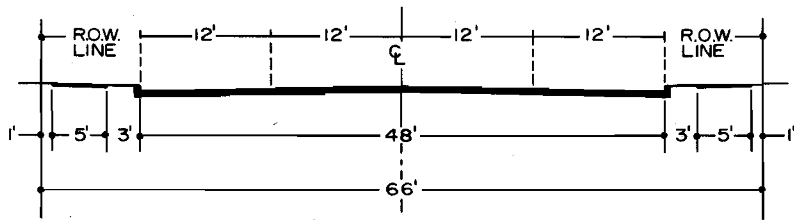
One improvement alternative was considered for the segment of Wauwatosa Avenue between Harmonee Avenue and W. North Avenue. This alternative called for widening this segment of Wauwatosa Avenue to a minimum urban cross-section with sidewalks, and would entail the provision of a four-lane, undivided roadway with a curb-to-curb pavement width of 48 feet within the existing right-of-way. A typical cross-section for this alternative is shown in Figure 112. In order to maintain two traffic lanes in the peak direction during peak periods under this alternative, it would be necessary to prohibit on-street parking in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing businesses and residences which front this segment of Wauwatosa Avenue during the periods of restriction would have to seek parking space on nearby intersecting streets or use off-street parking space in the area. This alternative could be expected to eliminate any remaining traffic congestion along this segment of Wauwatosa Avenue.

The widening of the segment of Wauwatosa Avenue between Harmonee Avenue and W. North Avenue to provide for a six-lane, median-divided desirable urban cross-section was not considered because a minimum urban roadway cross-section with peak-period parking prohibited would be adequate to abate the remaining traffic congestion along this segment, and because the widening proposals advanced in the past for this segment of Wauwatosa Avenue have met with strong public opposition. Residents along Wauwatosa Avenue historically have been strongly opposed to widening proposals for any portion of Wauwatosa Avenue, particularly proposals for widening the segment of Wauwatosa Avenue from Harmonee Avenue to W. North Avenue. Maintenance of the restrictive pavement width on this arterial to constrain increases in traffic volumes, of the closely abutting adjacent land uses—including historic residential and institutional structures, and of the remaining large trees in the curb lawns is perceived necessary by residents to the maintenance of the historic "village" character of the area.

A plan for widening this segment of Wauwatosa Avenue to a desirable urban roadway cross-section, with dual 36-foot-wide pavements and a 26-foot-wide median within a 120-foot-wide right-of-way, was proposed by the Wisconsin Department of Transportation in 1962; and a plan for widening this segment to a divided urban roadway cross-section with dual 26-foot-wide pavements and a four-foot-wide mountable median within an 80-foot-wide right-of-way was proposed by the City of Wauwatosa in 1969. Both of these proposals were rejected by the City of Wauwatosa Common Council. Moreover, the second proposal did not meet minimum roadway design standards of the Wisconsin Department of Transportation. Widening this segment of Wauwatosa Avenue to a minimum urban cross-section with a curb-to-curb pavement width of 48 feet within the existing

Figure 112

TYPICAL CROSS-SECTION OF IMPROVEMENT ALTERNATIVE FOR WAUWATOSA AVENUE (STH 181) FROM HARMONEE AVENUE TO W. NORTH AVENUE



Source: Wisconsin Department of Transportation and SEWRPC.

right-of-way, as proposed herein as an alternative, had been proposed by the Wisconsin Department of Transportation in 1970 as an alternative minimum roadway cross-section which could accommodate existing and projected traffic volumes for the arterial. This proposal was defeated in a public referendum held in 1971.

The prohibition of on-street parking was also the only alternative considered for the segment of Wauwatosa Avenue between W. North Avenue and W. Center Street. This alternative would entail the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods. Such parking prohibition may be politically sensitive and may be difficult to implement based on local opposition because it would mean that vehicles accessing commercial and residential land uses along this segment of Wauwatosa Avenue would have to seek parking space on nearby intersecting streets or use off-street parking space in the area.

The existing development along Wauwatosa Avenue between W. North Avenue and W. Center Street consists principally of residential land use interspersed with residential and institutional land uses. The prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along this segment, as an alternative for alleviating remaining traffic congestion, is considered implementable because of the availability of alternative parking space on nearby intersecting streets and in off-street locations.

The widening of the segment of Wauwatosa Avenue between W. North Avenue and W. Center Street to provide a desirable urban cross-section with two traffic lanes and a parking lane in each direction was not considered. The residents of the City of Wauwatosa have strongly opposed further widening of this segment of Wauwatosa Avenue. Such widening could entail disruption of a cemetery as well as several residential and commercial units. The reconstruction of this segment of Wauwatosa Avenue to a minimum urban cross-section with a pavement width of 52 feet curb-to-curb in 1951 was accordingly deemed a widening to the maximum urban roadway cross-section implementable along this segment of Wauwatosa Avenue.

The prohibition of on-street parking was also the only alternative considered for the segment of N. 76th Street between W. Center Street and W. Brown Deer Road. This alternative would entail the prohibition of on-street parking in both directions of traffic flow during the peak periods only along that congested segment of N. 76th Street between W. Capitol Drive and W. Brown Deer Road. On-street parking would need to be prohibited in both directions of traffic flow under this alternative, as the traffic volumes on N. 76th Street are very evenly balanced during the peak periods in the north- and southbound directions. Such parking prohibition may be politically sensitive and may be difficult to implement based on local opposition because it would mean that vehicles accessing commercial and residential land uses along N. 76th Street between W. Capitol Drive and W. Brown Deer Road would have to seek parking space on nearby intersecting streets or use off-street parking space in the area. The existing development along N. 76th Street between W. Capitol Drive and W. Brown Deer Road consists principally of commercial land uses interspersed with residential land uses. The prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along this segment of N. 76th Street, as an alternative for alleviating remaining traffic congestion along this segment, is considered implementable because parking space is available in off-street locations. It would not be necessary to prohibit on-street parking between W. North Avenue and W. Capitol Drive under this alternative because the analyses indicated that an increase in roadway capacity is not required along this segment. By prohibiting all on-street parking during both peak periods under this alternative, three through lanes of traffic could be maintained in each direction during the morning and evening peak periods along N. 76th Street between W. Capitol Drive and W. Brown Deer Road, except along a 300-foot-long segment of the northbound lanes of N. 76th Street between the on- and off-ramps to and from the Fond du Lac Freeway. Under this alternative, the existing outside curbline of N. 76th Street along this segment would have to be reconstructed to provide an additional eight feet of pavement. This reconstruction, in conjunction with the prohibition of on-street parking, may be expected to eliminate all remaining traffic congestion along this segment of the arterial.

The widening of N. 76th Street between W. Capitol Drive and W. Brown Deer Road to provide for three traffic lanes and a parking lane in each direction was not considered. The roadway is already widened to a desirable urban cross-section, and any further widening would jeopardize safe pedestrian movement and result in excessive neighborhood disruption.

The impacts of each of the alternatives considered for each of the four segments of STH 181 are set forth in Table 243. The impact of a "do nothing" alternative for each of these segments, under which the physical dimensions of the roadway surface would remain essentially unchanged, is also provided in Table 243. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings

Table 243

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 76TH STREET (STH 181) FROM GLENVIEW AVENUE TO W. BROWN DEER ROAD (STH 100)

Impact	Segment of W. Harwood Avenue and Harmonee Avenue from Glenview Avenue to Wauwatosa Avenue: "Do Nothing" Alternative	Segment of W. Harwood Avenue and Harmonee Avenue from Glenview Avenue to Wauwatosa Avenue: Alternative 1 (on-street parking prohibition)	Segment of Wauwatosa Avenue from Harmonee Avenue to W. North Avenue: "Do Nothing" Alternative	Segment of Wauwatosa Avenue from Harmonee Avenue to W. North Avenue: Alternative 1 (48-foot-wide urban roadway)	Segment of Wauwatosa Avenue from W. North Avenue to W. Center Street: "Do Nothing" Alternative	Segment of Wauwatosa Avenue from W. North Avenue to W. Center Street: Alternative 1 (on-street parking prohibition)	Segment of N. 76th Street from W. Center Street to W. Brown Deer Road: "Do Nothing" Alternative	Segment of N. 76th Street from W. Center Street to W. Brown Deer Road: Alternative 1 (on-street parking prohibition)
Cost (in 1980 dollars)[a]								
Construction	$ 71,000	$ 72,000	$233,000	$ 867,000	$350,000	$351,000	$ 7,411,000	$ 7,417,000
Real Estate Acquisition, Relocation, and Demolition	--	--	--	--	--	--	--	--
Maintenance	96,000	96,000	168,000	215,000	354,000	354,000	$ 3,446,000	$ 3,446,000
Total	$167,000	$168,000	$401,000	$1,082,000	$704,000	$705,000	$10,857,000	$10,863,000
Disruption								
Residential Units Taken	--	--	--	--	--	--	--	--
Commercial Units Taken	--	--	--	--	--	--	--	--

[a] *Construction costs for each alternative include estimates of the roadway construction costs, including the cost of sidewalks and driveways; utility relocation costs; and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation, City of Wauwatosa, and SEWRPC.

would be accomplished along the arterial segments between 1980 and 2000. Two resurfacings would also be accomplished during the design period under those alternatives which recommend the prohibition of all on-street parking.

Under each of the alternative plans, any traffic management actions considered for the arterial segments under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions, and which were not accounted for under the long-range improvement plans for any other arterial segment, were assumed to have been implemented. In the case of these segments, it was recommended that the exclusive left-turn lanes on the north- and southbound approaches to the intersection of Wauwatosa Avenue and W. North Avenue be lengthened; that parking be prohibited on two approaches to the intersection with W. Capitol Drive; that a signal phase be added; that the existing south-to southeast-bound single left-turn lane be expanded to a double left-turn lane; that the existing north-to-northwest-bound left-turn lane be lengthened at the intersection with W. Appleton Avenue; that a signal phase be added at the intersection with W. Fond du Lac Avenue; that a signal phase in addition to a new traffic controller be added at the intersection with W. Silver Spring Drive; that a new signal phase be added at the intersection with W. Mill Road; that a new signal phase be added at the intersection with W. Acacia Street, and that a median opening be reconstructed at that intersection; and that a new signal phase and traffic controller be added at the intersection with W. Bradley Road. The cost of these improvements, approximately $115,000, is accordingly included in the cost of each plan for the appropriate segments of this arterial problem reach. Capital costs associated with the recommended traffic management actions at the intersection of N. 76th Street and W. Good Hope Road were not included in the capital costs of improvement of this segment of N. 76th Street. These costs were accounted for in the capital costs of improvements to the segment of W. Good Hope Road from the Waukesha/ Milwaukee County line to N. 76th Street. While effective in abating the short-range problems along Wauwatosa Avenue and N. 76th Street, these actions were found to be ineffective as a means of resolving the long-range problems along this arterial. It should be pointed out that implementation of the "do nothing" alternative for each segment would not serve to abate the remaining congestion along these arterials.

The costs shown in Table 243 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative for each segment over the plan design period.

As shown in Table 243, the alternative which proposes the prohibition of all on-street parking in the direction of peak traffic flow during the morning and evening peak hours on that segment comprised of W. Harwood Avenue and Harmonee Avenue between Glenview Avenue and Wauwatosa Avenue would have capital and maintenance costs of about $168,000, while the total cost for the "do nothing" alternative for this segment would be about $167,000, the additional costs representing the costs of the regulatory signing necessary to prohibit on-street parking. Neither of these alternatives would involve any urban disruption.

As also shown in Table 243, of the alternatives proposed for the segment of Wauwatosa Avenue between Harmonee Avenue and W. North Avenue, the first alternative—which provides for the widening of Wauwatosa Avenue to a minimum urban cross-section—would have the highest capital and maintenance costs, estimated at $1,082,000, compared with an estimated capital and maintenance cost of $401,000 for the "do nothing" alternative for this segment. Neither of these alternatives would involve any urban disruption.

As shown in Table 243, of the alternatives proposed for the segment of Wauwatosa Avenue between W. North Avenue and W. Center Street, Alternative 1—which provides for the prohibition of all on-street parking in the direction of peak traffic flow during the morning and evening peak hours—would have capital and maintenance costs of about $705,000, compared with estimated capital and maintenance costs of $704,000 for the "do nothing" alternative, the additional costs again representing the costs of the regulatory signing necessary to prohibit on-street parking. Neither of these alternatives would involve any urban disruption.

As also shown in Table 243, Alternative 1 for the segment of N. 76th Street between W. Center Street and W. Brown Deer Road—which proposes the prohibition of all on-street parking in the direction of peak traffic flow during the morning and evening peak hours on a portion of this segment, in addition to the reconstruction of a 300-foot-long segment of the outside curbline of the northbound lanes of N. 76th Street—would have capital and maintenance costs of about $10,863,000, while the "do nothing" alternative for this segment of N. 76th Street would have capital and maintenance costs of about $10,857,000, the additional costs representing the regulatory signing necessary to prohibit on-street parking along the portion of this arterial segment from W. Capitol Drive to W. Brown Deer Road, as well as the necessary curbline reconstruction along this segment. Neither of these alternatives would involve any urban disruption.

The environmental impacts of the improvement alternatives and the "do nothing" alternative for each segment in terms of air quality and noise levels may be expected to be significantly different. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions along each segment.

For the segment of STH 181 which consists of W. Harwood Avenue and Harmonee Avenue from Glenview Avenue to Wauwatosa Avenue through the central business district of the City of Wauwatosa, based on the additional capacity afforded and congestion abated by each alternative, and the cost and environmental impacts of the alternatives proposed for this segment, it is recommended that Alternative 1 be implemented—that is, the prohibition of on-street parking where it exists along these arterials in the direction of peak traffic flow during both peak periods. While such prohibition would mean that vehicles accessing businesses and residences along segments of W. Harwood Avenue and Harmonee Avenue would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking should make this recommendation implementable. This action was also recommended because it would involve little capital costs.

For the segment of Wauwatosa Avenue from Harmonee Avenue to W. North Avenue, it is also recommended that Alternative 1 be implemented. This alternative would provide for a minimum urban cross-section, having a 48-foot-wide pavement with sidewalks. Parking would have to be prohibited during the peak periods. This alternative was recommended because it was the only alternative that would serve to abate the congestion along this segment of Wauwatosa Avenue, and because it could be implemented within the existing right-of-way with minimal urban disruption.

For the segment of Wauwatosa Avenue from W. North Avenue to W. Center Street, it is further recommended that Alternative 1 be implemented—that is, the prohibition of on-street parking in the direction of peak traffic flow during both peak periods along this entire segment. Such prohibition would mean that vehicles accessing businesses and residences along Wauwatosa Avenue between W. North Avenue and W. Center Street would have to seek parking space on nearby intersecting streets or use off-street parking space in the area. However, the availability of such parking should make this recommendation implementable. This action is also recommended because it would require little additional capital and maintenance costs.

Finally, for the segment of N. 76th Street from W. Center Street to W. Brown Deer Road, it is recommended that Alternative 1 be implemented—that is, the prohibition of on-street parking in the direction of peak traffic flow during both peak periods along N. 76th Street between W. Capitol Drive and W. Brown Deer Road, as well as the reconstruction of a 300-foot-long segment of the northbound lanes on N. 76th Street. While such prohibition would mean that vehicles accessing businesses and residences along N. 76th Street between W. Capitol Drive and W. Brown Deer Road would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such alternative parking should make this recommendation implementable. This action was also recommended because it would involve little capital costs.

The recommended prohibition of all on-street parking in the direction of peak traffic flow along the portion of this segment of N. 76th Street between W. Capitol Drive and W. Brown Deer Road is consistent with recommendations made for N. 76th Street by the Wisconsin Department of Transportation as part of a special prototype traffic management plan for the abatement of problems between signalized intersections, the findings of which are presented in Chapter V of this report. In this analysis, it was recommended that on-street parking be prohibited along N. 76th Street from W. Grantosa Drive to W. Bradley Road.

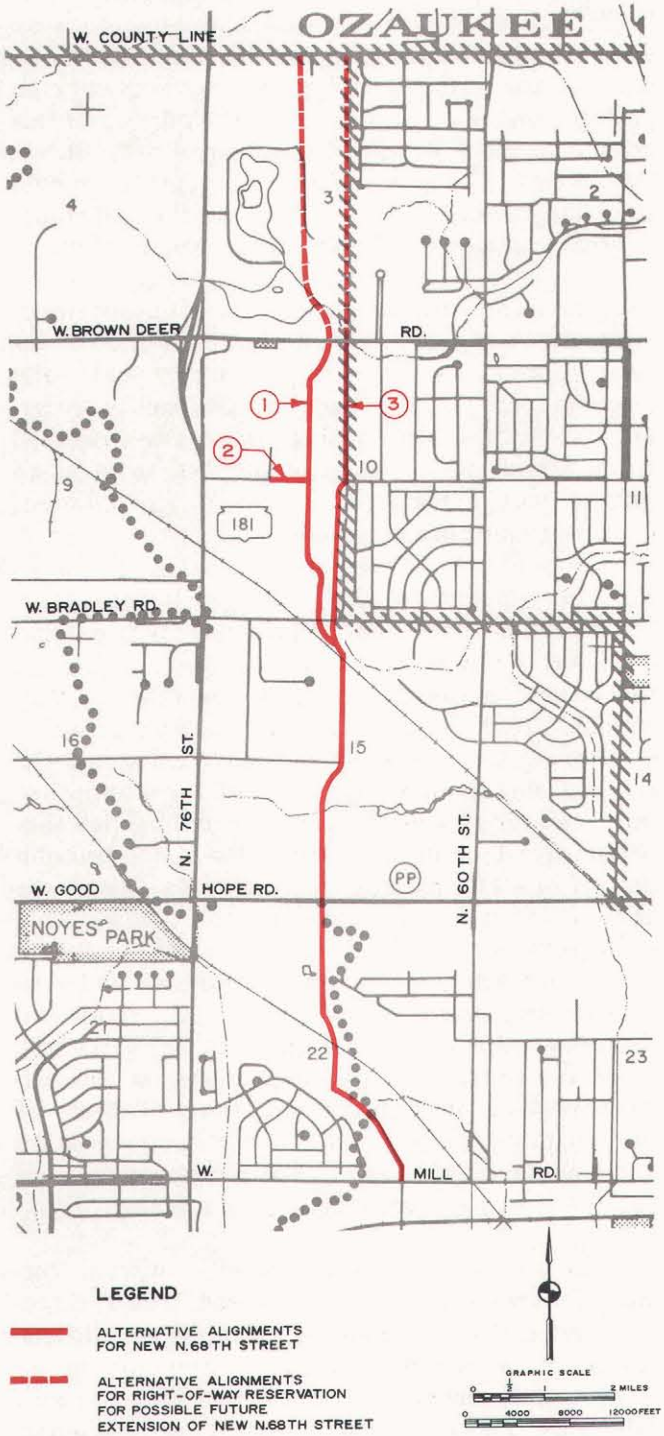
A New N. 68th Street from W. Mill Road to W. Brown Deer Road: To help alleviate the anticipated congestion and the current and anticipated traffic flow problems along N. 76th Street from about W. Florist Avenue to W. Brown Deer Road, consideration was given to the development of a new arterial roadway which would be located approximately equidistant between, and parallel to, the existing N. 76th Street and N. 60th Street arterials between W. Mill Road and W. Brown Deer Road. This facility would provide adequate transportation services to existing and proposed industrial development in the City of Milwaukee industrial land bank, as well as to existing and proposed commercial and residential development within this section of northwest Milwaukee County. In addition, such a new facility would provide arterial street and highway system continuity, and a desirable arterial street spacing in this section of Milwaukee County. It was determined that the corridor along N. 68th Street extended should be used for this new facility in order to utilize available open land areas in this section of northwest Milwaukee County the most efficiently.

Three alternative alignments were considered for the location of this new segment of N. 68th Street within the corridor. Each of the alignments followed a common location from W. Mill Road to the right-of-way of the Chicago & North Western Transportation Company south of W. Bradley Road, with different locations north of that right-of-way. The alternative alignments considered are shown on Map 230.

Between W. Mill Road and the right-of-way of the Chicago & North Western Transportation Company, all of the alignments would utilize N. Industrial Road from its intersection with W. Mill Road at N. 64th Street to about N. 67th Street extended. Between that intersection and the intersection with the right-of-way of the Wisconsin & Southern Railroad Company, the new arterial would be located along the east side of the existing Wisconsin Electric Power Company (WEPCo) transmission line easement, and would utilize the eastern 10 feet of that easement. The tracks of the Wisconsin & Southern Railroad Company would be crossed at-grade, and the new arterial would then swing to the western side of the WEPCo transmission line easement, utilizing the western 10 feet of the easement to W. Calumet Road. At its intersection with W. Calumet Road, the new roadway would again swing to the east side of the WEPCo easement, utilizing the eastern 10 feet of the easement from W. Calumet Road to its intersection with the right-of-way of the Chicago & North Western Transportation Company south of W. Bradley Road. It would cross the railroad right-of-way at-grade and would then again cross to the west side of the WEPCo transmission line easement, in order to avoid the taking of a nursing home.

Map 230

ALTERNATIVE ALIGNMENTS FOR NEW N. 68TH STREET BETWEEN W. MILL ROAD AND W. BROWN DEER ROAD



This map shows the three alternative alignments considered in the study for a proposed new N. 68th Street from W. Mill Road to W. Brown Deer Road. As shown on this map, all three alternative alignments would have a common location from W. Mill Road to W. Bradley Road. As also shown on this map, north of W. Bradley Road, Alternative Alignment 1 would follow a location along approximately N. 70th Street extended from N. Industrial Drive to W. Brown Deer Road; Alternative Alignment 2 would follow a location along N. 70th Street extended, but only to its intersection with an extended W. Dean Road, at which point the new facility would veer west to intersect with N. 76th Street; and Alternative Alignment 3 would follow a location along the existing and extended N. 68th Street to W. Brown Deer Road. This map also shows two possible alternative alignments considered in the study for right-of-way reservation for a possible future extension of proposed new 68th Street north of W. Brown Deer Road to W. County Line Road.

Source: City of Milwaukee and SEWRPC.

Under the first alternative alignment considered, north of the at-grade crossing of the Chicago & North Western Transportation Company right-of-way the new arterial would be located parallel to the railroad tracks for a short distance, and then swing northerly to intersect W. Bradley Road at about N. 70th Street extended. The new arterial would then continue northerly along N. 70th Street extended through vacant land held by the City of Milwaukee for industrial development, land reserved for street purposes, and vacant land zoned for residential and commercial development. About two blocks south of W. Brown Deer Road, the new roadway would swing to the east and intersect W. Brown Deer Road at about N. 69th Street extended. Under this alternative, W. Dean Road would be extended eastward to intersect the new N. 68th Street roadway, and would be utilized as a truck route between the new N. 68th Street and N. 76th Street.

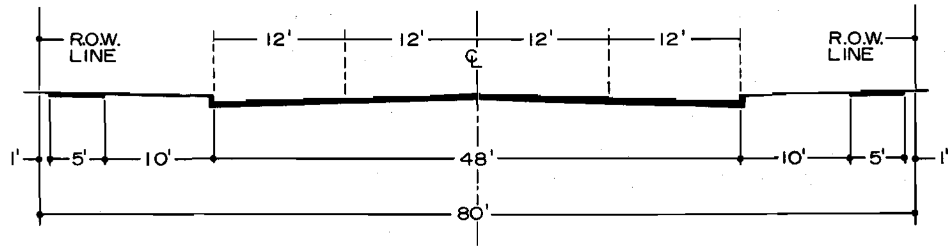
The location proposed for this first alternative alignment would provide a continuous north-south arterial, about three miles in length, between W. Mill Road and W. Brown Deer Road. This would provide a framework for the development of the largely vacant land between W. Bradley Road and W. Brown Deer Road, as well as additional arterial capacity. The new arterial, in conjunction with W. Dean Road, could be expected to reduce truck traffic on N. 76th Street, traffic anticipated to be generated by proposed industrial development within the City of Milwaukee industrial land bank lands lying between W. Mill Road and W. Bradley Road and by the Parkland industrial area, located adjacent to the intersection of N. 68th Street and W. Bradley Road. In addition, this alternative routing would most readily facilitate the extension of a north-south arterial north of W. Brown Deer Road along an existing segment of N. 70th Street, and along N. 70th Street extended to W. County Line Road, to serve existing and planned residential development in the Northridge Lakes development and in the southern portion of Ozaukee County. Presently, the segment of N. 70th Street north of W. Brown Deer Road has a minimum urban cross-section with a 48-foot-wide pavement curb-to-curb, adequate to provide for two through traffic lanes and two parking lanes. The right-of-way width along this segment is 70 feet. The existing roadway is curvilinear, and serves principally as the access road to new and proposed residential development in the area. The extension of N. 70th Street as a north-south arterial north of W. Brown Deer Road under this alternative routing would require the relocation of a short segment of the street to the east, whereby its intersection with W. Brown Deer Road would be moved from its present location west of a small shopping center to a new location east of the shopping center. A short segment of N. 70th Street immediately north of W. Brown Deer Road would be vacated. No structures would need to be acquired under such an extension.

Two minimum urban cross-sections were considered for a new arterial located along this first alternative alignment. The first, hereafter referred to as Alternative 1a, would consist of a four-lane, undivided roadway with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way. The second Alternative 1b, would consist of a four-lane with parking lanes, undivided roadway with a curb-to-curb pavement width of 60 feet within a 90-foot-wide right-of-way. The segment of N. Industrial Road between W. Mill Road and the new N. 68th Street currently consists of a rural cross-section with a 48-foot-wide pavement between pavement edges within a 100-foot-wide right-of-way. Under the third alternative long-range plan, it is assumed that this segment of N. Industrial Road will be converted from a rural to an urban cross-section with a 48-foot-wide pavement curb-to-curb. Under either of these alternative cross-sections, W. Dean Road extended would consist of a 48-foot-wide roadway curb-to-curb within a 90-foot-wide right-of-way to match the existing cross-section of W. Dean Road. The proposed 80- and 90-foot-wide rights-of-way for the new facility would permit the provision of left- and right-turn channelization at the intersections of the proposed facility with W. Good Hope Road, W. Bradley Road, and W. Brown Deer Road. Under both of these alternatives, the at-grade crossings of both the Wisconsin & Southern and the Chicago & North Western Transportation Company railway tracks would be provided with rubberized crossings and crossing protection gates, flashers, and bells; a new culvert would be constructed over an existing water hazard at Brynwood Country Club; and a power transmission tower in the vicinity of the Chicago & North Western Railway right-of-way and W. Bradley Road would be relocated. Typical cross-sections for these alternatives are shown in Figure 113. It would not be necessary to prohibit on-street parking during peak travel periods along the route under either of these alternatives. Both alternatives may be expected to help alleviate the remaining traffic congestion and the heavy truck traffic along N. 76th Street between W. Florist Avenue and W. Brown Deer Road, and

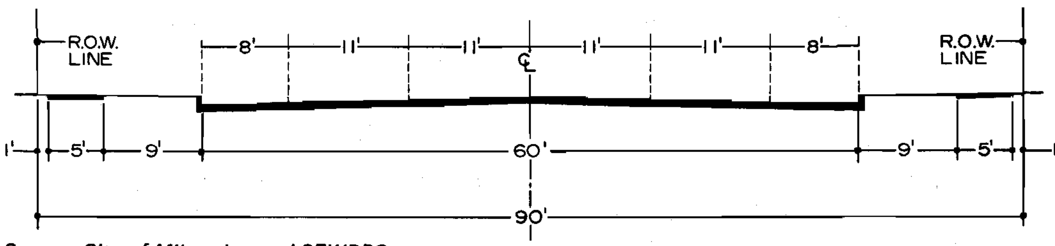
Figure 113

TYPICAL CROSS-SECTIONS OF IMPROVEMENT AND EXPANSION ALTERNATIVES
FOR N. 68TH STREET BETWEEN W. MILL ROAD AND W. BROWN DEER ROAD
ALTERNATIVE ALIGNMENTS 1 AND 2

ALTERNATIVES 1A AND 2A



ALTERNATIVES 1B AND 2B



Source: City of Milwaukee and SEWRPC.

would provide a high level of accessibility for planned development in this north-south corridor. The eventual extension of a north-south arterial north of W. Brown Deer Road to W. County Line Road under either of these alternatives would require the acquisition of from 10 to 20 feet of additional right-of-way along the existing segment of N. 70th Street, depending on the roadway cross-section selected, as the existing right-of-way width along N. 70th Street is 70 feet.

Under the second alternative alignment considered, the new arterial would continue parallel to the railroad tracks for a short distance north of its at-grade crossing of the tracks of the Chicago & North Western Transportation Company and then swing northerly to intersect W. Bradley Road at approximately N. 70th Street extended. The new arterial would then continue northward along N. 70th Street extended to W. Dean Road extended, and then would follow W. Dean Road and W. Dean Road extended between N. 76th Street and the new north-south roadway.

Two cross-sections were also considered for an arterial facility located along this alignment. The first, Alternative 2a, would entail the provision of a new four-lane, undivided roadway with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way. The second, Alternative 2b, would entail the provision of a new four-lane, undivided roadway with a curb-to-curb width of 60 feet within a 90-foot-wide right-of-way on the segment between N. Industrial Road and W. Dean Road. N. Industrial Road would be utilized as it currently exists. Under both alternatives, a 48-foot-wide minimum urban cross-section on a 90-foot-wide right-of-way would be provided to match construction on the existing segment of W. Dean Road. Also under both alternatives, adequate right-of-way would be available to provide left- and right-turn channelization at the intersections of N. 68th Street with W. Good Hope Road and W. Bradley Road. Under this alternative, at-grade railroad crossings with the Wisconsin & Southern Railroad and the Chicago & North Western Railway would be provided with rubberized crossings and crossing protection flashers, gates, and bells; a new culvert bridge would be constructed over an existing water hazard at Brynwood Country Club north of W. Good Hope Road; and a power transmission tower in the vicinity of the Chicago & North Western Railway right-of-way and W. Bradley Road would be replaced. A typical cross-section for this alternative is shown in Figure 113. On-street parking could be permitted during the peak travel periods under these alternatives along N. Industrial Road, the new N. 68th Street, and W. Dean Road.

Both of the alternative cross-sections considered under this second alternative alignment would provide a high level of accessibility to the industrial development proposed for the City of Milwaukee land bank lands, and could serve to reduce truck traffic on N. 76th Street as under the first alternative. Terminating the facility at W. Dean Road would, however, reduce the effectiveness of this route in establishing an additional north-south travel corridor for existing and future residential development to the north in the vicinity of the Northridge Lakes development and in southern Ozaukee County. This alternative alignment, included for consideration at the request of the City of Milwaukee Department of City Development, would preclude truck traffic from penetrating planned residential development located between W. Dean Road and W. Brown Deer on N. 68th Street extended and on N. 70th Street extended.

Under the third alternative considered, the new arterial would be extended northerly from the intersection of the new arterial with the Chicago & North Western Railway right-of-way, bordering the west side of the Wisconsin Electric Power Company easement to W. Dean Road and utilizing the western 10 feet of that easement. Between W. Dean Road and W. Brown Deer Road, the new roadway would be partially located over land reserved for street right-of-way adjacent to a segment of N. 68th Street which is partially in the City of Milwaukee and partially in the Village of Brown Deer. Construction of an arterial roadway over this alignment between W. Dean Road and W. Brown Deer Road would require the provision of a divided urban roadway cross-section in order to accommodate existing WEPCo transmission towers within the median area.

Two combinations of alternative cross-sections were considered for this third alternative alignment. The first combination, or Alternative 3a, would utilize a four-lane, undivided urban cross-section with a curb-to-curb pavement width of 48 feet within an 80-foot-wide right-of-way from N. Industrial Road to W. Dean Road; and dual 28-foot-wide urban roadways separated by a 30-foot-wide median on a 110-foot-wide right-of-way from W. Dean Road to W. Brown Deer Road.

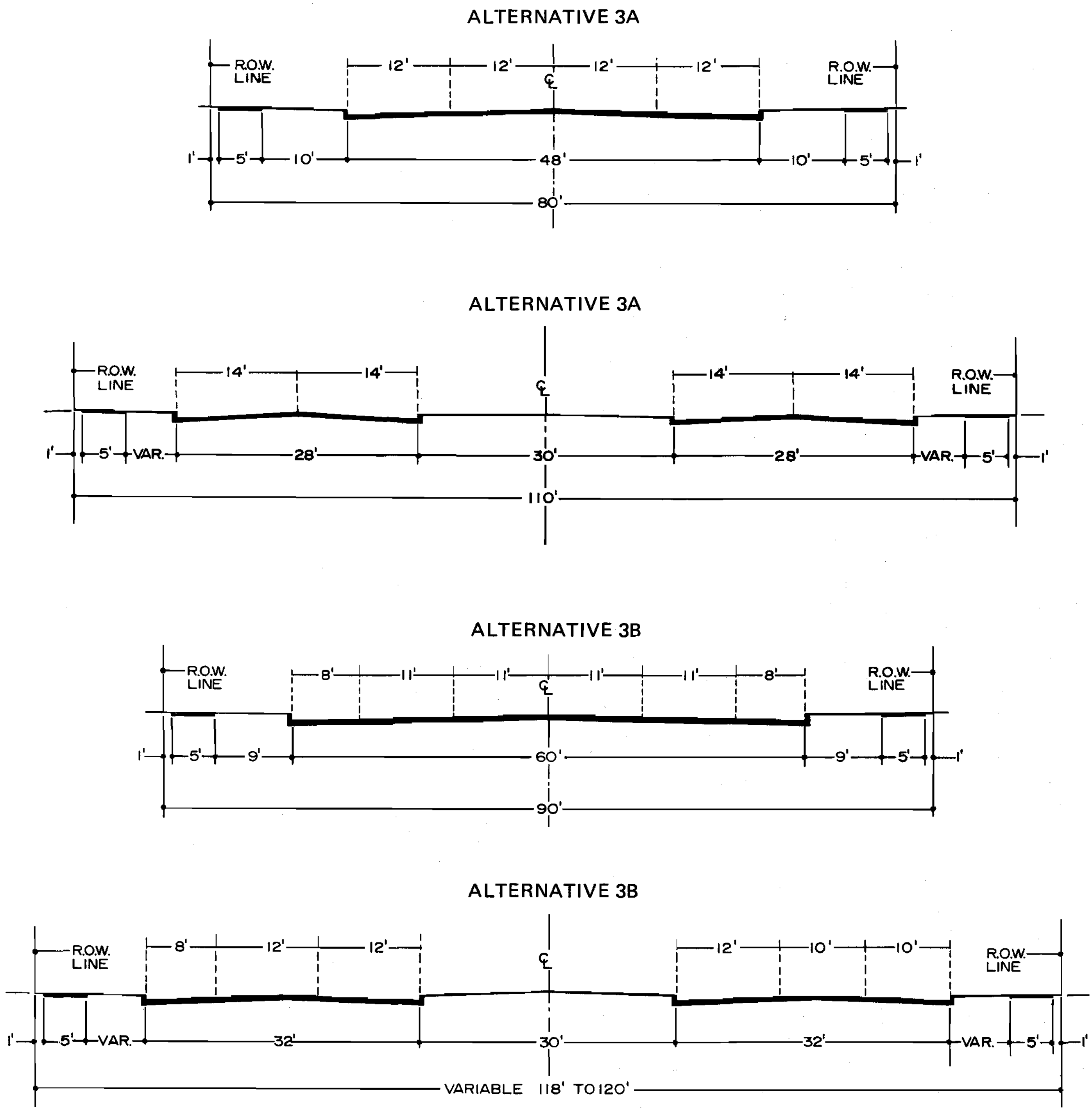
The second combination of alternative cross-sections considered, or Alternative 3b, would utilize a four-lane with parking lanes, undivided roadway with a curb-to-curb pavement width of 60 feet within a 90-foot-wide right-of-way between N. Industrial Road and W. Dean Road, and a divided urban roadway cross-section consisting of dual 32-foot-wide pavements separated by a 30-foot-wide median within a right-of-way varying from 118 to 120 feet wide from W. Dean Road to W. Brown Deer Road.

Under each of the roadway cross-sections considered for this third alternative alignment, the existing segment of N. Industrial Road between W. Mill Road and the new arterial would be utilized, and an existing segment of N. 68th Street between W. Dean Road and W. Brown Deer Road would be widened as necessary. Left- and/or right-turn channelization could be provided at the intersections of N. 68th Street with W. Good Hope Road, W. Bradley Road, and W. Brown Deer Road under each of these alternatives. Also under each of these alternatives, the at-grade crossing of the Wisconsin & Southern and Chicago & North Western railroad tracks would be provided with rubberized crossings and crossing protection gates, flashers, and bells; a new culvert would be constructed over an existing water hazard at Brynwood Country Club north of W. Good Hope Road; and a power transmission tower in the vicinity of the Chicago & North Western Transportation Company right-of-way and W. Bradley Road would be relocated. Typical cross-sections for these alternatives are shown in Figure 114. On-street parking could be permitted during peak periods along N. Industrial Road and the new N. 68th Street under these alternatives. Each of the cross-sections considered for the third alternative alignment would help to abate the remaining traffic congestion along the segment of N. 76th Street between W. Florist Avenue and W. Brown Deer Road.

Like the first alternative alignment, the third alternative alignment would provide a continuous arterial approximately three miles in length between W. Mill Road and W. Brown Deer Road. This route would, however, provide the least accessibility of any of the three alternative alignments considered for urban development north of W. Bradley Road. In addition, if the extension of this facility north of W. Brown Deer Road along the N. 68th Street corridor were required by future development, the residential land currently being developed in conjunction with the Northridge Lakes development would need to be acquired.

Figure 114

TYPICAL CROSS-SECTIONS OF IMPROVEMENT AND EXPANSION ALTERNATIVES FOR N. 68TH STREET BETWEEN W. MILL ROAD AND W. BROWN DEER ROAD: ALTERNATIVE ALIGNMENTS 3A AND 3B



Source: City of Milwaukee and SEWRPC.

The impacts of each of the alternatives considered for the provision of a new arterial facility in the N. 68th Street corridor are set forth in Table 244.

The costs shown in Table 244 are expressed in 1980 dollars and include construction costs, including the cost of storm sewers, sidewalks, traffic signalization, driveways, and design and construction engineering, and the cost of railroad grade crossing modification. Right-of-way acquisition, relocation, and demolition costs are also included in the table, as well as the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 244 is the urban disruption which may be expected to be associated with each of the alternatives as indicated by the number of residential units and amounts of other lands required to be taken.

As shown in Table 244, the first alternative alignment would be the most costly of the three alignments, having capital and maintenance costs of $8,368,000 for Alternative 1b and $7,318,000 for Alternative 1a. The third alternative alignment would be the next most costly, having capital and maintenance costs of $7,880,000 for Alternative 3b and $6,970,000 for Alternative 3a. The second alternative alignment would be the least costly, having capital and maintenance costs of $6,925,000 for Alternative 2b and $6,075,000 for Alternative 2a.

As also shown in Table 244, each of the three alternative routings for the proposed new arterial would entail some disruption, that common to all three alignments occurring along the southern segment of each of the routings between W. Mill Road and the right-of-way of the Chicago & North Western Transportation Company. Right-of-way requirements along this southern portion of N. 68th Street would include commercial land located in the vicinity of N. Industrial Road, and strips of

Table 244

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT AND EXPANSION PLANS FOR A NEW N. 68TH STREET FROM W. MILL ROAD TO W. BROWN DEER ROAD

	Alternative Alignment 1		Alternative Alignment 2		Alternative Alignment 3	
Impact	Alternative 1a (48-foot-wide urban roadway)	Alternative 1b (60-foot-wide urban roadway)	Alternative 2a (48-foot-wide urban roadway)	Alternative 2b (60-foot-wide urban roadway)	Alternative 1a (48-foot-wide urban roadway from W. Mill Road to W. Dean Road and 28-foot-wide urban roadways from W. Dean Road to W. Brown Deer Road)	Alternative 3b (60-foot-wide urban roadway from W. Mill Road to W. Dean Road and 32-foot-wide urban roadways from W. Dean Road to W. Brown Deer Road)
Cost (in 1980 dollars)[a]						
Construction	$4,706,000	$6,241,000	$3,930,000	$4,370,000	$4,550,000	$5,020,000
Real Estate Acquisition, Relocation, and Demolition	1,549,000	1,709,000	1,210,000	1,330,000	1,400,000	1,560,000
Maintenance	1,063,000	1,318,000	935,000	1,225,000	1,020,000	1,300,000
Total	$7,318,000	$8,368,000	$6,075,000	$6,925,000	$6,970,000	$7,880,000
Disruption						
Residential Units Taken	--	--	--	--	1	1
Recreational Land Taken	Brynwood Country Club (2 holes) Uihlien Field (strip taking)	Brynwood Country Club (2 holes) Uihlien Field (strip taking)	Brynwood Country Club (2 holes) Uihlien Field (strip taking)	Brynwood Country Club (2 holes) Uihlien Field (strip taking)	Brynwood Country Club (2 holes) Uihlien Field (strip taking)	Brynwood Country Club (2 holes) Uihlien Field (strip taking)

[a]*Construction costs for each alternative include estimates of the roadway construction costs, including the cost of storm sewers, sidewalks, signalization, driveways, and railroad grade crossing modification; and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

recreational land adjacent to Uihlein Polo Field and Brynwood Country Club. The acquisition of land from Brynwood Country Club would require the relocation of two holes of the facility's golf course, and would probably entail a redesign of the golf course layout. The third alternative alignment for the proposed arterial would entail the acquisition of one residential unit on the north side of W. Bradley Road.

The three alternative alignments may be expected to have similar environmental impacts in terms of air quality and noise levels. Increases in noise levels and air pollutant emissions along the corridor would be offset by attendant reductions along adjacent arterial streets, including particularly N. 76th Street between W. Florist Avenue and W. Brown Deer Road.

An assessment was made of the impacts which each of the alignments may be expected to have on traffic volumes based on the two arterials which currently traverse this north-south travel corridor—N. 76th Street and N. 60th Street. The analyses indicated that, in the plan design year, a new N. 68th Street from W. Mill Road to W. Brown Deer Road located along either the first or third alignments may be expected to carry between 5,000 and 10,000 vehicles per day, the greatest volume being carried south of W. Good Hope Road. This diverted traffic volume would serve to reduce traffic volumes on N. 76th Street between W. Mill Road and W. Good Hope Road by about 2,000 vehicles per day—from about 22,600 to about 20,600; and between W. Good Hope Road and W. Brown Deer Road by about 1,300 vehicles per day—from about 25,000 to about 23,700. Traffic volumes would be reduced on N. 60th Street between W. Mill Road and W. Good Hope Road by about 3,200 vehicles per day—from about 9,900 to about 6,700; between W. Good Hope Road and W. Bradley Road by 2,300 vehicles per day—from about 7,700 to about 5,400; and between W. Bradley Road and W. Brown Deer Road by 700 to 800 vehicles per day. The analyses also indicated that an extension of N. 68th Street north of W. Brown Deer Road to W. County Line Road under either of these two alternatives could be expected to carry about 3,000 vehicles per day. This diverted traffic volume would not significantly affect the traffic volumes or level of service on either N. 76th Street or N. 60th Street north of W. Brown Deer Road. The analyses also indicated that these volume reductions, while lowering the volume-to-design-capacity ratios on N. 76th Street, would not be sufficient to raise the overall level of service of that arterial in the design year.

The analyses also indicated that in the year 2000 under the second alignment, a new N. 68th Street from W. Mill Road to W. Dean Road—or along N. 70th Street extended and then along W. Dean Road to N. 76th Street—would carry between 4,000 and 10,000 vehicles per day, the greatest volume being carried south of W. Good Hope Road, and would carry about 3,500 vehicles per day on W. Dean Road between N. 68th Street and N. 76th Street. While this diversion of traffic would serve to reduce traffic volumes on N. 76th Street by about 2,000 vehicles per day between W. Mill Road and W. Good Hope Road, traffic volumes would not be significantly reduced on N. 76th Street north of W. Good Hope Road. Traffic volumes on N. 60th Street may be expected to be reduced under this second alternative alignment by about 3,000 vehicles per day between W. Mill Road and W. Good Hope Road, and by about 2,000 vehicles per day between W. Good Hope Road and W. Bradley Road. No significant reduction would be realized on N. 60th Street north of W. Bradley Road. The analyses also revealed that the volume reduction on N. 76th Street, while lowering the volume-to-design capacity on N. 76th Street south of W. Good Hope Road, would not be sufficient to raise the overall level of service of the arterial.

The traffic analyses thus indicated that, while the construction of a new N. 68th Street along any of the three alternative alignments would result in the diversion of significant traffic volumes from N. 76th Street and N. 60th Street, such an extension within the N. 68th Street corridor would principally serve to carry shorter, more local trips. As such, its travel corridor would be extremely narrow, principally carrying traffic volumes associated with the existing and planned industrial and residential development in the City of Milwaukee land bank areas between N. 76th Street and N. 60th Street.

Based on the consideration of several factors, it is recommended that Alternative 1a be implemented—that is, the provision of a 48-foot-wide urban roadway within an 80-foot-wide right-of-way along a continuous north-south alignment, oriented on about N. 70th Street extended. Factors considered in this recommendation include the additional arterial capacity, arterial continuity, and arterial spacing in this area of northwestern Milwaukee County afforded by the alternatives; the ability of the alternatives to reduce traffic on N. 76th Street; the framework for future residential and industrial development provided by the alternatives, and the effects on traffic volumes on adjacent arterial streets; and the costs and environmental impacts of each of the alternative alignments considered. It should be noted that the precise location of this facility is to be determined during the preliminary engineering and engineering phases of the development of this project. The roadway provided under this alternative would extend from N. Industrial Road to W. Brown Deer Road, and would include provision for left- and right-turn lanes at principal arterial intersections. Although on-street parking could be permitted along this segment of the new N. 68th Street, future development should be encouraged to access interior streets rather than the N. 68th Street arterial itself, thus minimizing direct access to the arterial and the attendant traffic conflicts. Also, with such constraint on future development, on-street parking could be more readily prohibited during peak periods if additional roadway capacity were needed in the future.

Under this recommendation, a new north-south arterial facility would not be extended north of W. Brown Deer Road through the Northridge Lakes development to W. County Line Road along N. 70th Street extended. Such a facility was not recommended because analyses indicated that only relatively low volumes of traffic may be expected to use such an extension; because such an extension would not provide any connection to an existing arterial in Ozaukee County, but would serve principally to provide access between the Northridge Lakes development and either W. County Line Road or W. Brown Deer Road; and because the existing segment of N. 70th Street through the Northridge Lakes development, which would be used to accommodate the arterial extension, has a curvilinear alignment poorly adaptable to arterial use. It was concluded instead that any roadway north of W. Brown Deer Road within this north-south travel corridor would serve a land access rather than an arterial function, and that the existing roadway is capable of serving such a function. It is recommended, however, that this land access segment of N. 70th Street immediately to the north of W. Brown Deer Road be considered for relocation to the east to align with the new facility proposed to be located to the south of W. Brown Deer Road.

<u>W. Capitol Drive (STH 190) from N. 124th Street to the North-South Freeway (IH 43); W. Hampton Avenue from N. 124th Street to N. Green Bay Avenue (STH 57); and W. Grantosa Drive and W. Villard Avenue from W. Fond du Lac Avenue to N. Teutonia Avenue:</u> In an attempt to resolve the congestion which may be expected to remain in the plan design year along the east-west travel corridor through the central part of the Milwaukee County portion of the study area from the Milwaukee/Waukesha County line to the North-South Freeway (IH 43), consideration was given to improving three arterials through the area: W. Capitol Drive (STH 190) from N. 124th Street to the North-South Freeway (IH 43), W. Hampton Avenue from N. 124th Street to N. Green Bay Avenue (STH 57), and W. Grantosa Drive and W. Villard Avenue from W. Fond du Lac Avenue to N. Teutonia Avenue. In the plan design year, the segment of W. Capitol Drive from N. 124th Street to the North-South Freeway would remain congested, as would segments of W. Hampton Avenue from the Zoo Freeway (USH 45) to N. Teutonia Avenue and segments of W. Grantosa Drive and W. Villard Avenue from W. Fond du Lac Avenue to N. Teutonia Avenue. An increase in the number of moving traffic lanes provided on one or each of these three arterials may be expected to abate the congestion in this portion of Milwaukee County.

From N. 124th Street to a location about 200 feet east of N. 124th Street, W. Capitol Drive (STH 190) is improved to a desirable urban cross-section with dual 40-foot-wide roadways separated by a 24-foot-wide median, and, except for the portion of W. Capitol Drive under the Zoo Freeway (USH 45) interchange, which provides for dual 24-foot-wide roadways, W. Capitol Drive is improved to a desirable urban cross-section with dual 36-foot-wide roadways separated by a 24-foot-wide median between that location and N. 60th Street. Between N. 60th Street and the North-South Freeway (IH 43), W. Capitol Drive is improved to a desirable urban cross-section with dual 34-foot-wide roadways separated by an 18- to 22-foot-wide median. Except for the area under the USH 45 overpass, these cross-sections are adequate to provide for either three through traffic lanes or two through traffic lanes and a parking lane in each direction. The median strip along this portion of W. Capitol Drive is only 10 feet wide through the existing overpass of the Zoo Freeway, and widens to about 80 feet to accommodate the intersections with N. 100th Street and W. Lisbon Avenue, and to about 35 feet between N. 35th Street and N. 31st Street to accommodate additional channelization associated with traffic flow between N. 35th Street, W. Roosevelt Drive, and W. Hopkins Street. The Zoo Freeway is carried over this segment of W. Capitol Drive on a structure located between N. 124th Street and Mayfair Road; the tracks of the Chicago & North Western Transportation Company are carried over this segment of W. Capitol Drive on a structure located between N. 124th Street and the Zoo Freeway overpass; and the tracks of the Chicago, Milwaukee, St. Paul & Pacific Railroad (the Milwaukee Road) are carried over this segment of W. Capitol Drive on a structure located between N. 34th Street and N. 31st Street. Development along this segment of W. Capitol Drive is comprised of a mixture of residential and commercial land uses. On-street parking is currently prohibited during the morning and evening peak periods in the direction of peak traffic flow along W. Capitol Drive between N. 124th Street and the North-South Freeway.

From N. 124th Street to N. Green Bay Avenue, W. Hampton Avenue has also been improved to a desirable urban cross-section. Between N. 124th Street and its intersection with the Zoo Freeway, W. Hampton Avenue consists of dual 32-foot-wide roadways separated by a 22-foot-wide median within a 110-foot-wide right-of-way. This segment of W. Hampton Avenue consists of dual 33-foot-wide pavements from the Zoo Freeway to N. 92nd Street, consists of dual 32-foot-wide pavements between N. 92nd Street and N. Sherman Boulevard, consists of dual 31-foot-wide pavements between N. Sherman Boulevard and N. 35th Street, consists of dual 33-foot-wide pavements between N. 35th Street and N. Teutonia Avenue, and consists of dual 34-foot-wide pavements between N. Teutonia Avenue and N. Green Bay Avenue. The median along these segments varies in width from four to 20 feet within a 110-foot-wide right-of-way. Except for the segments of W. Hampton Avenue which pass under railroad structures as noted below, these roadway cross-sections are adequate to provide for two through lanes and one parking lane in each direction, or for three through traffic lanes. Those segments under existing railroad structures are adequate to provide for two through traffic lanes in each direction. The median section along this segment of W. Hampton Avenue is reduced to between four and seven feet wide between N. 41st Street and N. 22nd Street, and is 18 feet wide between N. 22nd Street and W. Green Bay Avenue. The Zoo Freeway is carried under this segment of W. Hampton Avenue on a structure located between N. 124th Street and N. Mayfair Road. The tracks of the Chicago & North Western Transportation Company are carried under this segment of W. Hampton Avenue on a structure about 200 feet east of N. 124th Street, where the pavement is reduced to dual 26-foot roadways; the tracks of the Milwaukee Road are carried over this segment of W. Hampton Avenue on a structure located between N. 34th Street and N. 32nd Street on dual 28-foot-wide roadways; and another set of Milwaukee Road tracks are crossed at-grade immediately west of N. Teutonia Avenue. Land uses along this segment of W. Hampton Avenue are largely residential, with commercial land uses occurring adjacent to the intersection of W. Hampton Avenue with W. Appleton Avenue, and along the arterial between N. 60th Street and N. 51st Street. On-street parking is currently permitted along this entire segment of W. Hampton Avenue, except under the overpass structures.

For an approximately 0.1-mile segment from W. Fond du Lac Avenue to W. Villard Avenue, W. Grantosa Drive has a desirable urban cross-section with dual 36-foot-wide roadways separated by a 24-foot-wide median within a 120-foot-wide right-of-way, adequate to provide for two through traffic lanes and a parking lane or for three through traffic lanes in each direction of traffic flow. W. Villard Avenue merges with W. Grantosa Drive at about N. 73rd Street. Between W. Grantosa Drive and N. Sherman Boulevard, W. Villard Avenue has been improved to a desirable urban cross-section with dual 31-foot-wide roadways separated by a four-foot-wide median within a 90- to 100-foot-wide right-of-way, adequate to provide for two through traffic lanes in each direction with parking permitted, or for three through traffic lanes in each direction of traffic flow. Between N. Sherman Boulevard and N. Teutonia Avenue, W. Villard Avenue has been improved to a minimum urban cross-section with a 48-foot-wide roadway curb-to-curb within a 66- to 90-foot-wide right-of-way, adequate to provide for one through traffic lane and one parking lane or for two through traffic lanes in each direction of traffic flow. W. Grantosa Drive crosses over the Fond du Lac Freeway (STH 145) on a structure between W. Fond du Lac Avenue and W. Villard Avenue; and W. Villard Avenue intersects the tracks of the Milwaukee Road railway at-grade in two locations—the first, immediately east of N. 38th Place and the second, immediately east of N. 33rd Street. Land use adjacent to W. Grantosa Drive consists of the vacant right-of-way of the Fond du Lac Freeway. Land uses adjacent to

W. Villard Avenue are primarily residential between W. Grantosa Drive and N. 64th Street, are primarily commercial between N. 64th Street and N. 49th Street, are primarily residential between N. 49th Street and N. Sherman Boulevard, and are primarily commercial between N. Sherman Boulevard and N. Teutonia Avenue. On-street parking is currently permitted along these segments of W. Grantosa Drive and W. Villard Avenue.

The remaining traffic congestion along this east-west travel corridor, as well as on intersecting segments of W. Appleton Avenue, W. Fond du Lac Avenue (STH 145), N. 91st Street, N. 60th Street, W. Hopkins Street, N. 27th Street, and N. Teutonia Avenue, may be expected to be alleviated by the provision of additional travel lanes on either W. Capitol Drive, W. Hampton Avenue, or W. Grantosa Drive and W. Villard Avenue, or on a combination of these arterial segments. Additional travel lanes, however, are not feasible on W. Capitol Drive. W. Capitol Drive in this corridor already has all on-street parking prohibited during peak periods, and it is already widened to a desirable urban cross-section. Any further widening would jeopardize safe pedestrian movement and result in extensive urban disruption.

W. Hampton Avenue in this corridor is also already widened to a desirable urban cross-section, and thus further widening is infeasible. On-street parking, however, is currently permitted on W. Hampton Avenue, and its prohibition in peak periods in the peak direction is a feasible alternative for resolving the corridor congestion problem. Because adequate off-street parking locations are provided along this segment of W. Hampton Avenue, in both parking lots and private garages and along intersecting side streets, the prohibition of on-street parking to provide three lanes of traffic in the direction of peak traffic flow during both the morning and evening peak periods is considered implementable. As previously noted, Hampton Avenue currently has two sections with pavement widths which will not permit the operation of three travel lanes in each direction: the railroad overpass located east of N. 124th Street and the railroad underpass located between N. 32nd and N. 34th Streets. It is proposed that traffic be restricted to two moving lanes in each direction through these structures. However, the widened intersections at each end of these structures should provide adequate capacity for uncongested operation. Such on-street parking prohibition along this segment of W. Hampton Avenue may also be expected to eliminate all of the remaining traffic congestion on W. Hampton Avenue within this corridor, and may be expected to help abate the remaining traffic congestion on W. Capitol Drive and on W. Grantosa Drive and W. Villard Avenue. Such prohibition may also be expected to help abate the remaining traffic congestion along portions of the arterial streets which intersect W. Hampton Avenue along this segment, or on segments of W. Appleton Avenue, W. Fond du Lac Avenue, N. 91st Street, N. 60th Street, W. Hopkins Street, N. 27th Street, and N. Teutonia Avenue. Implementation of this alternative in conjunction with the improvement of W. Green Bay Avenue from W. Capitol Drive to W. Hampton Avenue, as discussed in this chapter, would create a continuous corridor for east-west traffic flow through this section of Milwaukee County, with an eastern terminus at the North-South Freeway. On-street parking prohibition along this segment of W. Hampton Avenue, however, will be feasible only if pavement markings are provided to clearly delineate three through traffic lanes in each direction, since the dual pavements along this segment vary from 31 to 34 feet wide. While it is realized that 10-foot travel lanes are not the present minimum lane width, it was determined that reconstruction of Hampton Avenue for two additional feet of pavement was not justified.

The other arterial facility in the corridor is composed of segments of W. Grantosa Drive and W. Villard Avenue. From W. Fond du Lac Avenue to N. Sherman Boulevard, this facility is already widened to a desirable urban cross-section. From N. Sherman Boulevard to N. Teutonia Avenue, the present cross-section of a 48-foot-wide pavement within a 66- to 90-foot-wide right-of-way could be improved through widening. However, such widening may be impractical, as the taking of 30 to 67 residential or commercial structures would be required for improvement to a desirable urban cross-section. On-street parking prohibition, however, would be a feasible alternative along this segment of W. Grantosa Drive and W. Villard Avenue, as parking is currently permitted. Such prohibition during peak periods in the direction of peak traffic flow would provide for three through lanes of traffic in the peak direction between W. Fond du Lac Avenue and N. Sherman Boulevard, and for two through traffic lanes in the peak direction on W. Villard Avenue between N. Sherman Boulevard and N. Teutonia Avenue. Such prohibition is considered implementable because adequate off-street parking is provided adjacent to these arterial segments both in private garages and in off-street parking lots. Parking prohibition along the segment of W. Villard Avenue between W. Grantosa Drive and N. Sherman Boulevard, however, will be feasible only if pavement markings are provided to clearly delineate three through lanes in each direction. This segment of W. Villard Avenue has only a 31-foot-wide pavement. While it is understood that 10-foot travel lanes are narrorer than desirable, this alternative is acceptable in lieu of facility reconstruction.

The impacts of the parking prohibition alternatives considered for this travel corridor for W. Hampton Avenue and W. Grantosa Drive and W. Villard Avenue are set forth in Table 245. The impacts of a "do nothing" alternative for these arterial segments, under which the physical dimensions of the roadway surface and the existing parking regulations would remain essentially unchanged, are also provided in Table 245. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished as necessary along these arterials between 1980 and 2000. Also, any traffic management actions previously recommended for these segments of W. Hampton Avenue and W. Grantosa Drive and W. Villard Avenue under the short-range plan for the northwest side study area are included as parts of the "do nothing" alternative and parking prohibition alternatives.

More specifically, at the intersection of W. Hampton Avenue and N. 92nd Street, it was recommended that the overall signal cycle be lengthened, that an additional signal phase be added, that a new traffic controller be added, and that an existing single left-turn lane be lengthened. At the intersection of W. Hampton Avenue and W. Appleton Avenue, it was recommended that the existing signal be retimed. At the intersection of W. Hampton Avenue and W. Fond du Lac Avenue, it was recommended that additional signal phases and a new traffic controller be added, that an existing single left-turn lane be expanded to a double left-turn lane, and that signing be installed to designate an exclusive right-turn lane. At the intersection of W. Hampton Avenue and N. Teutonia Avenue, it

Table 245

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR E. HAMPTON AVENUE FROM N. 124TH STREET TO N. GREEN BAY AVENUE (STH 57) AND FOR W. GRANTOSA DRIVE AND W. VILLARD AVENUE FROM W. FOND DU LAC AVENUE TO N. TEUTONIA AVENUE

Impact	Segment of W. Hampton Avenue: "Do Nothing" Alternative	Segment of W. Hampton Avenue: On-Street Parking Prohibition Alternative	Segment of W. Grantosa Drive and W. Villard Avenue: "Do Nothing" Alternative	Segment of W. Grantosa Drive and W. Villard Avenue: On-Street Parking Prohibition Alternative
Cost (in 1980 dollars)[a]				
Construction	$6,705,000	$6,708,000	$2,352,000	$2,356,000
Real Estate Acquisition, Relocation, and Demolition	--	--	--	--
Maintenance	3,106,000	3,106,000	1,149,000	1,149,000
Total	$9,811,000	$9,814,000	$3,501,000	$3,505,000
Disruption				
Residential Units Taken	--	--	--	--
Commercial Units Taken	--	--	--	--

[a] *Construction costs for each alternative include estimates of the roadway resurfacing costs. Under both alternatives, two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

was recommended that the existing signal be retimed and that an existing right-turn lane be reconstructed. At the intersection of W. Hampton Avenue and W. Green Bay Avenue, it was recommended that the existing signal be retimed, that an additional signal phase be added, and that the existing single left-turn lane be expanded to a double left-turn lane. The cost of these improvements, $101,400, is reflected in the capital and maintenance costs of both the "do nothing" and parking prohibition alternatives considered for this segment of W. Hampton Avenue. It was determined that these actions, while effective in abating the short-term traffic congestion along this segment of W. Hampton Avenue, would not eliminate the need for additional traffic lanes in the long range along this segment.

The costs shown in Table 245 for each of the alternatives are expressed in 1980 dollars and include estimates of the roadway resurfacing costs, as well as the maintenance costs associated with the operation of each of these alternatives over the plan design period. As shown in Table 245, the alternative which proposes the prohibition of all on-street parking in the direction of peak traffic flow during both the morning and evening peak periods on W. Hampton Avenue between N. 124th Street and W. Green Bay Avenue would have capital and maintenance costs of about $9,814,000, while the capital and maintenance costs of the "do nothing" alternative for this segment of W. Hampton Avenue would be about $9,811,000, the difference in these costs representing the cost of the signing necessary to regulate on-street parking. Neither of the alternatives proposed for this segment would involve any urban disruption.

As also shown in Table 245, the alternative which proposes the prohibition of all on-street parking in the direction of peak traffic flow during both the morning and evening peak periods on W. Grantosa Drive and W. Villard Avenue between W. Fond du Lac Avenue and N. Teutonia Avenue would have capital and maintenance costs of about $3,505,000, while the capital and maintenance costs of the "do nothing" alternative for these segments would be about $3,501,000. The difference in these costs represents the costs of the signing required to regulate on-street parking. Neither of these alternatives would involve any urban disruption.

The difference in environmental impacts, in terms of air quality and noise levels, between the improvement alternative and the "do nothing" alternative for W. Hampton Avenue would be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions. Also, under the "do nothing" alternative, there would be no alleviation of congestion and thus no alleviation of air and noise pollution on any of the arterial segments within this east-west travel corridor.

Based on the additional capacity afforded and congestion abated by each alternative, and the cost and environmental impacts of each of the alternatives proposed for these segments of W. Hampton Avenue, and W. Grantosa Drive and W. Villard Avenue, it is recommended that those alternatives be implemented which provide for the prohibition of all on-street parking in the direction of peak traffic flow in order to provide three through traffic lanes during both peak periods along both of these arterial segments. While such prohibition would mean that vehicles accessing residences and commercial enterprises along these arterial segments would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking should make these recommendations implementable. These actions are also recommended because they involve little additional capital or maintenance costs.

N. Teutonia Avenue from W. Capitol Drive (STH 190) to W. Villard Avenue: To resolve the congestion which may be expected to remain in the plan design year in the northwest-southeast corridor along N. Teutonia Avenue, consideration was given to improving N. Teutonia Avenue from W. Capitol Drive (STH 190) to W. Villard Avenue.

Except at its intersections with W. Hampton Avenue and W. Villard Avenue, this entire segment of N. Teutonia Avenue has a minimum urban cross-section. From W. Capitol Drive to W. Ruby Avenue, N. Teutonia Avenue has a curb-to-curb pavement width of 56 feet with sidewalks within a right-of-way which varies in width from 110 to 120 feet. The pavement width is adequate to provide for two minimum 10-foot-wide traffic lanes and a parking lane of eight feet in each direction of traffic flow. Parking is currently prohibited during the evening peak hour between W. Congress Street and W. Ruby Avenue in the northwest-bound direction, and is prohibited at all times between W. Congress Street and W. Capitol Drive in the southeast-bound direction. This parking prohibition does not increase the number of through traffic lanes carried on N. Teutonia Avenue. However, it does eliminate the interference of curb parking with traffic flow, and it does permit through traffic to be carried on lanes that are wider than 10 feet. Between W. Ruby Avenue and a point 500 feet north of W. Ruby Avenue, N. Teutonia Avenue has a curb-to-curb pavement width of 60 feet with sidewalks, also adequate to provide for two through traffic lanes and a parking lane in each direction of traffic flow. Parking is currently prohibited during peak periods on this segment of N. Teutonia Avenue. The right-of-way width along this segment varies from 95 to 97 feet between W. Ruby Avenue and a point 500 feet northwest of W. Ruby Avenue, and is 66 feet from that point to W. Glendale Avenue. Except at its intersection with W. Hampton Avenue, which has been improved to a desirable urban cross-section having dual 34-foot-wide pavements, N. Teutonia Avenue between W. Glendale Avenue and W. Fairmount Avenue consists of an urban cross-section with a 40-foot-wide pavement curb-to-curb with sidewalks within a 66- to 90-foot-wide right-of-way. The pavement width of 40 feet is adequate to provide for two minimum, 10-foot-wide, through traffic lanes in each direction with parking prohibited. On-street parking is currently prohibited on this segment of N. Teutonia Avenue during both the morning and evening peak periods. The segment of N. Teutonia Avenue between W. Fairmount Avenue and W. Villard Avenue, except at its intersection with W. Villard Avenue, has a curb-to-curb width of 56 feet with sidewalks within a 90-foot-wide right-of-way. The 56-foot pavement width is adequate to provide for two through traffic lanes and one parking lane in each direction of traffic flow. Parking is currently prohibited during both peak periods in the direction of peak traffic flow along N. Teutonia Avenue between W. Fairmount Avenue and W. Eggert Place, and is permitted along the section of N. Teutonia Avenue between W. Eggert Place and W. Villard Avenue. Again, the parking prohibition does not result in the provision of additional through traffic lanes, but does permit wider through traffic lanes and does eliminate the interference of curb parking with the flow of traffic. At its intersection with W. Villard Avenue, N. Teutonia Avenue is widened and channelized to provide dual 28-foot-wide pavements. The transition from the 56-foot-wide undivided pavement begins at W. Eggert Place, where the pavement widens to 66 feet. This segment of N. Teutonia Avenue crosses at-grade with the tracks of the Milwaukee Road railway south of its intersection with W. Hampton Avenue, and crosses over Lincoln Creek on a structure located immediately south of W. Eggert Place. Development along this segment of N. Teutonia Avenue is comprised of a combination of industrial, commercial, and residential uses.

Four alternatives were developed for increasing the capacity of this segment of N. Teutonia Avenue. The first alternative called for prohibiting all on-street parking where it exists along the arterial segment; the second alternative called for widening the 40-foot-wide segment of N. Teutonia Avenue to accommodate channelization of the intersection of N. Teutonia Avenue and W. Cornell Street; the third alternative called for widening the entire 40-foot-wide segment of N. Teutonia Avenue to a minimum urban cross-section; and the fourth alternative called for improving this entire segment of N. Teutonia Avenue to a desirable urban cross-section.

The first alternative, the prohibition of all remaining on-street parking along the arterial during peak periods, has limited benefits. Most peak-period on-street parking is already prohibited along this segment. In particular, all peak-period on-street parking is prohibited in the substandard stretch of N. Teutonia Avenue from approximately W. Glendale Avenue to W. Hampton Avenue and from W. Hampton Avenue to W. Fairmount Avenue, which has a pavement width of only 40 feet and a right-of-way of only 66 feet. This substandard segment includes the intersection of N. Teutonia with W. Cornell Street, which is the location of the principal future congestion problem along this stretch of N. Teutonia Avenue. Attendant to this alternative would be the prohibition of all on-street parking during both the morning and evening peak periods between W. Capitol Drive and W. Congress Street in the northwesterly direction; the prohibition of all on-street parking during the evening peak period between W. Ruby Avenue and W. Congress Street; and the prohibition of all on-street parking in each direction of peak traffic flow during both the morning and evening periods between W. Eggert Place and W. Villard Avenue. Such prohibition would not provide for an increase in the number of through traffic lanes along this segment of N. Teutonia Avenue. It would, however, provide for wider traffic lanes, and would eliminate the interference of curb parking with traffic flow. The prohibition of on-street parking during both peak periods under this alternative is considered implementable along this segment of

N. Teutonia Avenue, as adequate off-street parking is provided along the arterial in private garages, in off-street parking lots, and along intersecting side streets.

Like the first alternative, the second alternative considered for the improvement of this segment of N. Teutonia Avenue would involve the prohibition of all remaining peak-period on-street parking along the arterial in the direction of peak traffic flow. Unlike the first alternative, this alternative would also involve the provision of median channelization and turn lanes as necessary at the intersection of N. Teutonia Avenue and W. Cornell Street within a 90-foot-wide right-of-way.

Such channelization would require the acquisition of 24 feet of additional right-of-way on the north and south approaches to the intersection. The location for this additional right-of-way which would result in the least cost and disruption was determined to be along the east side of N. Teutonia Avenue. Like the first alternative, this improvement would not provide for an increase in the number of through traffic lanes provided along this segment of N. Teutonia Avenue, and would provide for no substantial improvement in the substandard lane widths on N. Teutonia Avenue between W. Glendale Avenue and W. Fairmount Avenue. However, by improving the intersection of N. Teutonia Avenue and W. Cornell Street under this alternative, the remaining congestion along this segment of N. Teutonia Avenue may be expected to be reduced. It should be noted that under the short-range plan for the study area, it was recommended that a south- to westbound right-turn lane be constructed at the intersection of N. Teutonia Avenue and W. Cornell Street. It was concluded that the additional 10 feet of right-of-way necessary for this lane was to be taken from the west side of the roadway, taking a strip of land from a manufacturing company as well as one residential structure. Taking into account this necessary acquisition of land under the short-range plan, it may be possible to acquire less than the recommended 24 feet of additional right-of-way along the east side of N. Teutonia Avenue immediately north of W. Cornell Street in order to fully channelize this intersection. Such determination will need to be made by the City of Milwaukee during the final engineering phase of the project.

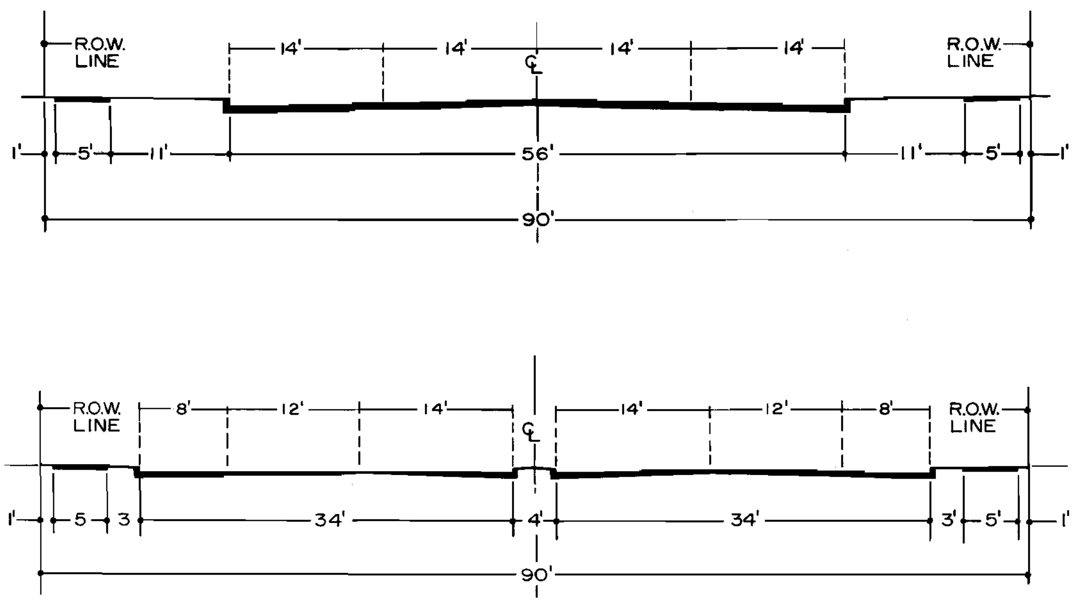
The third alternative considered for the improvement of this segment of N. Teutonia Avenue called for the provision of a continuous, standard, minimum urban cross-section roadway with at least a 56-foot-wide roadway curb-to-curb with sidewalks within a minimum of 90 feet of right-of-way throughout. Specifically, this alternative would require the widening of the segment of N. Teutonia Avenue between W. Glendale Avenue and W. Fairmount Avenue to a cross-section similar to those immediately to the north and south of this segment. A typical cross-section for the widened portion of N. Teutonia Avenue is shown in Figure 115. Because of the provision of a minimum of 90 feet of right-of-way along N. Teutonia Avenue under this alternative, separate channelization for left- and/or right-turn lanes could be provided as necessary at major intersections along the arterial. In those locations along this segment of N. Teutonia Avenue where the roadway would be widened, and an additional 24 feet of right-of-way would be required, the location for the additional right-of-way which would result in the lowest cost and disruption was determined to be along the east side of the roadway. These segments are that segment between a point about 200 feet south of W. Glendale Avenue and the at-grade crossing of the tracks of the Milwaukee Road railway; a short segment adjacent to the intersection of N. Teutonia Avenue with N. 28th Street; and a short segment of N. Teutonia Avenue north of W. Fairmount Avenue. In order to maintain two through traffic lanes in the direction of peak traffic flow during peak periods under this alternative, on-street parking would have to be prohibited along this segment of N. Teutonia Avenue during both the morning and evening peak periods in the direction of peak flow. This alternative may be expected to eliminate all of the remaining traffic congestion along this segment.

The fourth alternative considered for the improvement of this segment of N. Teutonia Avenue called for widening the arterial to provide for a continuous, divided, urban cross-section. This alternative would entail the widening of the entire problem segment of N. Teutonia Avenue to provide for dual 34-foot-wide roadways with a four-foot-wide median and sidewalks within a 90-foot-wide right-of-way. Such widening would be adequate to provide for two through traffic lanes and a parking lane in each direction of traffic flow, or for three through traffic lanes in each direction of traffic flow with parking prohibited. Under this alternative, the existing channelization at W. Hampton Avenue would be retained, and the channelization at W. Villard Avenue would be expanded to provide for dual 34-foot-wide roadways. This alternative would also provide a continuation of the

Figure 115

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES FOR N. TEUTONIA AVENUE BETWEEN W. CAPITOL DRIVE (STH 190) AND W. VILLARD AVENUE

ALTERNATIVE 3



Source: SEWRPC.

divided roadway cross-section on N. Teutonia Avenue to the north of W. Villard Avenue. A typical cross-section for this alternative is shown in Figure 115. Under this alternative, it would be necessary to acquire the same right-of-way required under the second improvement alternative. This alternative could also be expected to eliminate all the remaining traffic congestion along this segment of N. Teutonia Avenue.

The impacts of each of the four alternatives considered for the improvement of N. Teutonia Avenue are set forth in Table 246. The impacts of a "do nothing" alternative, under which the physical dimensions of the roadway surface would remain essentially unchanged, are also provided in Table 246. Under the "do nothing" alternative, only summer and winter maintenance work would be accomplished along N. Teutonia Avenue between W. Capitol Drive and W. Villard Avenue between 1980 and the year 2000. Under this alternative and the parking prohibition alternative, two major resurfacings would be accomplished along this segment of N. Teutonia Avenue. Also, under each of the alternative plans, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. The cost of the improvements to the intersection of N. Teutonia Avenue and W. Cornell Street which were recommended for implementation under the short-range plan was accounted for in the discussion of the segment of N. 27th Street and W. Cornell Street from the East-West Freeway to N. Teutonia Avenue. No other actions were recommended for this segment of N. Teutonia Avenue under the short-range plan for the northwest side study area. It should be pointed out that implementation of the "do nothing" alternative would not serve to abate future traffic congestion along the segment of N. Teutonia Avenue between W. Capitol Drive and W. Villard Avenue.

The costs shown in Table 246 are expressed in 1980 dollars and include estimates of the construction costs, including utility and storm sewer relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 246 is the number of properties which may need to be acquired under each of the alternatives.

Table 246

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. TEUTONIA AVENUE FROM W. CAPITOL DRIVE (STH 190) TO W. VILLARD AVENUE

Impact	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)	Alternative 2 (on-street parking prohibition in addition to intersection widening)	Alternative 3 (widening to minimum urban cross-section)	Alternative 4 (widening to desirable urban cross-section)
Cost (in 1980 dollars)[a]					
Construction	$ 989,000	$ 992,000	$1,108,000	$1,514,000	$2,971,000
Real Estate Acquisition, Relocation, and Demolition . . .	--	--	27,000	544,000	544,000
Maintenance	535,000	535,000	540,000	618,000	773,000
Total	$1,524,000	$1,527,000	$1,675,000	$2,676,000	$4,288,000
Disruption					
Residential Units Taken	--	--	--	4	4
Commercial Units Taken	--	--	--	--	--
Industrial Units Taken	--	--	--	--	--
Transportation-Related Units Taken.	--	--	--	1	1

[a]*Construction costs for each alternative include estimates of the roadway construction, utility and storm sewer relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

As shown in Table 246, of the alternatives proposed for the improvement of this segment of N. Teutonia Avenue, Alternative 4, which proposes widening the segment of N. Teutonia Avenue between W. Capitol Drive and W. Villard Avenue to provide for a continuous desirable urban cross-section with dual 34-foot-wide roadways and a four-foot-wide median, would have the highest capital and maintenance costs, $4,288,000; while the third widening alternative, which proposes widening segments of N. Teutonia Avenue from W. Capitol Drive to W. Villard Avenue in order to provide for a continuous minimum urban cross-section with a 56-foot-wide pavement curb-to-curb, would have the second highest capital and maintenance costs, $2,676,000. The capital and maintenance costs of the second improvement alternative, under which all remaining on-street parking would be prohibited along the segment and the intersection of N. Teutonia Avenue and W. Cornell Street would be widened, were estimated at $1,675,000, while the capital costs of the first improvement alternative, which provided for only the prohibition of all remaining on-street parking along this segment, were estimated at $1,527,000. The capital and maintenance costs of a "do nothing" alternative for this segment were estimated at $1,524,000, the additional cost of the parking prohibition alternative representing the cost of the necessary regulatory signing. As also shown in Table 246, both the third and fourth improvement alternatives would require the taking of four residential structures and one transportation-related structure. It would not be necessary to acquire any structures under either of the other alternatives.

There would be no significant difference in environmental impacts in terms of air quality and noise levels among the improvement alternatives considered; however, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative may be expected to be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

Based upon consideration of the additional capacity afforded and congestion abated by each alternative, and the costs and environmental impacts of the alternatives, it is recommended that the second improvement alternative be implemented—that is, the prohibition of all remaining on-street parking along N. Teutonia Avenue to provide for two continuous through traffic lanes during both the morning and the evening peak periods in the direction of peak traffic flow, in addition to the channelization of the intersection of N. Teutonia Avenue and N. Cornell Street within a 90-foot-wide right-of-way. This alternative, while including the use of 10-foot-wide travel lanes, is recommended principally because its implementation could be expected to abate the congestion along this segment of N. Teutonia Avenue at the least cost and with the least disruption, and because the provision of on-street parking is not considered essential along this segment of N. Teutonia Avenue.

W. Hopkins Street between W. Villard Avenue and N. 27th Street: In the plan design year, congestion may be expected to remain in the northwest-southeast travel corridor along W. Hopkins Street between W. Villard Avenue and N. 27th Street. With the exception of a short segment between its intersections with W. Congress Street and N. 31st Street, W. Hopkins Street provides a continuous northwest-southwest roadway through northeastern Milwaukee County from N. Sherman Boulevard to W. Center Street. Between W. Congress Street and N. 31st Street, W. Hopkins Street is discontinuous, and vehicles desiring to continue on W. Hopkins Street between these two points must utilize segments of N. 35th Street, N. 34th Street, W. Capitol Drive, and N. 31st Street. Vehicles continuing on W. Hopkins Street between W. Congress Street and N. 31st Street have the option of utilizing N. 35th Street or N. 34th Street between W. Hope Street and W. Capitol Drive. To resolve the traffic congestion which may be expected to remain in the design year along W. Hopkins Street, consideration was given to improving segments of W. Hopkins Street, as well as segments of N. 35th Street, N. 34th Street, and N. 31st Street. An increase in the number of moving traffic lanes provided on one or more of these arterials may be expected to abate the congestion remaining in this portion of Milwaukee County.

W. Hopkins Street, as well as the other arterial segments which provide the routing of W. Hopkins Street between W. Villard Avenue and N. 27th Street, has been improved to a minimum urban cross-section, adequate to provide for one through lane and one parking lane in each direction of traffic flow. From W. Villard Avenue to W. Congress Street, W. Hopkins Street has a pavement width of 48 feet curb-to-curb within a 66-foot-wide right-of-way; from W. Congress Street to W. Hope Avenue, N. 35th Street has a pavement width of 60 feet curb-to-curb within a 100-foot-wide right-of-way; and from W. Hope Avenue to W. Capitol Drive, N. 35th Street has a 56-foot-wide pavement curb-to-curb within a 100-foot-wide right-of-way. The segment of N. 34th Street from W. Hopkins Street to W. Capitol Drive has a 56-foot-wide pavement curb-to-curb within a 90-foot-wide right-of-way. As discussed in a previous section, the segment of W. Capitol Drive between N. 35th Street and N. 31st Street has been improved to a desirable urban cross-section with dual 34-foot-wide roadways separated by a 22-foot-wide median; additional lanes are provided on W. Capitol Drive between these points to accommodate traffic flow from N. 35th Street, W. Roosevelt Drive, and W. Hopkins Street. From W. Capitol Drive to N. 27th Street, the segment of N. 31st Street has a 56-foot-wide roadway within a 90-foot-wide right-of-way, and W. Hopkins Street has a pavement width of 50 feet curb-to-curb within a 66-foot-wide right-of-way. The Milwaukee Road railway tracks cross over the segment of W. Capitol Drive on a structure located between N. 34th Street and N. 31st Street; and N. 35th Street crosses over Lincoln Creek on a structure located at W. Congress Boulevard. Land uses along this segment are principally industrial. On-street parking is currently permitted during peak periods along this arterial except on the segment of N. 35th Street between W. Hope Avenue and W. Capitol Drive, where on-street parking is prohibited during the morning peak period in the southbound direction, as well as on the segment of W. Capitol Drive between N. 35th Street and N. 31st Street, where on-street parking is prohibited during both peak periods in the direction of peak traffic flow.

The remaining traffic congestion along this northwest-southeast travel corridor could be alleviated by the provision of additional travel lanes on the arterial segments which make up the routing of W. Hopkins Street through this area. Since there is intensive industrial and residential use adjacent to these arterial segments, any further widening of these segments would result in extensive disruption and would require the taking of much industrial land, many industrial structures, and several residential and commercial structures. Specifically, the analysis indicated that the widening of the arterials which comprise the routing of W. Hopkins Street from W. Villard Avenue to N. 27th Street, to create a continuous desirable urban cross-section with dual 36-foot-wide roadways separated by a 24-foot-wide median within a 120-foot-wide right-of-way, would require the acquisition of 45 residential structures, five industrial structures, and four commercial structures, and the construction of a new bridge across Lincoln Creek. Such widening would also require the acquisition of a wide strip of land along N. 31st Street and W. Hopkins Street between W. Capitol Drive and N. 27th Street which is currently owned by the A. O. Smith Corporation and used for off-street parking. The provision of adequate off-street parking in this area for employees of the A. O. Smith Corporation has been, and is currently, a recognized problem. In an effort to provide adequate off-street parking for its employees, the Corporation has been attempting over the past several years to acquire additional lands east of W. Hopkins Street to be utilized for off-street parking lots. The taking of a wide strip of land from these parking lots would serve to defeat the efforts of the A. O. Smith Corporation, and would exacerbate the parking problem in this area. For these reasons, improvement alternatives which would provide for the physical widening of the arterial segments which comprise the W. Hopkins Street corridor were considered to be impractical. The prohibition of on-street parking along these arterial segments was considered to be the only practical alternative to the provision of additional roadway capacity within this northwest-southeast corridor.

On-street parking is currently used regularly along the segment of W. Hopkins Street between W. Villard Avenue and W. Congress Street, as well as along the segment of N. 31st Street and W. Hopkins Street between W. Capitol Drive and N. 27th Street. On-street parking is used with less regularity along the segment of N. 35th Street between W. Congress Street and W. Capitol Drive and the segments of W. Hopkins Street and N. 34th Street between W. Hope Avenue and W. Capitol Drive. Because adequate off-street parking is provided along the segment of W. Hopkins Street between W. Villard Avenue and W. Congress Street, both in parking lots and in private garages and along intersecting streets, the prohibition of on-street parking in order to provide for two lanes of traffic in the direction of peak traffic flow during both the morning and evening peak periods is considered an implementable alternative for alleviating the remaining traffic congestion along this segment. The prohibition of on-street parking in order to provide for two lanes of through traffic in the direction of peak traffic flow during both the morning and evening peak periods was also considered implementable along the segment of N. 35th Street between W. Congress Street and W. Capitol Drive and along the segments of W. Hopkins Street and N. 34th Street between W. Hope Avenue and W. Capitol Drive. Because on-street parking is used regularly along the segment of N. 31st Street and W. Hopkins Street between W. Capitol Drive and N. 27th Street by employees of the A. O. Smith Corporation, the prohibition of on-street parking along this segment during the peak periods is likely to cause some inconvenience. However, because off-street parking lots are located adjacent to this segment of W. Hopkins Street, and because the A. O. Smith Corporation has long-term plans to provide additional off-street parking, it should be possible to prohibit on-street parking along the segments of N. 31st Street and W. Hopkins Street between W. Capitol Drive and N. 27th Street during both the morning and evening peak periods to provide for two lanes of traffic in the direction of peak traffic flow. Such on-street parking prohibition may be expected to abate all of the remaining traffic congestion along this northwest-southeast corridor.

The impacts of the parking prohibition alternative considered for the arterial segments which comprise the routing of W. Hopkins Street through this area are set forth in Table 247. The impacts of a "do nothing" alternative along this arterial routing, under which the physical dimensions of the roadway surface and the existing parking regulations would remain essentially unchanged, are also provided in Table 247. Under the "do nothing" alternative for these arterial segments, only summer and winter maintenance work and two major resurfacings would be accomplished as necessary between 1980 and 2000. Also, any traffic management actions previously recommended for these arterial segments under the short-range plan for the northwest side study area which would not be precluded by physical road-

Table 247

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. HOPKINS STREET FROM W. VILLARD AVENUE TO N. 27TH STREET

Impact	"Do Nothing" Alternative	On-Street Parking Prohibition Alternative
Cost (in 1980 dollars)[a]		
Construction	$1,541,000	$1,544,000
Real Estate Acquisition, Relocation, and Demolition	--	--
Maintenance	861,000	861,000
Total	$2,402,000	$2,405,000
Disruption		
Residential Units Taken	--	--
Commercial Units Taken	--	--

[a]*Construction costs for each alternative include estimates of the roadway resurfacing costs. Under both alternatives, two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

way dimensions are assumed to have been implemented. In the case of these arterial segments, at the intersection of N. 35th Street with W. Capitol Drive it was recommended that the existing traffic signal be retimed, that an additional signal phase and a new traffic controller be added, and that an existing single left-turn lane be lengthened; and at the intersection of W. Capitol Drive with N. 31st Street it was recommended that the existing traffic signal be retimed and that an existing left-turn lane be lengthened. The capital cost of these improvements, $44,000, was added to the capital and maintenance cost of both the "do nothing" and parking prohibition alternatives considered for the arterial segments which comprise the routing of W. Hopkins Street through this area. It was determined that these actions, while effective in abating the short-range traffic congestion problems which were identified for the segment along W. Capitol Drive, would not be effective in abating the long-range traffic congestion problems along this W. Hopkins Street travel corridor.

The costs shown in Table 247 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, or demolition costs; and the maintenance costs associated with the operation of each of these alternatives over the plan design period. Also indicated in Table 247 is any urban disruption which may be expected to be associated with each of the alternatives.

As shown in Table 247, the parking prohibition alternative would have capital and maintenance costs of about $2,405,000, while the "do nothing" alternative would have capital and maintenance costs of about $2,402,000, the difference in these costs representing the capital cost of the signing necessary to regulate on-street parking. Neither of these alternatives would involve any urban disruption.

The difference in environmental impacts between the parking prohibition alternative and the "do nothing" alternative for these segments of W. Hopkins Street would be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions along these segments.

Based on the additional capacity afforded and congestion abated by each alternative, and the costs and environmental impacts of each alternative, it is recommended that the alternative be implemented which provides for the prohibition of all on-street parking in the direction of peak traffic flow during both peak periods where it currently exists along the arterial segments which comprise the routing of W. Hopkins Street between W. Villard Avenue and N. 27th Street in order to provide for two continuous through traffic lanes in each direction of traffic flow. Such prohibition would mean that vehicles accessing residential and commercial, as well as industrial, land uses along these arterial segments would have to seek parking space on nearby intersecting streets or use off-street parking space in the area. The current and planned availability of such parking makes this recommendation implementable. This action is also recommended because it involves little capital or maintenance costs.

N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190); and N. 124th Street from W. Greenfield Avenue (STH 59) to W. Silver Spring Drive: Traffic congestion is expected to remain in the western edge of the Milwaukee County portion of the study area along N. Mayfair Road (STH 100) and N. 124th Street even after implementation of all recommended transportation systems management measures. In order to abate this remaining congestion and to provide a more adequate spacing of arterial streets to serve existing and planned land use development in this portion of the study area, consideration was given to improving two arterial streets through the area—N. Mayfair Road (STH 100) from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), and N. 124th Street from W. Greenfield Avenue to W. Silver Spring Drive.

From the East-West Freeway to W. Capitol Drive, N. Mayfair Road consists of a desirable urban cross-section with dual 36-foot-wide roadways divided by a 24-foot-wide median, adequate to provide for two through traffic lanes and a parking lane in each direction of traffic flow. This segment of N. Mayfair Road crosses over the tracks of the Chicago & North Western Transportation Company on a structure located at its intersection with W. Blue Mound Road (STH 18); and crosses over the tracks of the Milwaukee Road Railroad and passes under the Zoo Freeway (USH 45) on structures located between W. Watertown Plank Road and W. North Avenue. On-street parking is currently prohibited during both peak periods in the direction of peak traffic flow along the entire length of this segment of N. Mayfair Road.

With the exception of a two-mile-long gap in central Milwaukee County, N. 124th Street is a continuous 12-mile-long arterial roadway which extends from W. Silver Spring Drive within the study area to W. Grange Avenue, an arterial street located about six miles south of the southern boundary of the study area. The two-mile gap is located between W. Greenfield Avenue (STH 59), which is located about one mile south of the southern boundary of the study area, and W. Watertown Plank Road in the study area. Within this two-mile gap, there are portions of N. 124th Street which function as nonarterial roadways between W. Greenfield Avenue and W. Crest Road, and between W. Watertown Plank Road and W. Knoll Road. The adopted long-range transportation system plan for the Southeastern Wisconsin Region proposed construction of a new roadway within the N. 124th Street corridor which would close this gap in N. 124th Street in order that it would function as a continuous arterial running along the Milwaukee/Waukesha County line.

N. 124th Street consists of two roadways between its intersection with W. Knoll Road, about three-tenths of a mile south of W. Watertown Plank Road, and its intersection with W. Watertown Plank Road. These two roadways are located on either side of the Waukesha/Milwaukee County line. The two roadways are at different elevations, the grades differing by as much as about 20 feet. Both of these roadways presently function as non-arterial streets, and both carry two-way traffic to serve abutting residential land uses. Each roadway consists of a rural cross-section with a pavement width of 24 feet, adequate to provide for one through traffic lane in each direction of traffic flow. The rights-of-way of these two roadways abut, the combined right-of-way width ranging from 95 to 110 feet. Except at its intersection with W. North Avenue, which is channelized to provide for dual 26-foot-wide urban roadways curb-to-curb with an 18-foot-wide grass median, N. 124th Street from W. Watertown Plank Road to W. Burleigh Street consists of a rural cross-section with a pavement width of 24 feet curb-to-curb, adequate to provide for one through traffic lane in each direction of traffic flow. The right-of-way width along this segment ranges from 93 to 120 feet. Between W. Burleigh Street and W. Lisbon Avenue, N. 124th Street consists of a desirable urban cross-section with dual 36-foot-wide urban roadways and a 24-foot-wide grass median, adequate to provide for two through traffic lanes and a parking lane in each direction. On-street parking is currently permitted along this segment of N. 124th Street. The right-of-way along this segment of N. 124th Street ranges from 120 to 132 feet wide. Between W. Lisbon Avenue and W. Silver Spring Drive, N. 124th Street consists of a rural cross-section with a pavement width of 20 feet, barely adequate to provide for one through traffic lane in each direction of traffic flow. The right-of-way width along this segment is 110 feet between W. Lisbon Avenue and W. Hampton Avenue, 83 feet between W. Hampton Avenue and W. Villard Avenue, 66 feet between W. Villard Avenue and the Menomonee River, and 93 feet between the Menomonee River and W. Silver Spring Drive. N. 124th Street terminates at its intersection with W. Silver Spring Drive. Outside the northwest side study area, N. 124th Street extends as a nonarterial roadway about four-tenths of a mile north of W. Greenfield Avenue to W. Zinke Street. This segment of N. 124th Street has a rural cross-section with a 24-foot-wide pavement from W. Greenfield Avenue to W. Robinwood Street, and a median-divided rural cross-section with dual 18-foot-wide roadways from W. Robinwood Street to W. Zinke Street. This segment of N. 124th Street north of W. Greenfield Avenue is of adequate pavement width to provide for one through traffic lane in each direction of traffic flow. N. 124th Street crosses over the Menomonee River on a structure between W. Villard Avenue and W. Custer Street. This structure provides a 20-foot-wide pavement.

Although the remaining traffic congestion along this north-south corridor through western Milwaukee County could be alleviated by the provision of additional travel lanes on either N. Mayfair Road or N. 124th Street, improvement and expansion alternatives were considered only for N. 124th Street because on-street parking is currently prohibited during peak periods along N. Mayfair Road. Further widening of N. Mayfair Road to provide for four through traffic lanes in each direction was considered to be impractical, as such widening would make pedestrian crossing difficult.

In the consideration of improvement and expansion alternatives for N. 124th Street through western Milwaukee County, the arterial was divided into four study segments. The first segment extends from W. Greenfield Avenue to W. Watertown Plank Road or, within the study area, from the East-West Freeway to W. Watertown Plank Road; the second segment extends from W. Watertown Plank Road to W. North Avenue; the third segment extends from W. North Avenue to W. Hampton Avenue; and the fourth segment extends from W. Hampton Avenue to W. Silver Spring Drive. One alternative, the improvement and expansion of the roadway segment to a minimum urban cross-section, was developed for the first segment; two improvement alternatives, the improvement of N. 124th Street to a minimum urban cross-section and to a desirable urban cross-section, were considered for the second and third segments; and one improvement alternative, the improvement of N. 124th Street to a minimum urban cross-section, was developed for the fourth segment. Different cross-sections were considered for each of these four segments of N. 124th Street because of the differences in the abutting land uses and in the traffic demand on each segment.

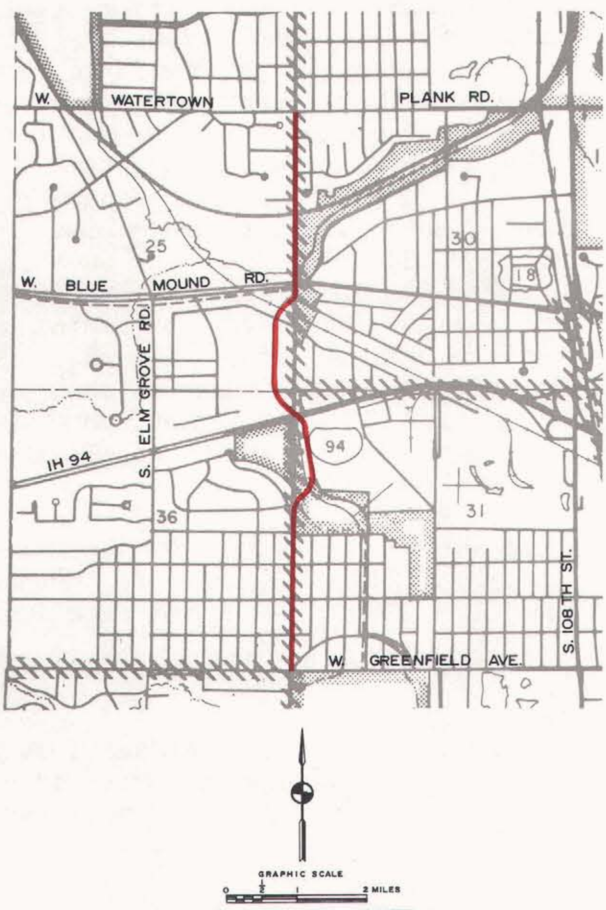
The one alternative considered for the first segment of N. 124th Street called for the provision of a new arterial roadway between W. Greenfield Avenue and W. Watertown Plank Road, or, within the study area, between the East-West Freeway and W. Watertown Plank Road. Such expansion could be expected to help abate the forecast traffic congestion along N. Mayfair Road and along N. 124th Street. In addition, it would create a continuous arterial facility through western Milwaukee County and would thereby provide a more adequate arterial spacing and more desirable framework for existing and planned urban development within this section of Milwaukee County. This extension of N. 124th Street could also be expected to reduce traffic volumes through the central business district of the Village of Elm Grove, lying immediately west of the study area on W. Watertown Plank Road and S. Elm Grove Road, by about 1,600 vehicles, or by about 20 percent, on an average weekday, thereby abating another traffic flow problem in the Region.

Under this alternative, the westernmost roadway on N. 124th Street between W. Watertown Plank Road and W. Knoll Road would be converted from a 24-foot-wide rural roadway to a 48-foot-wide urban roadway with curb and gutter, adequate to provide for two through traffic lanes in each direction of traffic flow with parking prohibited. Between these limits, this improvement would be set within a 66-foot-wide right-of-way. To accomplish this widening, some reconstruction would be necessary in the area of the maximum difference in elevation of the eastern and western roadways in order to obtain six feet of additional right-of-way from the eastern roadway. Between W. Knoll Road and W. Blue Mound Road, it would be necessary to acquire a new 80-foot-wide right-of-way from lands owned by United Parcel Service to accommodate the new roadway. This right-of-way would abut the western edge of the Wisconsin Electric Power Company (WEPCo) right-of-way to a point about 600 feet north of its intersection with W. Blue Mound Road, at which point the roadway would veer southwesterly to utilize the existing driveway to the United Parcel Service facility. This driveway, which currently has a 30-foot-wide pavement, would be reconstructed and widened to accommodate the new roadway. The location of the new roadway along this alignment would require the relocation of eight lighting standards, and could also require the relocation of several telephone poles and lines. The intersection of W. Blue Mound Road with the driveway to the United Parcel Service facility is already signalized, and this signalization could be utilized for the reconstructed intersection. Under this alternative, it would be necessary to provide a new structure immediately south of W. Knoll Road adequate to carry the proposed 48-foot-wide arterial roadway as well as pedestrian ways over the tracks of the Milwaukee Road.

South of W. Blue Mound Road, the roadway would cross over Underwood Creek on the existing structure, which would require reconstruction to accommodate the proposed 48-foot-wide cross-section. South of this structure, the new roadway would follow a curved alignment along the east side of the channel which carries Underwood Creek through Underwood Creek Parkway between W. Blue Mound Road and the East-West Freeway, taking advantage of a 70-foot-wide right-of-way which has been reserved within this area. Immediately south of its intersection with the East-West Freeway, the new roadway would merge with the existing segment of Underwood Creek Parkway, and would be carried on Underwood Creek Parkway for a distance of about one-quarter mile south of the East-West Freeway. Underwood Creek Parkway would be widened on its existing right-of-way along this segment from a 30-foot-wide rural pavement to a 48-foot-wide urban pavement. This 48-foot-wide pavement can be accommodated under the existing structure which carries the East-West Freeway over Underwood Creek Parkway through the construction of a retaining wall on the east side of this structure. At the point south of the East-West Freeway where Underwood Creek Parkway curves southeasterly, the new roadway would veer to the southwest and be carried on a new structure over Underwood Creek to an existing segment of N. 124th Street at W. Zinke Street. Between W. Zinke Street and W. Robinwood Street, the existing dual 18-foot-wide pavements would be widened to dual 24-foot-wide pavements with curb and gutter and a 20-foot-wide median. Between W. Robinwood Street and W. Greenfield Avenue, the roadway would be converted from a 24-foot-wide rural cross-section to a 48-foot-wide urban cross-section with curb and gutter and sidewalks. The alignment of this southerly segment of N. 124th Street is shown on Map 231.

Map 231

ALIGNMENT OF PROPOSED N. 124TH STREET BETWEEN W. GREENFIELD AVENUE (STH 59) AND W. WATERTOWN PLANK ROAD



This map shows the proposed alignment of a new roadway which would be situated along N. 124th Street extended between W. Greenfield Avenue and W. Watertown Plank Road. Completion of this segment of N. 124th Street would help to abate traffic congestion in the north-south travel corridor in the western portion of the study area.

Source: SEWRPC.

Because of the provision under this alternative of an 80-foot-wide right-of-way along portions of N. 124th Street, left- and/or right-turn lanes could be provided as necessary at the intersections of N. 124th Street with W. Watertown Plank Road, W. Blue Mound Road, and W. Greenfield Avenue. A typical cross-section for this alternative is shown in Figure 116. Under this alternative, on-street parking would be prohibited during the morning and evening peak periods in the direction of peak traffic flow in order to provide for two through traffic lanes in the direction of peak traffic flow. This alternative could be expected to alleviate the remaining traffic congestion along the north-south travel corridor through this section of Milwaukee County, and, importantly, to provide arterial street and highway system continuity and a more adequate arterial spacing to serve existing and planned land use development in this area.

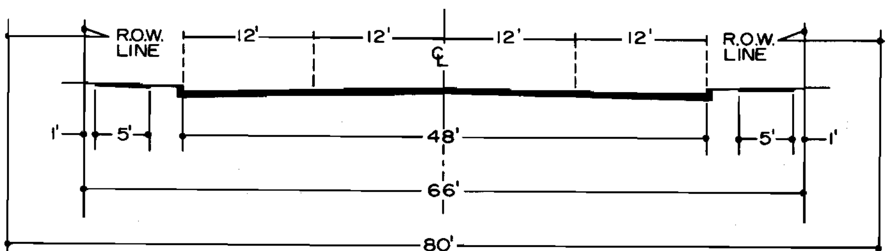
It was not considered practical to provide a desirable urban cross-section for N. 124th Street from W. Greenfield Avenue to W. Watertown Plank Road, with dual 36-foot-wide roadways separated by a 24-foot-wide median—adequate to provide for two through lanes of traffic plus a parking lane in each direction of traffic flow along this corridor. On-street parking would not be required along this segment of N. 124th Street because of the characteristics of residential land use adjacent to the segment and the availability of alternative off-street parking in private garages. Also, the design of an alternative roadway alignment along this southern segment of N. 124th Street was intended to result in the least disruption possible along Underwood Creek Parkway.

The first alternative considered for the second segment of N. 124th Street called for widening N. 124th Street from W. Watertown Plank Road to W. North Avenue to a minimum urban cross-section with a 48-foot-wide pavement curb-to-curb within the existing 93- to 110-foot-wide right-of-way, adequate to provide for two through traffic lanes in each direction of traffic flow with on-street parking prohibited. Under this alternative, the existing channelization at the intersection of N. 124th Street and W. North Avenue would be retained. A typical cross-section for this alternative is shown in Figure 117. Because of the width of right-of-way available along this segment, right-turn and left-turn lanes could be provided as necessary, and the intersection of N. 124th Street with W. Watertown Plank Road could be widened. Under this alternative, it would be necessary to prohibit on-street parking during both the morning and evening peak periods in the direction of peak traffic flow. Such prohibition should be implementable because of the availability of off-street parking in private garages. This alternative could also be expected to help abate the traffic congestion along the north-south corridor within this section of Milwaukee County.

The second alternative considered for the improvement of the second segment of N. 124th Street called for widening N. 124th Street along this segment to a desirable urban cross-section with dual 36-foot-wide roadways divided by a four-foot-wide median on a 100-foot-wide right-of-way. Under this alternative, the channelized roadway at the intersection of N. 124th Street and W. North Avenue would be reconstructed to provide for dual 36-foot-wide roadways. This roadway cross-section would be adequate to provide for two through traffic lanes and one parking lane in each direction of traffic flow. A typical cross-section for this alternative is shown in Figure 117. For that segment under this alternative which would require an additional seven feet of right-of-way, or from

Figure 116

TYPICAL CROSS-SECTION OF IMPROVEMENT AND EXPANSION ALTERNATIVE FOR N. 124TH STREET BETWEEN W. GREENFIELD AVENUE (STH 59) AND W. WATERTOWN PLANK ROAD



Source: SEWRPC.

W. Walnut Street to W. Woodland Street, the location for the additional right-of-way which would result in the least cost and disruption was determined to be centered on the existing roadway. The provision of a median under this alternative would allow for separation of opposing traffic flows, thereby increasing travel safety along this segment of N. 124th Street. Also under this alternative, turn-lane channelization could be provided at the intersection of N. 124th Street with W. Watertown Plank Road.

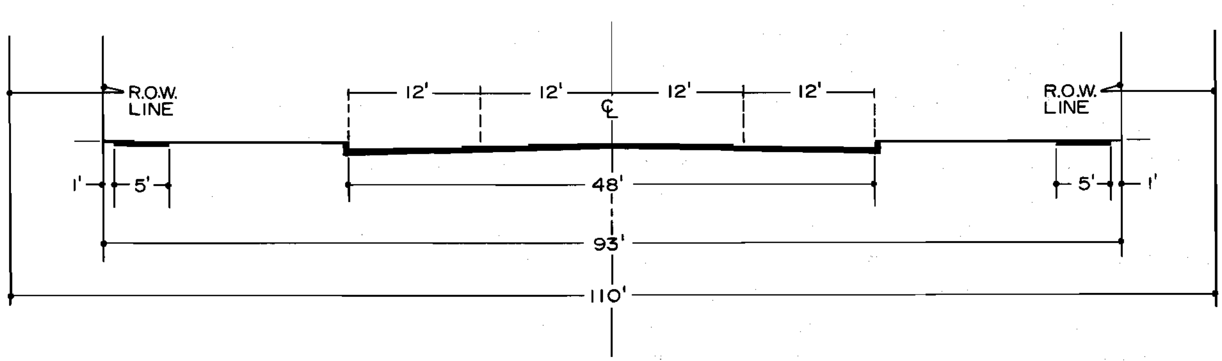
An important factor in the consideration of alternative improvements for this segment of N. 124th Street is the historic opposition by the Village of Elm Grove, which borders this segment on the west, to the installation of an urban roadway cross-section with curbs and gutters along this segment. The position of the Village has been that the improvement of this segment of N. 124th Street would destroy the desired rural appearance of the area. However, according to the City of Wauwatosa, poor drainage along this segment of N. 124th Street makes the installation of curbs, gutters, and storm sewers desirable.

The two alternatives proposed for the improvement of the third segment of N. 124th Street would involve the improvement of those portions of this segment which have not already been improved to a desirable urban cross-section, or those segments of N. 124th Street between W. North Avenue and W. Burleigh Street and between W. Lisbon Avenue and W. Hampton Avenue. The first alternative called for widening these parts of the third segment to minimum urban cross-sections with a 48-foot-wide pavement, curb and gutter, and sidewalks, adequate to provide for one through traffic lane and one parking lane or two through traffic lanes in each direction of traffic flow. This improvement could be accommodated within the existing 83- to 110-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 118. Under this alterna-

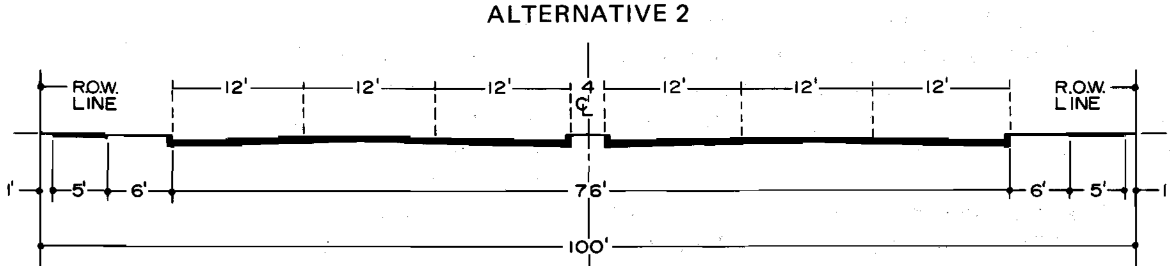
Figure 117

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES FOR N. 124TH STREET BETWEEN W. WATERTOWN PLANK ROAD AND W. NORTH AVENUE

ALTERNATIVE 1



ALTERNATIVE 2

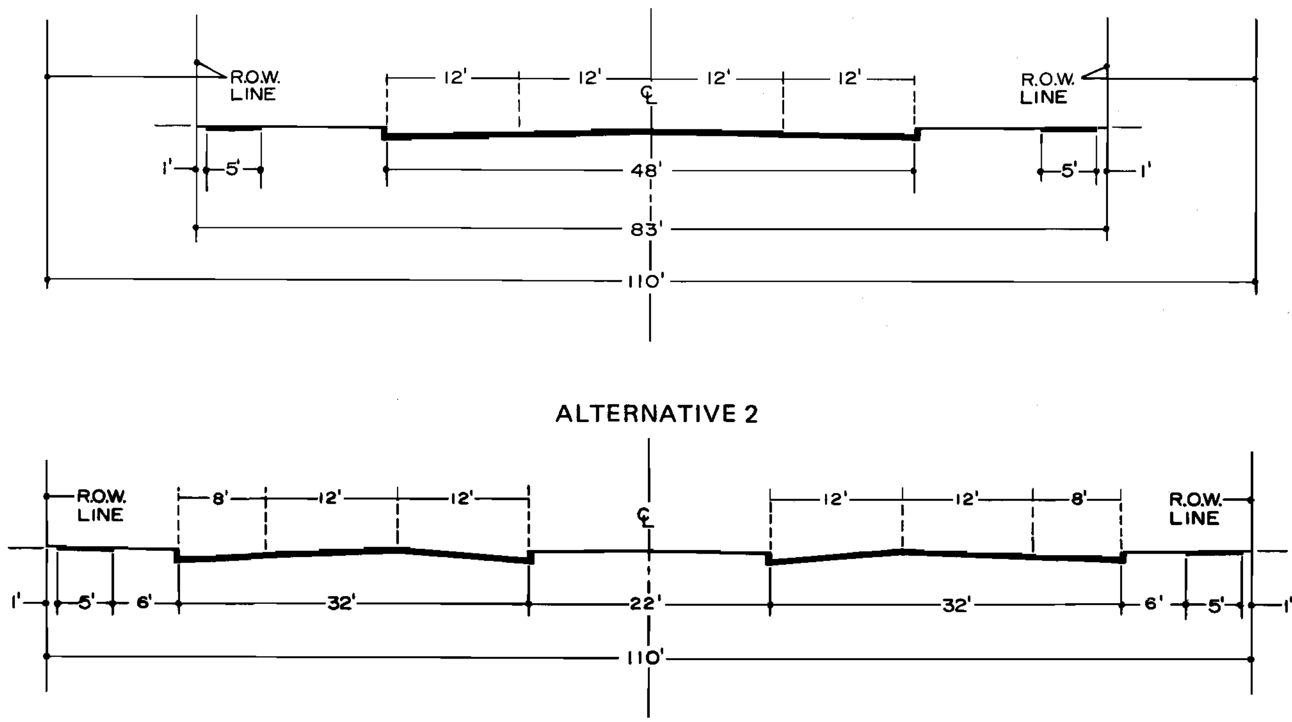


Source: SEWRPC.

Figure 118

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES FOR
N. 124TH STREET BETWEEN W. NORTH AVENUE AND W. HAMPTON AVENUE

ALTERNATIVE 1



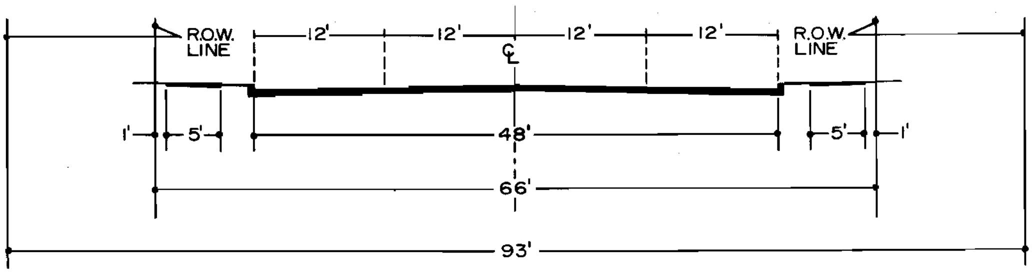
Source: SEWRPC.

tive, on-street parking would be prohibited during both the morning and evening peak periods in the direction of peak traffic flow. Major intersections which are not already widened along this segment of N. 124th Street, or, specifically, the intersections of N. 124th Street with W. Center Street, W. Hampton Avenue, and W. Silver Spring Drive, could be channelized. The prohibition of on-street parking from W. North Avenue to W. Burleigh Street and from W. Lisbon Avenue to W. Hampton Avenue during peak periods in the direction of peak flow should be implementable because of the availability of off-street parking in private garages and in off-street parking lots. This alternative, in conjunction with the improvement and expansion alternatives proposed for the first and second segments of N. 124th Street, could be expected to alleviate the remaining traffic congestion along this north-south travel corridor through western Milwaukee County.

The second alternative proposed for the third segment of N. 124th Street called for widening to a desirable urban cross-section from W. North Avenue to W. Burleigh Street and from W. Lisbon Avenue to W. Hampton Avenue. The desirable urban cross-sections would consist of dual 32-foot-wide roadways with a 22-foot-wide median on a 110-foot-wide right-of-way, adequate to provide for two through traffic lanes and a parking lane in each direction, or three through traffic lanes with parking prohibited. A typical cross-section for this alternative is shown in Figure 118. Under this alternative, on-street parking would be prohibited along the entire length of this segment of N. 124th Street during the morning and evening peak periods in the direction of peak traffic flow in order to provide for three through traffic lanes in each direction during peak periods. Under this alternative, it would be necessary to acquire 17 feet of additional right-of-way between W. Arbor Street and W. Center Street. The location for this new right-of-way which would result in the least cost and disruption was determined to be centered on the existing centerline of N. 124th Street. The provision of a median under this alternative would allow for the separation of opposing traffic flows, thereby increasing travel safety along this section of N. 124th Street, and would also allow for the provision of left-turn lanes as necessary along this

Figure 119

TYPICAL CROSS-SECTION OF IMPROVEMENT ALTERNATIVE FOR N. 124TH STREET BETWEEN W. HAMPTON AVENUE AND W. SILVER SPRING DRIVE



Source: SEWRPC.

segment. This alternative may be expected to eliminate much of the traffic congestion along this north-south corridor.

The single alternative considered for the fourth segment of N. 124th Street called for widening the existing 20-foot-wide rural roadway between W. Hampton Avenue and W. Silver Spring Drive to a minimum urban cross-section with a 48-foot-wide pavement curb-to-curb, adequate to provide for one through traffic lane and one parking lane, or two through traffic lanes, in each direction of traffic flow with peak-period parking prohibited. Under this alternative, the intersections of N. 124th Street with W. Hampton Avenue and W. Silver Spring Drive could be channelized within the existing 83- to 93-foot-wide right-of-way. For about one-tenth of one mile between W. Villard Avenue and the Menomonee River, the 48-foot-wide roadway would be contained within a 66-foot-wide right-of-way. A new structure, adequate to provide for four through traffic lanes plus pedestrian ways, would also be required under this alternative to carry N. 124th Street over the Menomonee River. A typical cross-section for this alternative is shown in Figure 119. Under this alternative, it would be necessary to prohibit on-street parking during both the morning and evening peak periods in the direction of peak traffic flow. Such prohibition along this segment should be implementable because of the availability of off-street parking in parking lots in the area. This alternative may also be expected to alleviate the traffic congestion along this north-south corridor.

An alternative which would provide for a desirable urban cross-section with dual 32-foot-wide roadways and a 22-foot-wide median on a 110-foot-wide right-of-way was not considered for this segment of N. 124th Street. On-street parking would not be required along this segment of N. 124th Street because of the availability of adequate off-street parking along this segment. Also, because of the restrictive right-of-way width along this segment, widening to a 110-foot right-of-way would require the taking of between two and seven commercial structures and between 12 and 18 industrial structures, depending on the location of the new right-of-way.

The impacts of each of the alternatives considered for the four segments of N. 124th Street between W. Greenfield Avenue and W. Silver Spring Drive are set forth in Table 248. The impacts of a "do nothing" alternative for these segments, under which the physical dimensions of the existing roadway would remain essentially unchanged, are also provided in Table 248. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along N. 124th Street between 1980 and 2000. Under each of the alternative plans, any traffic management actions previously recommended for this segment of N. 124th Street under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. In the case of N. 124th Street, no recommendations were made under the short-range plan. It should be pointed out that the implementation of the "do nothing" alternative would neither serve to abate any remaining traffic congestion along this north-south corridor, nor provide any additional arterial street and highway system network continuity or more adequate street spacing in this portion of Milwaukee County.

Table 248

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT AND EXPANSION PLANS FROM N. 124TH STREET FROM W. GREENFIELD AVENUE (STH 59) TO W. SILVER SPRING DRIVE

Impact	Segment 1—From the East-West Freeway to W. Watertown Plank Road (construction of new 48-foot-wide roadway)	Segment 2—From W. Watertown Plank Road to W. North Avenue			Segment 3—From W. North Avenue to W. Hampton Avenue			Segment 4—From W. Hampton Avenue to W. Silver Spring Drive	
		"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (dual 36-foot-wide urban roadways)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)	Alternative 2 (dual 32-foot-wide urban roadways)	"Do Nothing" Alternative	Alternative 1 (48-foot-wide urban roadway)
Cost (in 1980 dollars)[a]									
Construction	$2,376,000	$196,000	$1,374,000	$1,825,000	$ 795,000	$2,798,000	$3,570,000	$161,000	$1,127,000
Real Estate Acquisition, Relocation, and Demolition	275,000	- -	- -	11,000	- -	- -	25,000	- -	- -
Maintenance	317,000	155,000	310,000	466,000	768,000	1,031,000	1,443,000	127,000	254,000
Total	$2,968,000	$351,000	$1,684,000	$2,302,000	$1,563,000	$3,829,000	$5,038,000	$288,000	$1,381,000
Disruption									
Residential Units Taken	- -	- -	- -	- -	- -	- -	- -	- -	- -
Commercial Units Taken	- -	- -	- -	- -	- -	- -	- -	- -	- -

[a] *Construction costs for each alternative include estimates of the roadway construction, utility relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparsions between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement. Costs for segment 1 include only capital and maintenance costs incurred within the northwest side study area. Capital and maintenance costs for the expansion and improvement of the southernmost segment of N. 124th Street from W. Greenfield Avenue to W. Watertown Plank Road would total about $4,820,000.*

Source: City of Wauwatosa and SEWRPC.

The costs shown in Table 248 are expressed in 1980 dollars and include estimates of the construction costs, including utility and relocation costs; the right-of-way acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 248 are the numbers of residential or commercial properties which would be required to be taken under each of the alternative improvements considered.

As shown in Table 248, the expansion alternative proposed for the first segment of N. 124th Street between W. Greenfield Avenue and W. Watertown Plank Road, which calls for the construction of a new arterial segment between W. Greenfield Avenue and W. Watertown Plank Road, would have capital and maintenance costs of about $2,968,000. It is important to note that the costs in Table 248 include only the cost incurred for those portions of this new arterial which would be constructed within the study area, or from the East-West Freeway to W. Watertown Plank Road. The capital and maintenance costs necessary to complete this segment of roadway between W. Greenfield Avenue and the East-West Freeway at a minimum urban cross-section would approximate $1,852,000.

As also shown in Table 248, of the alternatives proposed for the segment of N. 124th Street between W. Watertown Plank Road and W. North Avenue, the second widening alternative—the widening of this segment of N. 124th Street to a desirable urban cross-section—would have the highest capital and maintenance costs, estimated at $2,302,000. The widening of this segment of N. 124th Street to a minimum urban cross-section having a 48-foot-wide pavement curb-to-curb would have capital and maintenance costs of about $1,684,000; and the capital and maintenance costs of the "do nothing" alternative for this segment were estimated at $351,000. Neither of the alternatives considered for this segment of N. 124th Street would require the acquisition of any residential units, although the second widening alternative would involve the taking of a seven-foot-wide strip of land along the residential development between W. Walnut Street and W. Woodland Street.

As also shown in Table 248, of the alternatives proposed for the third segment of N. 124th Street—from W. North Avenue to W. Hampton Avenue—the second widening alternative—the widening of those segments of N. 124th Street which are not currently improved to a desirable cross-section to a desirable urban cross-section—would have the highest capital and maintenance costs, about $5,038,000. The widening of those segments of N. 124th Street which are not currently improved to a desirable urban cross-section to a minimum urban cross-section having a 48-foot-wide pavement curb-to-curb would have a capital and maintenance cost of about $3,829,000. The capital and maintenance costs of a "do nothing" alternative along this segment were estimated at $1,563,000. Neither of the alternatives proposed for this segment would involve the taking of commercial or residential units.

Finally, as shown in Table 248, the improvement alternative proposed for the fourth segment of N. 124th Street—from W. Hampton Avenue to W. Silver Spring Drive—which called for the improvement of this segment of N. 124th Street to a minimum urban cross-section, would have capital and maintenance costs of about $1,381,000. The capital and maintenance costs of a "do nothing" alternative for this segment would be about $288,000. This alternative would not require the taking of any additional right-of-way or residential or commercial structures.

There would be no significant difference in the environmental impacts in terms of air quality and noise levels between the two widening alternatives considered for the second and third segments of N. 124th Street. However, the difference in environmental impacts between the widening alternatives and the "do nothing" alternative for each of these segments would be significant. Under the "do nothing" alternative for each of these segments, the unresolved congestion along this north-south corridor of N. Mayfair Road and N. 124th Street may be expected to result in increased stop-and-go driving and interrupted traffic flow, and attendant increased air pollutant emissions and noise levels.

Based upon consideration of the additional capacity afforded and congestion abated by the expansion alternative and the "do nothing" alternative for the first segment, and the capital costs and environmental impacts of those alternatives, it is recommended that the alternative which provides for the construction of a new continuous four-lane roadway between W. Greenfield Avenue and W. Watertown Plank Road be implemented for the first segment of the N. 124th Street corridor—from W. Greenfield Avenue to W. Watertown Plank Road. The costs and impacts of such a new roadway would be justified by the benefits it would offer—namely, the provision of additional arterial street and highway system continuity, the provision of adequate arterial street spacing in this area of Milwaukee County, and the alleviation of traffic flow problems in this area. Such provision of a new roadway is consistent with the adopted long-range transportation system plan for the Southeastern Wisconsin Region.

For the second segment of N. 124th Street—between W. Watertown Plank Road and W. North Avenue—it is recommended that the first widening alternative be implemented—that is, the widening of this segment of N. 124th Street to a minimum urban cross-section with a 48-foot-wide pavement curb-to-curb and peak-period on-street parking prohibited. While both widening proposals for this segment of N. 124th Street may be expected to abate the traffic congestion along the north-south corridor through this area, the first alternative is recommended because on-street parking is not required along this segment of N. 124th Street, and because the provision of a desirable urban cross-section would entail significant intrusion upon the desired rural appearance of this segment of N. 124th Street.

For the third portion of N. 124th Street—between W. North Avenue and W. Hampton Avenue—it is recommended that the alternative be implemented which provides for the widening to desirable urban cross-sections those segments of N. 124th Street along this segment which are not already desirable urban cross-sections. On-street parking would be prohibited during both peak periods in the direction of peak traffic flow under this alternative. This alternative improvement is recommended because its implementation would serve to create a continuous traffic corridor with three through traffic lanes in the direction of peak traffic flow along the entire length of N. 124th Street from W. North Avenue to W. Hampton Avenue, thereby creating a viable travel corridor through this section of Milwaukee County. This alternative is also recommended because the additional channelization and separation of opposing traffic flows provided by the provision of a median would enhance traffic safety and provide for improved level of service on this segment of N. 124th Street.

For the fourth portion of N. 124th Street—between W. Hampton Avenue and W. Silver Spring Drive—it is recommended that the alternative be implemented which provides for the widening of this segment of N. 124th Street to a minimum urban cross-section. On-street parking would be prohibited during both the morning and evening peak periods in the direction of peak traffic flow under this alternative, and two through traffic lanes would be provided in each direction. This alternative is recommended as its implementation, along with the implementation of the recommended alternative for each of the other segments of N. 124th Street, would help to create a continuous north-south travel corridor through western Milwaukee County, and would do so in the least disruptive manner possible.

W. Blue Mound Road (STH 18) and W. Wisconsin Avenue from N. 124th Street to the North-South Freeway (IH 43): To resolve the congestion which may be expected to remain in the plan design year in the east-west travel corridor along W. Blue Mound Road and W. Wisconsin Avenue between N. 124th Street and the North-South Freeway (IH 43), but (STH 18 for the segments of W. Blue Mound Road and W. Wisconsin Avenue between N. 124th Street and N. 35th Street), consideration was given to improving the segments of W. Blue Mound Road and W. Wisconsin Avenue. By increasing the number of moving traffic lanes provided along these segments of W. Blue Mound Road and W. Wisconsin Avenue, the traffic congestion problems in this travel corridor could be abated.

Between N. 124th Street and N. Glenview Avenue, W. Blue Mound Road currently is improved to a desirable urban cross-section, having dual 34-foot-wide roadways separated by a 24-foot-wide median, adequate to provide for two through traffic lanes and a parking lane or three through traffic lanes in each direction. The right-of-way along this section of W. Blue Mound Road is 120 feet wide. Between N. Glenview Avenue and N. 59th Street, W. Blue Mound Road consists of an undivided urban cross-section with a curb-to-curb pavement width of 60 feet, adequate to provide for two through traffic lanes and a parking lane in each direction. The right-of-way width along this section of W. Blue Mound Road is 120 feet from N. Glenview Avenue to N. 76th Street, varies from 90 to 105 feet between N. 76th Street and N. 68th Street, is 90 feet between N. 68th Street and N. 60th Street, and is 90 feet between N. 60th Street and N. 59th Street. On its east approach to N. Hawley Road, this section of W. Blue Mound Road consists of dual 42-foot-wide roadways, including a 14-foot-wide left-turn lane, separated by a 20-foot-wide median, and on its west approach W. Blue Mound Road has dual 32-foot-wide roadways including a 10-foot-wide left-turn lane, adequate to provide for two through traffic lanes in each direction of traffic flow. Between N. Hawley Road and N. Story Parkway, W. Blue Mound Road consists of an undivided urban roadway with a curb-to-curb pavement width of 49 to 54 feet, adequate to provide for one through traffic lane and one parking lane in each direction of traffic flow. The right-of-way width along W. Blue Mound Road between N. 60th Street and N. Hawley Road varies from 90 to 100 feet, and is 66 feet between N. Hawley Road and N. Story Parkway. East of its intersection with N. Story Parkway, W. Blue Mound Road curves northerly to intersect W. Wisconsin Avenue. Between N. Story Parkway and its intersection with W. Wisconsin Avenue, W. Blue Mound Road consists of dual 26-foot-wide roadways separated by a median which varies in width from 4 to 24 feet, adequate to provide for one through lane and one parking lane in each direction of traffic flow. The right-of-way along this section of W. Blue Mound Road is 90 feet wide.

Between its intersection with W. Blue Mound Road and N. 38th Street, W. Wisconsin Avenue is carried on a 1,200-foot-long viaduct as an undivided roadway having a curb-to-curb pavement width of 58 feet, adequate to provide for two through lanes of traffic in each direction of traffic flow. Between N. 38th Street and N. 35th Street, W. Wisconsin Avenue consists of dual 44-foot-wide roadways separated by a 12-foot-wide median, adequate to provide for three through traffic lanes and a parking lane in each direction of traffic flow. Between N. 35th Street and N. 16th Street, W. Wisconsin Avenue consists of dual 32-foot-wide roadways separated by a 12-foot-wide median, adequate to provide for two through traffic lanes and one parking lane or three through lanes in each direction. Between N. 12th Street and N. 11th Street, W. Wisconsin Avenue also consists of dual roadways which vary in width from 30 to 37 feet, adequate to provide for two through traffic lanes and a parking lane or three through lanes in each direction. The right-of-way width along W. Wisconsin Avenue between N. 38th Street and N. 11th Street varies from 100 to 120 feet.

W. Blue Mound Road is carried over the tracks of the Chicago & North Western Transportation Company on a structure at its intersection with N. Mayfair Road (STH 100); is carried over the Zoo Freeway (USH 45) on a structure located between N. 97th Street and N. 95th Street; and is carried over the Stadium Freeway (USH 41) on a structure located between N. Story Parkway and W. Wisconsin Avenue. W. Wisconsin Avenue is carried over the tracks of the Milwaukee Road and over the Menomonee River on a viaduct located between W. Blue Mound Road and N. 38th Street. On-street parking is subject to only minimal restriction on W. Blue Mound Road between N. 124th Street and N. 49th Street; is prohibited at all times between N. 49th Street and N. 38th Street; and is prohibited during both the morning and evening peak periods in the direction of peak traffic flow between N. 38th Street and the North-South Freeway (IH 43).

Two alternatives were developed for increasing the arterial street capacity of the segments of W. Blue Mound Road and W. Wisconsin Avenue between N. 124th Street and the North-South Freeway (IH 43). The first alternative called only for the prohibition of all remaining on-street parking along both arterial segments; and the second alternative called for widening segments of these arterials from minimum to desirable urban cross-sections.

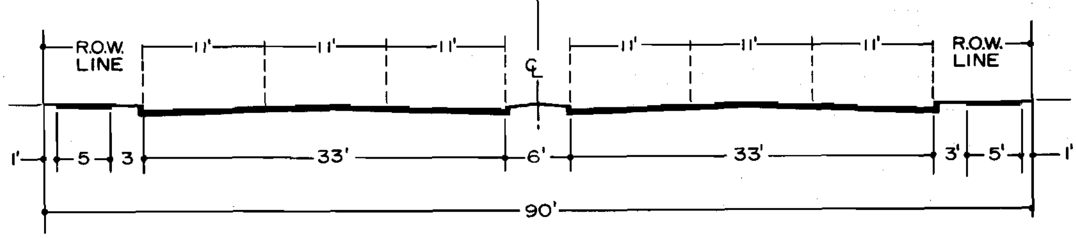
The first alternative would provide for the prohibition of all on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along W. Blue Mound Road between N. 124th Street and N. 49th Street in order to provide for three through traffic lanes in each direction during peak periods on W. Blue Mound Road from N. 124th Street to N. Glenview Avenue, and on W. Wisconsin Avenue from N. 38th Street to the North-South Freeway, and for two through traffic lanes in each direction during peak periods on W. Blue Mound Road between N. Glenview Avenue and N. 38th Street. Such parking prohibition would mean that vehicles accessing land uses along this segment of W. Blue Mound Road would have to seek parking space on nearby intersecting streets, or use off-street parking space in the area.

Development along this segment of W. Blue Mound Road consists of a mixture of residential and commercial land uses between N. 124th Street and N. Mayfair Road (STH 100); a combination of recreational, residential, and institutional land uses between N. Mayfair Road and the Stadium Freeway; a combination of residential and commercial land uses between the Stadium Freeway and N. 91st Street; primarily residential land uses between N. 91st Street and N. Glenview Avenue; a combination of recreational and commercial land uses between N. Glenview Avenue and N. 76th Street; primarily residential land uses between N. 76th Street and N. 66th Street; primarily commercial land uses between N. 66th Street and N. Hawley Road; and a combination of institutional and residential land uses between N. Hawley Road and N. 49th Street. Although on-street parking is used regularly along this segment of W. Blue Mound Road, the prohibition of on-street parking is considered implementable because of the availability of alternate parking space on nearby intersecting streets and in off-street parking locations. This alternative could be expected to eliminate the remaining traffic congestion along W. Blue Mound Road between N. 124th Street and N. 49th Street, but could not be expected to abate the remaining traffic congestion along W. Wisconsin Avenue.

The second alternative would entail the improvement of the segment of W. Blue Mound Road from N. Glenview Avenue to W. Wisconsin Avenue to a desirable urban cross-section with dual 33-foot-wide urban roadways separated by a six-foot-wide median within a 90-foot-wide right-of-way, and would entail the prohibition of all on-street parking during peak periods in the direction of peak traffic flow along W. Blue Mound Road between N. 124th Street and N. Glenview Avenue, as well as continued parking prohibition along W. Wisconsin Avenue between N. 38th Street and the North-South Freeway and on-street parking prohibition between N. Glenview Avenue and N. 38th Street. This widening would provide for three through traffic lanes in each direction during peak travel periods along W. Blue Mound Road between N. 124th Street and N. Glenview Avenue; three through traffic lanes in each direction during peak travel periods on W. Blue Mound Road between N. Glenview Avenue and W. Wisconsin Avenue; two through traffic lanes in each direction during peak travel periods on the W. Wisconsin Avenue viaduct; and three through traffic lanes in each direction during peak travel periods along W. Wisconsin Avenue between N. 38th Street and the North-South Freeway. A typical cross-section for this alternative is shown in Figure 120. The median called for under this alternative would provide for continuous separation of opposing traffic flows along these problem segments, thereby increasing travel safety. On those segments of W. Blue Mound Road where it would be necessary to acquire additional rights-of-way under this alternative, or between N. 70th Street and N. Story Parkway, the location for this right-of-way which would result in the least cost and disruption was determined to be to the north of the existing right-of-way line

Figure 120

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES FOR W. BLUE MOUND ROAD AND W. WISCONSIN AVENUE FROM N. 124TH STREET TO THE NORTH-SOUTH FREEWAY



Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

between N. 70th Steet and N. 63rd Street; to the south of the existing right-of-way line between N. 63rd Street and N. 60th Street; centered on the existing roadway between N. 60th Street and N. Hawley Road; and to the north of the existing right-of-way line between N. Hawley Road and N. Story Parkway. This alternative would also require the replacement of the bridge structure over the Stadium Freeway (USH 41) along W. Blue Mound Road. This alternative may also be expected to abate the remaining congestion along W. Blue Mound Road between N. 124th Street and W. Wisconsin Avenue, but would not abate any of the congestion remaining along W. Wisconsin Avenue.

Since the segment of W. Wisconsin Avenue carried on the W. Wisconsin Avenue viaduct may be expected to operate at design capacity in the design year, the replacement of this viaduct with a structure which would carry three through traffic lanes in each direction was not considered under the second alternative. Instead, this viaduct would continue to provide four through traffic lanes within the existing pavement. Also, widening the segment of W. Wisconsin Avenue between N. 38th Street and the North-South Freeway to provide for four through traffic lanes in each direction during peak periods was not considered under this alternative. This segment of W. Wisconsin Avenue is located immediately to the west of the central business district of the City of Milwaukee, and any further widening of this segment would result in extensive urban disruption.

The impacts of each of the alternatives considered for W. Blue Mound and W. Wisconsin Avenue are set forth in Table 249. The impact of a "do nothing" alternative, under which the physical dimensions of the roadway surface would remain essentially unchanged, are also provided in Table 249. In each case under both the "do nothing" and the first alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along W. Blue Mound Road and W. Wisconsin Avenue between 1980 and 2000. Also, under each of the alternative plans, any traffic management actions previously recommended for the arterial segments under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. In the case of these segments of W. Blue Mound Road and W. Wisconsin Avenue, it was recommended that an additional signal phase and a new traffic controller be added at the intersection of W. Wisconsin Avenue with N. 35th Street. The total cost of these improvements, $14,000, was added to the cost of each alternative plan. While effective in abating the short-range problem at this intersection, this action was found to be ineffective as a means of resolving the long-range problem along the segment of W. Wisconsin Avenue from N. 124th Street to the North-South Freeway (IH 43). Implementation of the "do nothing" alternative would not serve to abate any remaining congestion along these segments of W. Blue Mound Road and W. Wisconsin Avenue.

The costs shown in Table 249 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 249 is the urban disruption which may be expected to be associated with each of the alternatives as measured by the number of residential and commercial properties required to be taken.

Table 249

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. BLUE MOUND ROAD AND W. WISCONSIN AVENUE FROM N. 124TH STREET TO THE NORTH-SOUTH FREEWAY (IH 43)

Impact	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)	Alternative 2 (widening to dual 33-foot-wide roadways between W. Glenview Avenue and W. Wisconsin Avenue, and parking prohibition)
Cost (in 1980 dollars)[a]			
Construction	$6,136,000	$6,140,000	$ 8,958,000
Real Estate Acquisition, Relocation, and Demolition	- -	- -	6,127,000
Maintenance	3,049,000	3,049,000	3,283,000
Total	$9,185,000	$9,189,000	$18,368,000
Disruption			
Residential Units Taken	- -	- -	27
Commercial Units Taken	- -	- -	22

[a] *Construction costs for each alternative include estimates of the roadway construction, utility, and storm sewer relocation costs, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

As shown in Table 249, the second alternative—the widening of that segment of W. Blue Mound Road between N. Glenview Avenue and W. Wisconsin Avenue, as well as additional on-street parking prohibition along W. Blue Mound Road—would be the most costly of the two alternatives considered, having an estimated capital and maintenance cost of $18,368,000, while the alternative which provides only for the prohibition of all on-street parking where it remains along these arterial segments would have capital and maintenance costs of $9,189,000. The capital and maintenance cost of a "do nothing" alternative for these arterial segments was estimated at $9,185,000, the cost differential between the "do nothing" alternative and the parking prohibition alternative representing the cost of the additional signing required for the prohibition of on-street parking. As also shown in Table 249, only the second improvement alternative would involve urban disruption, requiring the taking of 27 residential units and 22 commercial units along W. Blue Mound Road.

There would be no significant difference in environmental impacts in terms of air quality and noise levels between the two alternatives considered for these segments of W. Blue Mound Road and W. Wisconsin Avenue; however, the difference in environmental impact between the improvement alternatives and the "do nothing" alternative would be significant. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

It is recommended that the first alternative, which provides for the prohibition of all on-street parking in the direction of peak traffic flow during both peak travel periods on W. Blue Mound Road, be implemented for these segments of W. Blue Mound Road and W. Wisconsin Avenue. This recommendation is based on consideration of the additional capacity afforded and congestion abated by the alternatives, and the costs and environmental impacts of the alternatives proposed for this segment. The recommended alternative would provide for three traffic lanes in each direction during peak periods between N. 124th Street and N. Glenview Avenue, and on W. Wisconsin Avenue between N. 38th Street and IH 43; and for two through lanes of traffic in each direction on W. Blue Mound Road between N. Glenview Avenue and N. 38th Street. While this prohibition of on-street parking would require vehicles currently accessing businesses and residences along the segment of W. Blue Mound Road between N. 124th Street and N. 49th Street to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking should make this recommendation implementable. This action was recommended because of its low capital costs and because it would result in no urban disruption. The second improvement alternative, which would provide for the widening of the segment of W. Blue Mound Road between N. Glenview Avenue and W. Wisconsin Avenue, was not recommended principally because of its high capital cost, and because it would result in considerable urban disruption within the City of Wauwatosa and the City of Milwaukee along W. Blue Mound Road. As already mentioned, the remaining congestion along W. Wisconsin Avenue between N. 38th Street and the North-South Freeway could not be abated under either of the alternatives considered.

N. 68th Street from the East-West Freeway (IH 94) to W. Burleigh Street; and N. Hawley Road from the East-West Freeway to W. Vliet Street: To resolve the traffic congestion which may be expected to remain in the south-central portion of Milwaukee County in the plan design year, consideration was given to widening two arterials through the area—N. 68th Street from the East-West Freeway (IH 94) to W. Burleigh Street, and N. Hawley Road from the East-West Freeway to W. Vliet Street. Increasing the capacity of either of these arterial segments may be expected to help abate the traffic congestion problems in this section of the study area.

Throughout its entire length, this segment of N. 68th Street consists of an undivided urban cross-section with curbs and gutters and sidewalks. Between the East-West Freeway and W. Wisconsin Avenue, N. 68th Street has a curb-to-curb pavement width which ranges between 34 and 36 feet, adequate to provide for one 10-foot-wide traffic lane and one seven- to eight-foot-wide parking lane in each direction of traffic flow. The right-of-way width along this segment is 66 feet. N. 68th Street has a curb-to-curb pavement width of 40 feet within a 66-foot-wide right-of-way between W. Wisconsin Avenue and W. State Street, adequate to provide for one traffic lane and one parking lane, or two 10-foot-wide traffic lanes, in each direction of traffic flow; a curb-to-curb pavement width of 36 feet within a 66-foot-wide right-of-way between W. State Street and W. Milwaukee Avenue, adequate to provide for one traffic lane and one parking lane in each direction of traffic flow; a curb-to-curb pavement width of 30 feet within a 60-foot-wide right-of-way between W. Milwaukee Avenue and W. Center Street, adequate to provide for one traffic lane in each direction of traffic flow; and a curb-to-curb pavement width of 36 feet within a 100-foot-wide right-of-way between W. Center Street and W. Lisbon Avenue, adequate to provide for one traffic lane and one parking lane in each direction of traffic flow. Between W. Lisbon Avenue and W. Burleigh Street, N. 68th Street has a curb-to-curb pavement width of 30 feet within a 63-foot-wide right-of-way, adequate to provide for one through traffic lane in each direction of traffic flow.

Parking is currently prohibited during peak periods along the segment of N. 68th Street between the East-West Freeway and W. Blue Mound Road and between W. Milwaukee Avenue and W. North Avenue in the northbound direction; between W. North Avenue and W. Center Street in the southbound direction; and in both directions between W. Lisbon Avenue and W. Burleigh Street. This segment of N. 68th Street traverses the Menomonee River Parkway and crosses over the Menomonee River on a structure which has a curb-to-curb pavement width of 40 feet at a point 600 feet south of W. State Street, and crosses the tracks of the Milwaukee Road railway at-grade immediately south of W. State Street. The intersection of N. 68th Street and W. Milwaukee Avenue is six-legged and is comprised of an east and west "T" intersection. This configuration accommodates a 300-foot-long jog in the alignment of N. 68th Street, whereby northbound vehicles negotiating the intersection must make a left turn followed by a right turn. This intersection is currently stop-signed controlled. It should be noted that this intersection was recommended for improvement under the short-range plan for the northwest side study area. While this improvement would provide for the signalization of this intersection in addition to the widening of the intersection approaches, the existing jog in the roadways would remain. N. 68th Street ends in a "T" intersection at W. Burleigh Street.

Land uses along this section of N. 68th Street are principally residential between the East-West Freeway and the Menomonee River Parkway; are principally commercial between the Menomonee River Parkway and W. State Street through the eastern edge of the City of Wauwatosa; and are principally residential between W. State Street and W. Burleigh Street.

Between the East-West Freeway and a point south of W. Park Hill Avenue, N. Hawley Road consists of a divided urban cross-section with dual 28-foot-wide pavements, adequate to provide for two through traffic lanes and a parking lane in each direction of traffic flow. Except at its intersection with W. Blue Mound Road, which is channelized to provide for dual 24-foot-wide pavements, the segment of N. Hawley Road between a point south of W. Park Hill Avenue and W. Valley Forge Avenue consists of an undivided urban roadway with a curb-to-curb pavement width of between 52 and 55 feet, adequate to provide for one through traffic lane and one parking lane in each direction of traffic flow. Between W. Valley Forge Avenue and W. Martin Street, N. Hawley Road has dual 26-foot-wide pavements, adequate to provide for two through traffic lanes in each direction. These pavements are carried on a viaduct structure over the Menomonee River, the tracks of the Milwaukee Road railway, and W. State Street. Between W. Martin Street and W. Vliet Street, N. Hawley Road consists of an undivided urban cross-section with a 40-foot-wide pavement curb-to-curb.

The right-of-way width along this segment of N. Hawley Road varies from 72 to 83 feet except along short segments of the roadway between the East-West Freeway and W. Blue Mound Road, which have a right-of-way width of 63 feet. Land use along this segment of N. Hawley Road is primarily residential. On-street parking is currently prohibited during both peak periods along this arterial segment.

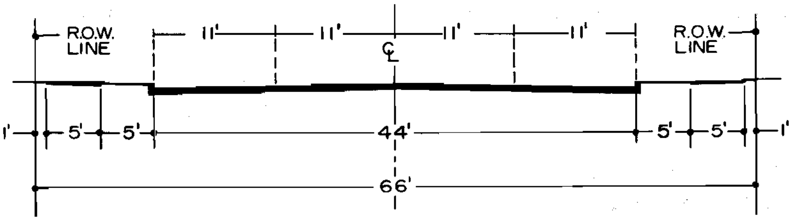
The remaining traffic congestion within the north-south travel corridor along N. 68th Street and N. Hawley Road may be expected to be partially alleviated by the provision of additional travel lanes on either or both of these arterials. However, additional travel lanes were not considered feasible for this segment of N. Hawley Road because this segment provides for four through traffic lanes along its entire length, all peak-period on-street parking is already prohibited along this segment, and the provision of a six-lane divided cross-section along this segment would require considerable disruption to adjacent land uses, as well as the reconstruction of the existing viaduct. The only alternative considered to provide additional roadway capacity within this north-south corridor was the provision of additional capacity on N. 68th Street.

Simulation studies indicated that there will be enough traffic along N. 68th Street in the design year to warrant four through traffic lanes between the East-West Freeway and W. Blue Mound Road. The analyses also indicated that improvements to N. 60th Street and W. Blue Mound Road, as discussed in subsequent sections of this chapter, would help to alleviate congestion on N. 68th Street north of W. Blue Mound Road. Thus, the only alternative developed for increasing the arterial capacity within this corridor called for widening that segment of N. 68th Street between the East-West Freeway and W. Blue Mound Road to provide for four through traffic lanes along the problem segment. More specifically, this alternative would provide only for the widening of that segment of the arterial between the East-West Freeway and W. Blue Mound Road to a minimum urban cross-section having a pavement width of 44 feet curb-to-curb. No improvement would be made to the segment of N. 68th Street between W. Blue Mound Road and W. Burleigh Street under this alternative. The widening called for under this alternative could be accomplished within the existing 66-foot-wide right-of-way. With peak-period on-street parking prohibited in the direction of peak traffic flow along this widened segment, this improvement would provide for two 11-foot-wide through traffic lanes in each direction of traffic flow during both the morning and evening peak periods, and, as such, may be expected to help to alleviate traffic congestion along the north-south travel corridor in this section of Milwaukee County. A typical cross-section for the widened portion of N. 68th Street under this alternative is shown in Figure 121.

The impacts of the alternative considered for the improvement of the problem segment of N. 68th Street are set forth in Table 250. The impacts of a "do nothing" alternative, under which the physical dimensions of the roadway surface along the entire problem segment would remain essentially unchanged, are also provided in Table 250. Under a "do nothing" alternative, only summer and winter maintenance work would be accomplished along N. 68th Street between the East-West Free-

Figure 121

TYPICAL CROSS-SECTION OF IMPROVEMENT ALTERNATIVE FOR A PORTION OF THE SEGMENT OF N. 68TH STREET BETWEEN THE EAST-WEST FREEWAY (IH 94) AND W. BURLEIGH STREET



Source: SEWRPC.

Table 250

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 68TH STREET BETWEEN THE EAST-WEST FREEWAY (IH 94) AND W. BURLEIGH STREET

Impact	"Do Nothing" Alternative	Alternative 1 (44-foot-wide urban roadway between IH 94 and W. Blue Mound Road, and on-street parking prohibition)
Cost (in 1980 dollars)[a]		
Construction	$1,605,000	$1,949,000
Real Estate Acquisition, Relocation, and Demolition	- -	- -
Maintenance	745,000	774,000
Total	$2,350,000	$2,723,000
Disruption		
Residential Units Taken	- -	- -
Commercial Units Taken	- -	- -

[a]*Construction costs for each alternative include estimates of the roadway construction, utility and storm sewer relocation , and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee, City of Wauwatosa, and SEWRPC.

way and W. Burleigh Street between 1980 and the year 2000. Also, two major resurfacings would be accomplished along this segment of N. 68th Street under this alternative.

Under the improvement alternative and the "do nothing" plan, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. Under the short-range plan it was recommended that all approaches to the east and west intersections be widened at the intersection of W. Milwaukee Avenue and N. 68th Street, and that a double left-turn lane and single right-turn lane be provided on the north- and southbound approaches to the intersection, that single left-turn lanes be provided on the east- and westbound approaches, and that median channelization be provided on all approaches. It was also recommended under the short-range plan that the southern terminus of W. Mountain Avenue be relocated from its present location within the western intersection of N. 68th Street with W. Milwaukee Avenue to a location midway between the east and west N. 68th Street at this intersection, and that the intersection be signalized. The total cost of these actions, including necessary right-of-way, was estimated at $290,000. The cost of this action is accordingly included in the cost of the improvement and "do nothing" alternatives proposed for this segment. Implementation of the "do nothing" alternative would not serve to abate the traffic congestion within this section of the study area.

The costs shown in Table 250 are expressed in 1980 dollars and include estimates of the construction costs, including utility and storm sewer relocation costs, and of the maintenance costs associated with the operation of each alternative over the plan design period.

As shown in Table 250, widening the arterial between the East-West Freeway and W. Blue Mound Road to provide for four traffic lanes along this segment of N. 68th Street would have the highest capital cost and maintenance costs, $2,723,000, compared with an estimated cost of $2,350,000 for the "do nothing" alternative. As also shown in Table 250, neither of the alternatives proposed for this segment of N. 68th Street would result in any urban disruption. It should be noted, however, that the implementation of the widening alternative would require the taking of a part of the curb lawn and some street trees on N. 68th Street.

There are significant differences in environmental impacts in terms of air quality and noise levels between the improvement alternative and the "do nothing" alternative. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

Based on the additional capacity afforded and congestion abated by the alternatives, and the costs and environmental impacts of the alternatives, it is recommended that that alternative be implemented which provides for the widening of the portion of the problem segment of N. 68th Street between the East-West Freeway and W. Blue Mound Road to a minimum urban cross-section with a 44-foot-wide pavement curb-to-curb. Under this alternative, on-street parking would be prohibited during peak periods along the segment of N. 68th Street from the East-West Freeway to W. Blue Mound Road in order to provide for two traffic lanes in the direction of peak traffic flow. This alternative was recommended principally because its implementation could be expected to help alleviate future congestion along the north-south travel corridor in this portion of Milwaukee County. Also, the widening of this segment could be accomplished within the existing right-of-way at minimal cost.

<u>N. 60th Street from W. Vliet Street to W. Florist Avenue; N. 51st Street from W. Lisbon Avenue to W. Silver Spring Drive; and W. Roosevelt Drive from W. Burleigh Street to W. Capitol Drive</u>: In the plan design year, traffic congestion may be expected to remain in the north-south travel corridor along N. 60th Street through the central section of the Milwaukee County portion of the study area between approximately W. Vliet Street and W. Silver Spring Drive; and may be expected to remain within a southwest-northeast corridor along W. Roosevelt Drive between W. Burleigh Street and W. Capitol Drive. To resolve this congestion, and to provide the spacing of arterials needed to serve existing and planned land use development within this portion of Milwaukee County, consideration was given to improving two arterial streets in these travel corridors—N. 60th Street from W. Vliet Street to W. Florist Avenue and W. Roosevelt Drive from W. Burleigh Street to W. Capitol Drive—and to improving one nonarterial street—N. 51st Street from W. Lisbon Avenue to W. Silver Spring Drive, in effect converting this street from a land access facility to an arterial facility. Improvements to one or more of these three roadway segments may be expected to abate the remaining traffic congestion in this portion of Milwaukee County.

These three streets were considered in conjunction with one another, as their traffic flow patterns are interrelated.

From W. Vliet Street to W. Burleigh Street, N. 60th Street consists of a minimum urban cross-section. The roadway has a curb-to-curb pavement width of 36 feet from W. Vliet Street to W. North Avenue, adequate to provide for one 10-foot-wide traffic lane and one parking lane in each direction, and a pavement width of 40 feet from W. North Avenue to W. Burleigh Street, adequate to provide for one traffic lane and one parking lane, or two 10-foot-wide traffic lanes, in each direction, all within a right-of-way that is 66 feet wide from W. Vliet Street to W. Center Street and 90 feet wide from W. Center Street to W. Burleigh Street. The pavement widens to 46 feet, 47 feet, and 44 feet at the intersections of N. 60th Street with W. Vliet Street, W. North Avenue, and W. Center Street, respectively, to provide left-turn channelization. Channelization is also provided at the intersection of N. 60th Street with W. Appleton Avenue. This channelization consists of dual roadways with a curb-to-curb width of 23 feet and a four-foot-wide median.

From W. Burleigh Street to W. Capitol Drive, N. 60th Street consists of a desirable urban cross-section with dual 33-foot-wide roadways divided by a five-foot-wide median—the median being delineated by pavement marking only—within a 90-foot-wide right-of-way from W. Burleigh Street to W. Keefe Avenue and a 102-foot-wide right-of-way from W. Keefe Avenue to W. Capitol Drive, adequate to provide for two through traffic lanes and one parking lane or three through lanes in each direction. From W. Capitol Drive to W. Florist Avenue, N. 60th Street has also been improved to a desirable urban cross-section, with dual 31- to 32-foot-wide roadways separated by a median which varies from four to 24 feet wide within a right-of-way which varies from 90 to 125 feet wide. This segment is also adequate to provide for two through traffic lanes and one parking lane, or one 11-foot-wide and two 10-foot-wide traffic lanes, in each direction. Parking is currently prohibited during both the morning and evening peak periods in the direction of peak traffic flow along N. 60th Street between W. Vliet Street and W. Burleigh Street, and is subject to only minimal restriction between W. Burleigh Street and W. Florist Avenue. Land uses along this segment of N. 60th Street are primarily residential.

From W. Lisbon Avenue to W. Capitol Drive, N. 51st Street consists of a minimum urban cross-section with a curb-to-curb pavement width of 34 to 36 feet within a 66- to 100-foot-wide right-of-way, adequate to provide for one 10-foot-wide through traffic lane and one parking lane in each direction. From W. Capitol Drive to W. Fond du Lac Avenue, N. 51st Street has been improved to a divided urban cross-section with dual 25-foot-wide roadways separated by a six-foot-wide median within a 100-foot-wide right-of-way, also adequate to provide for one through traffic lane and one parking lane or two through lanes in each direction. From W. Fond du Lac Avenue to W. Silver Spring Drive, N. 51st Street has been improved to a desirable urban cross-section with dual 31-foot-wide urban roadways separated by a median which varies from four to 14 feet wide within a right-of-way which varies from 75 to 95 feet wide, adequate to provide for two through traffic lanes and one parking lane in each direction, or one 11-foot-wide and two 10-foot-wide through traffic lanes in each direction. W. Silver Spring Drive represents the northern terminus of N. 51st Street in Milwaukee County. On-street parking is currently permitted along this entire segment of N. 51st Street. The existing land use along this segment of N. 51st Street is also primarily residential.

Along its entire length—from its intersection with W. Burleigh Street and N. 60th Street to its intersection with W. Capitol Drive and N. 35th Street—W. Roosevelt Drive has been improved to a desirable urban cross-section with dual 28-foot-wide roadways separated by a 24-foot-wide median within a 120-foot-wide right-of-way, adequate to provide for two through traffic lanes and one parking lane in each direction. On-street parking is currently permitted along W. Roosevelt Drive. Land use along W. Roosevelt Drive is primarily residential.

The traffic congestion remaining in the north-south corridor along N. 60th Street may be expected to be alleviated by the provision of additional travel lanes on portions of the arterial, and the remaining traffic congestion along W. Roosevelt Drive could be abated by improving adjacent arterial streets. Two improvement alternatives—one involving the prohibition of on-street parking and the other involving the widening of a segment of the roadway to a minimum urban cross-section—were considered for the problem segment of N. 60th Street, and one improvement alternative, on-street parking prohibition, was considered for the problem segment of N. 51st Street.

Under the first improvement alternative proposed for the problem segment of N. 60th Street, on-street parking would be prohibited during the morning and evening peak periods in the direction of peak traffic flow in those locations where it is not currently prohibited, or along the median-divided section of the arterial between W. Burleigh Street and W. Florist Avenue. This parking prohibition would provide for one continuous through traffic lane in each direction along N. 60th Street between W. Vliet Street and W. North Avenue, for two continuous through traffic lanes in each direction between W. North Avenue and W. Burleigh Street, and for three continuous through traffic lanes in each direction between W. Burleigh Street and W. Florist Avenue. Because the pavement widths along N. 60th Street are restrictive, it would be necessary to provide pavement markings between W. North Avenue and W. Florist Avenue in order to clearly delineate traffic lane separation. Although on-street parking is currently used regularly along N. 60th Street, this prohibition is considered implementable because of the availability of adequate parking locations along intersecting side streets, in private garages, and in off-street parking lots.

Under the second improvement alternative, the segment of N. 60th Street between W. Vliet Street and W. Burleigh Street would be widened to provide for a minimum urban cross-section with a pavement width of at least 44 feet curb-to-curb within the existing right-of-way. This improvement would provide for two traffic lanes in each direction with peak-period parking prohibited. When combined with the on-street parking prohibition along N. 60th Street between W. Vliet Street and W. Florist Avenue during peak periods, this widening would provide for four continuous through traffic lanes on N. 60th Street between W. Vliet Street and W. Burleigh Street and for six continuous traffic lanes on N. 60th Street between W. Burleigh Street and W. Florist Avenue. Pavement markings would need to be provided in order to clearly delineate lane separation. A typical cross-section for the widened segment of N. 60th Street under this alternative is shown in Figure 122. This alternative could be expected to abate the remaining traffic congestion along N. 60th Street.

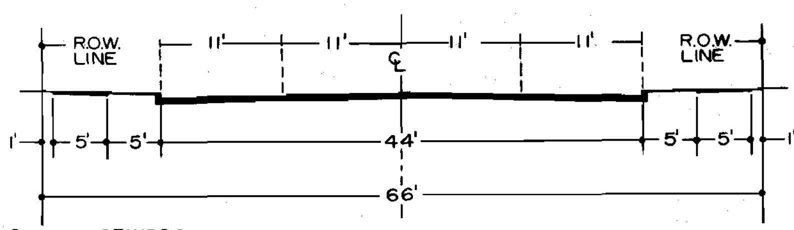
While this additional widening of N. 60th Street could be accomplished within the existing right-of-way and would not require the acquisition of any residential or commercial units, it should be noted that widening proposals for N. 60th Street have historically been met by strong public opposition. As a result, the segment of N. 60th Street between W. Vliet Street and W. North Avenue was reconstructed in 1978 to its existing 36-foot-wide pavement, rather than to a widened cross-section.

Also within this corridor, it is recommended that N. 51st Street from W. Lisbon Avenue to W. Silver Spring Drive be included as part of the arterial street and highway system of the study area, and that certain improvements be made to the segment of the roadway between W. Lisbon Avenue and W. Capitol Drive in order to raise it to arterial street status. These improvements would result in an arterial street spacing that would adequately serve the high-density urban land use patterns planned for this portion of Milwaukee County, and would provide an additional north-south thoroughfare through this north-south travel corridor.

Simulation model studies of design year traffic flow along N. 51st Street indicated that traffic volumes along the roadway would be insufficient to warrant more roadway capacity along the segment. Consequently, the prohibition of on-street

Figure 122

TYPICAL CROSS-SECTION OF IMPROVEMENT ALTERNATIVE FOR SEGMENT OF N. 60TH STREET



Source: SEWRPC.

parking during peak periods along the length of the segment was not considered, nor was the widening of the segment of N. 51st Street between W. Lisbon Avenue and W. Capitol Drive, which currently has a 36-foot-wide roadway curb-to-curb. The only improvements considered for this segment were those which would involve the upgrading of the roadway from a land access street to an arterial street. Such upgrading would consist of an assessment of intersection control along N. 51st Street to ensure that the thoroughfare would be given adequate treatment at each controlled intersection.

Intersection control along N. 51st Street consists of traffic signals at W. Lisbon Avenue, W. Center Street, W. Burleigh Street, W. Roosevelt Drive, W. Capitol Drive, W. Fond du Lac Avenue, W. Hope Avenue, W. Congress Street, W. Hampton Avenue, W. Villard Avenue, and W. Silver Spring Drive; and of four-way stop signs at W. Locust Street, W. Keefe Avenue, W. Fairmount Avenue, and W. Custer Avenue. Since traffic volumes simulated in the year 2000 would not warrant the signalization of these latter intersections, and because adequate signalization already exists along the roadway, it was concluded that no action other than a change in functional classification would be necessary along N. 51st Street.

Analysis of the traffic congestion which is expected to remain within the southwest-northeast travel corridor along W. Roosevelt Drive indicated that this congestion would be related to the capacity of the five-legged intersections which are located at both its southwestern and northeastern termini—or, more specifically, at its intersection with W. Burleigh Street and N. 60th Street and its intersection with W. Capitol Drive and N. 35th Street. The improvement of the segment of N. 60th Street between W. North Avenue and W. Florist Avenue through parking prohibition, as already described, may be expected to increase the overall capacity of the intersection of N. 60th Street, W. Burleigh Street, and W. Roosevelt Drive. In addition, the previously discussed improvements recommended for W. Hampton Avenue and W. Villard Avenue may divert traffic volume from, and thus improve the overall level of service on, W. Capitol Drive and the intersection of W. Capitol Drive with W. Roosevelt Drive and N. 35th Street. No other improvements were considered for W. Roosevelt Drive.

The impacts of each of the alternative improvements considered for the segment of N. 60th Street are set forth in Table 251. The impacts of the "do nothing" alternative for this segment, under which the physical dimensions of the roadway surface and the existing parking regulations along the arterial would remain essentially unchanged, are also provided in Table 251. Under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished along N. 60th Street between 1980 and 2000.

Any traffic management actions previously recommended for this segment of N. 60th Street under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. In the case of N. 60th Street, it was recommended that the existing signals be retimed at its intersections with W. Burleigh Street and W. Roosevelt Drive, that an additional signal phase be added, that a new traffic controller be added, and that on-street parking be prohibited on one approach. The cost of these traffic management improvements, about $14,000, was added to the capital and maintenance costs of both the "do nothing" alternative and the improvement alternative considered for the segment of N. 60th Street. Traffic management actions proposed at the intersection of N. 60th Street with W. Capitol Drive, and at the intersection of W. Roosevelt Drive with N. 35th Street and W. Capitol Drive, were accounted for in the consideration of long-range alternatives for the problem segment of W. Capitol Drive and the segment of N. 35th Street. Since the traffic management actions proposed under the short-range plan for the intersection of N. 60th Street with W. Burleigh Street and W. Roosevelt Drive proved ineffective in abating the existing congestion at that intersection, it was determined that these actions would also be ineffective in the long-range abatement of congestion at this intersection.

The costs shown in Table 251 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each of the alternatives over the plan design period. Also indicated in Table 251 is any urban disruption which may be expected to be associated with each of the alternatives.

As shown in Table 251, the second alternative, which proposes widening the segment of N. 60th Street between W. Vliet Street and W. Burleigh

Table 251

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 60TH STREET FROM W. VLIET STREET TO W. FLORIST AVENUE

Impact	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)	Alternative 2 (widening to minimum urban cross-section and parking prohibition)
Cost (in 1980 dollars)[a]			
Construction	$3,976,000	$3,979,000	$6,087,000
Real Estate Acquisition, Relocation, and Demolition	- -	- -	- -
Maintenance	2,026,000	2,026,000	2,122,000
Total	$6,002,000	$6,005,000	$8,209,000
Disruption			
Residential Units Taken	- -	- -	- -
Commercial Units Taken	- -	- -	- -

[a]*Construction costs for each alternative include estimates of the roadway construction, utility and storm sewer relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Construction costs shown for N. 60th Street do not reflect the cost of resurfacing the segment of N. 60th Street between W. Vliet Street and W. Center Street. This segment of N. 60th Street was reconstructed in 1978 and, therefore, would not require additional resurfacings during the design period. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: City of Milwaukee and SEWRPC.

Street to a minimum urban cross-section, and prohibiting on-street parking along N. 60th Street during both peak periods in the direction of peak traffic flow, would have a total capital cost of about $8,209,000. The first alternative, which proposes the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods on N. 60th Street between W. Burleigh Street and W. Florist Street, would have capital and maintenance costs of about $6,005,000. The capital and maintenance costs of the "do nothing" alternative would be about $6,002,000. Neither of the improvement alternatives would involve any urban disruption.

There are significant differences in environmental impacts in terms of air quality and noise levels between the improvement alternatives and the "do nothing" alternative. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions.

Based on consideration of the additional capacity afforded and congestion abated by the alternatives, and the costs and environmental impacts of each of the alternatives, it is recommended that the first alternative be implemented—that is, the prohibition of all on-street parking during the morning and evening peak periods in the direction of peak traffic flow on N. 60th Street between W. Vliet Street and W. Florist Avenue in order to provide for one through traffic lane in each direction from W. Vliet Street to W. North Avenue, two continuous through lanes in each direction from W. North Avenue to W. Burleigh Street, and three continuous through traffic lanes in each direction from W. Burleigh Street to W. Florist Avenue. While this prohibition would mean that vehicles accessing residences and commercial properties along this segment of N. 60th Street would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking makes this recommendation implementable. In addition, while 10-foot travel lanes are narrower than the minimum desirable lane width, this action was recommended because it involved relatively low capital and maintenance costs.

N. 35th Street from the East-West Freeway (IH 94) to W. Capitol Drive (STH 190), and N. 27th Street and W. Cornell Street from the East-West Freeway to N. Teutonia Avenue: To resolve the congestion which may be expected to remain in the plan design year along the north-south travel corridor through the eastern part of the Milwaukee County portion of the study area from the East-West Freeway (IH 94) to about W. Congress Street, consideration was given to improving two arterials through the area—N. 35th Street from the East-West Freeway to W. Capitol Drive (STH 190), and N. 27th Street and W. Cornell Street from the East-West Freeway to N. Teutonia Avenue. Both of these arterials are expected to remain congested in the plan design year. An increase in the number of moving traffic lanes provided on at least one of these parallel arterials may be expected to abate the congestion in this corridor.

Along the entire length of N. 35th Street from the East-West Freeway to W. Capitol Drive, the roadway has been improved to a minimum urban cross-section. The curb-to-curb pavement width along this segment varies from 42 to 64 feet, with the narrowest widths occurring between W. Vliet Street and W. Lisbon Avenue—42 feet—and between W. North Avenue and W. Townsend Street—from 45 to 47 feet. The right-of-way width along this segment ranges between 66 and 100 feet. The roadway cross-section of this segment of N. 35th Street is adequate to provide for two through lanes of traffic and two parking lanes. The tracks of the Milwaukee Road pass under this reach of N. 35th Street, with N. 35th Street being carried on a structure located between W. McKinley Boulevard and W. Vliet Street.

Land uses along this segment of N. 35th Street are principally commercial between the East-West Freeway and W. State Street, and residential interspersed with commercial and industrial between W. State Street and W. Capitol Drive. Industrial land uses along this segment are concentrated between W. Townsend Street and W. Capitol Drive. On-street parking is currently prohibited during the morning and evening peak periods in the direction of peak traffic flow along the entire segment of N. 35th Street between the East-West Freeway (IH 94) and W. Capitol Drive.

From the East-West Freeway to W. State Street, N. 27th Street consists of a minimum urban cross-section with a curb-to-curb pavement width of 50 feet, adequate to provide for two through traffic lanes and two parking lanes. From W. State Street to W. Lisbon Avenue, N. 27th Street has been improved to a desirable urban cross-section with dual 36-foot-wide roadways separated by a 24- to 28-foot-wide median, adequate to provide for two through traffic lanes and a parking lane in each direction. Between W. Lisbon Avenue and W. Capitol Drive, N. 27th Street consists of a minimum urban cross-section having a curb-to-curb pavement width of 50 feet, adequate to provide for one through traffic lane and one parking lane in each direction. From W. Capitol Drive to W. Glendale Avenue, N. 27th Street consists of a minimum urban cross-section with a curb-to-curb pavement width of 53 to 56 feet, adequate to provide for one through traffic lane and one parking lane in each direction. The sections of N. 27th Street and W. Cornell Street which curve easterly to intersect N. Teutonia Avenue have been improved to a desirable urban cross-section with dual 34-foot-wide pavements and a six-foot-wide median, adequate to provide for two through lanes of traffic and one parking lane in each direction. The right-of-way along these segments of N. 27th Street and W. Cornell Street varies from 66 to 130 feet wide.

Land uses along these segments of N. 27th Street and W. Cornell Street are principally commercial between the East-West Freeway and W. State Street, and are principally residential, and a combination of commercial and industrial, between W. State Street and N. Teutonia Avenue. Industrial land uses are concentrated along N. 27th Street between W. Townsend Street and W. Capitol Drive. On-street parking is currently permitted along the entire segment of N. 27th Street between the East-West Freeway and W. Cornell Street, and is prohibited at all times on the median-divided segment of N. 27th Street and W. Cornell Street between W. Glendale Avenue and N. Teutonia Avenue.

The remaining traffic congestion along this north-south travel corridor may be expected to be alleviated by the provision of additional travel lanes on either N. 35th Street or N. 27th Street. Since both of these arterials traverse highly urbanized sections of the City of Milwaukee, any further widening of either of these arterials would result in extensive urban disruption and the taking of many homes and businesses. The widening of N. 35th Street from the East-West Freeway to W. Capitol Drive to create a continuous desirable urban cross-section with dual 36-foot-wide roadways within a 120-foot-wide right-of-way would require the acquisition of 113 residential structures, 41 commercial structures, 15 industrial structures, 3 institutional structures, and a strip of parkland. Similarly, the widening of N. 27th Street in order to create a continuous desirable urban cross-section from the East-West Freeway to N. Teutonia Avenue within a 120-foot-wide right-of-way would require the acquisition of 158 residential structures, 42 commercial structures, 2 institutional structures, and 1 industrial structure. Because of this extensive disruption, alternatives which endorse such widenings were regarded as impractical.

Since on-street parking is already prohibited during both the morning and evening peak hours in the direction of peak traffic flow along N. 35th Street from the East-West Freeway to W. Capitol Drive, the only practical alternative for the provision of additional roadway capacity is to provide additional capacity on N. 27th Street, and thus only one alternative—the prohibition of on-street parking—was considered for this segment of N. 27th Street.

The available on-street parking space is used regularly along N. 27th Street between the East-West Freeway and N. Teutonia Avenue, and the prohibition of all on-street parking along this arterial during the peak periods is likely to cause some inconvenience. However, because off-street parking is available along N. 27th Street both in parking lots and in private garages, as well as along intersecting side streets, the prohibition of on-street parking to provide for two lanes of traffic in the direction of peak traffic flow along N. 27th Street during both the morning and evening peak periods is considered to be an implementable alternative for alleviating the remaining traffic congestion within this north-south corridor. Under this alternative, it would not be necessary to prohibit on-street parking along the median-divided portion of N. 27th Street between W. State Street and W. Lisbon Avenue. The prohibition of on-street parking may be expected to eliminate all of the remaining traffic congestion along N. 27th Street in this corridor, and to help to abate the remaining traffic congestion along N. 35th Street from the East-West Freeway to W. Capitol Drive. This prohibition may also be expected to abate the remaining traffic congestion along segments of W. Villard Avenue, W. Hampton Avenue, W. Burleigh Street, W. Center Street, W. North Avenue, and W. Wisconsin Avenue adjacent to the intersections of these streets with N. 27th Street.

The impacts of the parking prohibition alternative considered for the N. 27th Street and W. Cornell Street segment are set forth in Table 252. The impacts of a "do nothing" alternative for this arterial segment, under which the physical dimensions of the roadway surface and the existing parking regulations would remain essentially unchanged, are also provided in Table 252. Under the "do nothing" alternative for this segment, only summer and winter maintenance work and two major resurfacings would be accomplished as necessary along N. 27th Street between 1980 and 2000. Also, any traffic management actions previously recommended for this segment of N. 27th Street under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions are assumed to have been implemented. In the case of this segment of N. 27th Street, it was recommended that the existing signals be retimed at the intersections of N. 27th Street with W. St. Paul Avenue, W. Clybourn Street, W. Michigan Street, W. Highland Avenue, W. Burleigh Street, and W. Townsend Street; and, at the intersection of W. Cornell Street and N. Teutonia Avenue, it was recommended that the existing signals be retimed and that a new right-turn lane be added. The cost of these improvements, $32,000, was added to the capital and maintenance costs of both the "do nothing" and parking prohibition alternatives considered for this segment of N. 27th Street. Also, additional rights-of-way were required under these short-range recommendations at the intersection of N. Cornell Street and N. Teutonia Avenue. The cost of these additional rights-of-way (including the acquisition of one residential structure), about $80,000, was included in the cost of the alternatives considered for this segment of N. 27th Street. It was determined that these actions, while effective in abating the short-range traffic congestion along this segment of N. 27th Street, would not be effective in the long-range abatement of traffic congestion along this north-south corridor.

The costs shown in Table 252 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, or demolition costs; and the maintenance costs associated with the operation of each of these alternatives over the

Table 252

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR N. 27TH STREET AND W. CORNELL STREET FROM THE EAST-WEST FREEWAY TO N. TEUTONIA AVENUE

Impact	"Do Nothing" Alternative	On-Street Parking Prohibition Alternative
Cost (in 1980 dollars)[a]		
Construction	$3,097,000	$3,107,000
Real Estate Acquisition, Relocation, and Demolition	80,000	80,000
Maintenance	1,648,000	1,648,000
Total	$4,825,000	$4,835,000
Disruption		
Residential Units Taken	1	1
Commercial Units Taken	- -	- -

[a]Construction costs for each alternative include estimates of the roadway construction costs. Under both alternatives, two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.

Source: City of Milwaukee and SEWRPC.

plan design period. Also indicated in Table 252 is any urban disruption which may be expected to be associated with each of the alternatives.

As shown in Table 252, the alternative which proposes the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods on N. 27th Street between the East-West Freeway and N. Teutonia Avenue would have capital and maintenance costs of about $4,835,000, while the capital and maintenance costs of the "do nothing" alternative would be about $4,825,000, the difference in costs representing the capital costs of the signing necessary to regulate on-street parking. The parking prohibition alternative would not involve any urban disruption; however, one residential structure was required under the traffic management actions recommended for this segment of N. 27th Street under the short-range plan.

There would be significant differences in environmental impacts between the improvement alternative and the "do nothing" alternative for N. 27th Street. Under the "do nothing" alternative, reduced travel speeds and congestion-related stop-and-go driving would result in increased air pollutant emissions. Also, under the "do nothing" alternative there would be no alleviation of congestion, thus no subsequent alleviation of air and noise pollution on N. 35th Street or on any other arterial segments which intersect N. 27th Street.

Based on the additional capacity afforded and congestion abated by the alternatives, and the costs and environmental impacts of each of the alternatives, it is recommended that that alternative be implemented which provides for the prohibition of on-street parking in the direction of peak traffic flow during both peak periods along the segment of N. 27th Street between the East-West Freeway and N. Teutonia Avenue. While such prohibition may be politically sensitive and may be difficult to implement based on local opposition since it would mean that vehicles accessing residences and commercial properties along this arterial segment would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking makes this recommendation implementable. This action was also recommended because it involves little capital and maintenance costs.

The North-South Freeway (IH 43) in Northern Milwaukee County and Southern Ozaukee County: To resolve the congestion which may be expected to remain in the plan design year in the north-south corridor along the North-South Freeway (IH 43) in northern Milwaukee County and southern Ozaukee County, consideration was given to improving the North-South Freeway (IH 43) from Henry Clay Street to Mequon Road (STH 167) in Ozaukee County.

South of W. Henry Clay Street to the Marquette Interchange, the North-South Freeway (IH 43) now provides, or is being reconstructed to provide, three 12-foot-wide through lanes in each direction with three- to nine-foot-wide inside shoulders and nine-foot-wide outside shoulders. Between W. Henry Clay Street and W. Silver Spring Drive, the existing cross-section of IH 43 provides three 11-foot-wide lanes for traffic flow in each direction. One of these three northbound lanes, however, is not a through lane, but is an "exit only" lane for W. Silver Spring Drive. Thus, only two through lanes are provided for northbound traffic between W. Henry Clay Street and the W. Silver Spring Drive interchange. Currently, direct on- and off-ramp access is provided only between the southbound lanes of IH 43 and W. Silver Spring Drive at this interchange. On- and off-ramp access is provided between the northbound lanes of IH 43 and N. Port Washington Road at this interchange, and a portion of N. Port Washington Road is subsequently utilized by traffic associated with the northbound lanes of the freeway. Between W. Silver Spring Drive and STH 167, IH 43 consists of two 12-foot-wide through lanes in each direction of traffic. With the exception of the segments carried over or under structures at intersecting arterial streets, the median along IH 43 is 16 to 26 feet wide between W. Henry Clay Street and a point south of W. Silver Spring Drive, 26 feet wide between a point north of W. Silver Spring Drive and a point south of W. Brown Deer Road, and 50 to 70 feet wide between a point north of W. Brown Deer Road and STH 167. The median area is reduced to eight feet wide on the structures carrying the freeway over W. Silver Spring Drive and W. Bender Road, and is 14 feet wide under the structure carrying W. Brown Deer Road over the freeway. Between W. Henry Clay Street and W. Lexington Drive and between W. Silver Spring Drive and W. Bender Road, concrete median barriers provide protection for opposing traffic flows. Steel beam guardrails are provided in the median area between W. Lexington Drive and W. Silver Spring Drive and between W. Bender Road and W. Good Hope Road. Between W. Henry Clay Street and W. Lexington Drive, three-foot-wide inside shoulders are provided along IH 43; no inside shoulders are provided between Lexington Drive and W. Good Hope Road, and six-foot-wide inside shoulders are provided between W. Good Hope Road and STH 167. Between W. Henry Clay Street and W. Silver Spring Drive, no outside shoulders are provided, while 10-foot-wide outside shoulders are provided between W. Silver Spring Drive and STH 167.

IH 43 is situated on a fill between W. Henry Clay Street and W. Silver Spring Drive; is at-grade between W. Silver Spring Drive and W. Green Tree Road; is in a cut between W. Green Tree Road and W. Good Hope Road; and is again at-grade north of W. Good Hope Road. There are structures carrying railways or arterial streets over IH 43 at its intersection with the Chicago & North Western Transportation Company tracks, at W. Green Tree Road, at W. Good Hope Road, at W. Brown Deer Road, at W. County Line Road, at Old Port Washington Road, at Donges Bay Road, and at STH 167. IH 43 passes over Lexington Drive, W. Silver Spring Drive, and W. Bender Road on structures. The right-of-way width along this segment of IH 43 varies from 120 to 270 feet, expanding as necessary to accommodate on- and off-ramp configurations at intersecting arterial streets. The land uses along this segment of IH 43 are composed of a mix of commercial, industrial, residential, and recreational south of W. Bender Road; are recreational, institutional, and residential between W. Bender Road and W. County Line Road; and are residential, undeveloped land, and agricultural land on the segment of IH 43 between W. County Line Road and STH 167.

Only one alternative was developed for increasing the capacity of this segment of the North-South Freeway (IH 43). This alternative called for widening the entire segment of IH 43 between W. Henry Clay Street and STH 167 to provide for three continuous through traffic lanes in each direction of traffic flow. This alternative, importantly, would also involve improvement of the interchange at W. Silver Spring Drive and the widening of each of the two roadways between W. Henry Clay Street and W. Silver Spring Drive from 33 to 36 feet in order to provide for three through traffic lanes of standard width in both directions through the interchange area. Reconstruction of the W. Silver Spring Drive interchange under this alternative would include the provision of direct on- and off-ramp connections between the northbound lanes of IH 43 and W. Silver Spring Drive. Through such reconstruction, the use of the outer northbound lane of IH 43 between W. Henry Clay Street and W. Silver Spring Drive as an "exit only" lane could be eliminated, as could the use of a portion of N. Port Washington Road for traffic associated with the northbound lanes of IH 43. Also under this alternative, one additional through traffic lane would be added in each direction along IH 43 between W. Silver Spring Drive and STH 167. Thus, under this alternative, IH 43 would be widened to provide dual 36-foot-wide roadways from W. Henry Clay Street to STH 167. These roadways would likely feature 7- to 9-foot-wide inside and 9- to 11-foot-wide concrete outside shoulders and concrete median barriers to separate opposing traffic flows.

As recommended in the adopted regional transportation system plan, the segment of IH 43 between W. Silver Spring Drive and W. Good Hope Road is currently programmed for reconstruction under the Wisconsin Department of Transportation's (WisDOT's) six-year transportation improvement program, and the WisDOT has completed final engineering plans for this segment. These plans call for the reconstruction of this segment of IH 43 to provide for dual 36-foot-wide roadways with 7-foot-wide inside and 11-foot-wide outside concrete shoulders. These plans also call for the installation of a concrete median barrier along this segment to separate opposing traffic flows. It is assumed that a similar roadway cross-section will be utilized in the reconstruction of the remainder of the segment of IH 43 between W. Henry Clay Street and W. County Line Road, and that a similar roadway cross-section, except for the median, will be utilized between W. County Line Road and STH 167. A grassed median would be provided north of W. County Line Road since adequate right-of-way exists along this segment for a wide median. A typical cross-section for the reconstruction of this segment of IH 43 is shown in Figure 123.

Nearly all of the proposed widening of IH 43 between W. Henry Clay Street and STH 167 could be accomplished within the existing right-of-way. However, additional right-of-way would need to be acquired along the west side of IH 43 between W. Bender Road and W. Silver Spring Drive to accommodate the proposed widening of the freeway segment and attendant reconstruction of the interchange at W. Silver Spring Drive. Preliminary analyses indicate that, to accomplish this widening, it would be necessary to acquire three residential structures. Preliminary estimates also indicate that, as part of this widening project, the existing structure at W. Brown Deer Road would need to be replaced in order to provide sufficient lateral clearance for the improved freeway cross-section.

The impacts of the improvement alternative considered for this segment of IH 43 are set forth in Table 253. The impacts of a "do nothing" alternative, under which the capacity of this segment of IH 43 would remain essentially unchanged, are also provided in Table 253. Under the "do nothing" alternative, routine maintenance would be accomplished along IH 43 between W. Henry Clay Street and STH 167 between 1980 and the year 2000, together with two major resurfacings. It should be pointed out that adoption and implementation of a "do nothing" alternative for this segment would not serve to abate any of the traffic congestion anticipated along this segment of IH 43. Under the improvement alternative, this segment of IH 43 would be expected to operate at level-of-service C, with the portion of IH 43 in Ozaukee County operating at level-of-service B and the segment of IH 43 nearest the interchange with W. Silver Spring Drive operating at level-of-service D. Under a "do nothing" alternative, this portion of the freeway would operate at level-of-service D, with the portion of IH 43 in Ozaukee County operating at level-of-service C and the portion of IH 43 nearest the interchange with W. Silver Spring Drive operating at level-of-service E. Also under the "do nothing" alternative, 5,000 vehicles could be expected to be diverted from IH 43 to adjacent parallel arterial streets, thereby increasing the level of traffic congestion on those facilities.

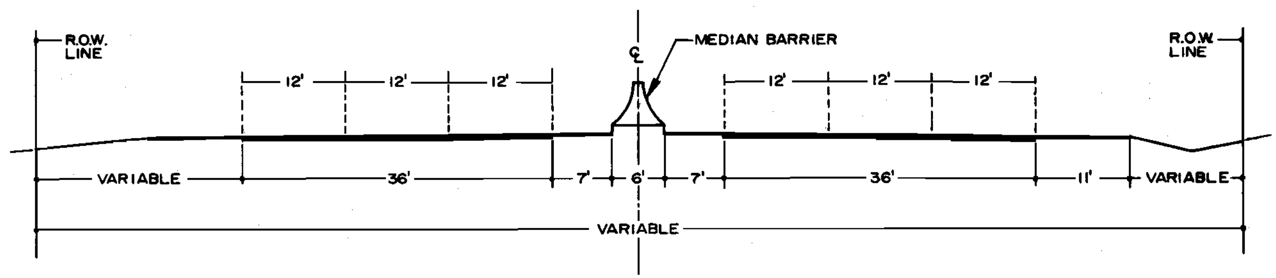
The costs shown in Table 253 are expressed in 1980 dollars and include estimates of the construction costs, including utility and relocation costs; the real estate acquisition, relocation, and demolition costs for the improvement of the segment of IH 43 between W. Henry Clay Street and STH 167; and the maintenance costs associated with the operation of each alternative over the plan design period. Also indicated in Table 253 is the number of properties which may need to be acquired under each of the alternatives.

As shown in Table 253, the alternative which proposes widening the segment of IH 43 between W. Henry Clay Street and STH 167 to provide for a continuous six-lane freeway with dual

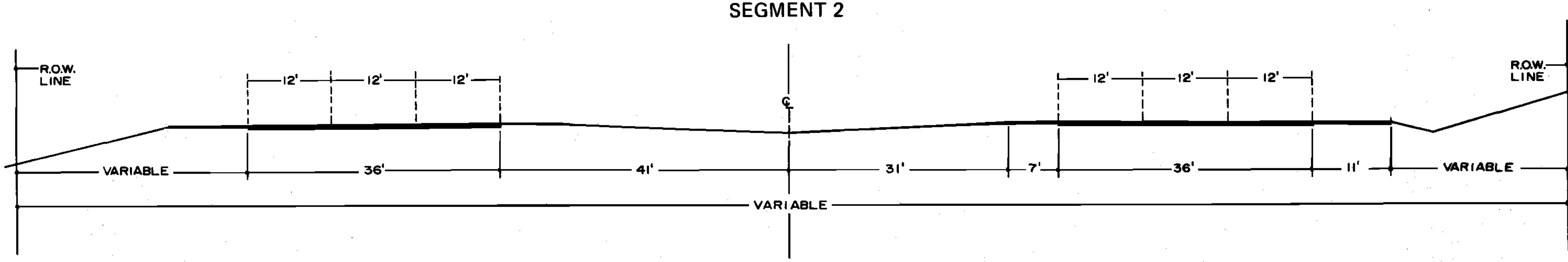
Figure 123

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVE FOR THE NORTH-SOUTH FREEWAY (IH 43) BETWEEN W. HENRY CLAY STREET AND MEQUON ROAD (STH 167)

SEGMENT 1



SEGMENT 2



Source: Wisconsin Department of Transportation and SEWRPC.

Table 253

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR THE NORTH-SOUTH FREEWAY (IH 43) BETWEEN HENRY CLAY STREET AND MEQUON ROAD (STH 167)

Impact	"Do Nothing" Alternative	Widening from Four to Six Lanes
Cost (in 1980 dollars)[a]		
Construction	$3,894,000	$29,100,000
Real Estate Acquisition, Relocation, and Demolition	- -	800,000
Maintenance	3,663,000	4,780,000
Total	$7,557,000	$34,680,000
Disruption		
Residential Units Taken	- -	3
Commercial Units Taken	- -	- -

[a]*Construction costs for each alternative include estimates of the roadway construction, utility relocation, and engineering costs. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

36-foot-wide roadways would have the highest capital and maintenance costs of the two alternatives, $34,680,000; while the "do nothing" alternative would have capital and maintenance costs of about $7,557,000. As also shown in Table 253, the improvement alternative would require the taking of three residential structures. No structures would need to be acquired under the "do nothing" alternative.

There would be a significant difference in environmental impacts in terms of air quality and noise levels between the improvement alternative and the "do nothing" alternative. Under the "do nothing" alternative, reduced travel speeds and congestion-induced stop-and-go driving would result in increased air pollutant emissions.

Based upon the additional capacity afforded and congestion abated by the alternatives, and the costs and environmental impacts of the alternatives, it is recommended that that alternative be implemented which provides for the reconstruction of this segment of IH 43 to provide for three continuous through traffic lanes of standard width in each direction of traffic flow between Henry Clay Street and STH 167. This alternative was recommended principally because its implementation could be expected to abate the congestion along this segment of IH 43, and thereby provide a more adequate level of service in this important travel corridor of the Milwaukee urbanized area.

Although the staff-recommended action for the improvement of the problem segment of the North-South Freeway included the widening of IH 43 between N. Henry Clay Street and STH 167, including, importantly, the reconstruction of the interchange at W. Silver Spring Drive, the Advisory Committee directed that this improvement and a second improvement proposal, whereby IH 43 would be widened and reconstructed only through the W. Silver Spring Drive interchange, be presented in this report as two separate projects. Under this second proposal, each of the dual roadways along IH 43 between W. Henry Clay Street and W. Silver Spring Drive would be widened from 33 to 36 feet, and the W. Silver Spring Drive interchange would be reconstructed to provide for direct on- and off-ramp connections between the northbound lanes of IH 43 and W. Silver Spring Drive. This widening would be extended to W. Good Hope Road in order to integrate the reconstructed interchange with the existing segment of IH 43 north of W. Silver Spring Drive. Under this second proposal, IH 43 would not be widened north of W. Good Hope Road.

The capital and maintenance costs of this second proposal, which would include the cost of a "do nothing" alternative for the segment of IH 43 between W. Good Hope Road and STH 167, are estimated at $15,129,000 compared, as noted, with $34,680,000 for the improvement of the entire segment of IH 43 between W. Henry Clay Street and STH 167, and with $7,557,000 for a "do nothing" alternative for this segment of IH 43. This improvement alternative would also require the acquisition of three residential structures. Under this second improvement alternative, the portion of IH 43 in Ozaukee County could be expected to operate at level-of-service C, during peak periods and this portion of IH 43 could be expected to operate at average speeds of 50 miles per hour; the portion of IH 43 between W. Good Hope Road and W. County Line Road could be expected to operate at level-of-service D during peak periods and this portion of IH 43 would operate at average speeds of 40 miles per hour; and the portion of IH 43 in the vicinity of the interchange with W. Silver Spring Drive could also be expected to operate at level-of-service D during peak periods and to operate at average speeds of 40 miles per hour.

Under the first improvement alternative and the "do nothing" alternative, respectively, the portion of IH 43 in Ozaukee County could be expected to operate at level-of-service B during peak periods with operating speeds of 55 miles per hour, and C, with operating speeds of 50 miles per hour; the portion of IH 43 between W. Good Hope Road and W. County Line Road could be expected to operate at level-of-service C during peak periods, ,with operating speeds of 50 miles per hour and D, with operating speeds of 40 miles per hour; and the portion of IH 43 in the vicinity of the W. Silver Spring Drive interchange could be expected to operate at level-of-service D during peak periods, with operating speeds of 40 miles per hour, and E, with operating speeds of 30 to 35 miles per hour.

<u>W. Fond du Lac Avenue (STH 145) from N. 68th Street to W. Walnut Street:</u> To resolve the traffic congestion which may be expected to remain in the travel corridor along W. Fond du Lac Avenue (STH 145), even after full implementation of the recommended transportation systems management measures, consideration was given to improving the segment of W. Fond du Lac Avenue from N. 68th Street to W. Walnut Street. Only by increasing the number of moving traffic lanes on this arterial can traffic congestion in this travel corridor be reduced, and in some cases abated.

Between N. 68th Street and N. 35th Street, W. Fond du Lac Avenue has an urban cross-section with curbs and gutters and sidewalks. This segment has dual 36-foot-wide roadways separated by a 24-foot-wide median between N. 68th Street and N. 60th Street, and dual 34-foot-wide roadways separated by a 26-foot-wide median between N. 60th Street and N. 35th Street, all within a 120-foot right-of-way, adequate to provide for two traffic lanes and one parking lane in each direction. Between N. 35th Street and W. Walnut Street, W. Fond du Lac Avenue also has an urban cross-section with curbs and gutters and sidewalks. The pavement is 50 feet wide curb-to-curb within a 66-foot-wide right-of-way, adequate to provide for two traffic lanes and two parking lanes. The transition between the two cross-sections occurs between N. 36th Street and N. 34th Street. At its intersection with N. 13th Street, W. Fond du Lac Avenue divides into paired one-way roadways, the southeast-bound roadway proceeding southbound on N. 13th Street to W. Walnut Street, and the northwest-bound roadway being carried on W. Fond du Lac Avenue. At its western terminus at N. 68th Street, W. Fond du Lac Avenue merges with the Fond du Lac Freeway (STH 145). At its eastern terminus at W. Walnut Street, W. Fond du Lac Avenue is proposed to merge with the on- and off-ramps of the Hillside Interchange "stub end" connection recommended under the short-range plan, which includes the improvement of W. Fond du Lac Avenue to a desirable urban cross-section from W. Walnut Street to N. 15th Street. There are substantial portions of cleared right-of-way within the Park Freeway-West corridor in the vicinity of W. Fond du Lac Avenue and adjacent arterials east of N. 27th Street. The tracks of the Milwaukee Road Railroad Company cross over W. Fond du Lac Avenue on a structure located between N. 32nd and N. 30th Streets at W. Locust Street. Currently, there are only minimum parking restrictions along this segment of W. Fond du Lac Avenue.

Roadway improvement alternatives were designed for three separate segments of W. Fond du Lac Avenue because of the variation in existing cross-sections and rights-of-way between the segments, and because of the characteristics of the land uses adjacent to each of the segments. The first segment extends from N. 68th Street to N. 35th Street, the second from N. 35th Street to N. 27th Street, and the third from N. 27th Street to W. Walnut Street. Only one improvement alternative—the removal of on-street parking—was considered for the first segment. Five alternatives were developed for increasing the capacity of the second segment; and eight alternatives were developed for increasing the capacity of the third segment.

The five alternatives developed for the second segment of W. Fond du Lac Avenue are the same as the first five alternatives developed for the third segment of the arterial. The first of these five alternatives called for the prohibition of all remaining peak-period on-street parking, as well as the prohibition of all left turns, along the length of these two segments of W. Fond du Lac Avenue. The next two alternatives called for widening each of these segments of W. Fond du Lac Avenue to two types of minimum urban cross-sections. The last two alternatives called for widening these two segments to desirable cross-sections. A sixth alternative developed for the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street would also involve widening to a desirable urban cross-section, except under this alternative W. Fond du Lac Avenue would not be widened through the W. Fond du Lac Avenue business district. This alternative would instead use a pair of one-way arterials to bypass this district.

The seventh and eighth alternatives developed for the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street would attempt to provide an alternate route for traffic by improving arterial streets other than W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street. As the alternate routing, the seventh alternative would use a widened N. 27th Street from W. Fond du Lac Avenue to W. North Avenue, and a widened and realigned W. North Avenue from N. 27th Street to W. Fond du Lac Avenue at a new intersection between N. 19th and N. 20th Streets. The eighth alternative would use a widened N. 27th Street from W. Fond du Lac Avenue to W. Lisbon Avenue, and W. Lisbon Avenue and W. Walnut Street from N. 27th Street to W. Fond du Lac Avenue as the alternate routing. This segment of W. Lisbon Avenue and W. Walnut Street has a desirable urban cross-section with the exception of the segment east of N. 14th Street, which has a minimum urban cross-section.

For the latter two segments of W. Fond du Lac Avenue, the alternatives were evaluated in terms of cost and disruption; traffic impact, including volume-to-design-capacity ratios; parking prohibitions; left-turn restrictions; air pollution impacts in terms of the amount of carbon monoxide and hydrocarbon emissions; and fuel consumption. For the first segment of W. Fond du Lac Avenue, only the cost and disruption attendant to the proposed parking prohibition improvement was evaluated. The impacts of a "do nothing" alternative, under which the physical dimensions of the roadway surface and regulations concerning parking and left-turn movements would remain essentially unchanged, were also assessed for each segment of W. Fond du Lac Avenue.

Segment of W. Fond du Lac Avenue (STH 145) from N. 68th Street to N. 35th Street: As already noted, only one alternative—the prohibition of on-street parking—was considered for the segment of W. Fond du Lac Avenue between N. 68th Street and N. 35th Street. This alternative would entail the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods along this segment of W. Fond du Lac Avenue. This prohibition would mean that vehicles accessing commercial and residential land uses along this segment of W. Fond du Lac Avenue would have to seek parking space on nearby intersecting streets or use off-street parking space in the area.

Development along this segment of W. Fond du Lac consists primarily of a combination of commercial and residential land uses. Although on-street parking is used regularly along this segment, the prohibition of on-street parking in the direction of peak traffic flow during both the morning and evening peak periods is considered implementable because of the availability of parking on nearby intersecting streets and at off-street locations. The physical widening of this segment of W. Fond du Lac Avenue to provide for three traffic lanes and a parking lane in each direction was not considered. The roadway is already widened to a desirable urban cross-section, and any further widening of the arterial could jeopardize safe pedestrian movement and result in excessive disruption. Such prohibition of on-street parking could be expected to abate all traffic congestion along this segment, and to reduce traffic congestion in the corridor of the study area.

Segment of W. Fond du Lac Avenue from N. 35th Street to N. 27th Street: As already noted, five alternatives were also developed for the second segment of W. Fond du Lac Avenue. The first of these alternatives would require the prohibition of all remaining on-street parking and the institution of a no-stopping and tow-away zone on W. Fond du Lac Avenue during both the morning and evening peak periods in the direction of peak traffic flow. In this manner, two through traffic lanes could be provided in each direction along W. Fond du Lac Avenue during peak periods. To further increase capacity under this alternative, all left-turn movements from W. Fond du Lac Avenue would be prohibited during both peak travel periods. These left-turn movements would be accommodated by right-turn movements from W. Fond du Lac Avenue followed by left- or right-turn movements on adjacent residential streets. The attendant crossing movements of W. Fond du Lac Avenue would be encouraged to be made at signalized intersecting streets. The signals along the arterial would be retimed to maintain good progression and minimal travel times. Because of the parking restrictions under this alternative, vehicles accessing businesses or residences which front W. Fond du Lac Avenue between N. 35th Street and N. 27th Street during periods of parking restrictions would have to seek parking space along nearby intersecting streets, or use off-street parking space in the area. As shown in Table 254, W. Fond du Lac Avenue from N. 35th Street to N. 27th Street could be expected to operate over design capacity even with parking and left turns prohibited. As seen in this table, the level of service along this segment under this alternative, compared with that under a "do nothing" plan for this segment, would be improved from E to D during peak periods.

The second alternative considered for W. Fond du Lac Avenue between N. 35th Street and N. 27th Street would retain the existing cross-section except at W. Locust Street, where the existing 66-foot-wide right-of-way would be widened to 80 feet to provide for the addition of left- and/or right-turn lanes. Under this plan, it would be necessary to replace the structure which carries the Milwaukee Road railway over W. Fond du Lac Avenue between N. 30th Street and N. 32nd Street. In order to maintain two through lanes of traffic in the peak direction during peak periods under this alternative, it would again be necessary to prohibit on-street parking, standing, and stopping, and to institute a tow-away zone in the direction of peak traffic flow, during both the morning and evening peak periods. As under the first alternative, vehicles accessing businesses or residences which front this segment of W. Fond du Lac Avenue during periods of parking restrictions would have to seek parking space along nearby intersecting streets or use off-street parking in the area. Even though additional left-turn lanes would be provided at the intersection of W. Fond du Lac Avenue and W. Locust Street under this alternative, the prohibition of all left-turn movements from W. Fond du Lac Avenue would be required during peak periods.

The third improvement alternative considered for this segment of W. Fond du Lac Avenue would involve widening the arterial between N. 35th Street and N. 27th Street to a 64-foot-wide undivided urban roadway within an 80-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 124. Under this alternative, it would be necessary to acquire an additional 14 feet of right-of-way along the arterial. The location for the widened right-of-way which would result in the least cost and disruption was determined to be along the south right-of-way line between N. 35th Street and N. 27th Street. It would be necessary under this alternative to replace the structure which carries the Milwaukee Road railway over W. Fond du Lac Avenue between N. 30th Street and N. 32nd Street. This widening would provide for two traffic lanes in each direction in addition to a center lane which could be used as a continuous left-turn lane for both directions of traffic.

In order to maintain two through lanes of traffic in the direction of peak traffic flow during peak periods along this segment of W. Fond du Lac Avenue, it would be necessary to prohibit on-street parking, standing, and stopping under this alternative, and to institute a tow-away zone in the direction of peak traffic flow during both the morning and evening peak periods. Vehicles accessing businesses or residences which front W. Fond du Lac Avenue between N. 35th Street and N. 27th Street would have to seek parking space along nearby intersecting streets, or use off-street parking space in the area. Left turns, however, would be permitted at all times along this segment of W. Fond du Lac Avenue.

As shown in Table 254, the traffic volumes and levels of service on this segment of W. Fond du Lac Avenue are expected to be about the same under

Table 254

COST AND DISRUPTION IMPACTS, TRAFFIC IMPACTS, POLLUTANT EMISSION RATES, AND FUEL CONSUMPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR THE SEGMENT OF W. FOND DU LAC AVENUE FROM N. 35TH STREET TO N. 27th STREET

Impact	"Do Nothing" Alternative	Alternative 1 (parking and left-turn prohibition)	Minimum Urban Cross-Section: Alternative 2 (existing roadway with widened intersections)	Minimum Urban Cross-Section: Alternative 3 (64-foot-wide urban roadway with continuous left-turn lane)	Desirable Urban Cross-Section: Alternative 4 (36-foot-wide urban roadway pairs with median, and peak-period parking permitted)	Desirable Urban Cross-Section: Alternative 5 (36-foot-wide urban roadway pairs with median, and peak-period parking prohibited)
Cost (in 1980 dollars)[a]						
Construction	$ 980,000	$1,130,000	$1,402,000	$3,462,000	$4,914,000	$4,917,000
Real Estate Acquisition, Relocation, and Demolition	- -	- -	495,000	660,000	742,000	742,000
Maintenance	212,000	212,000	217,000	265,000	318,000	318,000
Total	$1,192,000	$1,342,000	$2,114,000	$4,387,000	$5,974,000	$5,977,000
Disruption						
Residential Units Taken	- -	- -	- -	- -	- -	- -
Commercial Units Taken	- -	- -	6	8	9	9
Industrial Units Taken	- -	- -	- -	- -	- -	- -
Level of Service						
Average Peak Period	E	D	D	D	D	B/C
Midday Period	C	C	B	B	A	A
Evening Period	A	A	A	A	A	A
Year 2000 Traffic Volume (vehicles per day) (1981 traffic volume on existing roadway—14,100 vehicles per day)	14,500	20,800	20,800	20,800	20,800	20,800
Parking Prohibition						
Morning Peak Period	No prohibition	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction
Midday Period	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition
Evening Peak Period	No prohibition	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction
Left-Turn Restrictions						
Peak Periods	Permitted	Prohibited	Prohibited	Permitted	Permitted	Permitted
Midday Period	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Evening Period	Permitted	Prohibited	Prohibited	Permitted	Permitted	Permitted
Pollutants Emitted in the Year 2000 (tons per year)						
Carbon Monoxide	127.0	112.0	99.7	99.7	97.5	90.6
Hydrocarbons	13.5	12.0	10.4	10.4	10.1	9.0
Fuel Consumption (total gallons 1980-2000)	3,695,000	3,450,000	3,271,000	3,271,000	3,246,000	3,153,000
Total Fuel Cost 1980-2000 (in 1980 dollars)	$6,651,000	$6,120,000	$5,730,000	$5,730,000	$5,676,000	$5,474,000

[a] *Construction costs for each alternative include estimates of the cost of roadway construction, lighting, traffic signals, utility and storm sewer relocation, and engineering. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

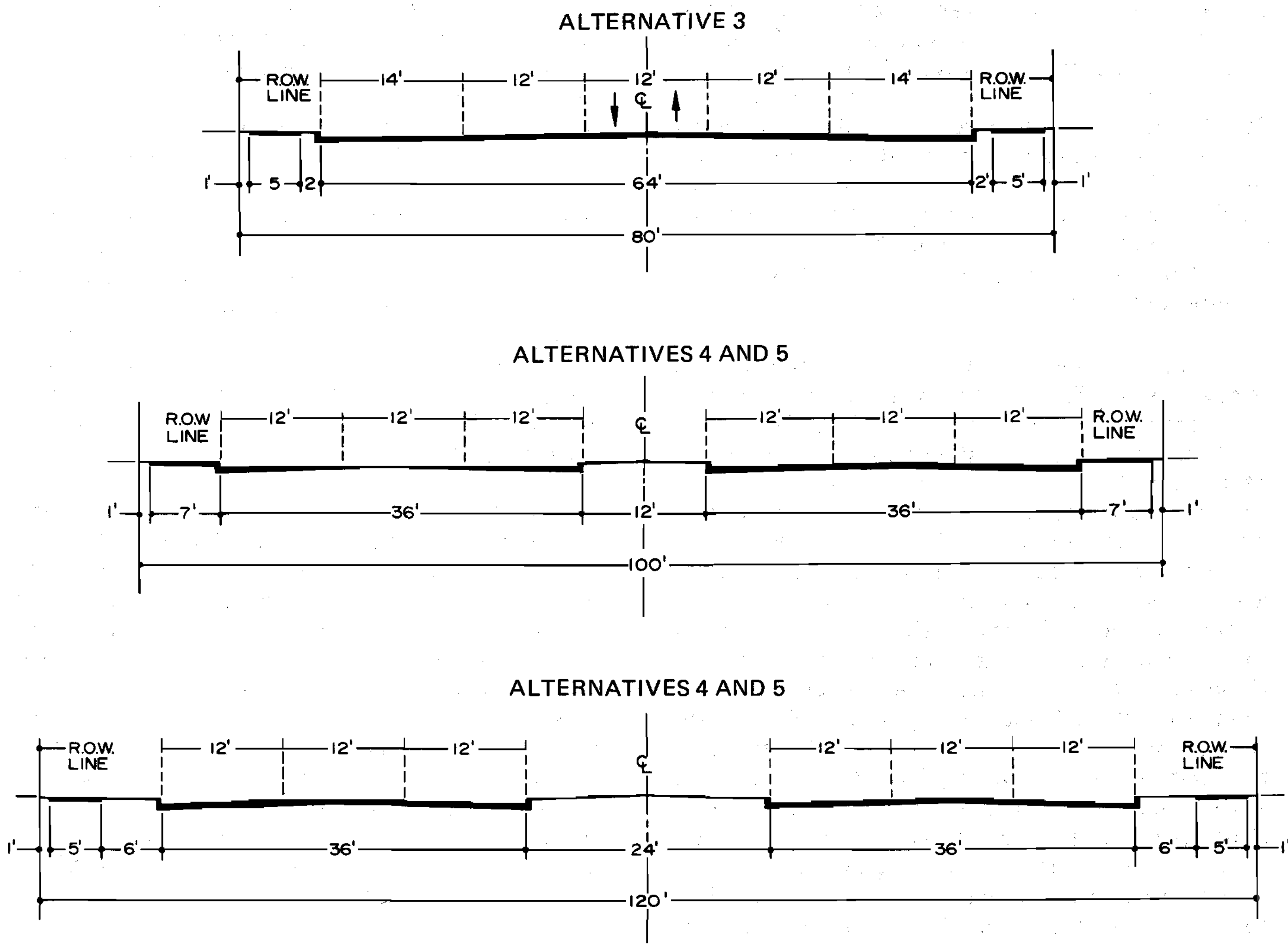
Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

the second and third alternative improvement plans. Peak-period level of service would remain at D, as under the first alternative plan. During the midday period, however, the level of service may be expected to be improved from C to B.

The fourth alternative considered for the segment of W. Fond du Lac Avenue between N. 35th Street and N. 27th Street would involve widening the arterial to provide a desirable six-lane urban roadway. This alternative would entail the provision

Figure 124

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES FOR W. FOND DU LAC AVENUE



Source: SEWRPC.

of dual 36-foot-wide roadways separated by a 12-foot-wide median with curbs, gutters, and sidewalks within a 100-foot-wide right-of-way between N. 35th Street and N. 32nd Street; and dual 36-foot-wide roadways separated by a 24-foot-wide median with curbs, gutters, and sidewalks within a 120-foot-wide right-of-way between N. 32nd Street and N. 27th Street. A 100-foot-wide right-of-way and narrowed median would be provided under this alternative between N. 35th Street and N. 32nd Street because of the right-of-way limitations imposed by the Milwaukee County Transit System bus storage facility located to the south of W. Fond du Lac Avenue. Typical cross-sections for this alternative are shown in Figure 124. Under this alternative, it would be necessary to acquire an additional 34 feet of right-of-way along W. Fond du Lac Avenue between N. 35th Street and N. 32nd Street, and an additional 54 feet of right-of-way between N. 32nd Street and N. 27th Street. The location for the widened right-of-way which would result in the least cost and disruption was determined to be along the south right-of-way line between N. 35th Street and N. 27th Street. Also under this alternative, the structure which carries the tracks of the Milwaukee Road railway over W. Fond du Lac Avenue between N. 32nd Street and N. 30th Street would need to be replaced. The widening of this segment would provide for two through traffic lanes and a parking lane in the direction of peak traffic flow during each peak travel period. The provision of a 24-foot-wide median between N. 32nd Street and N. 27th Street would permit the addition, as necessary, of left-turn lanes along this segment, and would provide for the separation of opposing traffic flows for increased travel safety. Table 254 sets forth the expected traffic volumes and levels of service under this fourth alternative. Under this alternative, W. Fond du Lac Avenue between N. 35th Street and N. 27th Street would continue to operate over design capacity during both peak periods. The level of service under this alternative would continue to be D during peak travel periods, as under the second and third alternatives considered. However, midday level of service would be improved to A under this alternative.

The fifth, and final, alternative considered for this segment of W. Fond du Lac Avenue would provide for three traffic lanes between N. 35th Street and N. 27th Street during peak periods in the direction of peak traffic flow. This alternative would have the same cross-sections provided under the fourth alternative. The additional third lane would be provided by prohibiting all on-street parking, standing, and stopping, and by instituting a tow-away zone, in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing businesses or residences which front this segment of W. Fond du Lac Avenue during peak periods would, as under the first three alternatives, have to seek parking space along nearby intersecting streets or use off-street parking space in the area. This is the first alternative considered for this segment of W. Fond du Lac Avenue which may be expected to alleviate the traffic congestion anticipated on this segment, and in this corridor of the study area. As shown in Table 254, under this alternative the level of service could be expected to be improved to between B and C during peak periods.

Segment of W. Fond du Lac Avenue from N. 27th Street to W. Walnut Street: Eight alternatives were considered for the provision of added roadway capacity within the Fond du Lac Avenue corridor between N. 27th Street and W. Walnut Street. The first five of these alternatives were the same five alternatives proposed for the improvement of W. Fond du Lac Avenue from N. 35th Street to N. 27th Street, and thus represent extensions of the five roadway cross-section alternatives.

The first of these alternatives would again require only the prohibition of all remaining on-street parking, together with the prohibition of all left turns along this segment during both the morning and evening peak periods. Left-turn movements would again be accommodated by right-turn movements from W. Fond du Lac Avenue, followed by turn movements on adjacent residential streets. The signals along this segment of W. Fond du Lac Avenue would be retimed to maintain good progression and minimal travel times. Because of the parking restrictions proposed under this alternative, vehicles accessing businesses or residences which front W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street during the periods of parking restriction would have to seek parking space along nearby intersecting streets or use off-street parking space in the area. Land use along this segment of W. Fond du Lac Avenue is largely commercial and, although a minimal amount of off-street parking exists along the segment, there are probably enough parking spaces on adjacent side streets in off-street locations to make this alternative implementable.

This alternative would provide for two through lanes of traffic in the direction of peak traffic flow during each peak travel period from N. 27th Street to N. 15th Street and, in conjunction with the reconstruction of W. Fond du Lac Avenue associated with completion of the Hillside Interchange, three through traffic lanes east of N. 15th Street. As shown in Table 255, under this alternative W. Fond du Lac Avenue from N. 27th Street to W. Walnut Street would continue to operate over design capacity during the peak periods. Under this alternative, the peak-period level of service would be D, improved from E under the "do nothing" alternative for this segment.

Under the second alternative considered for this segment of W. Fond du Lac Avenue, only certain intersections would be widened. At these intersections, the right-of-way would be widened from the existing 66 feet to 80 feet, and left- and right-turn lanes would be provided as necessary. Along this segment, both Oak Street and N. 23rd Street and N. 21st Street and W. North Avenue would be widened. In order to maintain two through lanes for traffic in the peak direction from N. 27th Street to N. 15th Street and three through lanes east of N. 15th Street during the peak periods, it would be necessary to prohibit on-street parking, standing, and stopping, and to institute a tow-away zone, in the direction of peak traffic flow during both the morning and evening peak periods along this segment of W. Fond du Lac Avenue. The prohibition of left-turn movements from W. Fond du Lac Avenue would also be necessary during peak periods under this alternative.

Table 255

COST AND DISRUPTION IMPACTS, TRAFFIC IMPACTS, POLLUTANT EMISSION RATES, AND FUEL CONSUMPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR THE SEGMENT OF W. FOND DU LAC AVENUE FROM N. 27TH STREET TO W. WALNUT STREET

Impact	"Do Nothing" Alternative	Alternative 1 (parking and left-turn prohibition)	Alternative 2 (existing roadway with widened intersections)	Alternative 3 (64-foot-wide urban roadway with continuous left-turn lane)	Alternative 4 (36-foot-wide urban roadway pairs with median and peak-period parking permitted)	Alternative 5 (36-foot-wide urban roadway pairs with median, and peak-period parking prohibited)[b]	Alternative 6 (36-foot-wide urban roadway pairs with median and peak-period parking prohibited, with one-way pairs around Fond du Lac Avenue business district)[b]	Alternative 7 (alternate route composed of segments of N. 27th Street, W. North Avenue, W. Garfield Avenue, and W. Fond du Lac Avenue)[c]	Alternative 8 (alternate route) composed of segments of N. 27th Street, W. Lisbon Avenue, and W. Walnut Street)[c]
Cost (in 1980 dollars)[a]									
Construction	$ 1,727,000	$ 2,015,000	$ 2,442,000	$3,092,000	$ 3,708,000	$ 3,711,000	$ 3,697,000	$ 4,397,000	$ 2,514,000
Real Estate Acquisition, Relocation, and Demolition	--	--	1,903,000	1,981,000	2,293,000	2,293,000	1,334,000	1,150,000	3,337,000
Maintenance Costs	371,000	371,000	380,000	464,000	556,000	556,000	588,000	661,000	766,000
Total	$ 2,098,000	$ 2,386,000	$ 4,725,000	$ 5,537,000	$ 6,557,000	$ 6,560,000	$ 5,619,000	$ 6,208,000	$ 6,617,000
Disruption									
Residential Units Taken	--	--	1	7	7	7	6	18	58
Commercial Units Taken	--	--	24	33	38	38	25	6	8
Institutional Properties Taken	--	--	--	1	1	1	1	1	1
Level of Service on W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street									
Average Peak Period	E	D	D	D	D	C	C	D	D
Midday Period	C	C	B	B	A	A	A	C	C
Evening Period	A	A	A	A	A	A	A	A	A
Year 2000 Traffic Volume (vehicles per day) (1980 traffic volumes on existing roadway—9,000-14,000 vehicles per day)	13,200-16,000	20,300-23,500	20,300-23,500	20,300-23,500	20,300-23,500	22,400-25,700	22,400-25,700	19,800-23,500	20,300-23,500
Parking Prohibition on W. Fond du Lac Avenue									
Morning Peak Period	No prohibition	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction	Peak direction (on southeast-bound roadway only)	Peak direction	Peak direction
Midday Period	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition
Evening Peak Period	No prohibition	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction	No prohibition	Peak direction	Peak direction
Left-Turn Restrictions									
Peak Periods	Permitted	Prohibited	Prohibited	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Midday Period	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Evening Period	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Pollutants Emitted in the Year 2000 (tons per year)									
Carbon Monoxide	254.2	239.2	220.0	220.0	214.7	198.1	208.4	233.6	239.2
Hydrocarbons	26.1	25.1	22.5	22.5	21.7	19.5	20.6	24.5	25.1
Fuel Consumption (total gallons 1980-2000)	9,083,000	8,782,000	8,544,000	8,544,000	8,485,000	8,218,000	8,423,000	8,659,000	8,782,000
Total Fuel Cost 1980-2000 (in 1980 dollars)	$15,414,000	$14,761,000	$14,243,000	$14,243,000	$14,116,000	$13,537,000	$13,875,000	$14,554,000	$14,761,000

[a] *Construction costs for each alternative include estimates of the cost of roadway construction, lighting, traffic signals, utility and storm sewer relocation, and engineering. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of the winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

[b] *On-street parking prohibition during peak periods is assumed on N. 27th Street from W. Fond du Lac Avenue to W. Lisbon Avenue and on W. North Avenue from N. 27th Street to W. Fond du Lac Avenue.*

[c] *On-street parking prohibition during peak periods is assumed on W. Fond du Lac Avenue from N. 27th Street to W. Walnut Street and on N. 27th Street from W. North Avenue to W. Lisbon Avenue.*

Source: Wisconsin Department of Transportation, City of Milwaukee, and SEWRPC.

The third alternative proposed for W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street would involve widening to a 64-foot-wide undivided roadway, featuring four traffic lanes and a continuous left-turn lane with curbs and gutters and sidewalks within an 80-foot right-of-way from N. 27th Street to N. 15th Street. A typical cross-section for this alternative is shown in Figure 124. The location for the additional 14 feet of right-of-way required under this alternative which would result in the least cost and disruption was determined to be along the north right-of-way line between N. 27th Street and N. 24th Street, and along the south right-of-way line between N. 24th Street and N. 15th Street. In order to maintain two through lanes of traffic in the direction of peak traffic flow during peak periods along W. Fond du Lac Avenue between N. 27th Street and N. 15th Street, and three through traffic lanes east of N. 15th Street, it would again be necessary to prohibit on-street parking, standing, and stopping, and to institute a tow-away zone, in the direction of peak traffic flow during both the morning and evening peak periods.

As shown in Table 255, under both the second and third alternatives, W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street may be expected to remain congested during the peak periods. The average level of service during peak periods along W. Fond du Lac Avenue under each of these alternatives would be the same as under the first alternative and the "do nothing" alternative, or level-of-service D. However, midday level of service under this alternative is expected to be improved from C to B.

The fourth alternative considered for the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street would involve widening to provide for a continuous, desirable, six-lane urban roadway. This alternative would entail the provision of new, dual 36-foot-wide roadways with a 24-foot-wide median on a 120-foot-wide right-of-way between N. 27th Street and N. 15th Street which would merge with the desirable urban roadway east of N. 15th Street recommended under the short-range plan in conjunction with the completion of the Hillside Interchange. A typical cross-section for this alternative is shown in Figure 124. The location for the additional 54 feet of right-of-way required under this alternative which would result in the least cost and disruption was determined to be along the north right-of-way line of W. Fond du Lac Avenue from N. 27th Street to N. 24th Street, and along the south right-of-way line of W. Fond du Lac Avenue between N. 24th Street and W. Walnut Street. East of N. 20th Street, this alternative would take advantage of available rights-of-way in the cleared Park Freeway-West corridor. This widening would provide for two through lanes of traffic and a parking lane in the direction of peak traffic flow during each peak travel period on this segment of W. Fond du Lac Avenue. The provision of a 24-foot-wide median under this alternative would permit the addition of left- and right-turn lanes as required at major intersections, and would provide for the separation of opposing traffic flows for increased travel safety.

As shown in Table 255, under this alternative, W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street may be expected to remain congested during peak periods. The peak-period level of service on this segment of W. Fond du Lac Avenue would be the same under this alternative as under the second and third alternatives, or level-of-service D. However, the average midday level of service would be improved to A.

The fifth alternative considered for this segment of W. Fond du Lac Avenue would provide for three continuous traffic lanes between N. 27th Street and W. Walnut Street during each peak period in the direction of peak traffic flow, within the same desirable urban cross-section provided for under the fourth alternative. These three lanes would be provided through the prohibition of all on-street parking, standing, and stopping, and the institution of a tow-away zone, in the direction of peak traffic flow. This is the first alternative which may be expected to abate the peak-period congestion on this segment of W. Fond du Lac Avenue and to reduce traffic congestion in this travel corridor. As shown in Table 255, the average peak-period level of service on W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street could be expected to be improved to C under this alternative.

An important consideration in the design and evaluation of alternatives for the third segment of W. Fond du Lac Avenue was the existing land use along this arterial between N. 27th Street and W. Garfield Avenue. Land uses along this corridor are principally commercial and comprise the W. Fond du Lac Avenue business district. The widening of W. Fond du Lac Avenue proposed under the fourth and fifth alternatives would result in the taking of several business units and the consequent disruption of the business district. To partially reduce the disruption which would be incurred under the fourth and fifth alternatives, a sixth alternative was considered under which the existing cross-section of the arterial between W. Oak Street and W. Garfield Avenue would remain unchanged.

This sixth alternative would be similar to the fourth and fifth alternatives except that a 36-foot-wide roadway would be constructed for southeastbound W. Fond du Lac Avenue traffic from a point north of the intersection of W. Oak Street and W. Fond du Lac Avenue to the intersection of W. Garfield Avenue and W. Fond du Lac Avenue. The new roadway, as shown on Map 232, would be curvilinear to accommodate 30-mph speeds on W. Fond du Lac Avenue and would intersect with W. North Avenue at about N. 24th Street. The roadway would then carry traffic southeasterly to intersect W. Garfield Avenue at about N. 22nd Street, and W. Garfield Avenue would be widened under this alternative from 30 to 36 feet between N. 22nd Street and W. Fond du Lac Avenue. Under this alternative, W. Fond du Lac Avenue between W. Garfield Avenue and W. Oak Street would operate on its existing cross-section as a one-way street northwestbound; and the new curvilinear roadway and the widened segment of W. Garfield Avenue would operate as a one-way street south-east-bound. In order to construct the new roadway between W. Oak Street and W. North Avenue, additional right-of-way, including portions of two parking lots and one commercial unit, would need to be acquired from each side of the segment of W. Oak Street south of W. Fond du Lac Avenue. All other construction could be accommodated within the existing right-of-way, or on land presently owned by Milwaukee County or the City of Milwaukee within the cleared Park Freeway-West corridor. No structures would be required to be taken along W. Fond du Lac Avenue between W. Oak Street and W. Garfield Avenue under this alternative, and the business community along this segment of W. Fond du Lac Avenue would be unaffected. Traffic engineering considerations, including intersection control and signalization and street closings, which have the potential to hinder traffic circulation, would need to be carefully considered in the final design engineering phase. Preliminary recommendations for street closings which would be necessary under this alternative are shown on Map 232.

In order to provide for three traffic lanes in each direction during peak periods under this alternative, on-street parking could be permitted on one side of the street only on that segment of W. Fond du Lac Avenue between W. Oak Street and W. Garfield Avenue. On-street parking would be prohibited during peak periods along the remainder of this segment of W. Fond du Lac Avenue. As indicated in Table 255, the average peak-period level of service along this segment of W. Fond du Lac Avenue would be the same under this alternative as under the fifth alternative.

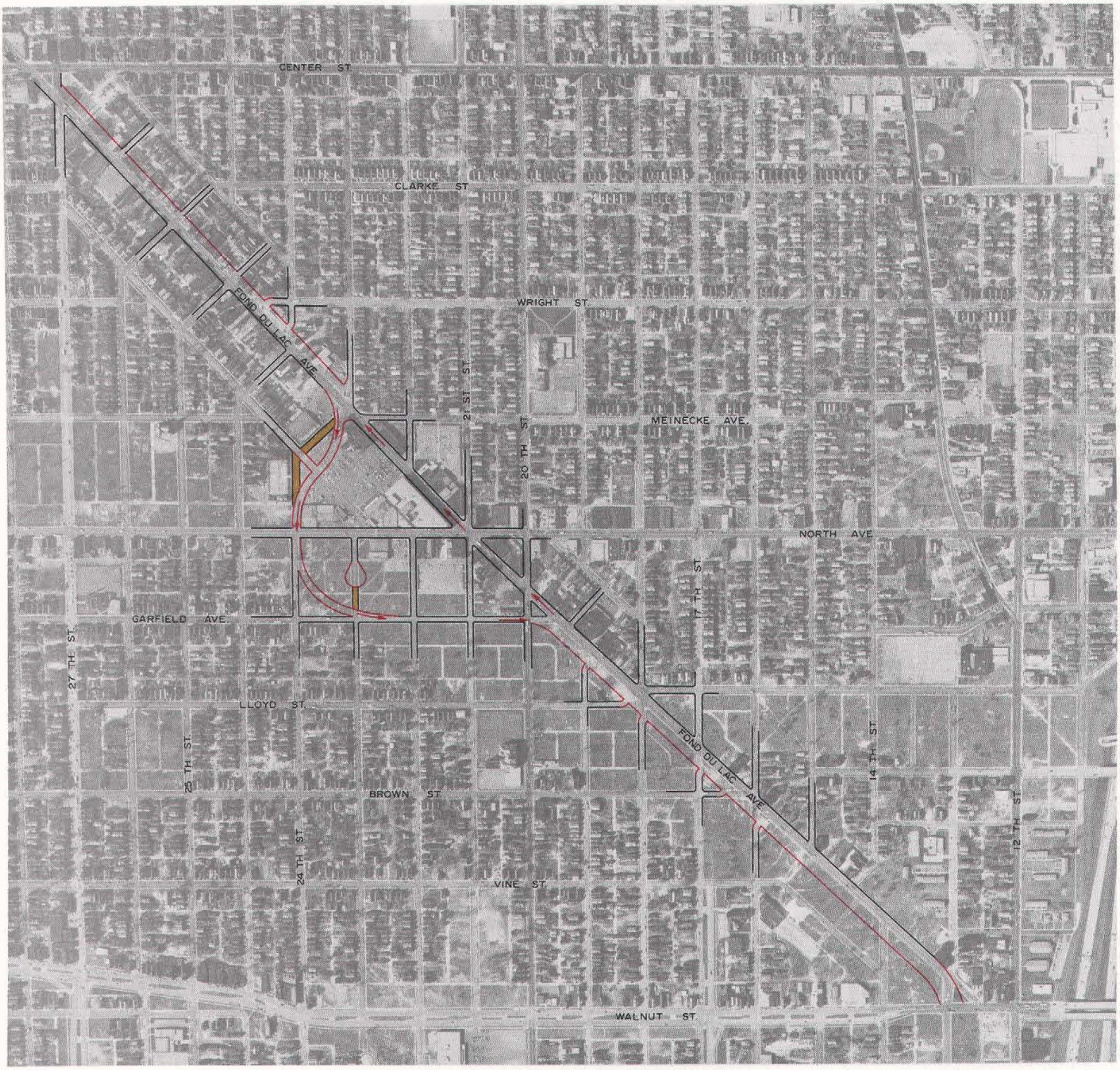
The last two alternatives considered for the alleviation of traffic congestion along the third segment of W. Fond du Lac Avenue proposed alternative arterial routes for traffic which would otherwise use this segment. Under each of these two alternatives—the seventh and eighth to be considered for this segment—W. Fond du Lac Avenue would maintain its existing cross-section between N. 27th Street and W. Garfield Avenue, and all peak-period on-street parking would be prohibited.

Under the seventh alternative, as shown on Map 233, the alternate route for traffic would be provided on N. 27th Street between W. Fond du Lac Avenue and W. North Avenue, on W. North Avenue and W. Garfield Avenue between N. 27th Street and W. Fond du Lac Avenue, and on W. Fond du Lac Avenue between W. Garfield Avenue and the W. Fond du Lac Avenue extension of the Hillside Interchange. Between W. Fond du Lac Avenue and W. North Avenue, N. 27th Street has an urban cross-section with curbs and gutters and sidewalks. The pavement is 50 feet wide curb-to-curb within a 66-foot-wide right-of-way, adequate to provide for two through traffic lanes in each direction of traffic flow. Between N. 27th Street and W. Fond du Lac Avenue, W. North Avenue also has an urban cross-section with curbs and gutters and sidewalks. The pavement is also 50 feet wide curb-to-curb within a 66-foot-wide right-of-way, and is adequate to provide for two through traffic lanes and two parking lanes. Between N. 22nd Street and W. Fond du Lac Avenue, W. Garfield Avenue also has an urban cross-section with curbs and gutters and sidewalks. The pavement is 30 feet wide along this segment within a 60-foot-wide right-of-way. On-street parking is currently permitted along all of these roadway segments.

Under this alternative, N. 27th Street would be widened between W. Fond du Lac Avenue and W. North Avenue, and W. North Avenue would be widened between N. 27th Street and N. 24th Street to provide for dual 36-foot-wide urban roadways separated by a 24-foot-wide median,

Map 232

LONG-RANGE IMPROVEMENT ALTERNATIVE NO. 6 FOR W. FOND DU LAC AVENUE FROM N. 27TH STREET TO THE HILLSIDE INTERCHANGE



LEGEND

EXISTING ROADWAY

NEW OR WIDENED ROADWAY

CLOSED ROADWAY

DIRECTION OF TRAFFIC FLOW IF ONE-WAY OPERATION IS REQUIRED UNDER ALTERNATIVE

GRAPHIC SCALE
0 400 800 FEET

This map shows the sixth alternative considered under the study for the improvement of W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange. Under this alternative, W. Fond du Lac Avenue would be improved to accommodate dual 36-foot-wide roadways separated by a 24-foot-wide median between N. 27th Street and a point north of W. Oak Street. At that point, a new roadway would be constructed which would loop west of the W. Fond du Lac Avenue business district between W. Oak Street and W. Garfield Avenue. This new roadway would carry eastbound traffic on W. Fond du Lac Avenue, and would operate in conjunction with the existing segment of W. Fond du Lac Avenue between W. Garfield Avenue and W. Oak Street, which would carry westbound traffic. Under this alternative, the W. Fond du Lac Avenue business district would remain as it currently exists.

Source: SEWRPC.

Map 233

LONG-RANGE IMPROVEMENT ALTERNATIVE NO. 7 FOR W. FOND DU LAC AVENUE FROM N. 27TH STREET TO THE HILLSIDE INTERCHANGE

This map shows the seventh alternative considered under the study for the improvement of W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange. Under this alternative, an alternate route would be provided for traffic which would otherwise utilize W. Fond du Lac Avenue. The alternate route would provide dual 36-foot-wide roadways separated by a 24-foot-wide median along N. 27th Street between W. Fond du Lac Avenue and W. North Avenue; along W. North Avenue and W. Garfield Avenue between N. 27th Street and W. Fond du Lac Avenue; and along W. Fond du Lac Avenue between W. Garfield Avenue and the Hillside Interchange. Under this alternative, the W. Fond du Lac Avenue business district between N. 27th Street and W. Garfield Avenue would remain as it currently exists.

Source: SEWRPC.

with curbs and gutters and sidewalks within a 120-foot-wide right-of-way. A new roadway, also consisting of dual 36-foot-wide urban roadways within a 120-foot-wide right-of-way, would be located diagonally between the intersection of W. North Avenue and N. 24th Street and the intersection of W. Garfield Avenue and N. 22nd Street. W. Garfield Avenue between N. 22nd Street and W. Fond du Lac Avenue, and W. Fond du Lac Avenue between W. Garfield Avenue and the W. Fond du Lac Avenue extension of the Hillside Interchange would also be improved to desirable roadway cross-sections under this alternative. This routing would avoid disruption of the business community along W. Fond du Lac Avenue, and would take advantage of vacant land in the cleared Park Freeway-West corridor which is located adjacent to portions of both W. North Avenue and W. Fond du Lac Avenue along this route. A typical cross-section for this alternative is shown in Figure 124.

Under this alternative, it would be necessary to acquire 54 feet of right-of-way along N. 27th Street between W. Fond du Lac Avenue and W. North Avenue. The location for the widened right-of-way which would result in the least cost and disruption was determined to be along the west side of N. 27th Street. All construction along W. North Avenue, along the proposed new roadway between W. North Avenue and W. Garfield Avenue, along W. Garfield Avenue, and along W. Fond du Lac Avenue under this alternative could be accommodated within land owned by Milwaukee County and the City of Milwaukee along the cleared Park Freeway-West corridor. With peak-period on-street parking prohibitions, this widening would provide for three through traffic lanes in the direction of peak traffic flow during each peak travel period along this alternate routing. Because of the necessary peak-period parking restrictions under this alternative, vehicles accessing businesses and residences along this routing, as well as along W. Fond du Lac Avenue southeast of N. 27th Street, would have to seek parking space in off-street locations or along nearby intersecting streets. The provision of the 24-foot-wide median under this alternative would permit the addition of left-turn lanes at major intersections, and would provide for the separation of opposing traffic flow for increased travel safety.

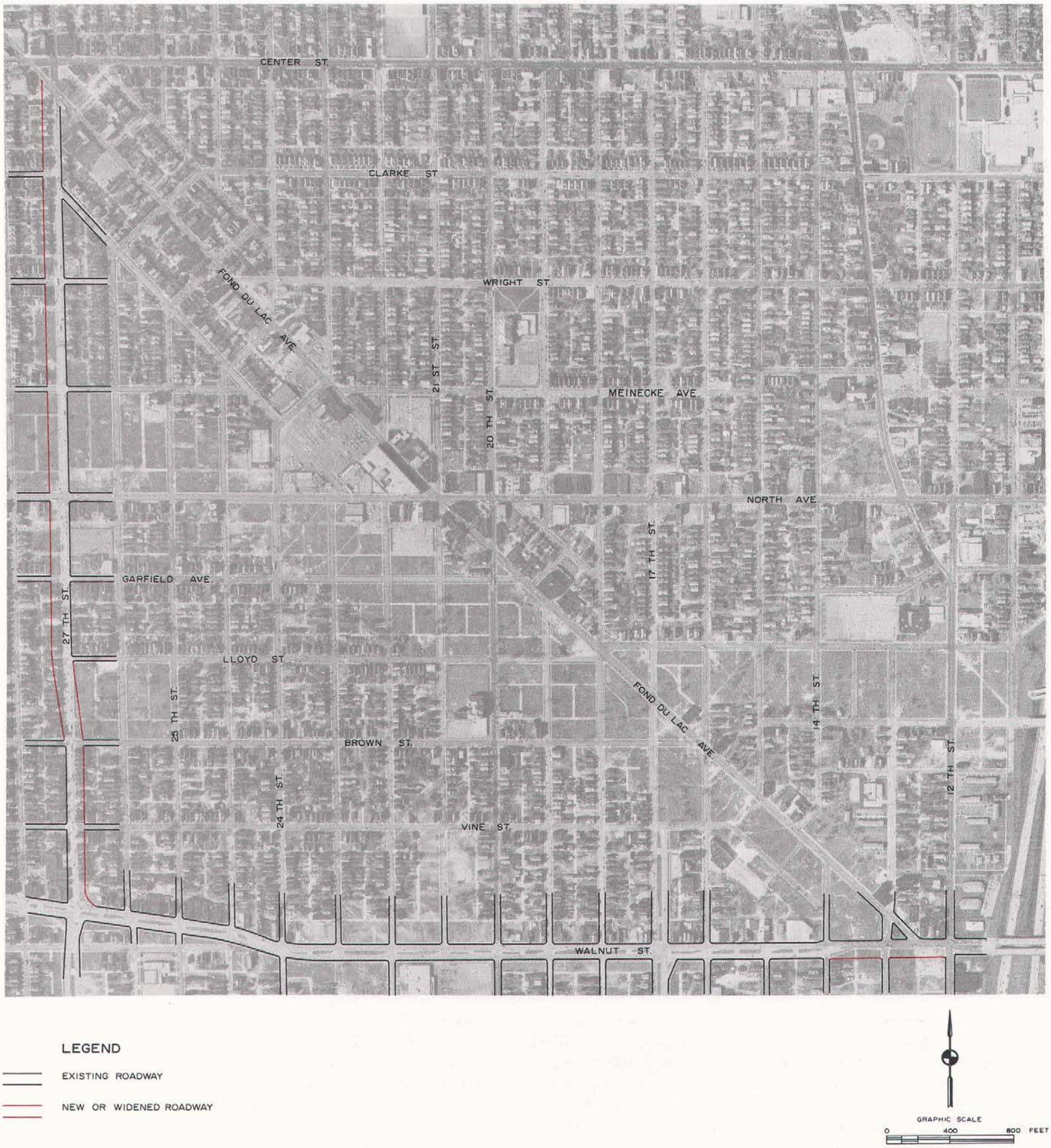
As indicated in Table 255, this alternative would not succeed in diverting sufficient traffic volume from the segment of W. Fond du Lac Avenue southeast of N. 27th Street to improve the level of service. Under this alternative, this segment of W. Fond du Lac Avenue would continue to operate over design capacity during peak periods at a level-of-service D.

As shown on Map 234, the eighth alternative considered for this travel corridor would provide an alternate route for traffic flow between the intersection of W. Fond du Lac Avenue and N. 27th Street and the Hillside Interchange along N. 27th Street, W. Lisbon Avenue, and W. Walnut Street. Between W. Fond du Lac Avenue and W. Lisbon Avenue, N. 27th Street has an urban cross-section with curbs and gutters and sidewalks. The pavement is 50 feet wide curb-to-curb within a 66-foot-wide right-of-way, adequate to provide for two through traffic lanes and two parking lanes. Both W. Lisbon Avenue between N. 27th Street and W. Walnut Street and W. Walnut Street between W. Lisbon Avenue and N. 14th Street consist of dual 36-foot-wide roadways separated by a 26-foot-wide median within a 130-foot-wide right-of-way, adequate to provide for two through traffic lanes in each direction with parking permitted, or for three through lanes in each direction. On-street parking is currently permitted along these segments of W. Lisbon Avenue and W. Walnut Street. W. Walnut Street between N. 14th Street and W. Fond du Lac Avenue has an urban cross-section with curbs and gutters and sidewalks. The pavement is 50 feet wide, adequate to provide for two through traffic lanes and two parking lanes. This segment of W. Walnut Street is bordered on both sides by the cleared Park Freeway-West corridor; and is proposed to be reconstructed to a desirable urban cross-section with 36-foot-wide roadways separated by a 20-foot-wide median as part of the completion of the Hillside Interchange recommended under the short-range plan for the study area.

This eighth alternative would involve widening N. 27th Street between W. Fond du Lac Avenue and W. Lisbon Avenue to a desirable urban roadway cross-section with dual 36-foot-wide roadways separated by a 24-foot-wide median, with curbs and gutters and sidewalks within a 120-foot-wide right-of-way. This alternative would involve the prohibition of peak-period on-street parking in the direction of peak traffic flow along this new roadway and along the existing six-lane, divided cross-section along W. Lisbon Avenue and W. Walnut Street. Under this alternative, the segment of W. Fond du Lac Avenue between N. 27th Street

Map 234

LONG-RANGE IMPROVEMENT ALTERNATIVE NO. 8 FOR W. FOND DU LAC AVENUE FROM N. 27TH STREET TO THE HILLSIDE INTERCHANGE



This map shows the eighth alternative considered under this study for the improvement of W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange. Under this alternative, an alternate route would be provided for traffic which would otherwise use this segment of W. Fond du Lac Avenue. The alternate route would provide dual 36-foot-wide roadways separated by a 24-foot-wide median along N. 27th Street, W. Lisbon Avenue, and W. Walnut Street. Under this alternative, the segment of W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange would remain as it currently exists.

Source: SEWRPC.

and the Hillside Interchange would maintain its existing cross-section, and would be unaffected except for the prohibition of peak-period on-street parking. A typical cross-section for this alternative is shown in Figure 124. To accommodate this alternative, it would be necessary to acquire 54 feet of right-of-way along N. 27th Street. The location for the widened right-of-way which would result in the least cost and disruption was determined to be along the west right-of-way line of N. 27th Street from W. Fond du Lac Avenue to W. Lloyd Street, and along the east right-of-way line of N. 27th Street from W. Lloyd Street to W. Lisbon Avenue. The transition from west to east right-of-way lines of N. 27th Street would occur between W. Lloyd Street and W. Brown Street. This widening would provide for the necessary three through traffic lanes in the direction of peak traffic flow during each peak travel period along N. 27th Street, W. Lisbon Avenue, and W. Walnut Street. The provision of a 24-foot-wide median on N. 27th Street under this alternative would permit the addition of left- and right-turn lanes at major intersections, and would provide for the separation of opposing traffic flows for increased travel safety. As indicated in Table 255, this alternative would not succeed in diverting sufficient traffic volume from W. Fond du Lac Avenue to improve the level of service. Under this alternate routing, the segment of W. Fond du Lac Avenue southeast of N. 27th Street may be expected to operate over design capacity during peak periods, or at level-of-service D.

Costs and Disruption Attendant to Alternatives for Each Segment of W. Fond du Lac Avenue: The costs of each of the improvement alternatives considered for each segment of W. Fond du Lac Avenue are provided in Tables 254 through 256. The costs are expressed in 1980 dollars and include estimates of the construction costs, including utility and storm sewer relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. In each case under the "do nothing" and on-street parking prohibition alternatives, only summer and winter maintenance work and two major resurfacings were assumed to be necessary between 1980 and 2000.

Table 256

COST AND DISRUPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR THE SEGMENT OF W. FOND DU LAC AVENUE FROM N. 68TH STREET TO N. 35TH STREET

Impact	"Do Nothing" Alternative	Alternative 1 (on-street parking prohibition)
Cost (in 1980 dollars)[a]		
Construction	$2,766,000	$2,769,000
Real Estate Acquisition, Relocation, and Demolition	--	--
Maintenance	1,280,000	1,280,000
Total	$4,046,000	$4,049,000
Disruption		
Residential Units Taken	--	--
Commercial Units Taken	--	--

[a] *Construction costs for each alternative include estimates of the cost of roadway construction, lighting, traffic signals, utility relocation, storm sewers, and engineering. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

Source: Wisconsin Department of Transportation and SEWRPC.

Under each of the alternatives, any traffic management actions previously recommended under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. Such traffic management actions were recommended for segments of both W. Fond du Lac Avenue and W. Walnut Street under the short-range plan. Along W. Fond du Lac Avenue, these actions include the lengthening of the southeast-to-eastbound left-turn lane at W. Maxwell Street; signal retiming and the lengthening of the north-west-to-westbound left-turn lane at W. Capitol Drive; retiming of the traffic signals at N. 51st Street; signal retiming, the addition of a separate signal phase, and the addition of a new traffic controller at Sherman Boulevard; the prohibition of on-street parking on one approach at both W. Burleigh Street and N. 35th Street and at N. 27th Street; the addition of a separate signal phase at W. Locust Street; the prohibition of on-street parking on one approach and signal retiming at N. 28th Street; signal retiming at W. North Avenue and N. 21st Street; on-street parking prohibition on one approach, the addition of a separate signal phase, and the addition of a new traffic controller at N. 17th Street; and the addition of a separate signal phase and new traffic controller at N. 16th Street. The costs of each of these actions—$56,800—were added as necessary to the capital costs shown in Tables 254 through 256.

Another action recommended under the short-range plan for the study area, and closely related to long-range improvements proposed for W. Fond du Lac Avenue, was the completion of the freeway "stub end" connection at the Hillside Interchange, whereby freeway on- and off-ramps would be connected directly to the intersection of W. Fond du Lac Avenue and W. Walnut Street. Included as parts of this connection were the improvement of the segment of W. Fond du Lac Avenue between N. 15th Street and W. Walnut Street and the improvement of the segment of W. Walnut Street between N. 14th Street and W. Fond du Lac Avenue to desirable urban cross-sections. The costs of these improvements are an estimated $400,000 for the improvement of W. Fond du Lac Avenue and $123,000 for the improvement of W. Walnut Street. These costs are accounted for under the costs of the short-range plan, and accordingly are included in the costs of each appropriate alternative plan for these arterial segments. Also indicated in Tables 254 through 256 is the urban disruption which may be expected to be associated with each of these alternatives as measured by the number of residential, commercial, industrial, and institutional properties required to be taken.

As shown in Table 256, the alternative which proposes the prohibition of all on-street parking in the direction of peak traffic flow during the morning and evening peak periods on that segment of W. Fond du Lac Avenue between N. 68th Street and N. 35th Street would have capital and maintenance costs of about $4,049,000, while the "do nothing" alternative for this segment of W. Fond du Lac Avenue would cost about $4,046,000, the additional costs representing the regulatory signing necessary to prohibit on-street parking. Neither of these alternatives would involve any disruption.

As shown in Table 254, of the alternatives proposed for the segment of W. Fond du Lac Avenue between N. 35th Street and N. 27th Street, the fourth and fifth alternatives, both of which provide for the widening of Fond du Lac Avenue along this segment to a desirable urban cross-section, would have the highest estimated capital and maintenance costs, or $5,974,000 and $5,977,000, respectively. The widening of this segment of W. Fond du Lac Avenue to a minimum urban cross-section with a 64-foot-wide pavement would have capital and maintenance costs of about $4,387,000, while the widening of this segment of W. Fond du Lac Avenue at principal intersections along this segment would have capital and maintenance costs of about $2,114,000. That alternative which would prohibit all on-street parking and left turns along this segment of W. Fond du Lac Avenue would have an estimated capital and maintenance cost of $1,342,000. The "do nothing" alternative for this segment would have capital and maintenance costs of about $1,192,000.

As shown in Table 255, of the six improvement alternatives proposed for the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street, the fourth and fifth alternatives, both of which provide for the widening of W. Fond du Lac Avenue along this segment to desirable urban cross-sections, would have the highest estimated capital and maintenance costs, or $6,557,000 and $6,560,000, respectively. The sixth alternative, which is similar to the fifth alternative but provides for one-way pairs which would bypass, and hence avoid disruption of, much of the W. Fond du Lac Avenue business community between W. Oak Street and W. Garfield Avenue, would be the next most costly, having capital and maintenance costs of about $5,619,000. The widening of W. Fond du Lac Avenue to a minimum urban cross-section having a 64-foot-wide pavement along this segment would have capital and maintenance costs of about $5,537,000, while the widening of this segment of W. Fond du Lac Avenue only at principal intersections along this segment would have capital and maintenance costs of about $4,725,000. That alternative which would prohibit both on-street parking and left turns along this segment of W. Fond du Lac Avenue would have capital and maintenance costs of about $2,386,000. The "do nothing" alternative for this segment would have capital and maintenance costs of about $2,098,000.

Also indicated in Table 255 are the costs of the seventh and eighth alternatives considered for this travel corridor east of N. 27th Street, or the two alternatives which provide for alternate routings of traffic flow between the intersections of W. Fond du Lac Avenue with N. 27th Street and with the Hillside Interchange. As shown in this table, the seventh alternative, which would provide for the improvement of segments of N. 27th Street, W. North Avenue, W. Garfield Avenue, and W. Fond du Lac Avenue along this segment, would have an estimated capital and maintenance cost of $6,208,000; and the eighth alternative, which would provide for the improvement of segments of N. 27th Street, W. Lisbon Avenue, and W. Walnut Street, would have an estimated capital and maintenance cost of $6,617,000.

As indicated in Table 256, the on-street parking prohibition alternative proposed for the segment of W. Fond du Lac Avenue between N. 68th Street and N. 35th Street would involve no urban disruption.

As indicated in Table 254, of the alternatives proposed for the segment of W. Fond du Lac Avenue from N. 35th Street to N. 27th Street, the fourth and fifth alternatives, which would provide for the widening of W. Fond du Lac Avenue to a desirable urban cross-section along this segment, would be the most disruptive of the alternatives considered for this segment, each requiring the taking of nine commercial units along W. Fond du Lac Avenue. Of the two alternatives which call for the widening of this segment of W. Fond du Lac Avenue to minimum urban cross-sections, that alternative which provides for widening the arterial to a 64-foot-wide pavement would require the taking of eight commercial units; and that alternative which provides for the widening of W. Fond du Lac Avenue only at major intersections along this segment would require the taking of six commercial units. No disruption would be incurred under either the first alternative—the prohibition of all on-street parking and all left turns along this segment—or the "do nothing" alternative.

As indicated in Table 255, of the first six alternatives considered for the improvement of the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street, the fourth and fifth alternatives, which provide for the widening of W. Fond du Lac Avenue along this segment to a desirable urban cross-section, would be the most disruptive, each requiring the taking of seven residential units, 38 commercial units, and one institutional property. Of the two alternatives which call for the widening of this segment of W. Fond du Lac Avenue to minimum urban cross-sections, that alternative which provides for a 64-foot-wide pavement would require the taking of seven residential units, 33 commercial units, and one institutional property; while that alternative which provides for the widening of W. Fond du Lac Avenue along this segment only at major intersections would require the taking of 24 commercial units. The sixth alternative, which provides for the creation of one-way pairs along W. Fond du Lac Avenue in order to avoid disruption of a portion of the business community along the arterial, would require the taking of six residential units, 25 commercial units, and one institutional property. No disruption would be incurred under either the first alternative, the prohibition of all on-street parking and left turns along this segment, or the "do nothing" alternative.

Table 255 also indicates the disruption which would be caused by each of the alternatives proposed to provide alternate routings for traffic flow between the intersections of W. Fond du Lac Avenue with N. 27th Street and with the Hillside Interchange. As shown in this table, the alternative which would provide for a desirable urban cross-section along N. 27th Street, W. North Avenue, W. Garfield Avenue, and W. Fond du Lac Avenue would require the taking of 18 residential units, six commercial units, and one institutional unit. The alternative which would attempt to divert this traffic flow by providing a desirable urban cross-section on N. 27th Street and prohibiting peak-period on-street parking on W. Lisbon Avenue and W. Walnut Street would require the taking of 58 residential units, eight commercial units, and one institutional unit.

There would be no significant differences in the noise levels generated by each of the improvement alternatives and the "do nothing" alternative considered for each segment of W. Fond du Lac Avenue.

However, there would be differences in the amount of air pollutant emissions and fuel consumption generated by each of the alternatives considered and by the "do nothing" alternatives. As shown in Table 254, for the segment of W. Fond du Lac Avenue between N. 35th Street and N. 27th Street 127 tons of carbon monoxide and 14 tons of hydrocarbons may be expected to be emitted annually in the design year by the traffic volume using the arterial under the "do nothing" alternative. As shown in this table, 15 fewer tons of carbon monoxide and about one and one-half fewer tons of hydrocarbons may be expected to be emitted per year in the design year under the first alternative; about 27 fewer tons of carbon monoxide and about three fewer tons of hydrocarbons may be expected to be emitted annually in the design year under the second and third alternatives; 29 fewer tons of carbon monoxide and about three fewer tons of hydrocarbons may be expected to be emitted annually in the design year under the fourth alternative; and 36 fewer tons of carbon monoxide and about four and one-half fewer tons of hydrocarbons may be expected to be emitted annually in the design year under the fifth alternative plan. As also shown in Table 254, 3,695,000 gallons of fuel may be expected to be used from 1980 to 2000 by the total traffic volume utilizing this segment of W. Fond du Lac Avenue under a "do nothing" plan. About 245,000 fewer gallons, representing a cost savings of about $531,000, may be expected to be consumed under the first alternative; 424,000 fewer gallons, representing a cost savings of about $921,000, may be expected to be consumed under the second and third alternatives; 449,000 fewer gallons, representing a cost savings of about $975,000, may be expected to be consumed under the fourth alternative; and 542,000 fewer gallons, representing a cost savings of about $1,177,000, may be expected to be consumed under the fifth alternative between 1980 and 2000.

As shown in Table 255, under a "do nothing" alternative, 254 tons of carbon monoxide and 26 tons of hydrocarbons may be expected to be emitted annually by traffic using the segment of W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street in the design year. As shown in this table, 15 fewer tons of carbon monoxide and one fewer ton of hydrocarbons may be expected to be emitted per year in the year 2000 under the first alternative; 34 fewer tons of carbon monoxide and about four fewer tons of hydrocarbons may be expected to be emitted per year in the year 2000 under the second and third alternatives for this segment; about 40 fewer tons of carbon monoxide and about four fewer tons of hydrocarbons may be expected to be emitted per year in the design year under the fourth alternative; and about 56 fewer tons of carbon monoxide and about seven fewer tons of hydrocarbons may be expected to be emitted per year in the year 2000 under the fifth alternative. Under the sixth alternative plan, 46 fewer tons of carbon monoxide and five and one-half fewer tons of hydrocarbons may be expected to be emitted per year in the year 2000 by the traffic volume using this segment of W. Fond du Lac Avenue. Under the seventh and eighth alternatives, 21 and 15 fewer tons of carbon monoxide and two and one-half tons and one fewer ton of hydrocarbons may be expected to be emitted per year, respectively, in the year 2000 by the traffic volume using Fond du Lac Avenue between N. 27th Street and W. Walnut Street.

As also shown in Table 255, about 9,083,000 gallons of fuel may be expected to be used from 1980 to 2000 by traffic volume on this segment of W. Fond du Lac Avenue under a "do nothing" plan. About 301,000 fewer gallons, representing a cost savings of about $653,000, may be expected to be consumed by this traffic volume under the first alternative; about 539,000 fewer gallons, representing a cost savings of about $1,171,000, may be expected to be consumed under the second and third alternatives; about 598,000 fewer gallons, representing a cost savings of about $1,298,000, may be expected to be consumed under the fourth alternative; and about 865,000 fewer gallons, representing a cost savings of about $1,877,000, may be expected to be consumed under the fifth alternative. Under the sixth alternative plan for this segment, an estimated 660,000 fewer gallons of fuel, representing a cost savings of about $1,539,000, may be expected to be consumed between 1980 and 2000 by the traffic volume on this segment of W. Fond du Lac Avenue. And finally, under the seventh and eighth alternatives, an estimated 424,000 and 301,000 fewer gallons of motor fuel, representing a cost savings of $860,000 and $653,000, respectively, may be expected to be consumed.

Recommendations: For the first segment of W. Fond du Lac Avenue, from N. 68th Street to N. 35th Street, based upon the additional capacity afforded and congestion abated by the two alternatives considered and the environmental impacts of the alternatives, it is recommended that that alternative be implemented which provides for the prohibition of all on-street parking in the direction of peak traffic flow during both peak periods along this segment. While this prohibition may be politically sensitive and may be difficult to implement based on local opposition because it would mean that vehicles accessing businesses and residences along this segment of W. Fond du Lac Avenue would have to seek parking space on nearby intersecting streets or use off-street parking space in the area, the availability of such parking makes this recommendation implementable. This action was also recommended because it involved little capital and maintenance costs.

For the segment of W. Fond du Lac Avenue from N. 35th Street to N. 27th Street, it is recommended that the fifth alternative be implemented—that is, the widening of this segment of W. Fond du Lac Avenue to a desirable urban cross-section with 36-foot-wide roadways separated by a 4- to 24-foot-wide median, with curbs and gutters and sidewalks within a 100- to 120-foot-wide right-of-way. Under this alternative, on-street parking would be prohibited during the peak periods in the direction of peak traffic flow. This alternative was recommended despite the fact that it would involve the highest capital cost, as well as the greatest amount of disruption, because it is the only alternative which would serve to abate the traffic congestion anticipated along this arterial, and because it offers the greatest potential reductions in motor fuel consumption and air pollution of the alternatives considered. Also the provision of a 24-foot-wide median under this alternative would serve to separate opposing traffic flows, thereby improving travel safety as well as providing adequate room for refuge and deceleration lanes for left-turning vehicles at median openings.

Eight improvement alternatives and a "do nothing" alternative were considered for the improvement of traffic flow along W. Fond du Lac Avenue between N. 27th Street and W. Walnut Street—including the two alternatives which proposed alternate routings for the diversion of traffic flow between the intersections of W. Fond du Lac Avenue with N. 27th Street and with the Hillside Interchange. It is recommended that one of the two alternatives which provide three lanes of traffic in each direction from N. 27th Street to N. 15th Street be implemented for this segment. One of these alternatives, the fifth of the eight considered, would widen this segment of W. Fond du Lac Avenue to a desirable urban cross-section with a 120-foot-wide right-of-way and a 24-foot-wide median. The other alternative, the sixth considered, would differ from the fifth alternative only in that it would provide a set of one-way arterial pairs which would bypass a portion of the business district along W. Fond du Lac Avenue between W. Oak Street and W. Garfield Avenue, thereby avoiding the disruption of land uses adjacent to that segment of the arterial. The implementation of one of these two alternatives is recommended, as either may be expected to abate traffic congestion on this segment of W. Fond du Lac Avenue and surrounding streets. Of these two alternatives, the alternative providing dual 36-foot-wide roadways is preferred for transportation purposes. If the City determines it is not feasible to construct this alternative, then the one-way pairs can be used.

The Advisory Committee chose to consider these two improvement proposals and a third improvement proposal for this segment of W. Fond du Lac Avenue as a separate projects to be taken to public hearing. The third improvement proposal, like the sixth proposal considered as shown on Map 235, would provide for a 36-foot-wide curvilinear roadway to be constructed for southeast-bound W. Fond du Lac Avenue traffic from a point north of the intersection of W. Oak Street and W. Fond du Lac Avenue to the intersection of W. Garfield Avenue and W. Fond du Lac Avenue. Under this alternative, the segment of W. Fond du Lac Avenue between W. Oak Street and W. Garfield Avenue would operate on its existing cross-section as a one-way street northwest-bound. Under this improvement proposal, however, the segment of W. Fond du Lac Avenue between N. 27th Street and W. Oak Street would operate on its existing cross-section, with on-street parking and left-turn movements prohibited during peak periods.

The capital and maintenance costs of this third improvement proposal are estimated at $4,602,000, with $3,177,000 for construction costs, $163,000 for right-of-way costs, and $631,000 for maintenance costs. This alternative improvement would require the acquisition of only one commercial unit, in comparison with 25 commercial units, six residential units, and one institutional unit under the sixth alternative. Under this alternative, how-

Map 235

LONG-RANGE IMPROVEMENT ALTERNATIVE NO. 9 FOR W. FOND DU LAC AVENUE FROM N. 27TH STREET TO THE HILLSIDE INTERCHANGE

This map shows the ninth alternative considered under the study for the improvement of W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange. As shown on this map, under this alternative the only improvement to W. Fond du Lac Avenue between N. 27th Street and W. Oak Street would be the prohibition of on-street parking during peak periods together with the prohibition of left turns. Southeast of W. Oak Street, as under the sixth improvement alternative considered, a new roadway would be constructed which would veer to the west of the W. Fond du Lac Avenue business district. This new roadway would carry eastbound traffic on W. Fond du Lac Avenue between W. Oak Street and W. Garfield Avenue. Westbound traffic would be carried on the existing segment of W. Fond du Lac Avenue between W. Garfield Avenue and W. Oak Street. Under this alternative, W. Fond du Lac Avenue between W. Garfield Avenue and the Hillside Interchange would be reconstructed with dual 36-foot-wide roadways separated by a 24-foot-wide median.

Source: SEWRPC.

ever, the average peak-period level of service on W. Fond du Lac Avenue between N. 27th Street and the Hillside Interchange could be expected to be D between N. 27th Street and N. 24th Street and B between N. 24th and the Hillside Interchange.

In conjunction with the consideration by the Advisory Committee of three improvement proposals for the segment of W. Fond du Lac Avenue east of N. 27th Street, it was necessary to consider two improvement proposals to be taken to public hearing for the segment of W. Fond du Lac Avenue between N. 35th Street and N. 27th Street. The first of these proposals would be the staff-recommended improvement of this segment to a desirable urban cross-section with dual 36-foot-wide urban roadways. The second proposal would be the first improvement alternative considered for W. Fond du Lac Avenue between N. 35th Street and N. 27th Street, or the prohibition of all peak-period on-street parking and left-turn movements along this segment.

While considering the improvement alternatives for W. Fond du Lac Avenue, concern was expressed that the widening of W. Fond du Lac Avenue to a six-lane facility would provide a corridor for the movement of heavy volumes of through traffic between outlying areas of northwestern Milwaukee County, northeastern Waukesha, and southeastern Washington Counties and the City of Milwaukee central business district, rather than providing a facility which would serve more localized traffic within Milwaukee County. In view of this concern, a supplemental analysis was conducted to determine the extent of the geographic area northwest and southeast of these two arterial segments within which tripmakers using all or part of the segment of W. Fond du Lac Avenue between N. 27th Street and N. 21st Street, as improved under the sixth alternative for the segment, may be expected to have trip origins and destinations. As shown in Figure 125, the analysis indicated that the area bounded by about 92nd Street on the west, W. Silver Spring Drive on the north, W. North Avenue on the south, and N. 27th Street on the east would be the area of origin or destination for 81 percent of the approximately 23,500 vehicle trips per day expected to use all or part of this segment of W. Fond du Lac Avenue; and that a larger area, which would include parts of northeastern Waukesha County, southeastern Washington County, and northern Milwaukee County, would account only for an additional 13 percent of these trips. This analysis would indicate that the improvement of W. Fond du Lac Avenue between N. 27th Street and N. 21st Street, as recommended under the sixth alternative, would, in fact, principally serve traffic generated in and serving a localized area northwest of the improvement.

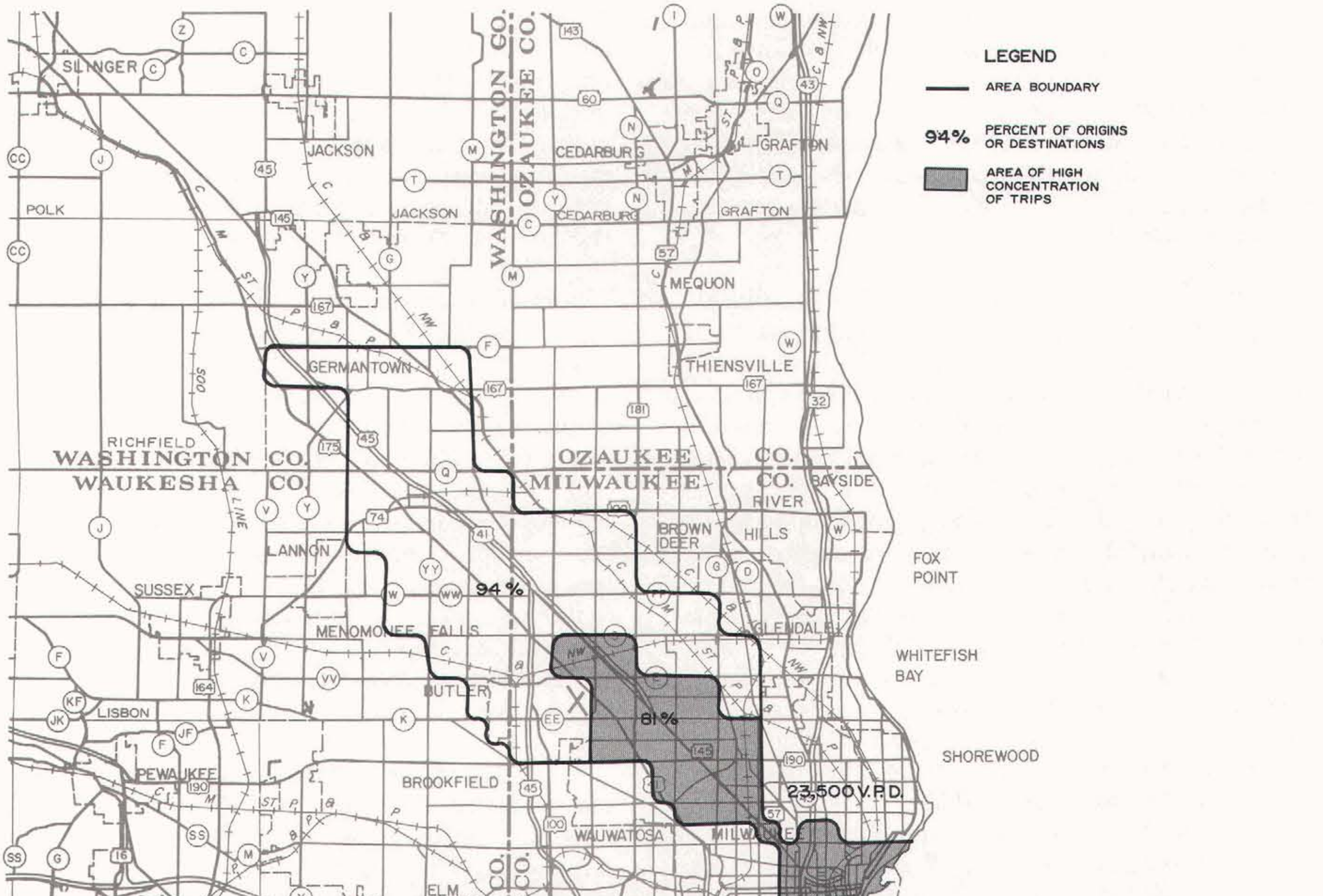
<u>W. Appleton Avenue and W. Lisbon Avenue—USH 41—from W. Burleigh Street to W. North Avenue:</u> To resolve the traffic congestion which may be expected in the northwest-southeast travel corridor along the two arterial streets which comprise the routing of USH 41 within Milwaukee County—W. Appleton Avenue and W. Lisbon Avenue—consideration was given to improving both W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue. Only by increasing the number of moving traffic lanes provided on USH 41 along both of these arterials could the traffic congestion problems associated with this travel corridor be abated, and in some cases reduced.

Between W. Burleigh Street and W. Lisbon Avenue, W. Appleton Avenue has an urban cross-section with curbs and gutters and sidewalks. The pavement is 50 feet wide curb-to-curb within a 66-foot right-of-way, adequate to provide for two moving lanes of traffic and two parking lanes. Between W. Appleton Avenue and W. North Avenue, W. Lisbon Avenue also has an urban cross-section with curbs and gutters and sidewalks. The pavement is also 50 feet wide curb-to-curb within a 66-foot-wide right-of-way, and is adequate to provide for two moving lanes of traffic and two parking lanes. During the morning peak hour, only minimal parking restrictions are in effect along W. Appleton Avenue between W. Burleigh Street and W. Lisbon Avenue, while parking is prohibited along W. Lisbon Avenue between W. Appleton Avenue and W. North Avenue. During the evening peak hour, parking is prohibited along W. Lisbon Avenue between W. North Avenue and W. Center Street, while only minimal parking restrictions are in effect along W. Appleton Avenue from W. Lisbon Avenue to W. Burleigh Street.

Five alternatives were developed for increasing the arterial street capacity of USH 41 along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue. The first alternative involved the prohibition of all remaining on-street parking and the prohibition of all left turns over the length of these two arterials; the next two alternatives involved widening both W. Appleton Avenue and W. Lisbon Avenue to a minimum urban cross-section; and two alternatives involved widening both W. Appleton Avenue and W. Lisbon Avenue to desirable urban cross-

Figure 125

PROJECTED TRIP ORIGINS AND DESTINATIONS OF VEHICLES TRAVERSING THE SEGMENT OF W. FOND DU LAC AVENUE BETWEEN N. 27TH STREET AND N. 21ST STREET UNDER THE RECOMMENDED ALTERNATIVE



Source: SEWRPC.

sections. Table 257 provides the cost and disruption impacts; traffic impacts, in terms of volume-to-capacity ratios, parking prohibitions, and left-turn restrictions; air pollution impacts, in terms of the amounts of carbon monoxide and hydrocarbon emissions; and fuel consumption impacts in the design year for each of the improvement alternatives for these two arterials. The impacts of a "do nothing" alternative, under which the physical dimensions of the roadway surface would remain essentially unchanged, are also included in this table.

The first alternative would require the prohibition of all remaining on-street parking on USH 41 along both W. Appleton Avenue and W. Lisbon Avenue during both the morning and evening peak periods in the direction of peak traffic flow. To further increase capacity along these arterials, all left-turn movements from both W. Appleton Avenue and W. Lisbon Avenue over this segment would also be prohibited under this alternative during both peak travel periods. These left-turn movements would be accommodated instead by right-turn movements from the arterial followed by subsequent left- or right-turn movements on adjacent residential streets. The necessary crossing movements of W. Appleton Avenue or W. Lisbon Avenue would be encouraged to be made at signalized intersecting streets by providing traffic signals at an additional four locations—at the intersections of W. Appleton Avenue with W. Chambers Street, W. Center Street with N. 59th Street, W. Lisbon Avenue with W. Wright Street, and W. Lisbon Avenue with W. Meinecke Street. The signals along the arterial would be retimed to maintain good progression and minimal travel times. In order to maintain two through lanes of traffic in the direction of peak traffic flow during each peak travel period along W. Appleton Avenue and W. Lisbon Avenue, it would be necessary to prohibit on-street parking, standing, and stopping and to institute a tow-away zone in the direction of peak traffic flow during both the morning and evening peak hours. Because of these parking restrictions, vehicles accessing businesses or residences which front W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue during the periods of parking restriction would have to seek parking space along nearby intersecting streets, or use off-street parking space in the area. Under this alternative, both W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue could be expected to operate over design capacity. As shown in Table 257, the volume-to-design capacity ratio on USH 41 along W. Appleton Avenue and W. Lisbon Avenue under this alternative plan, compared with a "do nothing" plan, would be reduced from 1.44 to 1.39 during the morning peak period and from 1.42 to 1.31 during the evening peak period, and would remain the same, at 0.97, during the midday period. The level of service under this alternative plan would remain at F during the morning peak period and at C during the midday period, but would be improved from F to E during the evening period.

The second alternative action considered for USH 41 along W. Appleton Avenue and W. Lisbon Avenue involved retaining the existing minimum urban roadway cross-section. This alternative would involve widening only at each signalized intersection along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue to provide for the addition of left- and/or right-turn lanes as necessary. Under this alternative, the right-of-way would be widened to 80 feet to accommodate additional turn lanes at the intersections of W. Appleton Avenue with W. Burleigh Street, N. 60th Street, W. Center Street, and W. Lisbon Avenue; and the intersections of W. Lisbon Avenue with N. 55th Street, N. 51st Street, and W. North Avenue. In order to maintain two through lanes of traffic in the peak direction during peak periods, it would be necessary to prohibit on-street parking, standing, and stopping and to institute a tow-away zone in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing businesses or residences which front either of these arterials during the periods of parking restrictions would have to seek parking space along nearby intersecting streets or use off-street parking space in the area. Even though additional left-turn lanes would be provided at major intersections along these two arterials under this alternative, the prohibition of all left-turn movements from both W. Appleton Avenue and W. Lisbon Avenue would be necessary during both peak periods.

The third alternative would widen USH 41 along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue to a 64-foot-wide undivided roadway with curbs and gutters and sidewalks within an 80-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 126. Under this alternative, it would be necessary to acquire an additional

Table 257

COST AND DISRUPTION IMPACTS, TRAFFIC IMPACTS, POLLUTANT EMISSION RATES, AND FUEL CONSUMPTION IMPACTS OF ALTERNATIVE IMPROVEMENT PLANS FOR W. APPLETON AVENUE AND W. LISBON AVENUE—USH 41—FROM W. BURLEIGH STREET TO W. NORTH AVENUE

Impact	"Do Nothing" Alternative	Minimum Urban Cross-Section			Desirable Urban Cross-Section	
		Alternative 1 (parking and left-turn prohibition)	Alternative 2 (existing roadway with widened intersections)	Alternative 3 (64-foot urban roadway with continuous left-turn lane)	Alternative 4 (36-foot urban roadway pairs with median and peak-period parking permitted)	Alternative 5 (36-foot urban roadway pairs with median and peak-period parking prohibited)
Cost (in 1980 dollars)[a]						
Construction	$ 1,710,000	$ 2,166,000	$ 3,182,000	$ 3,750,000	$ 4,500,000	$ 4,507,000
Real Estate Acquisition, Relocation, and Demolition	--	--	1,512,000	3,400,000	8,177,000	8,177,000
Maintenance	362,000	362,000	390,000	450,000	576,000	576,000
Total	$ 2,072,000	$ 2,528,000	$ 5,084,000	$ 7,600,000	$13,253,000	$13,260,000
Disruption						
Residential Units Taken	--	--	7	10	11	11
Commercial Units Taken	--	--	10	18	31	31
Transportation, Utility, and Communication Property	--	--	--	1	1	1
Governmental and Institutional Property	--	--	--	--	--	--
Volume-to-Design Capacity Ratio						
Morning Peak Period	1.44	1.39	1.36	1.36	1.34	1.10
Level of Service	F	F	E	E	E	C
Range	1.30-1.56	1.21-1.56	1.21-1.50	1.21-1.50	1.21-1.41	1.03-1.16
Midday Period	0.97	0.97	0.95	0.95	0.87	0.87
Level of Service	C	C	C	C	B	B
Range	0.90-1.01	0.88-1.06	0.79-1.03	0.79-1.03	0.79-0.96	0.79-0.96
Evening Peak Period	1.42	1.31	1.30	1.30	1.29	1.06
Level of Service	F	E	E	E	E	C
Range	1.33-1.50	1.21-1.50	1.24-1.41	1.24-1.41	1.20-1.34	1.00-1.10
Year 2000 Traffic Volumes (1980 traffic volumes: 18,000-32,000)	25,000-32,000	27,000-34,000	29,000-36,000	29,000-36,000	29,000-36,000	30,000-40,000
Parking Prohibition[b]						
Morning Peak Period	Partial peak direction	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction
Midday Period	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition	No prohibition
Evening Peak Period	Partial peak direction	Peak direction	Peak direction	Peak direction	No prohibition	Peak direction
Left-Turn restriction						
Morning Peak Period	Limited prohibition	Prohibited	Prohibited	Permitted	Permitted	Permitted
Midday Period	Limited prohibition	Limited prohibition	Limited prohibition	Permitted	Permitted	Permitted
Evening Peak Period	Limited prohibition	Prohibited	Prohibited	Permitted	Permitted	Permitted
Pollutants Emitted (tons per year)						
Carbon Monoxide	357.8	352.6	342.7	342.7	313.3	278.3
Hydrocarbons	39.5	37.7	36.5	36.5	32.7	28.0
Fuel Consumption (total gallons 1980-2000)	13,528,000	13,438,000	13,285,000	13,285,000	12,952,000	12,493,000
Total Fuel Cost 1980-2000 (in 1980 dollars)	$22,361,000	$22,165,000	$21,787,000	$21,787,000	$21,111,000	$20,115,000

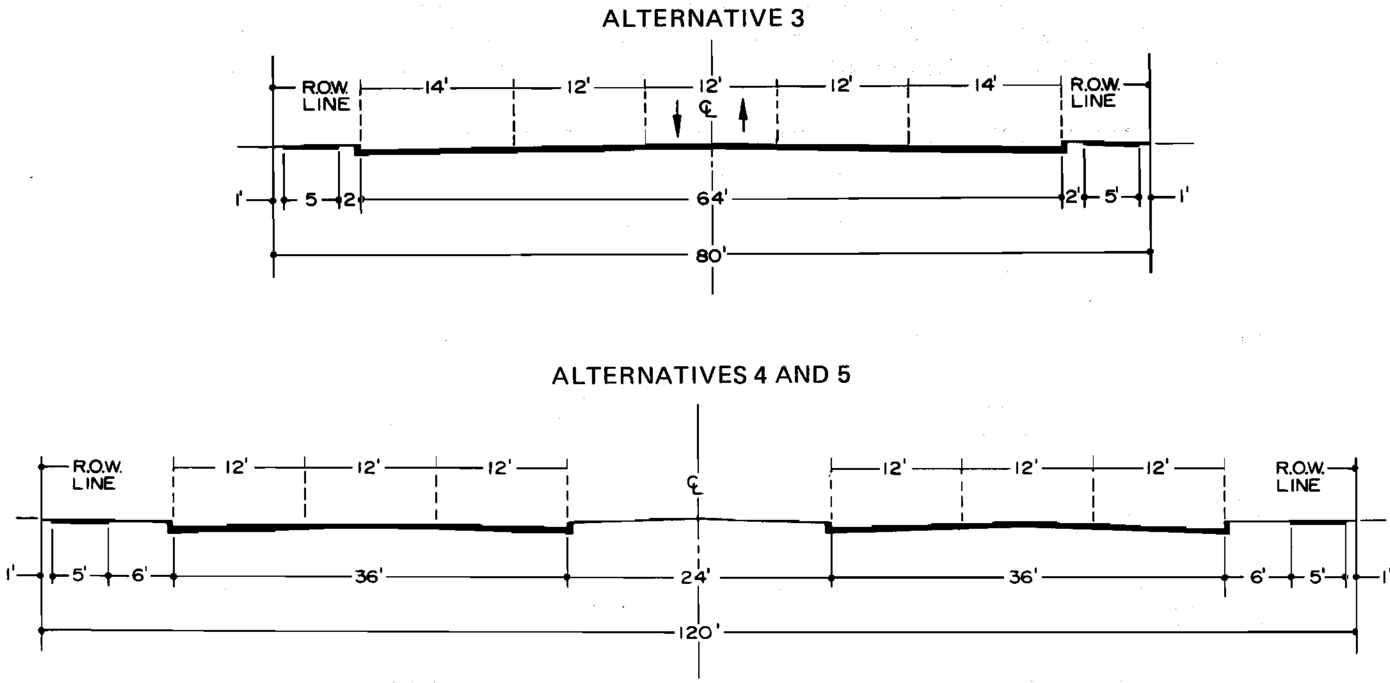
[a] *Construction costs for each alternative include estimates of the cost of roadway construction, lighting, traffic signals, utility relocation, and engineering. New roadway construction projects were assumed to have a useful life of 25 years. In order to facilitate economic comparisons between the new roadway construction projects and the "do nothing" alternative, under the "do nothing" alternative two roadway resurfacings were assumed to be required during the 20-year plan design period. The first of these resurfacings was assumed to have a useful life of 15 years, and the second a useful life of 10 years. Thus, the total effective useful life of resurfacing under the "do nothing" alternative would be 25 years, equivalent to the useful life of a new roadway construction project. Right-of-way acquisition costs for each alternative include estimates of the value of the required real property, the cost of relocation, the cost of demolition, if any, and the attendant administrative costs. Maintenance cost estimates include estimates of the costs of winter maintenance over the 20-year plan period based on the number and length of pavement lanes, as well as general maintenance costs, also based on the number and length of roadway lanes except that no general maintenance costs were assumed to be incurred in the first eight years following the construction of a new Portland cement concrete pavement, and in the first four years following the construction of a new bituminous pavement.*

[b] *It should be noted that parking prohibitions may be politically sensitive and difficult to implement because of local opposition.*

Source: Wisconsin Department of Transportation and SEWRPC.

Figure 126

TYPICAL CROSS-SECTIONS OF IMPROVEMENT ALTERNATIVES 3, 4 AND 5 FOR W. APPLETON AVENUE AND W. LISBON AVENUE—USH 41—FROM W. BURLEIGH STREET TO W. NORTH AVENUE



Source: Wisconsin Department of Transportation and SEWRPC.

14 feet of right-of-way along W. Appleton and W. Lisbon Avenues. The location for the widened right-of-way which would result in the least cost and disruption was determined to be, for W. Appleton Avenue, along the south right-of-way line between W. Burleigh Street and N. 63rd Street, along the north right-of-way line between N. 63rd Street and N. 61st Street, and along the south right-of-way line between N. 61st Street and W. Lisbon Avenue; and, for W. Lisbon Avenue, along the south right-of-way line from W. Appleton Avenue to N. 55th Street, along the north right-of-way line from N. 55th Street to N. 49th Street, and along the south right-of-way line between N. 49th Street and W. North Avenue. Such widening would provide for four lanes of moving traffic in addition to a center lane which could be used as a continuous left-turn lane for both directions of traffic flow on USH 41 along W. Appleton Avenue and W. Lisbon Avenue. In order to maintain two through lanes of traffic in the direction of peak traffic flow during peak travel periods along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue, it would be necessary to prohibit on-street parking, standing, and stopping and to institute a tow-away zone in the direction of peak traffic flow during both the morning and evening peak periods. Because of these parking restrictions, vehicles accessing businesses or residences which front either W. Appleton Avenue or W. Lisbon Avenue between W. Burleigh Street and W. North Avenue would have to seek parking space along nearby intersecting streets or use off-street parking space in the area.

The volume-to-design capacity ratios are expected to be the same under both the second and third alternative plans. Under both alternatives, USH 41 along both W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue could be expected to operate over design capacity during the peak periods, as shown in Table 257. The volume-to-design capacity ratios along W. Appleton Avenue and W. Lisbon Avenue under each of these plans would be lower than those under both the first alternative and the "do nothing" alternative during each travel period, or 1.36 during the morning peak period, 0.95 during the midday period, and 1.30 during the evening peak period. The levels of service under the second and third alternatives would be slightly improved over both the first alternative and the "do nothing" alternative, from level of service F to level of service E during the morning peak period, but would remain at level of service E during the evening peak period. The level of service during the midday period would continue to be C under both the second and third alternative.

The fourth alternative action considered for USH 41 along W. Appleton Avenue and W. Lisbon Avenue called for widening both W. Appleton Avenue and W. Lisbon Avenue to provide for a desirable six-lane urban arterial cross-section between W. Burleigh Street and W. North Avenue. This alternative would entail the provision of dual 36-foot roadways separated by a 24-foot-wide median, with curbs and gutters and sidewalks within a 120-foot-wide right-of-way. A typical cross-section for this alternative is shown in Figure 126. Under this alternative, it would be necessary to acquire an additional 54 feet of right-of-way along W. Appleton and W. Lisbon Avenues. The location for the widened right-of-way which would result in the least cost and disruption was determined to be, for W. Appleton Avenue, along the south right-of-way line between W. Burleigh Street and N. 63rd Street, along the north right-of-way line between N. 63rd Street and N. 60th Street, and along the south right-of-way line between N. 60th Street and W. Lisbon Avenue; and, for W. Lisbon Avenue, along the south right-of-way line from W. Appleton Avenue to W. North Avenue. Such widening would provide for two lanes of moving traffic and a parking lane in the direction of peak traffic flow during each peak travel period on USH 41 along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue. The provision of a 24-foot-wide median under this alternative would permit the addition of left-turn lanes at major intersections and median openings, as necessary, along W. Appleton Avenue and W. Lisbon Avenue to provide for the separation of opposing traffic flows for increased travel safety. Volume-to-design capacity ratios under this fourth alternative are shown in Table 257. Under this alternative, USH 41 along both W. Appleton Avenue and W. Lisbon Avenue could be expected to operate over design capacity during the peak periods. As shown in this table, the volume-to-design capacity ratios on USH 41 along W. Appleton Avenue and W. Lisbon Avenue under this alternative would be 1.34 during the morning peak period, 0.87 during the midday period, and 1.29 during the evening peak period. The levels of service under this alternative would be about equal to the levels of service under the second and third alternatives, or would be level-of-service E during both the morning and evening peak periods. The level of service during the midday period would be improved to B under this alternative, however.

The fifth alternative considered for USH 41 along W. Appleton Avenue and W. Lisbon Avenue would provide for three lanes of moving traffic between W. Burleigh Street and W. North Avenue during each peak period in the direction of peak traffic flow within the same desirable urban cross-section provided under the fourth alternative. This would be accomplished through the prohibition of all on-street parking, standing, and stopping and the institution of a tow-away zone in the direction of peak traffic flow during both the morning and evening peak periods. Because of these restrictions, vehicles accessing businesses or residences which front either W. Appleton Avenue or W. Lisbon Avenue during periods of parking prohibition would have to seek parking space along nearby intersecting streets or use off-street parking space in the area. Only under this alternative could congestion expected to be abated on USH 41 along both W. Appleton Avenue and W. Lisbon Avenue during both peak periods. As shown in Table 257, the volume-to-design capacity ratios on USH 41 along W. Appleton Avenue and W. Lisbon Avenue under this alternative would be 1.10 during the morning peak period, 0.87 during the midday period, and 1.06 during the evening peak period. The levels of service under this alternative would be improved to C during both peak periods and to B during the midday period.

The costs shown in Table 257 are expressed in 1980 dollars and include estimates of the construction costs, including utility relocation costs; the real estate acquisition, relocation, and demolition costs; and the maintenance costs associated with the operation of each alternative over the plan design period. In each case under the "do nothing" alternative, only summer and winter maintenance work and two major resurfacings would be accomplished on USH 41 along W. Appleton Avenue and W. Lisbon Avenue between 1980 and 2000. Under the parking and left-turn prohibition alternative, two major resurfacings would be accomplished as well. Also under each of the alternative plans, any traffic management actions previously recommended for the arterial segment under the short-range plan for the northwest side study area which would not be precluded by physical roadway dimensions were assumed to have been implemented. In the case of these segments of W. Appleton Avenue and W. Lisbon Avenue, it was recommended that an additional signal phase be added and that on-street parking be prohibited on one approach to the intersection of W. Appleton Avenue with W. Burleigh Street; that an additional signal phase be added in addition to a new controller, that parking be prohibited on two approaches, and that a left-turn lane be lengthened on the southeast-bound approach to the intersection of W. Appleton Avenue with N. 60th Street; and that on-street parking be prohibited on one or more approaches to the intersections of W. Appleton Avenue with W. Center Street, W. Lisbon Avenue, and N. 55th Street. The cost of each of these actions was accordingly added as necessary to the capital costs presented in Table 257. These short-range actions were not found to be effective in resolving the long-range problems along these segments. Also indicated in Table 257 is the urban disruption which may be expected to be associated with each of the alternatives as measured by number of residential; commercial; transportation, utility, and communication; and governmental and institutional properties required to be taken.

As shown in Table 257, the fourth and fifth alternatives, which provide for the widening of USH 41 along W. Appleton Avenue and W. Lisbon Avenue to desirable urban cross-sections, would have the highest estimated total capital and maintenance costs, or $13,253,000 and $13,260,000, respectively, the cost differential representing the cost of the signing required to regulate on-street parking along these segments. The widening of W. Appleton Avenue and W. Lisbon Avenue to a minimum urban cross-section having a 64-foot-wide pavement would have a total capital and maintenance cost of about $7,600,000, while the widening of these arterials at principal intersections only would have a capital and maintenance cost of about $5,084,000. That alternative which would provide for the prohibition of on-street parking and left turns along W. Appleton Avenue and W. Lisbon Avenue would have an estimated capital and maintenance cost of $2,528,000. The capital and maintenance cost of the "do nothing" alternative would be about $2,072,000.

As indicated in Table 257, the fourth and fifth alternatives would also be the most disruptive of the alternatives considered, each requiring the taking of 11 residential units; 31 commercial units; and one transportation, utility, or communication property. Some disruption would also be entailed in the implementation of those two alternatives which provide for the widening of USH 41 along W. Appleton Avenue and W. Lisbon Avenue to minimum urban cross-sections. Of these two alternatives, that which provides for expanding the two arterial facilities to a 64-foot-wide pavement would be the third most disruptive of the alternatives considered, requiring the taking of 10 residential units; 18 commercial units; and one transportation, utility, or communication property. That alternative which provides for the widening of USH 41 along W. Appleton Avenue and W. Lisbon Avenue only at major intersections would require the taking of seven residential units and 10 commercial units.

There would be no significant differences between the noise levels generated by each of the five alternatives considered, or between those generated by each of the alternatives and by the "do nothing" alternative. However, there would be differences in the amounts of air pollutant emissions generated by the five alternatives and the "do nothing" alternative. As shown in Table 257, under a "do nothing" alternative, about 358 tons of carbon monoxide and about 40 tons of hydrocarbons would be emitted per year in the year 2000 by vehicles traveling over the segment of USH 41 along W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue. As shown in this table, about five fewer tons of carbon monoxide and about two fewer tons of hydrocarbons would be emitted per year in the year 2000 under the first alternative; about 15 fewer tons of carbon monoxide and about three fewer tons of hydrocarbons would be emitted per year in the year 2000 under the second and third alternatives; about 45 fewer tons of carbon monoxide and about seven fewer tons of hydrocarbons would be emitted per year in the year 2000 under the fourth alternative; and about 80 fewer tons of carbon monoxide and about 12 fewer tons of hydrocarbons would be emitted per year in the year 2000 under the fifth alternative plan by vehicles traveling over this segment. As also shown in Table 257, under the "do nothing" alternative, about 13,528,000 gallons of fuel would be used from 1980 to 2000 by vehicles traveling over the segment of USH 41 along W. Appleton Avenue and W. Lisbon Avenue. About 90,000 fewer gallons, representing a cost savings of about $196,000, would be consumed under Alternative 1; about 243,000 fewer gallons, representing a cost savings of about $574,000, would be consumed under Alternatives 2 and 3; about 576,000 fewer gallons, representing a cost savings of about $1,250,000, would be consumed under Alternative 4; and about 1,035,000 fewer gallons, representing a cost savings of about $2,246,000, would be consumed under Alternative 5.

Based upon consideration of the costs and benefits of each alternative, it is recommended that the fifth alternative be implemented along the arterial between W. Burleigh Street to W. North Avenue—that is, the widening of USH 41 along W. Appleton Avenue and W. Lisbon Avenue to a desirable urban cross-section with 36-foot-wide roadways separated by a 24-foot-wide median with curbs and gutters and sidewalks within a 120-foot-wide right-of-way. Under this alternative, on-street parking would be prohibited during the peak periods in the direction of peak traffic flow. Despite the fact that this alternative would involve the highest capital cost as well as the greatest amount of urban disruption on USH 41 along both W. Appleton Avenue and W. Lisbon Avenue, it was recommended because it would offer substantial motor fuel savings and environmental benefits in terms of the amount of air pollutants emitted, and because it is the only alternative which would serve to abate the traffic congestion expected to remain along this southeast-northwest corridor. Also, the provision of a 24-foot-wide median under this alternative would serve to separate opposing traffic flows, thereby improving travel safety as well as providing adequate room for refuge and deceleration lanes for left-turning vehicles at median openings.

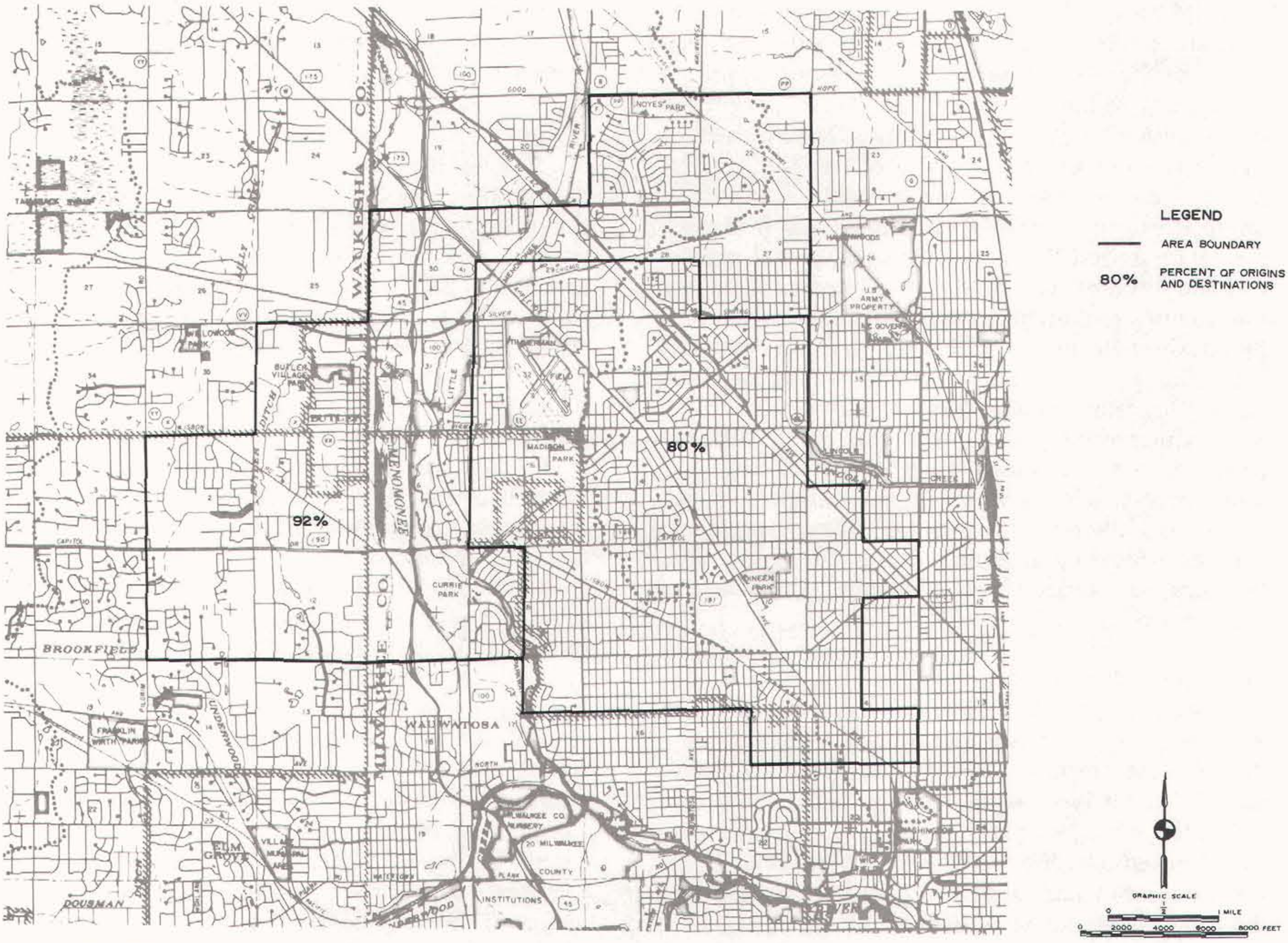
While considering improvement alternatives for USH 41 along W. Appleton Avenue and W. Lisbon Avenue, concern was expressed that the widening of these two arterials between W. Burleigh Street and W. North Avenue, as recommended under the fifth alternative, would provide a principal corridor for through traffic between outlying areas of northwest Milwaukee County and Waukesha and Washington Counties and the City of Milwaukee central business district, rather than providing a facility which would serve more localized traffic within Milwaukee County. In view of this concern, a supplemental analysis was conducted to determine the extent of the geographic area northwest of these two arterial segments within which tripmakers using all or part of the segments of W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue, as improved under the fifth alternative, may be expected to originate and/or terminate their trips in the year 2000. As shown in Figure 127, the analysis indicated that the area bounded by N. Mayfair Road on the west, W. Silver Spring Drive on the north, N. 51st Street on the east, and W. North Avenue on the south would be the area of origin and/or destination for 80 percent of the approximately 35,000 vehicle trips per day anticipated to use all or parts of this segment of USH 41 along W. Appleton Avenue and W. Lisbon Avenue; and that a larger area, which would include parts of eastern Waukesha County, would account only for an additional 12 percent of these trips. This analysis also indicated that only about 9,000, or about 26 percent, of the anticipated 35,000 vehicle trips per day would traverse the entire length of the segment of USH 41 between W. Burleigh Street and W. North Avenue, and that only about 1,500 of these 9,000 trips would be made by persons not residing in the innermost geographic area shown in Figure 127. This analysis would indicate that the improvement of USH 41 along W. Appleton Avenue and W. Lisbon Avenue, as recommended under the fifth alternative, would, in fact, principally serve traffic generated in or serving a localized area northwest of the improvement area.

Any improvement alternative for W. Appleton Avenue and W. Lisbon Avenue between W. Burleigh Street and W. North Avenue must be properly related to the Stadium Freeway-North "stub end" treatment. Based upon an analysis of the costs and benefits of each of the 10 "stub end" alternatives considered for the Stadium Freeway-North under the short-range plan for the study area, it is recommended that Alternative 10, which would provide for the construction of a southbound freeway on-ramp which would have an entrance from W. Lisbon Avenue at a point between N. 46th Street and N. 47th Street, be implemented. This alternative, considered one of four lower cost alternatives for completion of the Stadium Freeway-North "stub end," would, like the roadway design recommended under Alternative 5 for the improvement of W. Appleton Avenue and W. Lisbon Avenue from W. Burleigh Street to W. North Avenue, provide for the widening of the intersection of W. Lisbon Avenue with W. North Avenue to a channelized, median-divided cross-section by obtaining additional right-of-way from the south side of W. Lisbon Avenue. In order to accommodate the widening of W. Lisbon Avenue to a desirable urban cross-section under the fifth improvement alternative, Alternative 10 for completion of the Stadium Freeway-North "stub end" would need to be redesigned to provide for a 120-foot-wide right-of-way. Such widening would require the taking of one additional commercial unit under Alternative 10.

Following careful deliberation, it was the consensus of the Advisory Committee that, although the staff-recommended improvement of W. Appleton Avenue and W. Lisbon Avenue was the only alternative which would serve to abate the existing and

Figure 127

AREAS SERVED BY IMPROVED W. APPLETON AVENUE AND W. LISBON AVENUE FROM W. BURLEIGH STREET TO W. NORTH AVENUE



Source: SEWRPC.

probable future traffic congestion along these arterial segments, a "do nothing" alternative, under which the existing roadway cross-section would remain unchanged, should be recommended. Particular concern was expressed by the Committee over the urban disruption that would be entailed in the widening, and over the adverse effects which adoption of this alternative would have on the business district concerned in the interim between the adoption and implementation.

It was also concluded that, in conjunction with the recommendation of a "do nothing" plan for W. Appleton Avenue and W. Lisbon Avenue, Alternative 7 for completion of the Stadium Freeway-North "stub end" be recommended. Under this alternative plan, a southbound freeway on-ramp would be constructed which would have an entrance from W. Lisbon Avenue between N. 47th Street and N. 46th Street. Also under this alternative plan, no reconstruction would be accomplished at the intersection of W. Lisbon Avenue and W. North Avenue, and no additional right-of-way would be acquired.

Summary

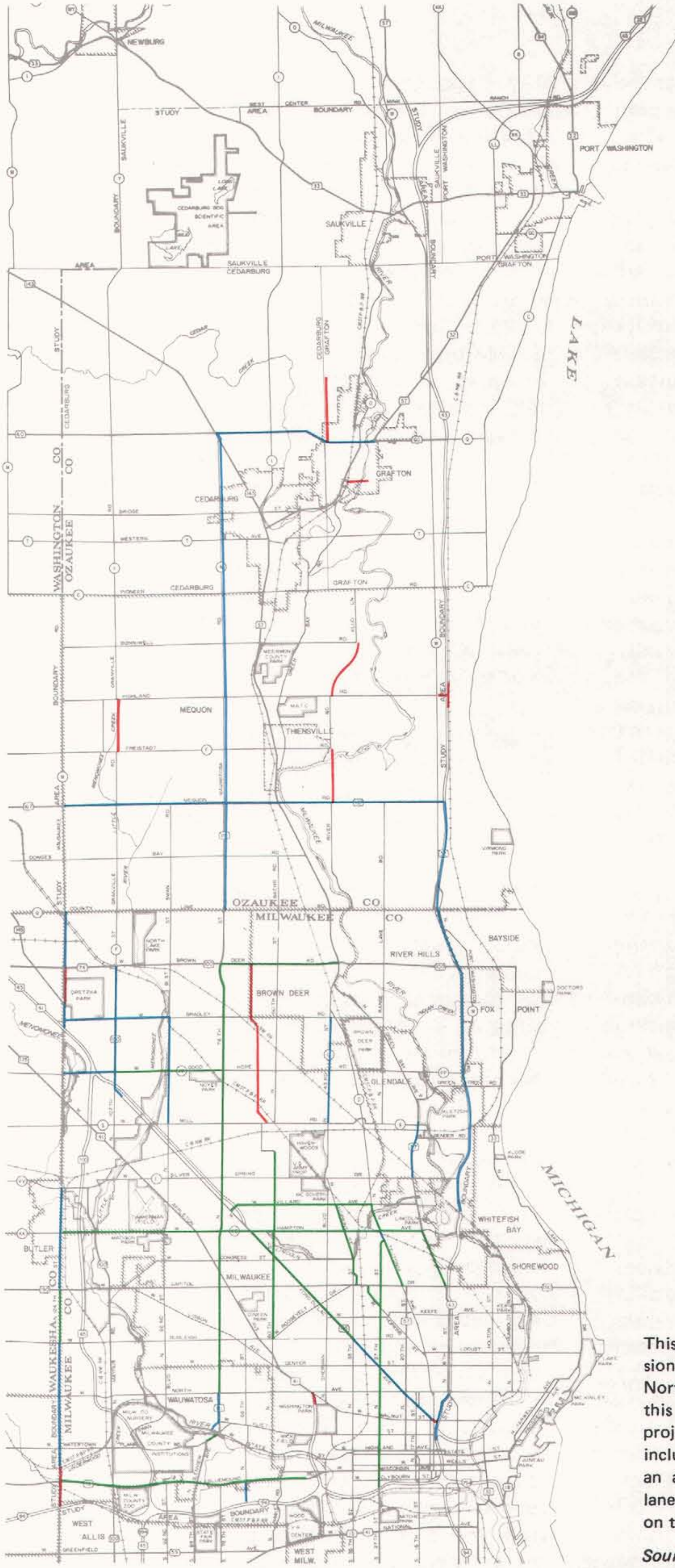
The third alternative long-range plan considered for the northwest side study area was specifically designed to resolve the transportation system deficiencies which the analysis indicated would remain unresolved under the second or "transportation systems management and transit improvement," long-range plan, through the recommendation of additional highway improvement and expansion actions. Improvement or expansion projects for the arterial system were investigated under this plan for a total of 21 additional arterial travel corridors within the study area in which remaining traffic congestion was identified.

Three types of actions were investigated in each of these travel corridors as a means of increasing roadway capacity and alleviating traffic congestion. In each case, these actions were considered in order of increasing cost and disruption. The first action investigated for each corridor was the prohibition of on-street parking along congested segments of an arterial street during peak travel periods in the direction of peak traffic flow. Such on-street parking prohibition was recommended only where it was considered practical and implementable. In those cases where on-street parking could not be considered as a practicable alternative, arterial street widening was investigated. The third and final type of action considered was the expansion of the arterial street system, under which totally new roadway segments would be added to the arterial system. Although such expansion projects also served to increase study area arterial capacity and to abate congestion problems, the principal reason for such expansion recommendations was to provide an integrated system of urban arterials with a proper spacing and with proper cross-sections to adequately serve developing areas.

Shown on Map 236 are the improvement and expansion actions which are recommended for the arterial street and highway system of the northwest side study area under the third long-range alternative plan, along with the staff-recommended option for W. Fond du Lac Avenue from N. 35th Street to the Hillside Interchange. The Advisory Committee chose to make no recommendation for this segment of W. Fond du Lac Avenue prior to public hearing and, rather, proposed three alternatives. Two of the alternatives would have provided for the improvement of this segment of W. Fond du Lac Avenue from its present two traffic lanes and two parking lanes to three traffic lanes in each direction. One improvement alternative would widen this segment of W. Fond du Lac Avenue for its entire length. The other improvement alternative would differ only in that it would carry the six-lane improved highway around the business district at W. Fond du Lac Avenue and W. North Avenue by way of a one-way pair routing. Either of these alternatives would have accomplished the staff-recommended improvement. The third alternative taken to public hearing would have improved this W. Fond du Lac Avenue segment only from the Hillside Interchange to approximately N. 23rd Street, and from N. 23rd Street a bottleneck would remain. Under this alternative, W. Fond du Lac Avenue from the Hillside Interchange to W. Garfield Avenue would be widened to six lanes along available right-of-way. The one-way pair around the business district would have been constructed then to approximately N. 23rd Street to provide six traffic lanes. From N. 23rd Street to N. 35th Street, parking would be prohibited to provide two lanes in each direction. As shown on this map, under the third alternative long-range transportation system plan, it is recommended that on-street parking be prohibited during peak periods in the direction of peak traffic flow on nearly 40 miles, or about 9 percent, of the 449 miles of existing arterial streets in the study area; that 39 miles, also about 9 percent, of the 449 miles of existing arterial streets in the study area be widened; and that nearly eight miles of new arterial facilities be constructed. Under this plan, it is also recommended that nearly nine miles of existing freeway be widened.

SUMMARY AND THE PRELIMINARY RECOMMENDED LONG-RANGE TRANSPORTATION SYSTEM PLAN FOR THE NORTHWEST SIDE STUDY AREA

The long-range transportation system planning for the northwest corridor of Milwaukee/Ozaukee County study area was conducted in a stepwise manner whereby each successive alternative plan was specifically designed to resolve any transportation system problems and deficiencies which the analyses indicated remained unresolved in the plan design year by the previous plan considered. Under this procedure, the first long-range plan considered—the "status quo" alternative plan—represented the minimum-capital cost plan, as it would entail no further major capital investment in transportation system improvements of any kind over the next 20 years. The second long-range plan considered, designed to resolve problems which may be expected to remain under the "status quo" plan, consisted solely of transportation systems management and public transit improvement measures. Consideration of such a plan was intended to ensure that relatively low-capital cost transportation systems management and public transit improvement measures were fully applied prior to consideration of more capital-intensive and potentially disruptive arterial street improvements. The third and final long-range plan included highway improvement and expansion actions in addition



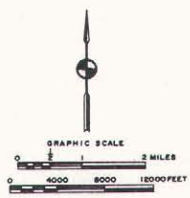
Map 236

PRELIMINARY RECOMMENDED ROADWAY IMPROVEMENT AND EXPANSION ACTIONS INCLUDED UNDER THE THIRD LONG-RANGE PLAN FOR THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA

LEGEND

- RECOMMENDED CONSTRUCTION OF A NEW ARTERIAL STREET SEGMENT
- RECOMMENDED WIDENING OF AN EXISTING ARTERIAL STREET SEGMENT [a]
- RECOMMENDED ON-STREET PARKING PROHIBITION DURING PEAK TRAVEL PERIODS IN THE DIRECTION OF PEAK TRAFFIC FLOW (IN ADDITION TO EXISTING ON-STREET PARKING PROHIBITION)

[a] ARTERIAL WIDENING PROJECTS ILLUSTRATED DO NOT INCLUDE THOSE ROADWAY IMPROVEMENT PROJECTS TO BE UNDERTAKEN DURING THE DESIGN PERIOD WHICH WOULD CONSTITUTE CONSTITUTE CONVERSION OF AN ARTERIAL SEGMENT FROM A RURAL TO AN URBAN CROSS-SECTION. UNDER THE STUDY IT IS ASSUMED THAT BY THE YEAR 2000 ALL ARTERIAL SEGMENTS LOCATED WITHIN THE MILWAUKEE URBANIZED AREA WOULD BE CONVERTED TO AN URBAN CROSS-SECTION. UNDER SUCH CONVERSION, IT IS TYPICALLY PROPOSED TO CONVERT A 24-FOOT-WIDE RURAL ROADWAY TO A 48-FOOT-WIDE URBAN PAVEMENT, THE LATTER WITH TWO TRAFFIC LANES AND TWO PARKING LANES, CURB AND GUTTER AND SIDEWALKS, IN AREAS OF FRINGE URBAN OR SUBURBAN DEVELOPMENT, HOWEVER, WHERE URBAN DEVELOPMENT WOULD ONLY BACK ONTO ARTERIALS, A 24-FOOT-WIDE PAVEMENT WITH SIX-FOOT-WIDE SHOULDERS MAY BE USED AS A MINIMUM URBAN CROSS-SECTION.



This map shows the surface arterial street improvement and expansion actions recommended under the final plan for the Milwaukee Northwest Side/Southern Ozaukee County study area. As shown on this map, the plan includes 18 specific arterial street widening projects and eight new facility construction projects. This plan also includes the prohibition of one-street parking during peak hours on an additional 13 street segments. A total of 86 miles of parking lanes would be required to carry traffic during peak hours, as shown on this map.

Source: SEWRPC.

to the actions recommended in the second plan. These actions were designed and evaluated on a corridor-by-corridor basis, and were designed to resolve the highway system capacity deficiencies which may be expected to remain unresolved in the plan design year after the maximum practicable application of transportation systems management and public transit improvement measures. Arterial street and highway improvements were proposed under this plan to abate those over- and at-design-capacity operations remaining upon implementation of the transportation systems management and transit plan.

This third long-range plan was selected as the preliminary recommended design year 2000 transportation system plan for the study area to be taken to public hearing. The preliminary recommended plan for the study area consists of two major components: arterial streets and highways, and public transit facilities and service.

Arterial Streets and Highways

Standard Surface Arterial Street System: Under the preliminary recommended transportation system plan for the study area, the arterial street and highway system of the study area would consist of about 452 miles of facilities, an increase of about 11 miles of arterial facilities over the 1980 total.

Table 258 summarizes by arterial facility type the miles of improvements proposed for the arterial street and highway system of the study area under the preliminary recommended transportation system plan. Table 259 provides a listing and identifies the limits of each of these improvements. For the segment of W. Fond du Lac Avenue from the Hillside Interchange to N. 35th Street for which the Committee chose to make no recommendation, the staff-recommended improvements are shown in Tables 258 and 259.

As shown in Table 258, the improvements may be categorized as system preservation, system improvement, and system expansion efforts. System preservation includes all arterial improvement projects required to maintain the structural adequacy and serviceability of the existing arterial system without significantly increasing the capacity of that system. This includes all projects classified as resurfacing and reconstruction for the same capacity—that is, without significant widening. System improvement includes all projects which would significantly increase the capacity

Table 258

ARTERIAL STREET AND HIGHWAY SYSTEM PRESERVATION, IMPROVEMENT, AND EXPANSION BY ARTERIAL FACILITY TYPE WITHIN THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA: YEAR 2000 PRELIMINARY RECOMMENDED TRANSPORTATION SYSTEM PLAN

Arterial Facility Type	System Preservation		System Improvement		System Expansion		Total (miles)
	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total	
Milwaukee County							
Freeway	28.5	81.0	6.7	19.0	- -	- -	35.2
Standard Surface Arterial.	225.7	91.4	16.9	6.8	4.4	1.8	247.0
Subtotal	254.2	90.1	23.6	8.4	4.4	1.5	282.2
Ozaukee County							
Freeway	13.3	86.9	2.0	13.1	- -	- -	15.3
Standard Surface Arterial	132.4	85.5	19.1	12.3	3.4	2.2	154.9
Subtotal	145.7	85.6	21.1	12.4	3.4	2.0	170.2
Total Study Area							
Freeway	41.8	82.8	8.7	17.2	- -	- -	50.5
Standard Surface Arterial	358.1	89.1	36.0	8.9	7.8	2.0	401.9
Total	399.9	88.4	44.7	9.9	7.8	1.7	452.4

Source: SEWRPC.

Table 259

HIGHWAY IMPROVEMENT AND EXPANSION ACTIONS INCLUDED UNDER THE PRELIMINARY RECOMMENDED LONG-RANGE PLAN FOR THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA CORRIDOR TRANSPORTATION PLAN

Roadway Type	Recommended Highway Improvement Action
Freeway	Freeway Improvements ● Completion of Hillside Interchange ● Ramp addition at Stadium Freeway-North "Stub End" ● Construction of freeway interchange at IH 43 and Highland Road Freeway Widenings ● Widening of IH 43 from 4 lanes to 6 lanes through Hillside Interchange ● Widening of IH 43 from 4 lanes to 6 lanes from Henry Clay Street to Mequon Road (STH 167) ● Widening of IH 43 from 4 lanes to 6 lanes from W. Henry Clay Street through the W. Silver Spring Drive interchange
Standard Surface Arterial	Arterial Expansion ● Granville Road from Friestadt Road to Highland Road (new 2-lane roadway) ● River Road from Mequon Road (STH 167) to Friestadt Road (new 2-lane roadway with on-street parking permitted) ● River Road from Highland Road to Bonniwell Road (new 2-lane roadway) ● 1st Avenue from Rose Street to Cedar Creek Road (new 4-lane roadway with on-street parking permitted) ● Extended N. 124th Street from STH 145 to W. Brown Deer Road (new 2-lane roadway with peak-period on-street parking permitted) ● New N. 68th Street from Industrial Road to W. Brown Deer Road (new 2-lane roadway with peak-period on-street parking permitted) ● Extended N. 124th Street from W. Greenfield Avenue to W. Watertown Plank Road (new 4-lane roadway with peak-period on-street parking permitted) ● Falls Road from STH 57 to Port Washington Road (new 2-lane roadway with peak-period on-street parking permitted)[a] Arterial Widenings[b] ● Wauwatosa Road from W. County Line Road to STH 60 (from 2 travel lanes to 4 travel lanes) ● STH 60 from STH 143 to STH 57 northbound (from 2 travel lanes to 4 travel lanes) ● STH 167 from Wausaukee Road to IH 43 (from 2 travel lanes to 4 travel lanes from Wausaukee Road to Swan Road and from 2 travel lanes to 4 travel lanes and 2 parking lanes from Swan Road to IH 43) ● W. Bradley Road from N. 124th Street to N. 91st Street (from 2 travel lanes to 4 travel lanes) ● W. Good Hope Road from N. 124th Street to N. 115th Street (from 2 travel lanes to 4 travel lanes) ● W. Good Hope Road from USH 45 to N. 107th Street (from 4 travel lanes to 6 travel lanes) ● STH 145 from W. Fond du Lac Avenue to the Waukesha/Milwaukee County line (from 2 travel lanes to 4 travel lanes with 2 parking lanes) ● N. Boundary Road from W. Brown Deer Road to W. County Line Road (from 2 travel lanes to 4 travel lanes) ● N. 91st Street from W. Good Hope Road to W. Bradley Road (from 2 travel lanes to 4 travel lanes and 2 parking lanes) ● N. 43rd Street from W. Mill Road to W. Bradley Road (from 2 travel lanes to 4 travel lanes and 2 parking lanes) ● N. Green Bay Avenue from W. Silver Spring Drive to W. Mill Road (from 2 travel lanes to 4 travel lanes) ● N. 107th Street and related segments of W. Fond du Lac Avenue (from 2 travel lanes to 4 travel lanes on STH 145 and N. 107th Street between the ramps to and from the southeast-bound lanes of the Fond du Lac Freeway and the northwest-bound off-ramp from the Fond du Lac Freeway; from 2 travel lanes to 4 travel lanes and 2 parking lanes north to W. Greenwood Terrace; and from 2 travel lanes to 4 travel lanes north to W. Brown Deer Road)

Table 259 (continued)

Roadway Type	Recommended Highway Improvement Action	
Standard Surface Arterial (continued)	Arterial Widenings[b] (continued) ● N. 76th Street from Harmonee Avenue to W. North Avenue (from 2 travel lanes to 4 travel lanes) ● W. Fond du Lac Avenue from N. 35th Street to N. 15th Street (from 2 travel lanes to 6 travel lanes)[c] ● N. 68th Street from IH 94 to W. Blue Mound Road (from 2 travel lanes to 4 travel lanes) ● N. 124th Street from W. Watertown Plank Road to W. North Avenue (from 2 travel lanes to 4 travel lanes) ● N. 124th Street from W. North Avenue to W. Hampton Avenue (unimproved segments from 2 travel lanes to 4 travel lanes and 2 parking lanes) ● N. 124th Street from W. Hampton Avenue to W. Silver Spring Drive (from 2 travel lanes to 4 travel lanes)	
	Type of Traffic Management Action	Number of Recommended Actions
	● Traffic Signal Modifications or Additions	108
	● On-Street Parking Prohibition or Pavement Markings on Intersection Approach.	39
	● Left-Turn-Lane Lengthening or Expansion	32
	● Left-Turn-Lane Addition.	8
	● Right-Turn-Lane Lengthening or Expansion.	3
	● Right-Turn-Lane Addition	7

[a] *Roadway expansion or improvement projects carried over from "status quo" long-range plan as part of the 1980 annual element of the 1980-1984 transportation improvement program.*

[b] *Arterial widening projects listed do not include those roadway improvement projects to be undertaken during the design period which would constitute conversion of an arterial segment from a rural to an urban cross-section. Under the study it is assumed that by the year 2000 all arterial segments located within the Milwaukee urbanized area will be converted to an urban cross-section. Under such conversion, it is typically proposed to convert a 24-foot-wide rural roadway to a 48-foot-wide urban pavement, the latter with two traffic lanes and two parking lanes, curb and gutter, and sidewalks. In areas of fringe urban or suburban development, however, where urban development would only back onto arterials, a 24-foot-wide pavement with six-foot-wide shoulders may be used as a minimum urban cross-section.*

[c] *The recommendation for this segment of W. Fond du Lac Avenue is the staff recommendation. The Advisory Committee chose to make no preliminary recommendation prior to public hearings.*

Source: SEWRPC.

of the existing system through street widening or relocation. System expansion includes all projects which would significantly increase the capacity of the existing system through construction of new facilities. As indicated in Table 258, under the recommended plan, about 400 miles of the total proposed system of 452 miles would fall into the system preservation category, representing about 88 percent of the total arterial system; and about 45 miles, or about 10 percent of the total proposed arterial system, would fall into the system improvement category. The remaining eight miles, or about 2 percent of the total proposed system, falls into the system expansion category where new construction of new facilities is required.

As indicated in Table 259, there are 23 specific improvement, or street widening, projects, and eight expansion, or new facility construction, projects proposed for the arterial street and highway system of the study area under the preliminary recommended transportation plan. As indicated in this table, no system expansion projects are proposed for freeways in the study area. The arterial street and highway system in the northwest side study area under the recommended plan was shown in the preceding section of this chapter on Map 236. Indicated on this map are the locations and limits of each of the improvement or expansion projects proposed under the recommended plan.

The Advisory Committee chose to make no recommendation for the segment of W. Fond du Lac Avenue from N. 35th Street to the Hillside Interchange prior to public hearing and, rather, proposed three alternatives. Two of the alternatives would have provided for the improvement of this segment of W. Fond du Lac Avenue from its present two traffic lanes and two parking lanes to three traffic lanes in each direction. One improvement alternative would widen this segment of W. Fond du Lac Avenue for its entire length. The other improvement alternative would carry the six-lane improved highway around the business district at W. Fond du Lac Avenue and W. North Avenue by way of a one-way pair routing. Either of these alternatives would have accomplished the staff-recommended improvement. The third alternative taken to public hearing would have improved this W. Fond du Lac Avenue segment only from the Hillside Interchange to approximately N. 23rd Street, and from N. 23rd Street a bottleneck would remain. Under this alternative, W. Fond du Lac Avenue from the Hillside Interchange to W. Garfield Avenue would be widened to six lanes along available right-of-way. The one-way pair around the business district would have been constructed then to approximately N. 23rd Street to provide six traffic lanes. From N. 23rd Street to N. 35th Street, parking would be prohibited to provide two lanes in each direction.

Freeway System: No additional freeway facilities are recommended to be built in the study area under the preliminary recommended transportation system plan. However, five major freeway facility improvements are recommended.

Completion of the Hillside Interchange "Stub End": The preliminary recommended plan for completion of the Hillside Interchange "stub end" is shown on Map 237. Under this alternative, on- and off-ramp connections would be provided between the North-South Freeway and the Park Freeway-East and the surface arterial street intersection of W. Fond du Lac Avenue and W. Walnut Street at about N. 13th Street. From this intersection, a freeway on-ramp would be provided to both the southbound lanes of the North-South Freeway and the eastbound lanes of the Park Freeway-East, and a freeway off-ramp would be provided from the northbound lanes of the North-South Freeway and the westbound lanes of the Park Freeway-East.

As also shown on Map 237, at the northern spur "stub end" of the Hillside Interchange, it is recommended that the two existing bridges which were designed to carry eastbound traffic from the previously proposed Park Freeway-West to both the North-South Freeway and the arterial street system east of the North-South Freeway be removed; that the ramp bridge on the southbound on-ramp to the North-South Freeway be replaced by an on-grade pavement; and that four ramps which are associated with these bridges be removed.[7]

Widening of IH 43 through the Hillside Interchange: In order to accomplish the recommended completion of the Hillside Interchange "stub end," and to ensure the proper operation of IH 43 through this area, it is recommended that three continuous through traffic lanes be provided in each direction on the North-South Freeway through the Hillside Interchange area. In order to accomplish this widening, it would be necessary to add a single outside traffic lane for northbound traffic from a point immediately south of W. Winnebago Street to a point south of W. North Avenue, and to add a single inside lane for southbound traffic from the freeway ramp entrance to the Park Freeway-East to a point immediately south of W. Winnebago Street. These lane additions are shown on Map 237.[8]

Widening of IH 43 from Henry Clay Street to Mequon Road (STH 167): Under the preliminary recommended transportation system plan for the study area, two alternative improvement plans were proposed for the segment of IH 43 north of Henry Clay Street, and recommended to be taken to public hearing. The first of these plans provided for the addition of one lane on IH 43 in each direction between W. Henry Clay Street and STH 167. The second plan provided for the addition of one lane in each direction on IH 43 only through the W. Silver Spring Drive interchange to W. Good Hope Road.

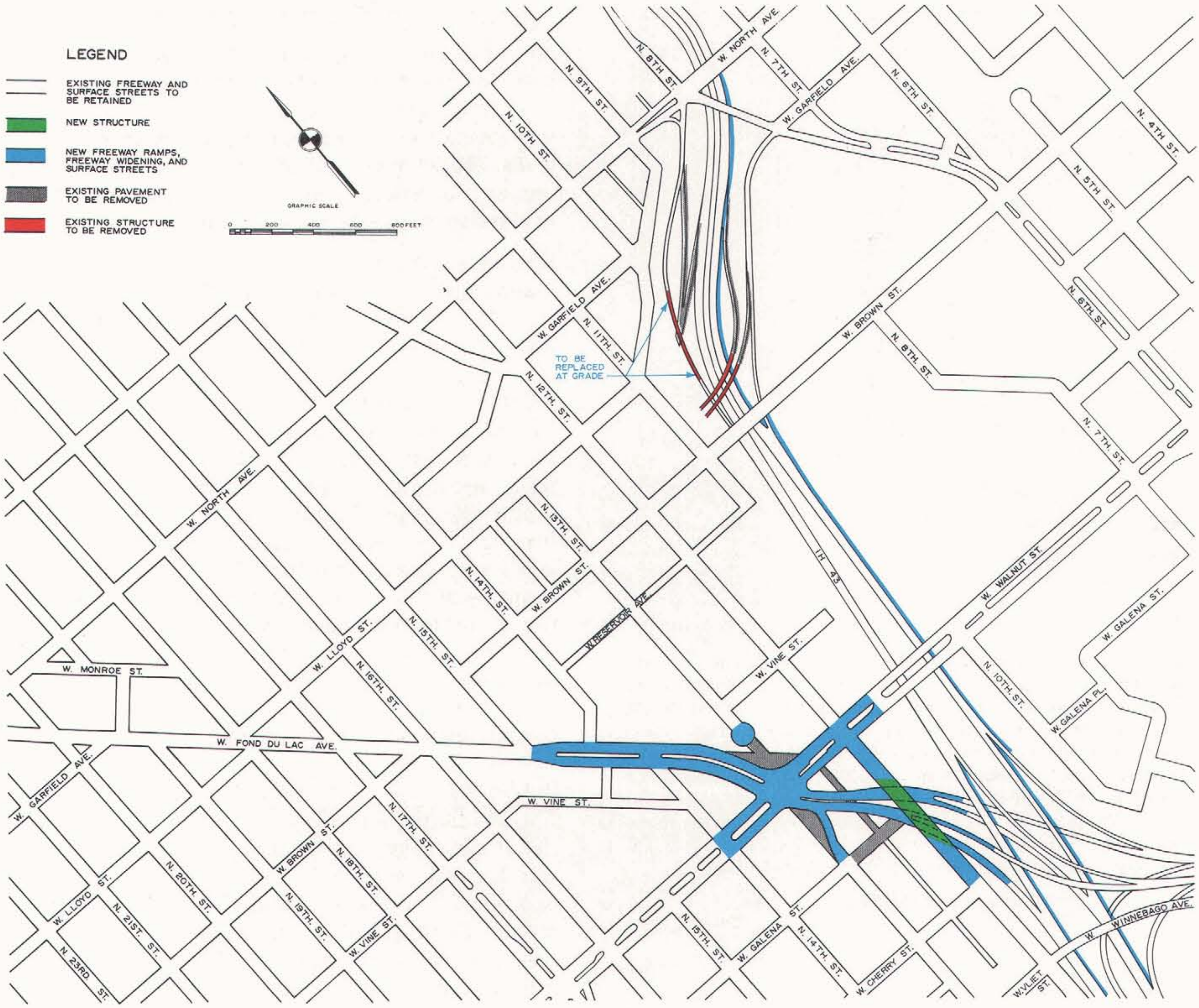
Stadium Freeway-North "Stub End": The preliminary recommended plan for completion of the Stadium Freeway-North "stub end" is shown on Map 238. As shown on this map, under this plan

[7] *Removal and reconstruction of the ramps associated with the Hillside Interchange began in July 1982, and was completed in October 1982. Connection of the "stub end" ramps at the Hillside Interchange proper began in October 1982.*

[8] *Widening of IH 43 through the Hillside Interchange began in July 1982, and was completed by November 1982.*

Map 237

HILLSIDE INTERCHANGE "STUB END" COMPLETION PROJECT–IH 43



This map shows the recommended improvement plan for the completion of the Hillside Interchange "stub end." As shown on this map, the recommended reconstruction of the Hillside Interchange would provide direct access between the North-South Freeway (IH 43) and W. Fond du Lac Avenue and W. Walnut Street, providing improved access from the adjacent neighborhoods to the freeway system and thereby to the entire metropolitan area. In addition, traffic would be able to move from W. Fond du Lac Avenue to the Park Freeway-East, thus providing better access from the neighborhoods concerned to the eastern areas of the Milwaukee central business district. The plan includes the reconstruction of W. Fond du Lac Avenue as far west as N. 14th Street.

Source: Wisconsin Department of Transportation and SEWRPC.

Map 238

STADIUM FREEWAY-NORTH
"STUB END" COMPLETION PROJECT

This map shows the recommended improvement plan for the Stadium Freeway-North "stub end." As shown on this map, the recommended design for the completion of the "stub end" at the Stadium Freeway-North would require no additional right-of-way taking. The only change in the current configuration of the Stadium Freeway-North/W. Lisbon Avenue/W. North Avenue intersection would be the closure of W. Garfield Avenue between N. 46th Street and N. 47th Street to facilitate the construction of the new southbound freeway on-ramp. The ramp would directly connect W. Lisbon Avenue and W. North Avenue to the Stadium Freeway.

Source: City of Milwaukee and SEWRPC.

design a southbound freeway on-ramp would be constructed which would have an entrance from W. Lisbon Avenue between N. 47th Street and N. 46th Street. As seen on this map, no reconstruction would be accomplished at the intersection of W. Lisbon Avenue and W. North Avenue under this plan design.

Highland Road Interchange: Under the preliminary recommended plan for the northwest side study area, south- and northbound on-ramp and off-ramp connections are recommended between the North-South Freeway and Highland Road in the City of Mequon. Such an interchange was recommended to provide needed access between the North-South Freeway and proposed development in the northeastern portion of the City of Mequon.

Transportation Systems Management Recommendations: As indicated in Table 259, the preliminary recommended, long-range transportation system plan for the arterial street and highway system of the study area for the year 2000 includes several transportation systems management recommendations. These recommendations, derived from the second long-range plan, were incorporated into the recommended long-range plan to ensure that relatively low-capital cost transportation systems management measures were fully utilized prior to the consideration of more capital-intensive arterial street improvements. Principal among the transportation systems management measures included in the recommended plan are proposals for the reconstruction, or addition, of 50 exclusive turn lanes at congested intersections within the study area. As indicated in Table 259, it was recommended that 32 existing left- and three right-turn lanes be reconstructed, and that 18 left-turn lanes and seven right-turn lanes be added. Other transportation systems management measures in the recommended plan include 108 traffic signal modifications or additions and 39 actions whereby on-street parking would be prohibited and/or pavement markings would be provided on intersection approaches.

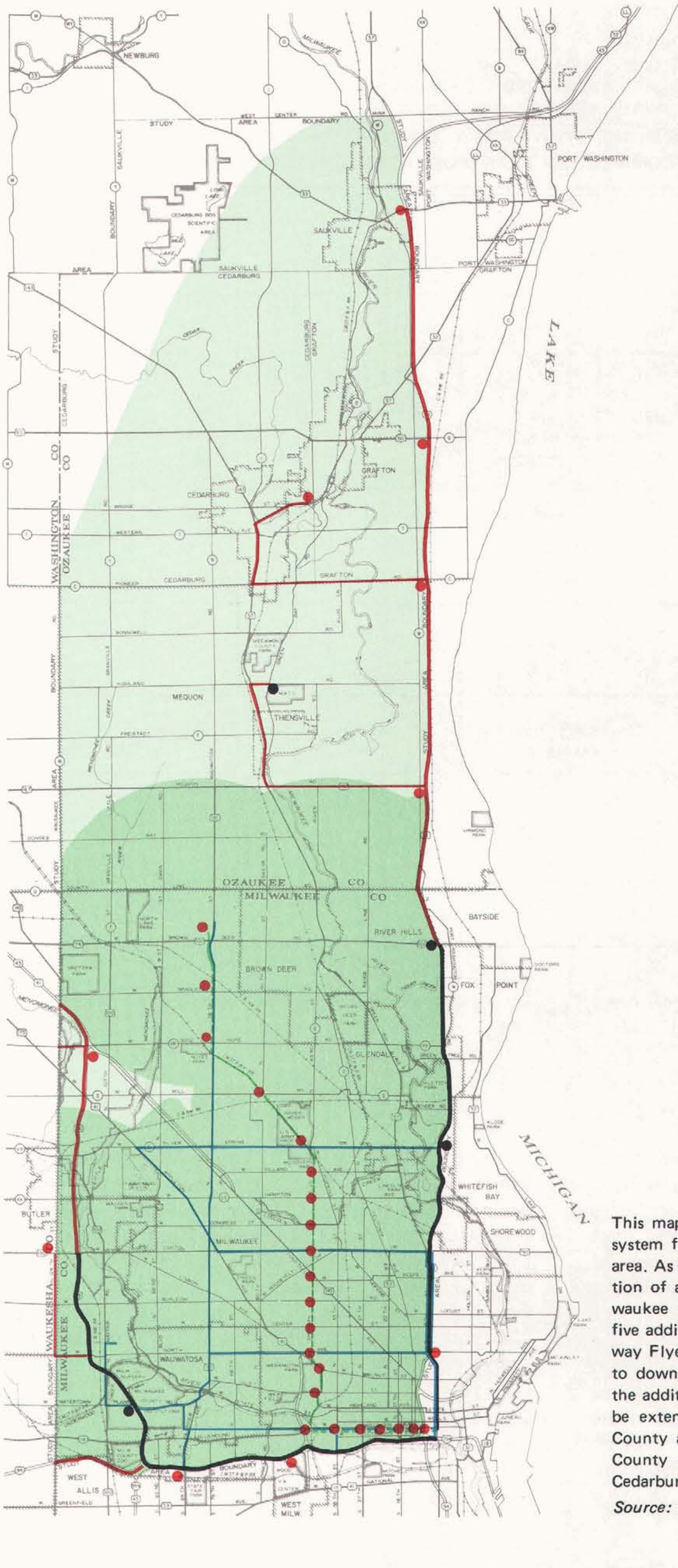
Public Transit Facilities and Service

The public transit system for the study area under the preliminary recommended transportation plan was defined to include the rapid, or primary; the express, or secondary; and the local, or tertiary, service as proposed to be provided in the study area under the newly adopted long-range primary transit system plan for the year 2000.

As shown on Map 239, transit service would be extended under the recommended plan to those parts of the study area expected to be developed at urban densities over the plan design period. As indicated in Table 260, the number of route miles operated in the study area would be increased from the 455 miles operated in 1980 and under the "status quo" plan, to 868 miles under the recommended plan. Transit vehicle miles operated would increase by 20 percent, from 37,500 to 45,100; and the number of transit vehicles required during peak hours of service would increase by 23 percent, from 329 to 404, based on morning peak-hour requirements.

Map 239

PUBLIC TRANSIT SYSTEM IN THE STUDY AREA: 2000 PRELIMINARY RECOMMENDED TRANSPORTATION SYSTEM PLAN



LEGEND

PRIMARY SERVICE

- EXISTING FREEWAY BUS LINE
- PROPOSED FREEWAY BUS LINE
- EXISTING NON-FREEWAY EXTENSION
- PROPOSED NON-FREEWAY EXTENSION
- LIGHT RAIL EXCLUSIVE RIGHT-OF-WAY
- LIGHT RAIL SHARED RIGHT-OF-WAY

SECONDARY SERVICE

- PROPOSED EXPRESS BUS LINE

TRANSIT STATIONS

- EXISTING
- PROPOSED

TRANSIT SERVICE AREA

- EXISTING
- PROPOSED

GRAPHIC SCALE

0 1 2 MILES

0 4000 8000 12000 FEET

This map shows the recommended design year 2000 public transit system for the Milwaukee Northwest Side/Ozaukee County study area. As shown on this map, included in this plan are the construction of a light rail transit facility extending from downtown Milwaukee to the Northridge Shopping Center; the construction of five additional park-ride lots to provide a basis for additional Freeway Flyer service; the provision of three new Freeway Flyer routes to downtown Milwaukee, all from the Ozaukee County area; and the addition of five new express bus routes. Local bus service would be extended throughout the northwestern portion of Milwaukee County and into the more heavily developed portion of Ozaukee County along the STH 57 corridor through Mequon, Thiensville, Cedarburg, and Grafton.

Source: SEWRPC.

Table 260

PUBLIC TRANSIT FACILITIES IN THE STUDY AREA: 1980 AND 2000 "STATUS QUO" AND PRELIMINARY RECOMMENDED TRANSPORTATION SYSTEM PLANS

Transit Facilities Characteristic	Existing 1980		2000 "Status Quo" Plan		2000 Preliminary Recommended Transportation System Plan	
	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total
Total Study Area						
Average Weekday Route Miles						
Primary	96.3	21.1	96.3	21.1	352	40.6
Secondary	7.6	1.7	7.6	1.7	80	9.2
Tertiary	351.3	77.2	351.3	77.2	436	50.2
Total	455.2	100.0	455.2	100.0	868	100.0
	Miles		Miles		Miles	
Special Facilities						
Exclusive Rights-of-Way	--		--		5.4	
Exclusive Lanes on Streets	--		--		8.9	
	Number of Vehicles per Hour[a]		Number of Vehicles per Hour[a]		Number of Vehicles per Hour[a]	
Average Weekday Vehicle Requirements[a]						
Peak Period[b]	329		329		404	
Midday Period	210		210		256	
Bus Miles per Average Weekday	37,500		37,500		45,100	
Average Weekday Transit Ridership	77,000		85,000		131,000	

[a] *Vehicle requirements are for those routes serving the study area.*

[b] *Taken for morning peak period only.*

Source: SEWRPC.

The rapid, or primary, transit service under the recommended plan would be provided by a light rail transit line and 14 routes of motor buses operating in mixed traffic on freeways and over connecting surface arterials. The freeways would be operationally controlled to permit the provision of a high level of transit service over the freeway system. The operational control system would use an areawide ramp-metering system to constrain access to the freeway system during peak hours, thereby seeking to ensure high rates of traffic flow at reasonable operating speeds on the freeway system. The system would consist of interconnected demand-responsive ramp meters, priority access for high-occupancy vehicles, improved driver information, and improved accident incident management procedures. Under the plan, primary transit service would be provided in the study area over 14 bus-on-freeway routes, totaling 324 route miles and serving 14 stations. This planned service represents an increase of nine routes, totaling 256 round-trip route miles, and six stations over the service provided in 1980.

The recommended light rail transit line would operate almost entirely at-grade in a transit mall, street median, and railway right-of-way. Stops would be provided at distances of one-eighth, one-fourth, one-half, one, and one and one-half miles, depending on the density of adjacent development. The final alignment of the light rail line was not determined by the system planning effort, but was to be established in subsequent detailed planning and preliminary engineering.

The express, or secondary, level of transit service under the recommended plan would consist of express bus routes operated over surface arterial streets, with stops generally limited to intersecting transit routes. A total of seven express routes would be provided, totaling 80 route miles and operating over 41 miles of surface arterials in the study area. In 1980, only one express route was operated in the study area—over four miles of surface arterials and no exclusive lanes for such service were provided in the study area. In 1982, an additional express route was operated from N. 60th Street and W. Fond du Lac Avenue to N. 12th Street and W. Wisconsin Avenue.

The primary transit system plan provides for the eventual upgrading of the bus express routes, if upgrading is determined to be needed in the future. The plan accomplished this by identifying an "upper tier" of recommendations, or recommendations made not for immediate implementation, but to ensure that the option of potential upgrading is not foreclosed. Within the northwest side study area, the primary transit system plan provided for the future upgrading of two express bus routes to two light rail transit line extensions.

The tertiary level of transit service under the preliminary recommended transportation system plan would consist of local transit service provided over arterial and collector streets, with frequent stops for passenger boarding and alighting. Under the plan, extensive additions to the tertiary, or local, transit service routes would be provided where such services could be expected to recover 50 percent of the operating costs from farebox revenues. The plan envisioned the ultimate extension of tertiary transit service to most of the urbanized parts of the study area, including areas of urban development in the southern half of Ozaukee County and northwestern Milwaukee County not now served. A total of 436 route miles of service would be provided under the recommended plan, an increase of 85 route miles over the 351 route miles operated in 1980.

Plan Performance and Cost

Selected characteristics of the highway element of the preliminary recommended transportation system plan for the study area are identified and compared to conditions under the "status quo" long-range plan in Tables 261 and 262. The performance and costs of the transit element of the plan, including capital and operating costs, financial feasibility, and benefit-cost ratio, were forecast and considered as part of the concurrent study of areawide rapid transit alternatives, and are set forth in SEWRPC Planning Report No. 33, A Primary Transit System Plan for the Milwaukee Area. As shown in Table 261, automobile availability could be expected to be about 247,320 under the preliminary recommended plan in the year 2000, or about 5 percent less than under the "status quo" plan. A total of 1,390,100 internal person trips, or about 1 percent fewer internal person trips, may be expected to be generated within the study area on an average weekday under the preliminary recommended plan than under the "status quo" plan. However, about 5 percent fewer automobile trips may be expected under the preliminary recommended plan than under the "status quo" plan. As also shown in Table 261, about 131,000 public transit trips may be expected to be made on an average weekday under the preliminary recommended plan, or about 54 percent more than under the "status quo" plan.

As also shown in Table 261, vehicle miles of travel on an average weekday may be expected to be about 3 percent less under the recommended plan than under the "status quo" plan, or about 7,032,500 in the year 2000. Of this total, about 3,137,600, or about 45 percent of the vehicle miles of travel made under the preliminary recommended plan, may be expected to be made on freeways. Under the "status quo" plan, about 49 percent of the total vehicle miles of travel within the study area may be expected to be made on freeways.

Arterial street and highway congestion, as measured by the number of miles of facilities operating over design capacity, may be expected to be about two miles, or about 0.1 percent of the total system under the preliminary recommended plan, compared with about 101 miles, or about 23 percent of the total system, under the "status quo" plan. The number of miles of facilities operating at design capacity under the preliminary recommended plan may be expected to be about 54 miles, or about 12 percent of the total system, compared with about 48 miles, or about 11 percent of the total system, under the "status quo" plan. The extent of congestion on study area arterial streets and highways under the preliminary recommended plan is shown graphically on Map 240 under recommended plan conditions.

Table 261

SELECTED CHARACTERISTICS OF THE PRELIMINARY RECOMMENDED AND "STATUS QUO" SYSTEM PLANS FOR THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA: 2000

Plan Element	"Status Quo" Plan	Recommended Plan
Arterial Street and Highway System (miles)		
Freeway	50.5	50.5
Standard Arterial	390.4	401.9
Total	440.9	452.4
Mass Transit System		
Round-Trip Route Miles		
Primary	96.3	352.0
Secondary	7.6	80.0
Tertiary	351.3	436.0
Total	455.2	868.0
Special Facilities		
Transitway (miles)	- -	14.3
Exclusive Lanes (miles)	- -	1.0
Stations	8	14
Number of Buses Required[a]		
Peak Period	329	404
Midday Period	210	256
Travel Demand Characteristics		
Automobile Availability	260,350	247,320
Average Weekday Internal Person Trips	1,406,200	1,390,100
Average Weekday Transit Trips	85,000	131,000
Percent of Trips Made by Transit	6.0	9.4
Estimated Yearly Transit Revenue Passengers	24.7	36.9
Vehicle Miles of Travel		
Total	7,238,600	7,032,500
On Freeway	3,518,000	3,137,600
Percent of Total on Freeway	48.6	44.6
Arterial Street and Highway Congestion		
Over Capacity (miles)	101.4	2.3
Over Capacity (percent of total system)	23.0	0.5
At Capacity (miles)	48.0	54.3
At Capacity (percent of total system)	10.9	12.0
Average Travel Time per Trip (minutes)	15	13
Proportion of Total Person Travel on Transit		
Mass Transit (percent)	5.2	6.8
Estimated Number of Accidents in Design Year	40,600	39,500
Motor Fuel Consumption (millions of gallons)		
Average Annual Assuming Automobile Fleet Efficiency of 30 mpg in Year 2000	87.2	86.8
Air Pollutants (tons per year)		
Carbon Monoxide	46,807.5	45,474.8
Hydrocarbons	4,956.2	4,815.1
Noise		
Miles of Transportation Facilities Exceeding 70 dba	235.0	230.0
Dislocation		
Number of Residential Units	- -	23
Number of Nonresidential Units	- -	63

[a] *Vehicle requirements are for those routes serving the study area.*

Source: SEWRPC.

Table 262

COSTS AND REVENUES ASSOCIATED WITH THE PRELIMINARY RECOMMENDED AND "STATUS QUO" TRANSPORTATION SYSTEM PLANS FOR THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA: 2000

Highway Plan Element	"Status Quo" Plan	Recommended Plan
Public Cost (millions)		
Capital		
Total	436.8	545.1
Average Annual	21.8	27.2
Operation and Maintenance		
Total	245.9	257.4
Average Annual	12.3	12.9
Total	682.7 34.1	802.5 40.1
Average Annual Public Revenues (millions)		
Inflation-Resistant Trend	71.1	71.1
Inflation-Impacted Trend	53.8	53.8
Economic Analysis[a]		
Incremental Capital Cost	$ 62,093,000	
Incremental Operation and Maintenance costs	8,906,000	
Total	$ 70,999,000	
Incremental User Benefits	$127,400,000	
Benefit/Cost Ratio	1.79	

[a]*Present worth analysis in 1980 dollars with a 6 percent interest rate.*

Source: SEWRPC.

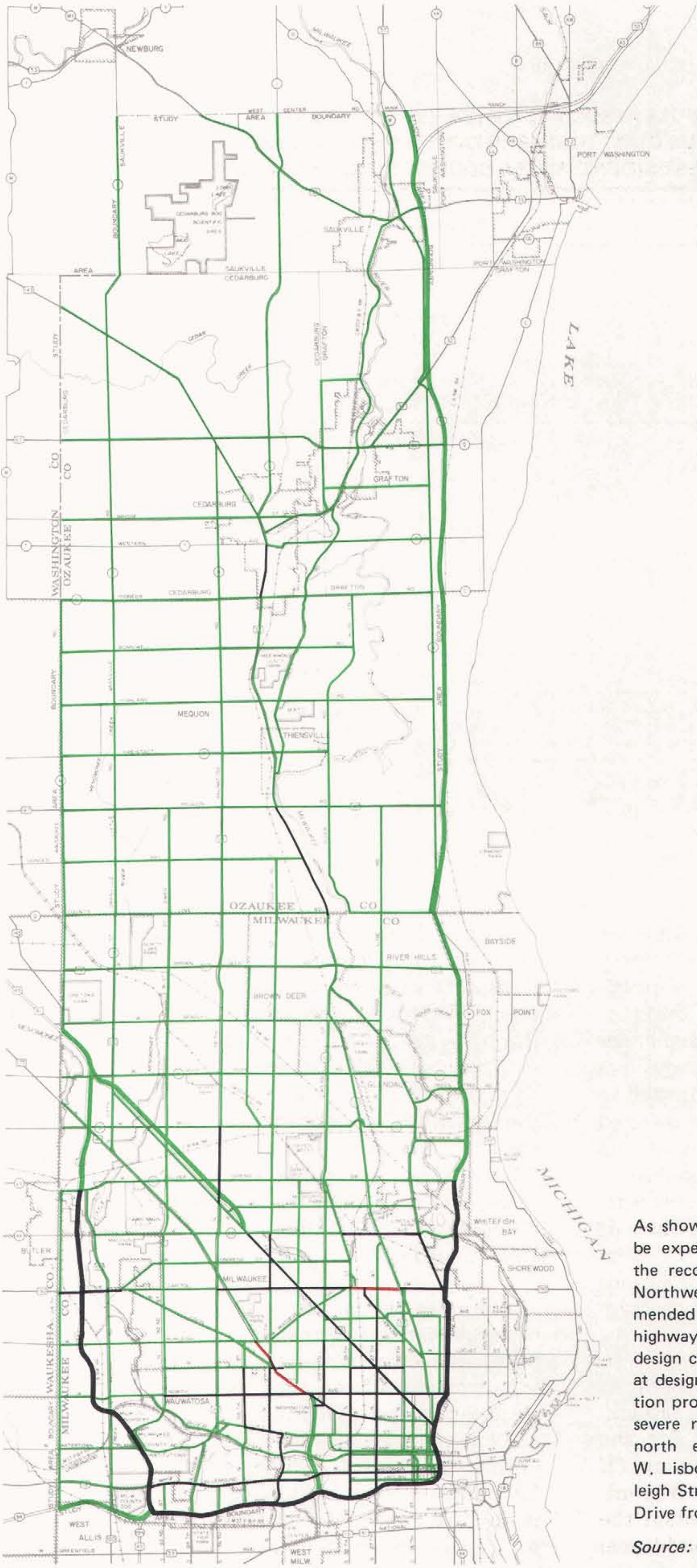
As shown in Table 261, motor fuel consumption within the study area under the preliminary recommended plan may be expected to approximate 86.8 million gallons per year in the year 2000, or about 0.4 million fewer gallons per year than would be consumed in the study area under the "status quo" plan. As also indicated in Table 261, under the preliminary recommended plan, about 45,475 tons of carbon monoxide and 4,815 tons of hydrocarbons may be expected to be emitted per year in the year 2000. This represents a 1,333-ton-per-year decrease in the amount of carbon monoxide emitted per year, and a 141-ton-per-year decrease in the amount of hydrocarbons emitted per year in the year 2000 in comparison to the "status quo" plan.

As indicated in Table 262, the total capital cost of carrying out the highway element of the preliminary recommended transportation plan for the study area was estimated to be $545.1 million. Of this total, about $427.0 million, or 78 percent, would be required to preserve and maintain the existing transportation system. An additional $118.1 million, or about 22 percent, would be required for projects which would improve the transportation system by providing additional capacity through street widening or relocation, or through street expansion; by improving transit service where such service is already provided; by the construction of new transit stations; and by the extension of new transit service into urban areas currently not served. It is estimated that 23 residential units and 63 nonresidential structures would need to be relocated if the highway element of the preliminary recommended plan were carried out.

The average annual public cost of carrying out the highway element of the preliminary recommended plan, including not only the construction and improvement of existing facilities and the construction of new facilities but also the operation and maintenance of the entire highway system, was estimated at $40.1 million, expressed in constant 1980 dollars, over the 25-year plan implementation period. It is anticipated that the average annual public cost for the highway system under the pre-

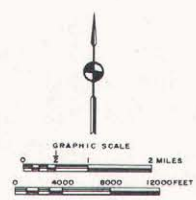
Map 240

TRAFFIC CONGESTION ON ARTERIAL STREETS AND HIGHWAYS WITHIN THE NORTHWEST SIDE STUDY AREA UNDER THE PRELIMINARY RECOMMENDED TRANSPORTATION SYSTEM PLAN: 2000



LEGEND

NONE	FREEWAY VOLUME OVER DESIGN CAPACITY
	STANDARD ARTERIAL VOLUME OVER DESIGN CAPACITY
	FREEWAY VOLUME AT DESIGN CAPACITY
	STANDARD ARTERIAL VOLUME AT DESIGN CAPACITY
	FREEWAY VOLUME UNDER DESIGN CAPACITY
	STANDARD ARTERIAL VOLUME UNDER DESIGN CAPACITY



As shown on this map, arterial street and highway congestion may be expected to be significantly reduced upon implementation of the recommended transportation system plan for the Milwaukee Northwest Side/Ozaukee County study area. Under the recommended plan, less than 1 percent of the total arterial street and highway system in the study area may be expected to operate over design capacity, and about 12 percent may be expected to operate at design capacity. The extent of the anticipated remaining congestion problems in the study area is reflected on this map. The more severe remaining traffic congestion problems would occur at the north end of the Stadium Freeway-North, particularly along W. Lisbon Avenue and W. Appleton Avenue as far north as W. Burleigh Street. A second problem area would extend along W. Capitol Drive from N. Teutonia to N. 35th Street.

Source: SEWRPC.

liminary recommended plan will be \$6.0 million, or about 18 percent more than under the "status quo" plan. The anticipated average annual public revenues, based on a projection of the historic trend of revenues from 1970 to 1976, total \$53.8 million, also expressed in constant 1980 dollars, indicating that the plan is financially attainable on an average annual basis.

Also indicated in Table 262 is the benefit-to-cost ratio of the highway element of the preliminary recommended long-range plan. This ratio represents a comparison of the direct benefits derived from the highway element of the transportation system, including reduction in the cost of travel time, of vehicle operation, and of accidents that are derived through improvements to the highway system; and the direct costs of such improvements, including the capital investments for the provision of the improvements and the cost to the public agencies to operate and maintain the physical facilities and transportation services. As shown in this table, the benefit-to-cost ratio of the highway element of the preliminary recommended plan compared with the "status quo" plan is 1.79.

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Chapter VIII

PLAN IMPLEMENTATION

INTRODUCTION

This chapter provides a guide for use in the implementation of the recommended short-range transportation system plan for the northwest corridor of the greater Milwaukee area, as described in Chapter V of this report, and the recommended long-range transportation system plan as described in Chapter VII and IX of this report. It outlines the actions which must be taken by the various levels and agencies of government concerned if the recommended plans are to be carried out. Specifically, those units and agencies of government which have plan adoption and implementation powers applicable to the major actions of the plan are identified; necessary or desirable formal plan adoption, endorsement, and acknowledgement actions are specified; and specific implementation actions are recommended for each of the units and agencies of government and private parties concerned with the plan.

The plan implementation recommendations contained in this chapter are based upon and related to the existing governmental structure and governmental programs, and are predicated upon existing enabling legislation. Because of the ever-present possibility of changes in state and federal legislation, case law decisions, governmental organization, and tax and fiscal policies, it is not possible to declare that transportation system plan implementation in the Milwaukee Northwest Side/Ozaukee County study area should proceed precisely as recommended in this chapter. Just as it will be necessary to update periodically the elements of the plan and the data and forecasts on which that plan is based, it will also be necessary to periodically update the implementation recommendations contained herein.

This chapter intentionally focuses on and identifies only those actions which should be taken to implement the transportation systems management actions and arterial street and highway improvement actions recommended in the northwest corridor plan. All other recommendations of the plan are included in other adopted regional plan elements, and the required implementation actions are identified in those plans. More specifically, the transit system improvement recommendations contained in the northwest corridor plan would be implemented through actions identified in SEWRPC Planning Report No. 33, A Primary Transit System Plan for the Milwaukee Area. The jurisdictional highway system realignment recommendations and, importantly, the land use recommendations of the plan would be implemented through actions identified in SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volume One, Inventory Findings, and Volume Two, Alternative and Recommended Plans.

Accordingly, adoption or endorsement of the northwest corridor transportation system plan is intended to constitute adoption or endorsement of only the recommended transportation systems management measures and arterial street and highway improvement actions recommended in the plan. These recommended measures and actions are intended to serve as a point of departure for the consideration of arterial street and highway operational improvements and development proposals as such proposals are advanced over time.

RECOMMENDED PLAN ADOPTION ACTIONS

The transportation system plan for the Milwaukee County/Ozaukee County northwest corridor as set forth in this report and, more specifically, its transportation systems management measures and arterial street and highway improvement actions, is intended to constitute an amendment to and refinement of the regional transportation system plan adopted by the Commission in accordance with Section 66.945(10) of the Wisconsin Statutes. Accordingly, the Commission, upon adoption of the northwest corridor transportation plan, will transmit a copy of the resolution adopting the plan, together with a copy of the report documenting the plan, to all local legislative bodies within the northwest corridor and to all of the local, state, and federal agencies which have the legal authority and financial capability to effectively implement the recommended highway element of the plans. The implementation of the plans is entirely dependent upon action by these local, state, and federal units of government and their agencies because the Regional Planning Commission is an entirely advisory planning agency.

Adoption, endorsement, or acknowledgement of the northwest corridor transportation system plan by the local legislative bodies and the appropriate local, state, and federal level agencies is highly desirable as the first step of implementation. Such adoption, endorsement, or acknowledgement is necessary to ensure a common understanding between the public and private sectors and between the several levels and units and agencies of government involved, so as to enable the programming of the necessary plan implementation work to proceed on a coordinated basis. Formal plan adoption may also be required to ensure eligibility for state and federal financial aid. It is important to understand that adoption of the recommended plan by any unit or agency of government pertains only to the statutory duties and functions of the adopting agency. Such adoption does not, and cannot, in any way preempt or commit action by another unit or agency of government acting within its own area of functional and geographical jurisdiction.

Upon adoption, endorsement, or acknowledgement of the plan by a unit or agency of government, it is recommended that the policy-making body of the unit or agency of government direct its staff to review in detail the elements of the plan. Once such review is completed, the staff can propose to the policy-making body for its consideration and approval the steps necessary to fully integrate the northwest corridor transportation plan elements into the plans and programs of the unit or agency of government.

In the remainder of this section, the local, state, and federal units and agencies of government which have the legal authority and financial capability to implement the highway element of the recommended plans are identified, and their recommended plan adoption or endorsement actions are specified.

Local Level Agencies

1. It is recommended that the County Boards of Supervisors of the Counties of Milwaukee and Ozaukee formally adopt the transportation systems management measures and arterial street and highway improvement actions of the northwest side study area transportation system plan by resolution as an amendment to the adopted regional transportation plan pursuant to Section 66.945(12) of the Wisconsin Statutes after review and recommendation by appropriate committees and commissions. Such appropriate committees and commissions for Milwaukee County include the Milwaukee County Transportation and Public Works Committee and the Milwaukee County Planning Commission, and for Ozaukee County, the Ozaukee County Highway Committee.

2. It is recommended that the planning commissions of the City of Milwaukee, the City of Mequon, the City of Wauwatosa, the Village of Brown Deer, and the Village of Grafton—all municipal units of government in the northwest corridor with recommended responsibilities for transportation systems management measures and arterial street and highway improvement actions under the plan—adopt the recommended plan as authorized by Section 66.956(12) of the Wisconsin Statutes as a guide to the development of their geographic and functional areas of jurisdiction, following review and recommendation by their respective staffs. The plans should be adopted by the local planning commissions as the transportation element of local master plans pursuant to Section 62.23(3)(b) of the Wisconsin Statutes.

3. While Wisconsin Statutes do not require adoption of local master plans by the municipal units of government, it is recommended that the City of Milwaukee, the City of Mequon, the City of Wauwatosa, the Village of Brown Deer, and the Village of Grafton adopt such local master plans as a matter of endorsing the local planning commission action.

State Level Agencies

1. It is recommended that the Wisconsin Department of Transportation, acting through its Secretary, endorse the northwest corridor transportation plan and integrate the plan element into its broad range of transportation planning and development responsibilities, as well as assist in coordinating plan implementation activities.

2. It is recommended that the Wisconsin Natural Resources Board acknowledge the plan as an amendment to, and refinement of, the regional transportation and regional air quality management plans for southeastern Wisconsin as those plans may impact upon and affect the State Implementation Plan for air quality.

Federal Level Agencies

1. It is recommended that the U. S. Department of Transportation, Urban Mass Transportation Administration, formally acknowledge the plan as an amendment to the regional transportation plan, and consider and give due weight to the plan recommendations in the administration and granting of federal aids for transportation system development and operations in the Region.

2. It is recommended that the U. S. Department of Transportation, Federal Highway Administration, formally acknowledge the plan as an amendment to the regional transportation plan, and consider and give due weight to the plan recommendations in the administration and granting of federal aids for highway-related construction and management in the Region.

3. It is recommended that the U. S. Environmental Protection Agency formally acknowledge the plan as an amendment to the regional transportation and air quality management plans, and consider and give due weight to the recommended plan in the exercise of its air quality management programs.

NORTHWEST CORRIDOR TRANSPORTATION PLAN IMPLEMENTATION

Beyond the plan adoption and endorsement actions listed in this chapter, there are specific plan implementation activities and responsibilities which must be undertaken by the units and agencies of government concerned if the highway elements of the northwest corridor transportation plan are all to be implemented. The following functional highway system major recommendations were made under the arterial street and highway element of the recommended northwest corridor transportation plan:

Freeways

- Widening of 2.5 miles of existing freeway;
- Preservation of 48.0 miles of existing freeway;
- Construction of freeway "stub end" treatments at the Hillside Interchange and at the terminus of the Stadium Freeway-North; and
- Construction of new freeway interchanges at IH 43 and Highland Road.

Standard Arterials

- Construction of 7.8 miles of new surface arterials;
- Widening of 34.5 miles of surface arterials;
- Preservation of 402.1 miles of surface arterials; and
- Implementation of traffic engineering improvements, including 50 turn lanes.

Several actions may be required for the implementation of these highway improvements by the appropriate governmental unit prior to the actual construction and reconstruction, as recommended, including preliminary engineering, detailed design and engineering, and right-of-way reservation and acquisition. The major highway improvements recommended under the plan and the responsible unit of government for the improvements are summarized in Table 263. Preliminary engineering would determine the best way in which to implement the recommended arterial street and highway system improvements, considering relevant technical, economic, and environmental factors. Preliminary engineering may require route location, investigation of alternative cross-sections, and preparation of an environmental impact statement. Detailed design and engineering would include the preparation of construction plans and specifications. Right-of-way acquisition may also be a necessary part of major arterial street and highway improvements. If it is, right-of-way reservation may be accomplished in advance of need utilizing statutory devices made available for this purpose, including official mapping, building setback line ordinances, and land subdivision control ordinances. Many of the highway improvement actions would not require additional right-of-way, as the

Table 263

RECOMMENDED HIGHWAY IMPROVEMENT AND EXPANSION ACTIONS UNDER THE NORTHWEST CORRIDOR TRANSPORTATION PLAN AND THE RECOMMENDED RESPONSIBLE UNIT OF GOVERNMENT

Roadway Type	Recommended Highway Improvement Action	Existing Jurisdiction	Proposed Jurisdiction
Freeway	Freeway Expansion		
	● Completion of Hillside Interchange	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	● Ramp addition at Stadium Freeway-North "stub end"	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	● Construction of freeway interchange at IH 43 and Highland Road	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	Freeway Widenings		
	● Widening of IH 43 from 4 lanes to 6 lanes through Hillside Interchange	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	● Widening of IH 43 from 4 lanes to 6 lanes from Henry Clay Street through W. Bender Road[c]	Wisconsin Department of Transportation	Wisconsin Department of Transportation
Standard Arterial[a,b]	Arterial Expansion		
	● Granville Road from Friestadt Road to Highland Road (new roadway with 2 travel lanes)	City of Mequon	Ozaukee County
	● River Road from Mequon Road (STH 167) to Friestadt Road (new roadway with 2 travel lanes)	--	City of Mequon
	● River Road from Highland Road to Bonniwell Road (new roadway with 2 travel lanes)	--	City of Mequon
	● 1st Avenue from Rose Street to Cedar Creek Road (new roadway with 2 travel lanes)	--	Village of Grafton
	● Extended N. 124th Street from STH 145 to W. Brown Deer Road (new roadway with 4 travel lanes)	--	Milwaukee County/ Waukesha County
	● New N. 68th Street from Industrial Road to W. Brown Deer Road (new roadway with 2 travel lanes)	--	City of Milwaukee
	● Extended N. 124th Street from W. Greenfield Avenue to W. Watertown Plank Road (new roadway with 4 travel lanes)	--	Milwaukee County/ Waukesha County
	● Falls Road from STH 57 to Port Washington Road (new roadway with 2 travel lanes)	--	Village of Grafton
	Arterial Widenings[a]		
	● Wauwatosa Road from W. County Line Road to STH 60 (from 2 travel lanes to 4 travel lanes)	Wisconsin Department of Transportation/ City of Mequon/ Ozaukee County	Wisconsin Department of Transportation
	● STH 60 from STH 143 to STH 57 northbound (from 2 travel lanes to 4 travel lanes)	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	● STH 167 from Wausaukee Road to IH 43 (from 2 travel lanes to 4 travel lanes from Wausaukee Road to Swan Road and from 2 travel lanes to 4 travel lanes from Swan Road to IH 43)	Wisconsin Department of Transportation	Wisconsin Department of Transportation

Table 263 (continued)

Roadway Type	Recommended Highway Improvement Action	Existing Jurisdiction	Proposed Jurisdiction
Standard Arterial (continued)	● W. Bradley Road from N. 124th Street to N. 91st Street (from 2 travel lanes to 4 travel lanes)	City of Milwaukee	City of Milwaukee
	● W. Good Hope Road from N. 124th Street to N. 115th Street (from 2 travel lanes to 4 travel lanes)	- -	Milwaukee County/ Wisconsin Department of Transportation
	● W. Good Hope Road from USH 45 to N. 107th Street (from 4 travel lanes to 6 travel lanes).	City of Milwaukee/ Wisconsin Department of Transportation	Milwaukee County
	● STH 145 from W. Fond du Lac Avenue to the Waukesha/Milwaukee County line (from 2 travel lanes to 4 travel lanes)	Wisconsin Department of Transportation	Wisconsin Department of Transportation
	● N. Boundary Road from W. Brown Deer Road to W. County Line Road (from 2 travel lanes to 4 travel lanes)	City of Milwaukee	Milwaukee County/ Waukesha County
	● N. 91st Street from W. Good Hope Road to W. Bradley Road (from 2 lanes to 4 travel lanes)	City of Milwaukee	City of Milwaukee
	● N. 43rd Street from W. Mill Road W. Bradley Road (from 2 travel lanes to 4 travel lanes)	Milwaukee County	City of Milwaukee/ Village of Brown Deer
	● N. Green Bay Avenue from W. Silver Spring Drive to W. Mill Road (from 2 travel lanes to 4 travel lanes).	Wisconsin Department of Transportation	Milwaukee County
	● N. 107th Street and related segments of W. Fond du Lac Avenue (from 2 travel lanes to 4 travel lanes on STH 145 and N. 107th Street between the ramps to and from the southeast-bound lanes of the Fond du Lac Freeway and the northwest-bound off-ramp from the Fond du Lac Freeway; from 2 travel lanes to 4 travel lanes north to W. Greenwood Terrace; and from 2 travel lanes to 4 travel lanes north to W. Brown Deer Road.	Wisconsin Department of Transportation/ City of Milwaukee	Wisconsin Department of Transportation/ City of Milwaukee
	● N. 76th Street from Harmonee Avenue to W. North Avenue (from 2 travel lanes to 4 travel lanes)	Wisconsin Department of Transportation	Milwaukee County
	● W. Fond du Lac Avenue from N. 19th Street to the Hillside Interchange (from 2 travel lanes to 6 travel lanes)[d]	Wisconsin Department of Transportation/ City of Milwaukee	Wisconsin Department of Transportation/ City of Milwaukee
	● N. 68th Street from IH 94 to W. Blue Mound Road (from 2 travel lanes to 4 travel lanes).	City of Milwaukee/ City of Wauwatosa	City of Milwaukee/ City of Wauwatosa
	● N. 124th Street from W. Watertown Plank Road to W. North Avenue (from 2 travel lanes to 4 travel lanes)	City of Wauwatosa/ City of Brookfield	Milwaukee County/ Waukesha County
	● N. 124th Streeet from W. North Avenue to W. Hampton Avenue (unimproved segments from 2 travel lanes to 4 travel lanes)	City of Wauwatosa/ City of Brookfield/ Village of Butler	Milwaukee County/ Waukesha County
	● N. 124th Street from W. Hampton Avenue to W. Silver Spring Drive (from 2 travel lanes to 4 travel lanes)	City of Milwaukee/ City of Menomonee Falls	Milwaukee County/ Waukesha County
	● STH 60 from STH 57 to IH 43 (from 2 travel lanes to 4 travel lanes)[e]	Wisconsin Department of Transportation/ Village of Grafton	Wisconsin Department of Transportation/ Village of Grafton

Table 263 (continued)

Type of Traffic Management Action	Number of Recommended Actions by Proposed Jurisdictional Agency			
	City of Milwaukee	Wisconsin Department of Transportation	Milwaukee County	City of Wauwatosa
● Traffic Signal Modifications or Additions	69	30	6	3
● On-Street Parking Prohibition or Pavement Markings on Intersection Approach	16	19	2	2
● Left-Turn-Lane Lengthening or Expansion	10	14	6	2
● Left-Turn-Lane Addition.	1	2	0	5
● Right-Turn-Lane Lengthening or Expansion	1	2	0	0
● Right-Turn-Lane Addition	0	3	1	3

[a] *Arterial widening projects listed do not include those roadway improvement projects to be undertaken during the design period which would constitute the conversion of an arterial segment from a rural to an urban cross-section. Under the study it is assumed that all arterial segments located within the Milwaukee urbanized area will be converted to an urban cross-section by the year 2000. Under such conversion, it is typically proposed to convert a 24-foot-wide rural roadway to a 48-foot-wide urban pavement, the latter with two traffic lanes and two parking lanes, curb and gutter, and sidewalks. In areas of fringe urban or suburban development, however, where urban development would only back onto arterials, a 24-foot-wide pavement with six-foot-wide shoulders may be used as a minimum urban cross-section.*

[b] *The selection of the roadway cross section with which each recommended improvement will be provided will be made by the affected units of government during the preliminary engineering phase of plan implementation.*

[c] *Due to state legislation enacted July 1, 1983, the final plan—unlike the preliminary recommended plan—does not recommend widening of the North-South Freeway (IH 43) from Bender Road to Mequon Road. This change is discussed in Chapter IX.*

[d] *As a result of the public hearings held on the preliminary plan and state legislation enacted July 1, 1983, the final plan recommends that no action be taken towards widening W. Fond du Lac Avenue from N. 19th Street to N. 35th Street. It is, however, recommended that the City of Milwaukee establish a set-back base line by official mapping to which all future redevelopment must adhere. This set-back base line should be established along the arterial between N. 19th Street and N. 35th Street. Preliminary study indicates that the set-back base line should be located along the south side of the street between N. 19th and N. 35th Streets and should be located 54 feet from the existing right-of-way line. The final location of the set-back base line, however, should be determined by the City after further study and public hearing.*

[e] *As a result of the public hearings held on the preliminary plan, the final plan—unlike the preliminary plan—recommends that STH 60 from STH 57 to IH 43 be widened to provide four, rather than two, lanes. This change is fully discussed in Chapter IX.*

Source: SEWRPC.

recommended widening could be achieved within the existing right-of-way. Therefore, it is suggested that all public actions taken within that right-of-way such as tree planting or replacement, street light installation or replacement, and sidewalk replacement be conducted in a manner consistent with the planned street pavement cross-section and not the existing cross-section.

SUMMARY

This chapter has described the adoption and endorsement actions essential to the implementation of the recommended transportation system plan for the Milwaukee County/Ozaukee County northwest corridor. In addition, the most important plan recommendations requiring implementation were identified, and the responsible agency and unit of government specified. Below is a summary of the plan adoption and plan implementation actions required to carry out the transportation systems management and arterial street and highway improvement actions of the plan.

Local Level

Milwaukee County: It is recommended that Milwaukee County:

1. Adopt the highway element of the recommended northwest corridor transportation

system plan following review and recommendation by its Transportation and Public Works Committee and County Planning Commission.

2. Take appropriate action to implement the major highway improvement recommendations for which it is recommended to assume responsibility, as set forth in Table 263.

Ozaukee County: It is recommended that Ozaukee County:

1. Adopt the highway element of the recommended northwest corridor transportation system plan, after review and recommendation by the County Highway Committee.

2. Take appropriate action to implement the major highway improvement recommendation for which it is recommended to assume responsibility, as set forth in Table 263.

Municipal Units of Government: It is recommended that:

1. The common councils and the plan commissions of the Cities of Mequon, Milwaukee, and Wauwatosa and the boards and plan commissions of the Villages of Brown Deer and Grafton adopt the highway element of the recommended northwest corridor transportation system plan.

2. The Cities of Mequon, Milwaukee, and Wauwatosa and the Village Boards of Brown Deer and Grafton take appropriate action to implement the major highway improvement recommendations for which they are recommended to assume responsibility, as set forth in Table 263.

State Level

Wisconsin Department of Transportation: It is recommended that the Wisconsin Department of Transportation:

1. Adopt and integrate the highway element of the recommended transportation system plan for the northwest corridor into the state long-range highway and transportation system plan as a functional guide to highway and transportation development within the Region.

2. Take appropriate action to implement the major highway improvements in the northwest corridor for which the Department is recommended to assume responsibility, as set forth in Table 263.

Wisconsin Department of Natural Resources: It is recommended that the Wisconsin Department of Natural Resources:

1. Acknowledge the recommended transportation system plan for the northwest corridor as an amendment to the regional transportation system plan.

2. Direct its staff to recognize the transportation system plan recommendations, as appropriate, in revisions to the state implementation plan for the attainment of the air quality standards.

Federal Level

U. S. Department of Transportation, Federal Highway Administration: It is recommended that the U. S. Department of Transportation, Federal Highway Administration, adopt the recommended transportation system plan for the northwest corridor and utilize the plan as a guide in the administration and granting of federal aids for highways.

U. S. Department of Transportation, Urban Mass Transportation Administration: It is recommended that the U. S. Department of Transportation, Urban Mass Transportation Administration, formally acknowledge the recommended northwest corridor transportation system plan as an amendment to the regional transportation system plan.

U. S. Environmental Protection Agency

It is recommended that the U. S. Environmental Protection Agency:

1. Formally acknowledge the recommended transportation plan for the northwest corridor as an amendment to the regional transportation system plan.

2. Utilize the plan recommendations, as appropriate, in matters dealing with review and oversight of the state implementation plan and the attainment and maintenance of air quality standards.

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Chapter IX

SUMMARY AND CONCLUSIONS

INTRODUCTION

In December 1977, the Southeastern Wisconsin Regional Planning Commission removed the Park Freeway-West and Stadium Freeway-North "gap closure" from the adopted regional transportation system plan. Recognizing that this action, in effect, left the area originally proposed to be served by these two freeways without an adequate transportation plan, the Commission concurrently resolved to undertake a study of the best way to meet the existing and probable future transportation needs of the area in the absence of the two freeways. The study was to be conducted in cooperation with the Wisconsin Department of Transportation (WisDOT), Ozaukee County, Milwaukee County, and the City of Milwaukee.

The Milwaukee Northwest Side/Ozaukee County transportation improvement study was to have two distinct but related purposes: 1) to identify the short- and long-range effects on the transportation system of the northwestern quadrant of the Milwaukee urbanized area of the absence of the once proposed freeways; and 2) to explore alternative means, including low-capital cost transportation systems management and higher capital cost surface street improvement and expansion options, of providing an adequate level of transportation service within acceptable limits of social, economic, and environmental impacts. The study area was defined to have the East-West Freeway (IH 94) as its southern boundary, the Milwaukee-Waukesha and Ozaukee-Washington County lines as its western boundary, Center Road in Ozaukee County as its northern boundary, and the North-South Freeway (IH 43) as its eastern boundary. The study area encompasses a total area of about 101 square miles, or 64,640 acres.

Work on the Milwaukee Northwest Side/Ozaukee County transportation improvement study began in June of 1979 and was essentially completed in November of 1982. The study was cooperatively funded by the Federal Highway and Urban Mass Transportation Administrations, the Wisconsin Department of Transportation, and the Southeastern Wisconsin Regional Planning Commission. Technical work on the study was performed by the Commission staff in cooperation with the staffs of the Wisconsin Department of Transportation, the City of Milwaukee, Milwaukee County, the City of Wauwatosa, and Ozaukee County.

To provide overall guidance to the study, the Commission established a 15-member advisory committee. Membership on this committee was broadly drawn to include elected and appointed public officials at the local, county, and state levels of government, as well as knowledgeable and concerned citizen members. The membership of the committee is listed on the inside front cover of this report.

This report presents the findings and recommendations of the approximately three-and-one-half-year study. The report presents the findings of the extensive inventories of the factors affecting the demand for, and supply of, transportation system capacity conducted under the study. These inventories provided definitive data on the demographic, economic, and public financial resource base, and on the land use pattern of the study area. The inventories also provided definitive data on the configuration, capacity, and use of the transportation system; and on the travel habits and patterns within the study area as of 1978, the base year of the study. Alternative short-range, low-capital cost, transportation systems management measures to abate the existing transportation system problems of the study area are presented and evaluated in this report, and a recommended set of such actions is identified. The report also presents forecasts of probable future population and economic activity levels, land use patterns, and attendant transportation demands which may be expected in the study area through the year 2000—the design year of the study. Alternative long-range transportation system plans to meet those demands are developed and evaluated, and a long-range plan for the abatement of the probable future transportation problems of the study area, in the absence of the previously proposed Park Freeway-West and Stadium Freeway-North facilities, is presented in the report.

TRANSPORTATION SYSTEM PLAN DEVELOPMENT OBJECTIVES

The first step in the development of both the short- and long-range transportation system plans for the study area was the identification of objectives that should be met by the transportation system. These objectives were to guide the conduct of the inventories and analyses, to provide the basis for defining existing and probable future transportation problems and deficiencies, to guide the development of alternative transportation system plans, to permit the quantitative test and evaluation of the alternative system plans, and to facilitate the selection of a recommended plan from among the alternatives considered.

The seven transportation systems management development objectives formulated by the Advisory Committee call for a balanced transportation system which promotes sound land use development, facilitates travel, increases travel safety, and is economical, while minimizing the disruption of neighborhood and community development. The seven objectives are supported by 41 standards which facilitate the quantitative evaluation of the ability of alternative plans to meet the specified objectives. The objectives and supporting principles and standards are set forth in Chapter II of this report.

The development of both short-range and long-range transportation system plans for the study area was a difficult task because some of the objectives were conflicting. Specifically, it was difficult to design a transportation system which provided travel convenience, safety, and economy without some unavoidable disruption of existing urban development.

INVENTORY FINDINGS

To provide the basic planning and engineering data necessary for the preparation and evaluation of alternative short-range transportation system plans for the study area, and to serve as a basis for the subsequent preparation and evaluation of alternative long-range plans, data were collated and collected on existing and historic trends in population and economic activity levels and characteristics; land use development; travel habits and patterns; and the configuration, capacity, and use of the existing transportation facilities and services. Some of the more important findings and conclusions resulting from the analyses of these data are:

1. The resident population of the study area has been declining since the mid-1960's. The resident population of the study area in 1960 totaled 517,300 people; in 1970 the population totaled 515,780, a decline of about 1,600 people, or 0.3 percent, from the 1960 level. In 1975 the population was estimated to total 499,200 people, a decline of about 16,600 people, or about 3 percent, from the 1970 level.[1] Over the same period the resident population of the Southeastern Wisconsin Region increased by over 13 percent—from 1,573,600 people in 1960 to 1,788,300 people in 1975.

2. While the resident population of the study area has been declining, the population of the outlying portions of the study area has been increasing. Between 1960 and 1970 the Ozaukee County portion of the study area experienced an increase of 10,300 people, or over 40 percent, in resident population—from 25,300 in 1960 to 35,600 in 1970; and from 1970 to 1975 the county population increased by 8,500 people, or over 23 percent—from 35,600 people in 1970 to 44,100 people in 1975.[2] One outlying part of the Milwaukee County portion of the study area has also experienced a steady increase in resident population—the former Town of Granville area in the extreme northwestern portion of Milwaukee County. Between 1960 and 1970 this area experienced an increase of 1,500 people in resident population, or nearly 29 percent—from 5,200 in 1960 to 6,700 in 1970; and from 1970 to 1975 this area increased by 8,600 people, or 128 percent—from 6,700 in 1970 to 15,300 in 1975. The Milwaukee County portion of the study area as a whole, how-

[1] *U. S. Census figures for 1980 show that the resident population of the Milwaukee Northwest Side/Ozaukee County study area in 1980 was 476,400 people, a decline of nearly 8 percent from the 1970 level.*

[2] *U. S. Census figures for 1980 show that the resident population of the Ozaukee County portion of the study area continued to increase to 46,200 people, an increase of 30 percent over the 1970 level.*

ever, experienced an 11,900-person decrease in resident population between 1960 and 1970—from 492,000 in 1960 to 480,100 in 1970, a 2 percent decrease; and a 25,100-person decrease in resident population from 1970 to 1975—from 480,100 in 1970 to 455,000 in 1975, a 5 percent decrease. Nevertheless, the Milwaukee County portion of the study area still represented over 90 percent of the total resident population of the study area in 1975.

3. The household characteristics of the population of the study area have also been changing and vary substantially between the Ozaukee County portion and the Milwaukee County portion of the study area. The number of total households has been increasing in the study area since 1970, and the average household size has been decreasing. There were 163,100 households in the study area in 1970. By 1975, the total number of households in the study area had increased by 6,400 households to 169,500, or by about 4 percent. In 1970, the average family size in the study area was 3.2 persons per household. By 1975, the average family size in the study area had decreased to 2.95 persons per household, or by about 8 percent. There were 153,500 households in the Milwaukee County portion of the study area in 1970, and the average family size was 3.07 persons per household. By 1975, the number of households had increased by 3,800 households to 157,300, or by 2.5 percent, and the average family size had decreased to 2.82 persons per household, or by about 8 percent. In the Ozaukee County portion of the study area in 1970, there were 9,600 households and the average family size was 3.69 persons per household. By 1975, the number of total households in the Ozaukee County portion of the study area had increased by 2,600 households, or by about 27 percent, to 12,200, and the average family size had decreased to 3.55 persons per household, or by about 4 percent.

4. Total family and per capita income have also been changing within the study area, and also vary substantially between the Ozaukee County and Milwaukee County portions of the study area. In 1970, per capita and family income in the study area were $3,430 and $11,000, respectively, in constant 1970 dollars. By 1975, per capita income in the study area had risen by only $70 in constant 1970 dollars, or by 2 percent, to $3,500; and family income had actually decreased in constant 1970 dollars by $700, or by about 6 percent, to $10,300. In the Milwaukee County portion of the study area in 1970, per capita and family income were $3,400 and $10,400, respectively. By 1975, per capita income in the Milwaukee County portion of the study area had risen by $40, or by 1 percent, in constant dollars to $3,440; and family income had decreased by $750, or by about 7 percent, in constant 1970 dollars to $9,650, reflecting smaller average family size in 1975. In the Ozaukee County portion of the study area in 1970, per capita income and family income were higher than in the Milwaukee County portion, or $4,220 and $15,600, respectively. By 1975, per capita income had increased by $330, or by about 8 percent, to $4,550 in constant dollars; and family income had increased by $500, or by about 4 percent, in constant 1970 dollars to $16,100.

5. Economic activity has increased steadily in Milwaukee and Ozaukee Counties since 1960. Between 1960 and 1970 total employment in Milwaukee County as a whole increased by 24,700 jobs, or by about 5 percent—from 486,200 jobs in 1960 to 510,900 jobs in 1970; and from 1970 to 1975 employment in the County increased by 4,800 jobs, or by about 1 percent—from 510,900 jobs in 1970 to 515,700 jobs in 1975. In Ozaukee County as a whole, total employment increased by 8,400 jobs, or by 88 percent, between 1960 and 1970—from 9,500 jobs in 1960 to 17,900 jobs in 1970; and by 2,300 jobs, or by 13 percent, from 1970 to 1975—from 17,900 jobs in 1970 to 20,200 jobs in 1975.

6. Since 1950, the pattern of urban development in the study area has changed from one of compact development, occurring in concentric rings of relatively high-density development contiguous to, and outward from, existing development, to a much more diffused pattern of development, with a proliferation of clusters of relatively low-density, noncontiguous urban development. This "urban sprawl" pattern of development has resulted in the rapid decline of urban population density within the study area.

7. Over 47 percent of the study area was devoted to urban uses in 1970. Nearly 80 percent of the Milwaukee County portion of the study area was in urban uses, while nearly 80 percent of the Ozaukee County portion was still in rural land uses. Of the urban land uses in the study area, residential use comprised the largest proportion, 22 percent of the total study area and 46 percent of the total urban land in the study area; followed by transportation uses, 15 percent and 32 percent, respectively. Commercial and industrial land uses comprised only 3 percent of the total study area lands and 6 percent of the total urban land uses in the study area.

8. Approximately 7.8 million vehicle miles of travel occurred over the arterial street and highway system of the study area on an average weekday in 1978, with over 89 percent of this utilization occurring in the Milwaukee County portion of the study area. Freeways, while comprising less than 12 percent of the arterial street and highway mileage of the study area in 1978, carried approximately 38 percent of the total arterial travel. Thus, within the study area on an average weekday in 1978, about 17,800 vehicle miles of travel occurred per mile of arterial street and highway; 60,400 vehicle miles occurred per mile of freeway; and 12,400 vehicle miles occurred per mile of standard arterial street and highway.

9. The increasing utilization of the arterial street and highway system of the study area has resulted in increasing traffic congestion. In 1972, 7 percent of the arterial street and highway facilities in the study area were operating over design capacity on an average weekday, and 13 percent were operating at design capacity. In the Milwaukee County portion of the study area 9 percent of the arterial street and highway system was operating over design capacity, and 17 percent was operating at design capacity. In the Ozaukee County portion of the study area about 2 percent of the facilities were operating over design capacity, and 5 percent were operating at design capacity. By 1978, approximately 13 percent of the total arterial street and highway system in the study area was operating over design capacity, and over 8 percent was operating at design capacity. Almost all of the arterial facilities operating over design capacity in 1978 were located in the Milwaukee County portion of the study area, with nearly 21 percent of the arterial system in that portion of the study area operating over design capacity. Maps 32 and 33 and Table 27 in Chapter III of this report show the location and extent of arterial street and highway congestion within the study area during the morning and evening peak hours on an average weekday in 1978.

10. Within the urbanized portion of the study area, three levels of transit service are provided: primary, secondary, and tertiary. Primary, or rapid, transit service is provided principally by the Milwaukee County Transit System. Four Freeway Flyer routes provide primary transit service in the study area. Seven park-ride lots serve these Freeway Flyer routes. One express bus route is operated within the extreme southeastern portion of the study area. Tertiary, or local, transit service is provided only within the Milwaukee County portion of the study area over 31 routes. Almost 4,300 vehicle trips were made in the study area on an average weekday in 1978 on the transit system of the study area.

11. The vast majority of travel made within the study area on an average weekday is made by automobile. According to the last origin-destination study conducted by the Commission in 1972, about 745,400 trips, or about 64 percent of the 1,156,700 person trips made within the study area on an average weekday, were made by automobile drivers, and about 311,400 trips, or about 27 percent of all trips, were made by auto passengers. About 72,100 trips, or about 6 percent of all trips, were made by public transit passengers, and about 27,700 trips, or about 3 percent of all trips, were made by school bus passengers. This dominance of automobile travel has not changed since 1972.

IDENTIFICATION OF EXISTING PROBLEMS AND DEFICIENCIES ON THE TRANSPORTATION SYSTEM OF THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA

Existing transportation problems in the study area were identified by evaluating the performance of the existing transportation system against the seven transportation systems management and development objectives and supporting standards. Arterial street and highway reaches exhibiting existing problems were identified on the basis of such symptoms as: operation over design capacity during either the morning or evening peak hour or both; substandard operating speeds—that is, operating speeds below 25 miles per hour (mph) on divided facilities, and below 20 mph on undivided facilities; and the presence of high accident locations—that is, intersections experiencing 10 or more accidents per year.

A total of 20 such problem arterial street and highway reaches in the study area were identified. Eighteen of the 20 problem reaches were located within Milwaukee County, and two were located within Ozaukee County. The problem reaches are shown on Map 99 on page 164 of Chapter IV of this report.

The public transit routes within the study area were not found to individually exhibit a combination of problems such as substandard speeds, poor frequency of service, and excessive load factors. Rather, existing public transit system problems in the study area were identified in terms of a lack of certain types of transit service in some parts of the study area. Within the central part of the southeastern portion of the study area only local transit service which operates at relatively slow speeds is provided. In the outlying portion of the transit service area, there are inadequacies in the provision of all three types of transit service: Freeway Flyer, express, and local. The transit service problem areas are shown on Map 100 on page 165 of Chapter IV of this report.

THE RECOMMENDED SHORT-RANGE TRANSPORTATION SYSTEM PLAN

To address the existing problems of the arterial street and highway and public transit systems, a short-range transportation system plan was developed for the study area. This short-range plan was designed to provide for the alleviation of traffic congestion and related traffic problems on the identified 20 problem reaches, involving 210 intersections, of the arterial street and highway system. The plan was also designed to address the identified public transit service problems of the study area. Finally, the short-range plan was also designed to provide recommendations for the completion of the freeway "stub ends" at the Stadium Freeway-North and at the Hillside Interchange.

Arterial Street and Highway System Problem Analysis

A traffic engineering analysis was performed for each of the 210 controlled intersections located along the 20 problem arterial street and highway segments. Sixty-three of the 210 controlled intersections were found to exhibit congestion problems of sufficient severity to warrant improvement; while another 21 intersections were found to exhibit sufficient inadequate turn-lane storage capacity and/or an inefficient traffic signal timing plan to also warrant improvement. The least costly and disruptive actions to abate the problems at each of the 84 problem intersections were identified and recommended for implementation.

A total of 209 traffic management actions, with an estimated capital cost of between $1,637,000 and $1,972,000 in 1980 dollars, are recommended for implementation at the 84 problem intersections along the 20 problem segments of the arterial street and highway system. This cost is expressed as a range because precise right-of-way needs and costs for five recommended actions cannot be determined in the absence of more detailed preliminary engineering studies. The recommended actions include the addition of traffic signals or the modification of the operation of existing traffic signals at 70 intersections; the prohibition of on-street parking and/or installation of pavement markings at 39 intersection approaches; the lengthening or widening of 32 left-turn lanes; the installation of 8 new left-turn lanes; the lengthening or widening of 3 right-turn lanes; and the installation of 7 new right-turn lanes. A detailed summary of these actions is given on page 552 of Chapter V of this report. The implementation of these 209 recommended actions is expected to be sufficient to abate the existing congestion-related or noncongestion-related traffic problems at all but three problem intersections each during both the morning and evening peak traffic hours.

Traffic management actions were also evaluated and recommended to abate the midblock congestion and accident problems along N. 76th Street, the arterial street in the study area identified as having the most severe midblock traffic problems. These midblock problems occur between signalized intersections at median openings along divided portions of the arterial, at locations of high-volume driveways and high on-street parking turnover, at pedestrian crossings, and at certain nonsignalized local street intersections. The analysis of midblock problems on N. 76th Street concluded that safety and operational problems exist at median openings and at five nonsignalized intersections along N. 76th Street, and recommended the provision of exclusive left-turn lanes and the prohibition of on-street parking to abate these problems. Tables 160 and 161 on pages 474 and 475 of Chapter V of this report summarize midblock problems and problem abatement actions along N. 76th Street.

Alternative and Recommended Completion Plans for the Hillside Interchange and the Stadium Freeway-North "Stub Ends"

The short-range improvement plan for the arterial street and highway system of the study area also included the evaluation of alternative designs and the recommendation of the best design for integration of the "stub ends" of the Park Freeway-West and Park Freeway spur of the uncompleted Hillside Interchange, and of the "stub ends" of the Stadium Freeway-North (USH 41), into the arterial street system of the study area.

Alternative and Recommended Completion Plans for the Hillside Interchange "Stub End": Five alternative plans, in addition to a "do nothing" alternative plan, for the integration of the Hillside Interchange "stub ends" into the surface arterial street system were prepared by the staff of the Wisconsin Department of Transportation and evaluated by the Advisory Committee. On January 30, 1980, the Advisory Committee adopted one of these five alternatives and recommended its implementation, and the Wisconsin Department of Transportation immediately began the necessary preliminary engineering for this project. The recommended alternative provides freeway on-ramps from the intersection of W. Fond du Lac Avenue and W. Walnut Street to the southbound lanes of the North-South Freeway and the eastbound lanes of the Park Freeway-East; and freeway off-ramps from the northbound lanes of the North-South Freeway and the westbound lanes of the Park Freeway-East to this arterial intersection, as shown in Figure 70 on page 490 of Chapter V of this report. This alternative has an estimated capital cost of $3,520,000 in 1980 dollars, meets desirable design standards, and requires no new right-of-way.

Alternative and Recommended Completion Plans for the Hillside Interchange Northern Spur: Nine alternative plans, including a "status quo" or "do nothing" alternative, for the integration of the Hillside Interchange northern spur "stub end" into the surface arterial street system were prepared by the staff of the Wisconsin Department of Transportation and evaluated by the Advisory Committee. On February 27, 1981, the Advisory Committee adopted a plan design whereby each of the ramp bridges at the Hillside Interchange northern spur, and each of the ramps leading to these bridges, would be removed. This design is shown in Figure 80 on page 498 of Chapter V of this report. As recommended in the adopted regional transportation system plan, the "stub end" design provided for the widening of the North-South Freeway (IH 43) through the area of the Hillside Interchange to provide for three continuous lanes in each direction of traffic flow. Map 237 on page 803 of Chapter VII of this report shows the extent of widening of IH 43 through the area of the Hillside Interchange.

The total cost of the improvements to IH 43, as well as the ramp removals at the Hillside Interchange northern spur, and of the completion of the Hillside Interchange proper was estimated to be $6.1 million, expressed in 1980 dollars.[3]

Alternative and Recommended Completion Plans for the Stadium Freeway-North Interchange: Ten alternative plans were designed under the study for the connection of the Stadium Freeway-North "stub end" to the surface arterial street system, in addition to a "do nothing" alternative. The first six of these plans were prepared by the Wisconsin Department of Transportation and the last four were prepared by the City of Milwaukee. The principal concerns in the design of these alternatives were the better integration of the Stadium Freeway-North "stub end" into the surface arterial street system, and the alleviation of traffic congestion at the intersection of W. Lisbon Avenue and W. North Avenue.

Of the 10 plans developed for this "stub end" connection, six were specifically designed to provide for "stub end" integration and congestion abatement. These six plans, those developed by the Wisconsin Department of Transportation, accomplished this by providing ramp connections to and

[3] *Reconstruction of the Hillside Interchange northern spur according to the recommended plan design, as well as the widening of the segment of IH 43 through the area of the Hillside Interchange, began in July 1982, and was completed in November 1982.*

from the freeway which would enable traffic associated with the freeway to completely bypass the intersection of W. Lisbon Avenue and W. North Avenue. Under each of these six alternatives, the construction of the new on- and off-ramps would require the acquisition of additional right-of-way and the displacement of several residential or commercial units. Two of these six alternatives featured ramps which would be located in a tunnel under the intersection of W. Lisbon Avenue and W. North Avenue. Of the four alternatives developed by the City of Milwaukee, three involved minor reconstruction and widening of the intersection of W. Lisbon Avenue and W. North Avenue. Each of the four alternatives proposed the construction of a new freeway on-ramp to the southbound lanes of the Stadium Freeway-North from W. Lisbon Avenue between N. 47th Street and N. 46th Street. None of the four alternatives could be expected to fully abate the congestion at the intersection of W. Lisbon Avenue and W. North Avenue.

Of the 10 alternatives considered, the six designed by the Wisconsin Department of Transportation, while the most effective in abating the traffic congestion associated with the Stadium Freeway-North "stub end," were also the most costly and disruptive. The estimated costs of these six alternatives ranged from $2.6 million to $13.3 million. The four alternatives designed by the City of Milwaukee, while being limited in their ability to abate traffic congestion in the area, involved little or no disruption and ranged in capital cost from $483,000 to $1.6 million, expressed in 1980 dollars.

The Advisory Committee recommended that the least costly of the 10 alternative plans—the alternative designed by the City of Milwaukee which would involve only the construction of a new freeway on-ramp—be adopted. No additional right-of-way would be required under this alternative. The total cost of this alternative was estimated at $483,000, expressed in 1980 dollars.

Recommended Short-Range Plan for Public Transit

A short-range plan for the public transit system of the study area was also developed under the study. This plan was prepared by the Milwaukee County Transit System as part of its transit system improvement study for the entire County. The plan for the study area was designed to address the identified existing problems of a lack of Freeway Flyer and express transit service.

Under the recommended short-range plan for public transit, an additional 102 route miles of transit service would be provided within the study area by 1985, including about 20 additional route miles of local service, about 15 additional route miles of express service, and about 67 additional route miles of Freeway Flyer service. Two additional Freeway Flyer park-ride lots would be constructed within the study area under this plan, and would be provided with Freeway Flyer service. The frequency of bus service on the study area transit system would be upgraded on four routes during peak travel periods, and on 16 routes during off-peak periods.

With these improvements, nearly twice as many residents of the study area and over twice as many jobs in the study area would be within walking distance of express transit service, and about 70 percent more residents and about 25 percent more jobs would be within walking distance of Freeway Flyer service. Also, one additional shopping center and two additional hospitals would be within walking distance of primary or express transit service, as would nearly three times as much high-density residential development. Transit travel times, particularly in some of the more outlying portions of the study area, would become more competitive with automobile travel times. Transit ridership in the study area would be expected to increase over 40 percent, resulting in between 32,100 and 41,800 fewer automobile trips per average weekday through the study area, and a savings of between 4,700 and 6,100 gallons of motor fuel per average weekday.

The total operation and maintenance subsidy of the recommended short-range transit plan in the study area over the five-year period from 1980 to 1985 would be about $85 million, or about $25 million more than the cost of maintaining the existing system, expressed in 1980 dollars. The public subsidy per ride would be about the same, however, because of the increase in ridership under the plan. The principal capital cost attendant to the recommended plan in the study area would be for the acquisition of 21 new buses per year at a cost of $15 million, expressed in 1980 dollars, over the five-year implementation period.

In summary, under the short-range plan for the transportation system of the study area, several actions are recommended to abate problems which have been identified on both the arterial street and highway system and public transit system of the study area. A total of 209 traffic management actions to abate traffic problems at 84 problem intersections are recommended under the plan at a cost of between $1,637,000 and $1,972,000 in 1980 dollars. These actions would be successful in abating congestion-related and noncongestion-related traffic problems on all but three problem intersections each during both the morning and evening peak traffic hours. Actions are also recommended for the freeway "stub ends" which exist at the Hillside and Stadium Freeway-North Interchanges within the study area. At the Hillside Interchange proper, ramp construction is recommended to integrate the Park Freeway-East and the North-South Freeway with the existing surface arterial street system. At the Hillside Interchange northern spur, removal of the existing ramps and ramp bridges is recommended. In addition, it is recommended that the North-South Freeway be widened through this area to provide for three continuous through traffic lanes in each direction. The total capital cost of the actions at the Hillside Interchange is estimated to be $6.1 million in 1980 dollars. At the Stadium Freeway-North "stub end," only a new on-ramp to the southbound lanes of the freeway is recommended, at an estimated cost of $483,000 in 1980 dollars. To abate the identified problems on the public transit system of the study area, it is recommended under the short-range plan that 20 miles of additional local service, 15 additional miles of express service, and 67 miles of additional Freeway Flyer service be provided, in addition to two new Freeway Flyer park-ride lots. These improvements, achievable at a cost of about $85 million over the five-year 1980 to 1985 period, would be expected to abate the existing problems on the transit system of the study area.

ANTICIPATED GROWTH AND CHANGE WITHIN THE MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY STUDY AREA

The second purpose of the Milwaukee Northwest Side/Ozaukee County transportation improvement study was to prepare a long-range transportation system plan for the study area. A necessary step in the preparation of the long-range plan was the consideration of probable future conditions in the study area determining the need for transportation facilities and services. Accordingly, future population and economic activity levels and attendant relevant characteristics were postulated based upon Commission forecasts for the year 2000 and the adopted regional land use plan. The population and economic activity level forecasts anticipate modest population and employment growth within the seven-county Region as a whole. The land use plan envisions a reversal of the decentralization of land use development which has occurred within the Region since the 1950's. Under the adopted regional land use plan, the population loss being experienced by Milwaukee County would be reversed and the County population level would return to its historic peak level reached in 1970. Most of the forecast population increment would, however, occur in the Region's outlying counties, including Ozaukee County. This increase in resident population would be accommodated by new urban development at medium densities located adjacent to existing urban centers, and not at suburban densities in scattered enclaves of development.

Population

The resident population of the study area was postulated to approximate 528,700 people by the year 2000, an increase of about 29,500 people, or 6 percent, over the 1975 resident population of 499,200 people. By the year 2000, the population of the Milwaukee County portion of the study area was postulated to approximate 445,900 people—a loss of 9,100 people, or 2 percent, from its 1975 population level of 455,000 people. The population of the Ozaukee County portion of the study area in the year 2000 was postulated to be 82,800 people—an increase of about 38,700 people, or about 88 percent, over its 1975 population of 44,100. Population increases are also expected to occur in the northern one-third of the Milwaukee County portion of the study area. Within the Milwaukee County portion of the study area as a whole, a loss of population is anticipated to occur until about 1985, at which time a reversal, or population increase, is anticipated to the year 2000.[4] This reversal would be attendant to the planned reversal of the decentralization of urban land use development called for under the adopted regional land use plan. Although the population of the Milwaukee County portion of the study area is anticipated to decrease about 2 percent between 1975 and 2000, this portion of the study area may still be expected to comprise over 84 percent of the total population of the study area in the year 2000.

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[4] *Planned year 2000 population levels in the study area would represent a 31,600-person, or 6 percent, increase over 1980 population levels in the study area, based on 1980 census data.*

Because of the continued decreases in household size anticipated to occur in the study area to the year 2000, the number of households in the study area is anticipated to increase faster than is population. The study area overall is expected to increase by 23,800 households, or 14 percent—from 169,500 households in 1975 to 193,300 in 2000. The Milwaukee County portion of the study area is anticipated to increase by 12,200 households, or nearly 8 percent—from 157,300 households in 1975 to 169,500 households in 2000. The Ozaukee County portion of the study area is anticipated to increase by about 11,600 households, or over 95 percent—from 12,200 households in 1975 to 23,800 households in 2000.

Employment

Employment in the study area in the year 2000 is anticipated to be 252,100 jobs, or an increase of 52,800 jobs, or 26 percent, over the 1975 employment level of 199,300 jobs. Employment in the Milwaukee County portion of the study area in the year 2000 is anticipated to be 225,800 jobs—an increase of 37,400 jobs, or nearly 20 percent, over the 1975 employment level of 188,400. Employment in the Ozaukee County portion of the study area in the year 2000 is anticipated to be 26,300—an increase of 15,400 jobs, or about 141 percent, over the 1975 employment level of 10,900. Although employment growth in the Ozaukee County study area portion is anticipated to be significantly greater than in the Milwaukee County portion, employment in the Milwaukee County portion may nevertheless be expected to represent nearly 90 percent of the total employment in the study area in the year 2000.

Land Use

The adopted year 2000 regional land use plan calls for the conversion of about 9,800 acres of rural land in the study area to urban use between 1970 and the year 2000. Most of this new urban development is proposed to occur in a centralized manner, largely in concentric rings outward from the existing urban centers including, importantly, the northwestern corner of existing urban development in the City of Milwaukee and areas in and around the Villages of Thiensville and Grafton, and the City of Cedarburg. Over one-half of this new urban land is proposed to be converted for residential use, virtually all at medium densities. The increase in urban land use in the study area to the year 2000 is designed to accommodate the postulated increases in study area population, households, and employment.

THE RECOMMENDED LONG-RANGE TRANSPORTATION SYSTEM PLAN

The growth and change anticipated to occur within the study area may be expected to generate demands for additional travel and for improved transportation facilities and services. The long-range plan for the study area is intended to address the best means of accommodating this future demand—through either the implementation of transportation systems management actions, the improvement and expansion of public transit facilities and services, the improvement and expansion of the surface arterial street system of the study area, or a combination of such measures.

The first step in the development of the long-range transportation system plan for the study area was the identification of the transportation system problems and deficiencies which could be expected to exist under a "status quo" alternative—that is, an alternative which would entail no further major capital investment in transportation system improvements of any kind over the next 20 years in the study area. The principal deficiency of such a plan is substantially increased congestion on the arterial street system of the study area, and its attendant implications for user costs, air pollutant emissions, and motor fuel consumption. Under a "status quo" plan, the number of miles of arterials operating over design capacity was projected to increase from about 57 miles in 1978, or 13 percent of the study area arterial system, to 101 miles in the year 2000, or 23 percent of the study area arterial system, and the number of miles operating at design capacity was projected to increase from about 35 miles, or 8 percent of the study area arterials, in 1978, to about 48 miles in the year 2000, or 11 percent of the study area arterials.

In an attempt to abate this anticipated increase in traffic congestion with a minimum of disruption of existing development, and at minimum public cost, an alternative long-range plan was developed which would include the intensive, areawide application of traffic management measures such as those evaluated and recommended for the problem arterial street segments under the short-range plan, and substantial public transit improvement and expansion measures—specifically, those measures recommended to be implemented in the study area under the Commission-adopted, long-range, primary transit system plan for the greater Milwaukee area. Consideration of such a plan of extensive traffic management and public transit improvement was intended to ensure that such measures would be fully utilized prior to consideration of potentially more disruptive, and possibly more capital-intensive, arterial street improvements. Under this alternative, 57 miles of arterials were projected to operate over design capacity by the year 2000, a decrease of about 44 miles from the total under the "status quo" plan, but a decrease of only one mile from existing conditions. About 75 miles of arterials were projected to operate at design capacity, an increase of 26 miles, or 56 percent, over the total under the "status quo" plan, and an increase of 38 miles, or about 100 percent, over existing conditions.

The third and final alternative long-range plan considered major arterial street and highway improvements in addition to the actions included in the second plan, as required to resolve the remaining identified arterial system capacity deficiencies. Under this plan, individual arterial street and highway improvements were designed and evaluated for each identified over-design-capacity arterial segment in the study area. Certain arterial improvements, although found to resolve existing and probable future traffic congestion, were not recommended by the Advisory Committee because of the disruption of existing development that the improvements would entail. Such improvements included, importantly, the improvement of W. Lisbon Avenue and W. Appleton Avenue, and improvements at the Stadium Freeway-North "stub end."

This third alternative long-range plan was selected as the preliminary recommended design year 2000 transportation system plan for the study area to be taken to public hearing. The preliminary recommended plan for the study area consists of two major components: one dealing with arterial streets and highways and one dealing with public transit facilities and service.

Arterial Streets and Highways

Standard Surface Arterial Street System: Under the preliminary recommended long-range transportation system plan for the study area, the arterial street and highway system would consist of about 452 miles of facilities, an increase of about 11 miles of arterial facilities over the 1980 level. Table 264 summarizes by arterial facility type the miles of improvements proposed for the arterial street and highway system of the study area under the preliminary recommended transportation system plan. As shown in Table 264, the improvements may be categorized as system preservation, system improvement, and system expansion efforts. System preservation includes all arterial improvement projects required to maintain the structural adequacy and serviceability of the existing arterial system without significantly increasing the capacity of that system. This includes all projects classified as resurfacing and reconstruction for the same capacity—that is, without significant widening. System improvement includes all projects which would significantly increase the capacity of the existing system through street widening or relocation. System expansion includes all projects which would significantly increase the capacity of the existing system through the construction of new facilities.

All tables and all discussion in this chapter relating to the preliminary recommended plan include the improvement to six lanes of the segment of W. Fond du Lac Avenue from the Hillside Interchange to N. 35th Street. The Advisory Committee chose to make no recommendation for this segment of W. Fond du Lac Avenue prior to public hearing and, rather, proposed three alternatives. Two of the alternatives called for improving this segment of W. Fond du Lac Avenue from its present two traffic lanes and two parking lanes to three traffic lanes in each direction. One improvement alternative would widen this segment of W. Fond du Lac Avenue for its entire length. The other improvement alternative would carry the six-lane improved highway around the business district at W. Fond du Lac Avenue and W. North Avenue by way of a one-way pair routing. Either of these alternatives would have accomplished the staff-recommended improvement. The third alternative taken to public hearing called for improving this W. Fond du Lac Avenue segment only from the Hillside Interchange to approximately N. 23rd Street; thus, from N. 23rd Street to N. 35th Street a bottleneck would remain. Under this alternative, W. Fond du Lac Avenue from the Hillside Interchange to W. Garfield Avenue would be widened to six lanes along available right-of-way. The one-way pair around the business district would be constructed then to approximately N. 23rd Street to provide six traffic lanes. From N. 23rd Street to N. 35th Street, parking would be prohibited to provide two lanes in each direction.

As indicated in Table 264, under the preliminary recommended plan, about 400 miles of the total proposed system of 452 miles would fall into the system preservation category, representing about

Table 264

ARTERIAL STREET AND HIGHWAY SYSTEM PRESERVATION, IMPROVEMENT, AND EXPANSION BY ARTERIAL FACILITY TYPE WITHIN THE MILWAUKEE NORTHWEST SIDE AND SOUTHERN OZAUKEE COUNTY STUDY AREA: YEAR 2000 PRELIMINARY RECOMMENDED TRANSPORTATION SYSTEM PLAN

Arterial Facility Type	System Preservation		System Improvement		System Expansion		Total (miles)
	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total	
Milwaukee County							
Freeway	28.5	81.0	6.7	19.0	- -	- -	35.2
Standard Surface Arterial	225.7	91.4	16.9	6.8	4.4	1.8	247.0
Subtotal	254.2	90.1	23.6	8.4	4.4	1.5	282.2
Ozaukee County							
Freeway	13.3	86.9	2.0	13.1	- -	- -	15.3
Standard Surface Arterial	132.4	85.5	19.1	12.3	3.4	2.2	154.9
Subtotal	145.7	85.6	21.1	12.4	3.4	2.0	170.2
Total Study Area							
Freeway	41.8	82.8	8.7	11.2	- -	- -	50.5
Standard Surface Arterial	358.1	89.1	36.0	8.9	7.8	2.0	401.9
Total	399.9	88.4	44.7	9.9	7.8	1.7	452.4

Source: SEWRPC.

88 percent of the total arterial system. The traffic-carrying capacity of approximately 40 of these 400 miles would be increased through parking prohibition. About 45 miles, or about 10 percent of the total proposed arterial system, would fall into the system improvement category. The remaining eight miles, or about 2 percent of the total proposed system, would fall into the system expansion category in which the construction of new facilities is required.

Twenty-three specific improvement, or street widening, projects, and eight expansion, or new facility construction, projects are proposed for the study area under the preliminary recommended long-range plan. Each of these projects is listed in Table 259 on page 800 of Chapter VII of this report, and the locations of these projects are shown on Map 236 on page 798 of Chapter VII. In addition, it is recommended that low-cost traffic engineering projects, similar to those recommended under the short-range plan for the arterial street and highway system of the study area, be pursued at each arterial intersection in the study area by the year 2000, in order to provide an average capacity increase of about 10 percent at each of these intersections. Such an areawide pursuit of such traffic engineering improvements over the design period was considered essential to the alleviation of traffic congestion under the preliminary recommended plan.

Freeway System: Two improvements were proposed for the freeway system of the study area under the preliminary recommended plan. The first was the addition of a new freeway interchange at IH 43 and Highland Road in the City of Mequon, and the second was the widening of IH 43 from two to three lanes either between Henry Clay Street and STH 167 in the City of Mequon, or between Henry Clay Street and W. Good Hope Road. Each of these improvements was as recommended in the adopted regional transportation system plan. In addition, two major improvements to the freeway system are recommended under the short-range plan which have long-range implications: the completion of the Hillside Interchange and the widening of IH 43 through the Hillside Interchange, the latter as also recommended in the adopted regional plan. A freeway improvement recommended under the short-range plan which would have very minor long-range implications is the construction of a new freeway on-ramp from W. Lisbon Avenue to the southbound lanes of the Stadium Freeway-North to replace the current use of an existing arterial street for an on-ramp.

Public Transit Facilities and Service

The public transit system for the study area under the preliminary recommended transportation plan was defined to include the rapid, or primary, the express, or secondary, and the local, or tertiary, service as proposed to be provided in the study area under the newly adopted, long-range, primary transit system plan for the year 2000. This plan, which is shown on Map 227 on page 652 in Chapter VII of this report, is more fully documented in SEWRPC Planning Report No. 33, A Primary Transit System Plan for the Milwaukee Area, and supporting reports. Specific details of this plan as it pertains to the study area can be obtained from these reports. The principal characteristics of this plan which pertain to the study area are summarized below.

Under the preliminary recommended plan, transit service would be extended to those parts of the study area expected to be developed at urban densities over the plan design period. The number of route miles operated in the study area would be increased from the 455 miles operated in 1980 to 868 miles. Transit vehicle miles operated would increase 20 percent, from 37,500 to 45,100; and the number of transit vehicles required during peak hours of service would increase 23 percent, from 329 to 404, based on morning peak-hour requirements.

The rapid, or primary, transit service under the preliminary recommended plan would be provided by a light rail transit line and 14 routes of motor buses operating in mixed traffic on freeways and over connecting surface arterials. The freeways would be operationally controlled by a ramp-metering system to permit the provision of a high level of transit service over the freeway system. The recommended light rail transit line would operate almost entirely at-grade over a transit mall, street medians, and existing railway right-of-way. Stops would be provided at distances of one-eighth, one-fourth, one-half, one, and one and one-half miles, depending on the density of adjacent development. Although the final alignment of the light rail line was not determined in the system planning effort, three candidate alternative alignments were proposed in the planning effort and are shown on Map 228 on page 654 in Chapter VII. Under the plan, primary transit service would also be provided in the study area over 14 bus-on-freeway routes, totaling 324 route miles and serving 14 stations. This planned service represents an increase of nine routes, totaling 256 round-trip route miles, and six stations over the service provided in 1980.

The express, or secondary, level of transit service under the preliminary recommended plan would consist of express bus routes operated over surface arterial streets, with stops generally limited to intersecting transit routes. A total of seven express routes would be provided, totaling 80 route miles and operating over 41 miles of surface arterials in the study area. In 1980, only one express route was operated in the study area—over four miles of surface arterials—and no exclusive lanes for such service were provided in the study area. In 1982, an additional express route was operated from N. 60th Street and W. Fond du Lac Avenue to N. 12th Street and W. Wisconsin Avenue.

The tertiary level of transit service under the preliminary recommended plan would consist of local transit service provided over arterial and collector streets with frequent stops for passenger boarding and alighting. Under the plan, extensive additions to the tertiary, or local, transit service routes would be provided where such services could be expected to recover at least 50 percent of the operating costs from farebox revenues. The plan envisions the ultimate extension of tertiary transit service to most of the urbanized parts of the study area, including areas of urban development in the southern half of Ozaukee County and northwestern Milwaukee County not now served. More than 436 route miles of service would be provided under the recommended plan, an increase of 85 miles over the 351 route miles operated in 1980.

Plan Performance and Cost

Selected performance characteristics of the preliminary recommended transportation system plan are set forth in Table 261 on page 808 of Chapter VII, along with those of the "status quo" plan. As shown in this table, about 247,320 automobiles would be available under the recommended plan in the year 2000, about 5 percent fewer than would be available under the "status quo" plan. While a total of 1,390,100 internal person trips may be expected to be generated within the study area on an average weekday under the preliminary recommended plan, about 1 percent fewer than under the "status quo" plan, about 5 percent fewer automobile trips may be expected to be made under the recommended plan. About 131,000 public transit trips may be expected to be made on an average weekday under the preliminary recommended plan, about 54 percent more than under the "status quo" plan.

About 7,032,500 vehicle miles of travel may be expected to be generated on an average weekday under the preliminary recommended plan in the year 2000, about 3 percent fewer than under the "status quo" plan. Of this total, about 3,137,600, or about 45 percent, of the vehicle miles of travel made under the preliminary recommended plan may be expected to be made on freeways. Under the "status quo" plan, about 49 percent of the total vehicle miles of travel within the study area may be expected to be made on freeways.

About two miles, or about 0.1 percent, of the total arterial street and highway system may be expected to be congested under the preliminary recommended plan, as measured by the number of miles of facilities operating over design capacity, compared with about 101 miles, or about 23 percent, of the total system under the "status quo" plan. About 54 miles of facilities may be expected to be operating at design capacity under the preliminary recommended plan, or about 12 percent of the total system, compared with about 48 miles, or about 11 percent, of the total system under the "status quo" plan. The extent of congestion on study area arterial streets and highways under the preliminary recommended plan is shown on Map 240 on page 810 of Chapter VII of this report.

Approximately 86.8 million gallons of motor fuel per year may be expected to be consumed within the study area in the year 2000 under the preliminary recommended plan, about 0.4 million fewer gallons per year than would be consumed under the "status quo" plan. Under the preliminary recommended plan, 45,475 tons of carbon monoxide and 4,815 tons of hydrocarbons may be expected to be emitted per year in the year 2000. In comparison to the "status quo" plan, this represents 1,333 fewer tons per year in carbon monoxide emissions and 141 fewer tons per year in hydrocarbon emissions in the year 2000.

The total costs of the plan, including capital and operating costs, the plan's financial feasibility, and the ratio of the plan's benefits to its costs, were estimated and carefully considered. The capital and operating costs, financial feasibility, and benefit-cost ratio of the transit element of the preliminary recommended plan were forecast as part of a concurrent study of areawide rapid transit alternatives, and are set forth in SEWRPC Planning Report No. 33, A Primary Transit System Plan for the Milwaukee Area.

The capital cost of the highway element of the preliminary recommended plan for the study area was estimated to be $545.1 million. Of this total, about $427.0 million, or 78 percent, would be required to preserve and maintain the existing highway system. An additional $118.1 million, or about 22 percent, would be required for projects which would improve the highway system by providing additional capacity through street widening or relocation, or through street expansion. The total cost of fully implementing the highway portion of the recommended plan is estimated at $802.5 million, of which $545.1 million would be required for capital costs and $257.4 million would be required for operating costs. It is estimated that 23 residential units and 63 nonresidential structures would need to be relocated if the highway element of the preliminary recommended plan were to be carried out.

The average annual public cost of carrying out the highway element of the preliminary recommended plan, including not only the construction and improvement of existing facilities and the construction of new facilities but also the operation and maintenance of the highway system, was estimated at $40.1 million, expressed in constant 1980 dollars, over the 20-year plan implementation period. It is anticipated that the benefits of the plan's highway element, including user and time savings, will be 79 percent greater than the highway element total capital, operating, and maintenance costs. The average annual public revenues anticipated for highways in the study area, based on a projection of the historic trend of revenues from 1970 to 1976, ranges from $53.8 million to $71.1 million, also expressed in constant 1980 dollars, indicating that the plan is financially attainable on an average annual basis.

PUBLIC REACTION TO PRELIMINARY RECOMMENDED PLAN

The preliminary findings and recommendations of the northwest side transportation improvement study, including the preliminary recommended long-range transportation system plan, were presented at two public hearings held during February 1983. The hearings were held in accordance with the schedule set forth in Table 265.

Prior to these hearings, the Commission prepared and distributed SEWRPC Newsletter, Vol. 22, No. 6. The newsletter described the findings of the inventories and analyses conducted under the study; the existing transportation system problems identified; the short-range traffic management plan proposed to address these problems; and the long-range transportation system plan proposed to address potential future problems as well as existing problems that could not be resolved by traffic management measures alone. The newsletter particularly emphasized the alternatives evaluated for W. Lisbon and W. Appleton Avenues from W. Burleigh Street to W. North Avenue, for which the preliminary plan recommended no improvement; the alternatives evaluated for W. Fond du Lac Avenue from N. 35th Street to the Hillside Interchange, for which the preliminary plan proposed that three alternative improvements be taken to public hearing; and the alternatives evaluated for the North-South Freeway (IH 43) from W. Henry Clay Street to Mequon Road, for which the preliminary plan recommended widening.

The minutes of the public hearings were published by the Commission for distribution to, and review by, the Advisory Committee and by the Commission itself, and are available for review at the Commission offices. The minutes, along with attendance records, meeting announcements, written comments, and pertinent newspaper articles, are documented in Minutes of Public Hearings: A Transportation System Improvement Plan for the Milwaukee Northwest Side/Ozaukee County Area.

The public reaction to the preliminary recommended plan is summarized below, including the questions raised and formal statements made at the public hearings and the written comments which were received for inclusion in the formal record of the hearings. It also includes the questions raised and statements made at a public meeting held by the Bethel Baptist Church, 2033 W. North Avenue, Milwaukee, Wisconsin, on March 19, 1983, and at two subsequent meetings between the Commission staff and a group of Bethel Baptist Church members—the Community Action Coalition to Save Fond du Lac Avenue. The public reaction summarized herein also includes the questions raised and statements made at a meeting of the City of Mequon Plan Commission attended by Commission staff.

Table 265

SCHEDULE OF PUBLIC HEARINGS HELD CONCERNING THE PRELIMINARY RECOMMENDED NORTHWEST SIDE TRANSPORTATION SYSTEM PLAN

County	Public Hearings	Date and Time
Milwaukee	Martin Luther King Center Milwaukee, Wisconsin	February 28, 1983 7:00 p.m.-8:45 p.m.
Ozaukee	Webster Transitional School Cedarburg, Wisconsin	February 21, 1983 7:00 p.m.-8:15 p.m.

Source: SEWRPC.

The reactions of interested citizens and public officials to the study findings and preliminary recommendations can be categorized into three principal areas of concern: 1) comments related to the segment of W. Fond du Lac Avenue from N. 35th Street to the Hillside Interchange; 2) comments related to the segment of the North-South Freeway (IH 43) from Mequon Road to Henry Clay Street; and 3) comments related to the City of Mequon arterial street system.

Comments Related to W. Fond du Lac Avenue Between N. 35th Street and the Hillside Interchange

The record of the public hearings reveals both support for and opposition to the improvement of the segment of W. Fond du Lac Avenue from N. 35th Street to the Hillside Interchange. Three citizens, seven representatives from the Bethel Baptist Church, and three elected officials expressed strong opposition to the improvement of W. Fond du Lac Avenue at the public hearings or through letters. Concern was particularly expressed over the taking of existing residences and businesses through the proposed improvement of W. Fond du Lac Avenue. The expected increase in traffic on an improved W. Fond du Lac Avenue, and the perceived attendant increases in air pollution and noise, was also cited. Concerns were also expressed over the perceived potential of a widened W. Fond du Lac Avenue to make pedestrian crossings difficult and unsafe, and to eliminate existing on-street parking. Most of the citizens expressing opposition to the W. Fond du Lac Avenue improvement resided in the vicinity of the improvement, or were members of the Bethel Baptist Church, while the elected officials expressing opposition to the improvement represented the citizens residing in an area located in the vicinity of the improvement.

Two citizens and one elected official expressed support for the proposed improvement of W. Fond du Lac Avenue at the public hearings. The citizens resided in an area located in the vicinity of the improvement, and the elected official represented citizens residing in that area. The need to serve existing and future traffic efficiently, and to ensure revitalization of the W. Fond du Lac Avenue area and development of the northwestern portion of the City of Milwaukee, was cited in support of the improvement, as was the condition and use of some of the buildings along some stretches of this segment of W. Fond du Lac Avenue. One of the citizens supporting the improvement suggested that the lands adjacent to the southern side of W. Fond du Lac Avenue from N. 27th Street to W. Garfield Street be taken if the improvement were to be made.

Nearly the entire audience of 60 people present at the public hearing held in Milwaukee County, however, were opposed to the W. Fond du Lac Avenue improvement. Following the public hearing in Milwaukee County, representatives of the Bethel Baptist Church requested that an additional public informational meeting be held at the Church to further discuss the issue. The Commission staff and the City of Milwaukee Department of City Development staff were invited to make presentations at the meeting, which was held on March 19, 1983. Three elected officials known to be opposed to the project were also invited to speak: City of Milwaukee Alderman Betty Voss, State Senator Mordecai Lee, and State Representative Marcia P. Coggs. Following the presentations by the Commission and Department of City Development staffs and by the three elected officials, the audience, consisting of members of the Church and of the community in the vicinity of W. Fond du Lac Avenue, was invited to ask questions or make comments. The Commission staff provided a summary of the Milwaukee Northwest Side/Ozaukee County study and of the four alternatives being considered by the Committee for W. Fond du Lac Avenue from the Hillside Interchange to N. 35th Street.

The Department of City Development staff indicated its support for the widening of W. Fond du Lac Avenue, and noted that this support was based on both traffic service and neighborhood redevelopment objectives. It was explained that W. Fond du Lac Avenue from W. North Avenue to W. Burleigh Street was once a regional shopping center, but now could best be considered to be, and must be expected to remain, a neighborhood or community shopping center. It was further noted that about 50 percent of the land parcels on each side of W. Fond du Lac Avenue from about W. Oak Street to N. 27th Street could qualify for renewal. These parcels either were city-owned, were vacant, had vacant structures, were tax-delinquent, or were underutilized. The W. Fond du Lac Avenue area was noted as simply not needing the number of potential commercial parcels it presently has to function as a neighborhood- or community-level shopping center. It was further noted that removal of the excess potential commercial parcels along W. Fond du Lac Avenue would not reduce the area's potential to develop into a viable neighborhood or community shopping center.

The three elected officials invited to speak then indicated their opposition to any improvement of W. Fond du Lac Avenue and identified their support for a "do nothing" alternative. The elected officials noted the disruption that the community would suffer under a widening alternative, and that the community had suffered for the past clearance of land for the once-proposed Park Freeway-West. The officials also argued that the widened W. Fond du Lac Avenue would make pedestrian crossings difficult and would serve primarily travelers from suburban areas and not those from the immediate community. Approximately 10 members of the audience then asked questions of the panel or made comments to the panel indicating their opposition to the widening of W. Fond du Lac Avenue. The entire audience of approximately 70 people was opposed to the widening. Many of the comments raised at the public hearing at the Martin Luther King Center were raised again at the meeting.

Two meetings were held subsequently between the Commission staff and a group of Bethel Baptist Church members—the Community Action Coalition to Save Fond du Lac Avenue. At the first meeting, held on May 10, 1983, the alternatives examined for the improvement of W. Fond du Lac Avenue, including the "do nothing" alternative, and their impacts were discussed at some length and in considerable depth. At the second meeting, held on June 28, 1983, the Coalition proposed a compromise alternative for the improvement of W. Fond du Lac Avenue. The Coalition was assisted in its preparation of a compromise alternative by Mr. Allen Flowers of Community Design Center, Inc. His work is summarized in a report entitled, "Improved West Fond du Lac Avenue Traffic Plan & Planning Strategy," which has been included in the published minutes of the public hearings. The Coalition recommended that W. Fond du Lac Avenue be widened to a divided boulevard between the Hillside Interchange and N. 20th Street and between N. 30th Street and N. 35th Street. The Coalition recommended that the eventual widening of W. Fond du Lac Avenue to a divided boulevard be provided for between N. 20th Street and N. 30th Street, but that no widening be provided for an indefinite period of time. Specifically, it was recommended that the acquisition of property within the proposed right-of-way not be actively pursued. Rather, it was recommended that the City establish a building setback line which would, over time, reserve adequate right-of-way for the ultimate widening of W. Fond du Lac Avenue from N. 20th Street to N. 30th Street. That is, as redevelopment of the existing property within the proposed right-of-way occurred, any redevelopment would be required to adhere to the building setback base line. The Coalition further recommended that on-street parking be banned in the peak period in the peak direction on this segment of W. Fond du Lac Avenue on weekdays until the segment is widened. Finally, the Coalition recommended that, to replace the lost on-street parking, additional off-street parking be provided in the area on the following four land parcels: 2007-2019, 2443, 2401-2405, and 2636-2650 W. Fond du Lac Avenue. In addition, the Coalition recommended that, in the interim, W. Fond du Lac Avenue between N. 20th Street and N. 30th Street be repaved and the sidewalks repaired.

Comments Related to the North-South Freeway (IH 43) Between Mequon Road and Henry Clay Street

The record of the public hearings reveals both support for and opposition to the proposed improvement of the North-South Freeway (IH 43). A citizen and an elected official expressed opposition to the improvement of the North-South Freeway (IH 43) from Henry Clay Street to Mequon Road; and a citizen and an elected official expressed support for the proposed improvement of this segment of the North-South Freeway. The citizen expressing opposition questioned the need for the improvement of the North-South Freeway north of W. Brown Deer Road to Mequon Road. The other comments opposing the improvement of IH 43 held that the improvement would largely serve suburban residents of northern Milwaukee County and southern Ozaukee County, and would encourage further urban sprawl. Comments supporting the improvement of the North-South Freeway noted the existing traffic congestion and safety problems along this freeway between W. Henry Clay Street and W. Brown Deer Road and the potential future traffic congestion north of W. Brown Deer Road.

Comments Related to the Arterial Street System of the City of Mequon

On May 23, 1983, Commission staff attended a meeting of the City of Mequon Plan Commission. At this meeting, the City of Mequon Plan Commission reviewed and approved the arterial street system recommendations of the preliminary recommended Milwaukee Northwest Side/Ozaukee County transportation system plan for the City of Mequon. Also at that meeting, the City of Mequon Plan Commission requested that three proposed improvements in the preliminary plan be given the highest possible priorities for construction. The three proposed improvements are the proposed interchange at the North-South Freeway (IH 43) and Highland Road, the proposed widening of Mequon Road (STH 167) from Buntrock Avenue to Wauwatosa Road (STH 181), and the proposed widening of Wauwatosa Road (STH 181) from County Line Road to Mequon Road. Also, the City of Mequon Plan Commission requested that one facility, Donges Bay Road, be added to the plan as an arterial facility from Port Washington Road to River Road. Lastly, the Plan Commission requested that Lakeshore Drive, which is outside the Milwaukee Northwest Side/Ozaukee County study area, be considered as a collector street facility and no longer as an arterial facility. The Plan Commission noted that the proposed realignment of Granville Road, extension of River Road from Highland Road to Bonniwell Road, and construction of a bridge on River Road across the Milwaukee River must be considered further by the City of Mequon Plan Commission in its preparation of a more detailed city transportation plan. The City of Mequon Plan Commission also asked that the Milwaukee Northwest Side/Ozaukee County transportation plan very clearly state that any roadway cross-section recommendations included in the plan are subject to refinement and that the ultimate selection of a cross-section will be made by the affected units of government during the preliminary engineering phase of plan implementation.

At the public hearings, other comments were received regarding the proposed arterial street system for the City of Mequon, including the following proposed improvements: the widening of Wauwatosa Road from W. County Line to STH 60, and the construction of a freeway interchange at the North-South Freeway (IH 43) and Highland Road.

Support was expressed for the construction of an interchange on the North-South Freeway at Highland Road. Opposition to and support for the improvement of Wauwatosa Road were expressed at the hearings. Comments expressing support identified the need for this improvement to abate existing and probable future traffic congestion. Comments opposing the improvement questioned its need. In addition, as noted in the previous sections, comments were received both in support of and opposition to the proposed widening of the North-South Freeway between Henry Clay Street and Mequon Road, of which the segment from W. County Line Road to Mequon Road is located in the City of Mequon.

Other Public Reaction to Preliminary Recommended Plan

Other comments received at the public hearings addressed the following proposed improvements: the construction of a new N. 68th Street; the construction of two new transit stations in Ozaukee County in the Village and Town of Grafton; the extension of First Avenue from Rose Street to Cedar Creek Road; the extension of Falls Road; the reconstruction of N. 124th Street between W. Hampton Road and W. Silver Spring Drive; and the improvement of STH 60 from STH 57 to the North-South Freeway (IH 43). Support was expressed for the proposed new N. 68th Street; for the proposed transit stations in Ozaukee County; for the Falls Road extension; and for the First Avenue extension. Ten citizens and one elected official sent to the Commission a fact sheet published by a citizens' committee opposed to the Falls Road extension. Some of the fact sheets were accompanied by a letter or were annotated with comments expressing opposition to the proposed extension. The impact of increased traffic volumes as a result of the extension on residential neighborhoods, Lime Kiln Park, property values, and natural resources was cited in opposition.

Comments received on the proposed N. 124th Street improvement between W. Hampton Avenue and W. Silver Spring Drive addressed the need to consider replacing the angle parking which would be lost to businesses along this segment of N. 124th Street, if and when it would be converted from a rural to urban cross-section and widened. Comments expressed at the public hearings concerning STH 60 between STH 57 and the North-South Freeway (IH 43) suggested the need to provide more than the recommended two lanes, and indicated that sufficient right-of-way was available to provide for these additional lanes.

COMMISSION STAFF REACTION TO PUBLIC COMMENTS

Based upon the public reaction to the preliminary recommended system plan, the Commission staff concluded that the following recommendations should be made for Advisory Committee consideration in preparing the final recommended Milwaukee Northwest Side/Ozaukee County transportation system plan:

- W. Fond du Lac Avenue should be recommended to be widened from N. 35th Street to N. 30th Street and from N. 20th Street to the Hillside Interchange. Between N. 20th Street and N. 30th Street, no action should be taken toward widening W. Fond du Lac Avenue. However, a setback line should be established which would permit the widening to occur at some long-term future date. Redevelopment projects would be required to adhere to the setback line. In the interim, parking would be prohibited in the peak direction during peak travel periods on this segment of W. Fond du Lac Avenue, and off-street parking would be developed to replace the lost parking supply, possibly including lots on the following vacant parcels: 2007-2019, 2443, 2401-2405, and 2636-2650 W. Fond du Lac Avenue.

- Change the recommendation in the preliminary plan for STH 60 between STH 57 and the North-South Freeway (IH 43) from two to four traffic lanes.

- Reaffirm the recommendation in the preliminary plan to widen the North-South Freeway (IH 43) from W. Henry Clay Street to Mequon Road.

- Reaffirm the recommendation in the preliminary plan to widen Wauwatosa Road from two to four traffic lanes from W. County Line Road to STH 60.

- Reaffirm the recommendation in the preliminary plan to construct the Falls Road bridge in the Village of Grafton.

- Recommend adding Donges Bay Road from Port Washington Road to River Road to the local trunk arterial street system of the City of Mequon.

- Reaffirm the remainder of the preliminary plan recommendations.

W. Fond du Lac Avenue

Four alternatives, including a "do nothing" alternative, were considered for W. Fond du Lac Avenue by the Commission staff following the public hearings. The first alternative combined two of the three alternatives taken to public hearing. The improvement would provide for three traffic lanes in each direction on W. Fond du Lac Avenue between N. 35th Street and the Hillside Interchange, and was recommended by the staff prior to the public hearings. Under this alternative, W. Fond du Lac Avenue from N. 35th Street to approximately N. 23rd Street would be widened to provide for three lanes in each direction. South of N. 23rd Street, the improvement would be implemented in one of two ways. One would be by continuing the widening of W. Fond du Lac Avenue to the Hillside Interchange. The other way would involve developing a pair of one-way streets around the business district at W. Fond du Lac Avenue and W. North Avenue from W. Oak Street to W. Garfield Street, and widening W. Fond du Lac Avenue south of W. Garfield Avenue to six lanes to the Hillside Interchange.

The second alternative for W. Fond du Lac Avenue considered by the Commission staff was initially proposed by Milwaukee County Board Supervisor Paul A. Henningsen. Under this alternative, improvements would be made only to that segment of W. Fond du Lac Avenue from N. 23rd Street to the Hillside Interchange, where right-of-way is generally available and any taking of land or existing businesses or homes would be very limited. Under this alternative, W. Fond du Lac Avenue would be widened to provide for three traffic lanes in each direction from the Hillside Interchange to W. Garfield Avenue. From W. Garfield Avenue to N. 23rd Street, a pair of one-way streets would be developed around the business district of W. Fond du Lac Avenue and W. North Avenue. From N. 23rd Street to N. 35th Street, no physical improvements would be made, but on-street parking would be prohibited during peak travel periods. Only four traffic lanes would thus be provided from N. 23rd Street to N. 35th Street.

The third alternative considered by the Commission staff was a new alternative, which was proposed by the Community Action Coalition to Save Fond du Lac Avenue. It would widen W. Fond du Lac Avenue to provide for six traffic lanes from the Hillside Interchange to N. 20th Street, where available right-of-way exists, and from N. 35th Street to N. 30th Street. Between N. 20th Street and N. 30th Street, no physical improvement would be made for an indefinite period. Instead, a building setback line would be established by the City under its official mapping authority to, over time, reserve adequate right-of-way for the ultimate widening of the street between N. 20th Street and N. 30th Street. Under this alternative, the further implementation of the W. Fond du Lac Avenue improvement would not be actively pursued through the acquisition of property within the proposed right-of-way. Instead, as redevelopment of the existing property within the proposed right-of-way occurred, any redevelopment would be required to adhere to the building setback base line. It should be noted that, under this alternative, the improvement of W. Fond du Lac Avenue may not be accomplished within the plan design period, nor within any specified period thereafter. Until W. Fond du Lac Avenue were widened, on-street parking would be prohibited in the peak direction during peak traffic periods in order to provide for four traffic lanes on W. Fond du Lac Avenue. To replace the lost on-street parking, it would be recommended that off-street parking be developed, including on the vacant lots located at 2007-2019, 2443, 2404-2405, and 2636-2650 W. Fond du Lac Avenue. Implementation of this third alternative could provide W. Fond du Lac Avenue with an improved six traffic lanes from the Hillside Interchange to N. 20th Street and from N. 30th Street to N. 35th Street, and four lanes from N. 20th Street to N. 30th Street. The setback base line would permit the additional two lanes to be provided over time from N. 20th Street to N. 30th Street.

In weighing the advantages and disadvantages of the improvement of W. Fond du Lac Avenue, particularly between N. 20th Street and N. 30th Street, the Commission staff recognized that any benefits from a widening improvement would accrue primarily to the local community and to the City of Milwaukee. That is, the benefits from the abatement of existing traffic congestion and the avoidance of future congestion would largely be received by the neighborhood and by the City of Milwaukee. Similarly, the greatest costs of the widening improvements—its impact on the future of the shopping area located at and around W. Fond du Lac Avenue and W. North Avenue and along W. Fond du Lac Avenue from W. North Avenue to N. 35th Street—would be borne by the neighborhood and the City.

Therefore, the Commission staff chose to weigh heavily the preferences of local community groups and the City of Milwaukee in the staff's recommendation to the Advisory Committee. The Commission staff therefore recommended to the Advisory Committee the third alternative considered by the staff following the public hearings. This alternative was proposed by the Community Action Coalition to Save Fond du Lac Avenue and received the support of the City of Milwaukee Department of City Development on June 30, 1983.

STH 60

The Commission staff changed its recommendation to the Advisory Committee for the improvement of STH 60 between STH 57 and the North-South Freeway (IH 43) in Ozaukee County to provide for four lanes rather than two lanes for traffic purposes, even though traffic volume and capacity analyses would not fully support the need for such an improvement. This change was requested by the Village of Grafton, and was considered warranted in view of the function of the roadway as the principal entrance from the interstate highway system into the Grafton area, considerations of civic design and related local land use development objectives, and the fact that the acquisition of needed right-of-way should not entail any significant urban disruption, and that such right-of-way has been reserved as development proceeds within the Village.

North-South Freeway

The Commission staff recommended that the Advisory Committee reaffirm its recommendation to widen the North-South Freeway (IH 43) from four to six lanes from W. Henry Clay Street to Mequon Road. This recommendation was proposed to be reaffirmed because strong support as well as opposition to the improvement was expressed at the public hearings.

Wauwatosa Road

The Commission staff recommended that the Advisory Committee reaffirm its recommendation to widen Wauwatosa Road from two to four lanes from County Line Road to STH 60. The recommendation was proposed to be reaffirmed because strong support as well as opposition to this proposed improvement was indicated at the public hearings.

Falls Road Bridge

The Commission staff also recommended that the Advisory Committee reaffirm its recommendation to construct the Falls Road bridge in the City of Grafton. Substantial opposition to this improvement was expressed at the public hearings. However, the Village of Grafton President and Board support the bridge construction, and are attempting to proceed with its implementation. Moreover, much of the opposition to the Falls Road bridge was based on the perception that it would act as a bypass to STH 57 and STH 60 in the Village of Grafton and would carry traffic volumes of 10,000 to 15,000 vehicles each weekday. Rather, it is expected that the bridge will serve only between 3,500 and 5,000 vehicles each weekday in the plan design year, as its principal function will be to connect the residential areas of the Village south of STH 60 and west of the Milwaukee River to the commercial and retail areas of the Village on the east side of the river.

Donges Bay Road

The Commission staff recommended that the Advisory Committee add to the final recommended plan Donges Bay Road from Port Washington Road to River Road as a local trunk arterial facility with two lanes for moving traffic, as requested by the City of Mequon Plan Commission. The one-mile spacing of arterial facilities in this portion of the City of Mequon which this addition of Donges Bay Road would provide would be warranted, given the anticipated land use development.

Highland Road Interchange

The Commission staff recommended that the Advisory Committee reaffirm its recommendation to construct a new interchange on the North-South Freeway (IH 43) at Highland Road. This recommendation was proposed to be reaffirmed because strong support for this improvement was indicated at the public hearings.

W. Lisbon Avenue and W. Appleton Avenue

The Commission staff considered whether to recommend to the Advisory Committee that a building setback base line be established for the potential improvement of W. Lisbon Avenue and W. Appleton Avenue from W. Burleigh Avenue to W. North Avenue. This widening had been rejected by the Advisory Committee, based upon the potential disruption of adjacent urban land uses. Establishing a building setback base line would not disrupt existing homes and businesses, but would serve to ensure that any redevelopment of the area would permit the future improvement without major disruption. The staff determined not to make this recommendation because, without the attendant improvement of the Stadium Freeway-North "stub end," an area of severe traffic congestion may be expected to remain in this corridor and the full benefit of widening W. Lisbon and W. Appleton Avenues would not be obtained. The Advisory Committee had rejected any improvement attendant to the Stadium Freeway-North "stub end" because of its attendant cost and disruption.

STATE LEGISLATIVE ACTION

On July 1, 1983, after the Commission staff determined its final recommendations for the Advisory Committee, but prior to the official transmittal of those recommendations, state legislation was enacted prohibiting the use of state and federal funds for the widening of the North-South Freeway (IH 43) between Bender Road and the north Ozaukee County line, and for the widening of W. Fond du Lac Avenue between N. 19th Street and N. 35th Street in the City of Milwaukee. In response to the new law, the recommendations of the Commission staff to the Advisory Committee for the North-South Freeway (IH 43) were revised to recommend widening that freeway only between Henry Clay Street and Bender Road; and, for W. Fond du Lac Avenue, to recommend widening only between the Hillside Interchange and N. 19th Street. W. Fond du Lac Avenue between N. 19th Street and N. 35th Street would not be widened. The Commission staff did, however, recommend that on-street parking be prohibited during peak traffic periods in the peak direction on W. Fond du Lac Avenue between N. 19th Street and N. 35th Street so that four lanes for moving traffic would be provided on this segment. The Commission staff further recommended that the City of Milwaukee establish a setback line on W. Fond du Lac Avenue between N. 19th Street and N. 35th Street so that, in the event that State legislation changed, the widening of W. Fond du Lac Avenue could occur without requiring right-of-way acquisition and significant disruption of homes, businesses, or industries.

The changes in the Commission staff recommendations to the Advisory Committee which were necessitated by the new State legislation will have a number of impacts on the transportation system plan for the northwest side study area. The North-South Freeway from Bender Road to W. Good Hope Road may be expected to operate substantially over design capacity and to be severely congested, rather than operate at design capacity. The North-South Freeway from W. Good Hope Road to W. Brown Deer Road may be expected to operate at or slightly exceeding its design capacity and approach congestion, rather than operate within its design capacity and under free-flow conditions. The North-South Freeway from W. Brown Deer Road to Mequon Road may be expected to operate at design-capacity volumes and experience some flow restrictions, rather than operate under its design capacity under free-flow conditions.

The final Commission staff recommendation for W. Fond du Lac Avenue, which was made in response to the new State legislation, differs from the original staff recommendation made following the public hearings with respect to the extent of the widening along W. Fond du Lac Avenue. The final recommendation is consistent with the State legislation which limited the recommended widening of W. Fond du Lac Avenue to only that section between the Hillside Interchange and N. 19th Street. The original staff recommendation also proposed widening from N. 19th Street to N. 20th Street and from N. 30th Street to N. 35th Street. Both final and original recommendations call for a setback base line along the unwidened sections of W. Fond du Lac Avenue. The setback base line would provide for the eventual widening of W. Fond du Lac Avenue possibly beyond the design year of the plan. The establishment of the setback base line would not conflict with the new State legislation. That legislation, however, prohibits the use of state and federal funds for the widening of W. Fond du Lac Avenue between N. 19th Street and N. 35th Street. Accordingly, even if the area affected by the proposed setback base line has been entirely redeveloped and all right-of-way for widening is available, such widening would have to be accomplished entirely with local funds, or the legislation would have to be changed.

ADVISORY COMMITTEE ACTION

The Advisory Committee to the Milwaukee Northwest Side/Ozaukee County transportation improvement study met on August 1, 1983, to consider the public reaction to the preliminary recommended transportation system improvement plan and the Commission staff recommendations for committee action. The Advisory Committee carefully considered the results of the public hearings and approved all of the recommendations of the Commission staff. All of the recommendations with the exception of those for W. Fond du Lac Avenue were approved unanimously. The City of Milwaukee representatives stated that they favored the compromise plan developed by the Community Action Coalition to Save Fond du Lac Avenue and the Commission staff following the public hearings. They also expressed concern that the new State legislation prohibited in perpetuity the use of state and federal funds for the widening of W. Fond du Lac Avenue from N. 19th Street to N. 35th Street. Although they did not support the taking of property for the widening of W. Fond du Lac Avenue from N. 20th Street to N. 30th Street, they noted that there was the potential for the proposed setback base line to accomplish the needed right-of-way reservation over time with no disruption to urban development, and that even when right-of-way becomes available, the State legislation would not permit the widening to take place with the assistance of state and federal funds.

PLAN IMPLEMENTATION

The recommended short- and long-range transportation system plans for the Milwaukee Northwest Side/Ozaukee County study area cannot be considered complete until the steps required to implement the plans—that is, to convert the plans into action plans and policies—have been specified. The legal and governmental framework of the study area is such that the existing county and local units and agencies of government, and certain private concerns, can implement all of the major recommendations contained in the short- and long-range plans. In Chapter VIII of this report, a comprehensive, cooperative, intergovernmental plan implementation program is set forth indicating the specific actions required by each level, agency, and unit of government to fully implement the recommended short- and long-range transportation system plans.

The plan implementation recommendations detailed in Chapter VIII will not be repeated here. It is, however, important to recognize that major responsibilities for plan implementation will rest with the City of Milwaukee, Milwaukee County, Ozaukee County, State of Wisconsin, City of Mequon, Village of Grafton, and City of Wauwatosa. The close coordination and cooperation among these units of government, as well as among other units of government affected by this plan, cannot be overemphasized. The adoption or endorsement of the recommended short- and long-range plans by the affected local units of government and by various state and federal agencies is highly desirable and, in some cases, essential in order to secure a common understanding of the transportation system development objectives and to permit the necessary plan implementation work to be cooperatively programmed and jointly executed. Finally, it must be understood that the recommended short- and long-range transportation system plans, as presented in this report, are intended to constitute a flexible guide to the development of transportation facilities and services in the study area.

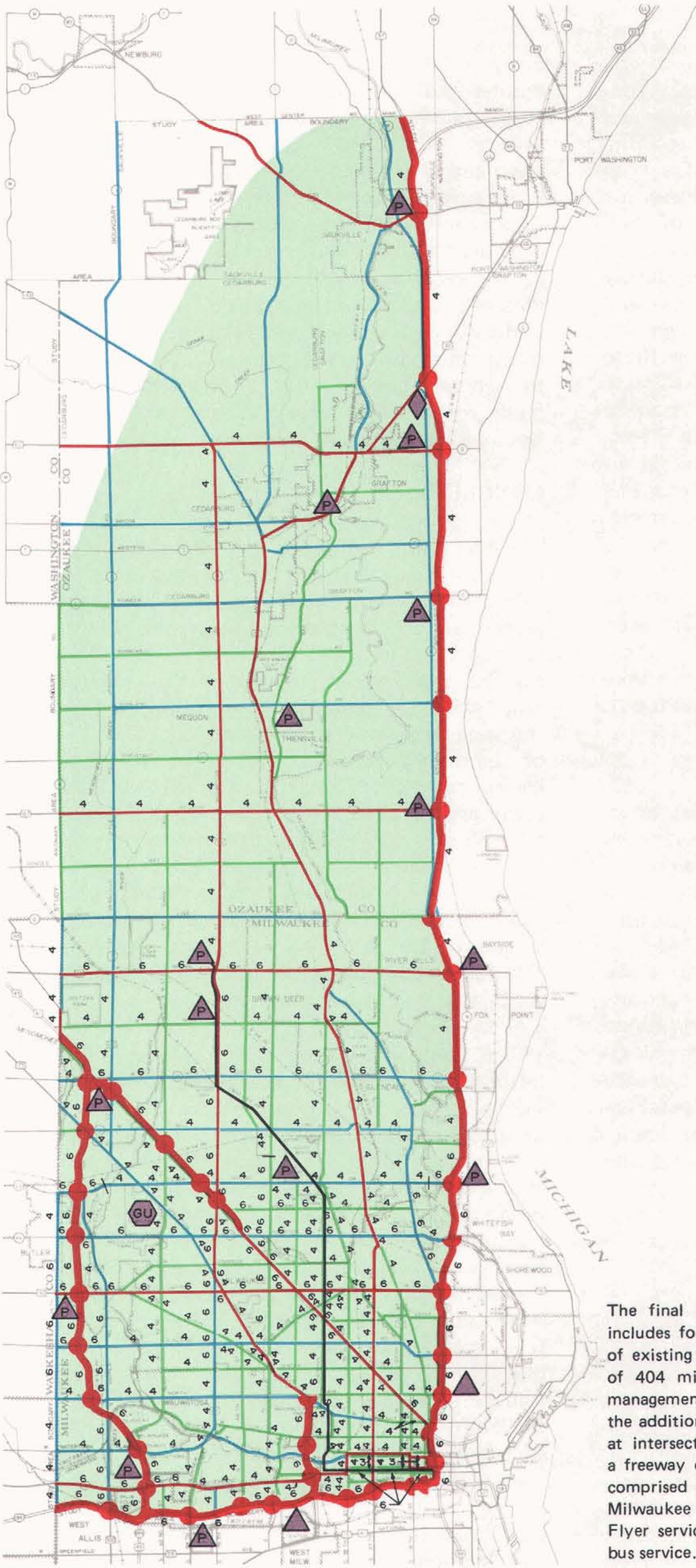
CONCLUSION

The recommended short- and long-range transportation system plans for the Milwaukee northwest side and southern Ozaukee County study area, as presented in this planning report, together amend an important element of the comprehensive plan for the physical development of the seven-county Southeastern Wisconsin Region. These plans amend the long-range arterial street and highway element of the transportation system plan as well as the transportation systems management plans for the study area, and together with pertinent sections of the recently adopted primary transit system plan for the greater Milwaukee area, and the airport element of the adopted transportation plan, provide the study area with a sound, coordinated guide to transportation facility and service development. The final recommended transportation plan for the study area is shown on Map 241.

The recommended short- and long-range transportation system plans for the Milwaukee northwest side and Ozaukee County study area are based upon extensive inventories and analyses of socioeconomic, land use, and transportation conditions and trends in the study area as these conditions relate to the existing need for and use of transportation facilities and services; and upon analyses of anticipated change in the study area which affects the need for and use of transportation facilities and services in the future. Both the short- and long-range plans have been selected from alternative plans which served to explore the full range of transportation improvement and expansion options available to the study area. A technical advisory committee composed of elected and appointed public officials and other representatives of local, county, state, and federal levels of government, and knowledgeable and concerned citizen members, has endorsed both the long- and short-range

Map 241

RECOMMENDED TRANSPORTATION PLAN FOR THE STUDY AREA 2000



LEGEND

ARTERIAL STREET AND HIGHWAY SYSTEM

JURISDICTIONAL CLASSIFICATION

- STATE TRUNK - FREEWAY
- STATE TRUNK - NONFREEWAY
- COUNTY TRUNK
- LOCAL TRUNK

FREEWAY - NONFREEWAY INTERCHANGE

4 NUMBER OF TRAFFIC LANES (TWO LANES WHERE UNNUMBERED)

4|6 CHANGE IN NUMBER OF TRAFFIC LANES

URBAN MASS TRANSIT SYSTEM

LIGHT RAIL TRANSIT ROUTE

SERVICE AREA

TRANSIT STATION

P - WITH PARKING

PARK AND POOL LOT

AIRPORT CLASSIFICATION SYSTEM

GU - GENERAL UTILITY

GRAPHIC SCALE
0 1 2 MILES
0 4000 8000 12000 FEET

The final recommended transportation plan for the study area includes four elements: a freeway element comprised of 50 miles of existing freeway facilities; a surface arterial element comprised of 404 miles of existing and proposed arterial streets; a traffic management element comprised of on-street parking restrictions, the addition of new and the improvement of existing turning lanes at intersections, traffic signal modifications and installations, and a freeway operational control system; and a public transit element comprised of a light rail transit facility extending from downtown Milwaukee to the Northridge Shopping Center, expanded Freeway Flyer service, and additional as well as improved local and express bus service.

Source: SEWRPC.

plans after appropriate consideration of the public reaction to the alternatives considered as presented at public hearings. The results of this public review are documented in published minutes of the hearings, and are summarized in this chapter of this report.

In conclusion, it may be useful to reflect upon the overall significance of the findings and recommendations of the Milwaukee Northwest Side/ Ozaukee County transportation improvement study. The recommended plan provides facilities and services intended to substitute, to the degree practicable, for the no-longer-planned Park Freeway-West and Stadium Freeway-North "gap closures." Major transportation facilities and measures provided for under the newly recommended plan which were not provided for under the previously adopted, regional, long-range transportation system plan include: 1) the completion of the Hillside Interchange, specifically providing a connection between the North-South Freeway (IH 43) and the Park Freeway-East and the surface arterial street system at the Hillside Interchange; 2) the widening of W. Fond du Lac Avenue between the Hillside Interchange and N. 19th Street; 3) the addition of a new N. 68th Street in north-central Milwaukee County between N. Industrial Road and W. Brown Deer Road; 4) extensive traffic management actions to increase the capacity of arterial intersections within the study area; and 5) a public transit system plan for the study area which will include expanded local and express bus service, and a substantially expanded primary transit system consisting of expanded bus-on-freeway service and a new light rail line in the Milwaukee County portion of the study area.

While the recommended plan, through these additional facilities, provides for the abatement of much of the traffic congestion which would be expected within the study area in the absence of the Park Freeway-West and Stadium Freeway-North, it does not and cannot provide for the complete replacement of the traffic-carrying capacity and level of transportation service which would have been provided by these two freeway facilities. This is due, in part, to the inherent efficiency of freeway facilities, and in part to the fact that, during the course of the study, the Advisory Committee determined not to recommend certain major improvements to the arterial street and highway system of the study area, and to the fact that during the course of the study State legislation was enacted that prohibited certain such improvements. Principal among such improvements would have been the more complete integration of the Stadium Freeway-North "stub end" into the surface arterial street system, as well as the improvement of the arterials which provide major access to the Stadium Freeway-North—W. Lisbon and W. Appleton Avenues. Without these improvements, the plan is unable to provide the traffic-carrying capacity, congestion abatement, and level of transportation service which the Park Freeway-West and Stadium Freeway-North would have provided.

Nevertheless, implementation of the recommended short- and long-range plans for the Milwaukee Northwest Side/Ozaukee County study area will provide the area with an integrated, balanced transportation system providing the appropriate types of transportation service needed by this area at an adequate level of service. It will achieve economy and efficiency in the provision of transportation services while supporting essential economic and social activities. Implementation of the plan will achieve a balance, not only between travel demand and the spatial configuration and capacity of arterial street and highway facilities, but also between the utilization of the automobile and of public transit vehicles as modes of transportation. It will also result in a reduction in traffic congestion, in a reduction in travel times between various parts of the study area, and in an increased measure of travel safety. The failure to recommend improvements at the Stadium Freeway-North "stub end," along W. Lisbon Avenue and W. Appleton Avenue, and along W. Fond du Lac Avenue may be expected, however, to result in continued traffic congestion on and in the vicinity of these facilities.

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APPENDICES

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Appendix A

MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY PROSPECTUS STEERING COMMITTEE

George C. Berteau Chairman	Chairman, Southeastern Wisconsin Regional Planning Commission
Kurt W. Bauer Secretary	Executive Director, Southeastern Wisconsin Regional Planning Commission
Robert W. Brannan	Deputy Director, Milwaukee County Department of Public Works
Warren D. Braun	Wisconsin State Senator
William R. Drew	Commissioner, Department of City Development, City of Milwaukee
Wayne P. Frank	Milwaukee Alderman; Chairman, Utilities and Licenses Committee, City of Milwaukee Common Council
Paul A. Henningsen	Milwaukee County Supervisor
John O. Hibbs	Division Administrator, U. S. Department of Transportation, Federal Highway Administration
Edwin J. Laszewski, Jr.	City Engineer, City of Milwaukee
Henry M. Mayer	Managing Director, Milwaukee County Transit System
Paul G. Meyer	Chairman, Ozaukee County Highway Committee
Roy B. Nabors	Milwaukee Alderman; Chairman, Park West Redevelopment Task Force
Harvey Shebesta	District Director, District 2, Wisconsin Department of Transportation
Dennis C. Vierra	Planning Representative, U. S. Department of Transportation, Urban Mass Transportation Administration
Richard Wegner	Executive Assistant, Office of the Secretary, Wisconsin Department of Transportation
Sylvester N. Weyker	Ozaukee County Highway Commissioner

COMPOSITION OF MILWAUKEE NORTHWEST SIDE/OZAUKEE COUNTY TRANSPORTATION IMPROVEMENT STUDY CITIZENS INTERGOVERNMENTAL AND TECHNICAL COORDINATING AND ADVISORY COMMITTEE

Milwaukee Area Subcommittee

Harvey Shebesta, Chairman	District Director, District 2, Wisconsin Department of Transportation
Kurt W. Bauer, Secretary	Executive Director, Southeastern Wisconsin Regional Planning Commission
Fred A. Behrens	Assistant Division Administrator, Federal Highway Administration, U. S. Department of Transportation
Warren D. Braun	Wisconsin State Senator
P. Douglas Gerleman	Director, Planning Division, Urban Mass Transportation Administration, Region V, U. S. Department of Transportation
Paul A. Henningsen	Milwaukee County Board Supervisor
Galen C. Larson	Managing Director, Milwaukee County Transit System
Edwin J. Laszewski, Jr.	City Engineer, City of Milwaukee
J. William Little	City Administrator, City of Wauwatosa
Paul G. Meyer	Ozaukee County Board Supervisor
Roy B. Nabors	Milwaukee Alderman, City of Milwaukee
Brian F. O'Connell	Planner, Department of City Development, City of Milwaukee
Marvin J. Schaeffer	Administrator, Division of Transportation Districts, Wisconsin Department of Transportation
Ernest R. Vogel	Deputy Director, Milwaukee County Department of Public Works
Sylvester N. Weyker	Highway Commissioner, Ozaukee County

Ozaukee County Subcommittee

Sylvester N. Weyker, Chairman	Highway Commissioner, Ozaukee County
Kurt W. Bauer, Secretary	Executive Director, Southeastern Wisconsin Regional Planning Commission
Russell A. Dimick	City Engineer, City of Cedarburg
Robert R. Dreblow	City Engineer, City of Port Washington
Thomas L. Frank	Planning and Research Engineer, Federal Highway Administration, U. S. Department of Transportation
Arne L. Gausmann	Director, Bureau of Systems Planning, Wisconsin Department of Transportation
Michael C. Harrigan	Village Administrator, Village of Saukville
Kenneth A. Roell	Administrator, Town of Cedarburg
Donald A. Roensch	Director of Public Works, City of Mequon
Emory R. Sacho	Administrator, Village of Grafton
Harvey Shebesta	District Director, District 2, Wisconsin Department of Transportation

The following individuals were members of the Committee during a part of its life: George C. Berteau, Chairman, Southeastern Wisconsin Regional Planning Commission; Robert W. Brannan, Deputy Director, Milwaukee County Department of Public Works; William J. Buglass, Deputy Secretary, Office of the Secretary, Wisconsin Department of Transportation; Wayne P. Frank, Chairman, Utilities and Licenses Committee, City of Milwaukee Common Council; James J. Gosling, Assistant Secretary, Wisconsin Department of Transportation; Quentin W. Laabs, Administrator, Village of Thiensville; Henry M. Mayer, Managing Director, Milwaukee County Transit System; Raymond F. Michaud, Director of Public Works, City of Port Washington; Scott W. Moebius, Citizen Representative of the Mayor of the City of Milwaukee; Herbert H. Peters, Park Commissioner, Ozaukee County; Brian C. Peterson, Citizen Representative of the Mayor of the City of Milwaukee; Gerald J. Reihsen, Assistant Division Administrator, U. S. Department of Transportation, Federal Highway Administration, Region V; Larry T. Sarver, Citizen Representative of the Mayor of the City of Milwaukee; and Dennis C. Vierra, Planning Representative, U. S. Department of Transportation, Urban Mass Transportation Administration.

Appendix B

MILWAUKEE COUNTY AND NORTHWEST SIDE STUDY AREA PUBLIC TRANSIT SYSTEM RIDERSHIP, REVENUE, AND OPERATING SUBSIDY IN 1985 UNDER THE RECOMMENDED SHORT-RANGE TRANSIT SYSTEM PLAN

Area	Conditions for Ridership and Revenue Estimate as Published by Milwaukee County Transit System	Consistent $0.50 Fare Conditions	Consistent $0.40 Fare Conditions	Consistent $0.40 Fare Conditions
	Gas Prices of $2.00 per Gallon and $0.12 per Mile. Fare of $0.50 Used in Ridership Estimates. Fare of $0.40 Used in Revenue and Operating Subsidy Estimates	Gas Price of $2.00 per Gallon and $0.12 per Mile. Fare of $0.50 Used in All Estimates	Gas Price of $2.00 per Gallon and $0.12 per Mile. Fare of $0.40 Used in All Estimates	Gas Price of $1.50 per Gallon and $0.08 per Mile. Fare of $0.40 Used in All Estimates
Milwaukee County				
1985 Average Weekday Ridership (trips)	312,900	312,900	335,300	262,900
1985 Annual Revenue (1980 dollars)	$28,701,000	$34,935,000	$29,949,000	$23,482,000
1985 Operating Subsidy[a] (1980 dollars)	$47,555,000	$41,321,000	$46,307,000	$50,391,000
Northwest Side Study Area				
1985 Average Weekday Ridership (trips)	137,100	137,100	147,000	117,400
1985 Annual Revenue (1980 dollars)	$12,245,800	$15,307,200	$13,130,000	$10,486,200
1985 Operating Subsidy[a] (1980 dollars)	$19,306,200	$16,244,800	$18,422,000	$20,079,800

[a] *The estimation of operating subsidy in this table assumes that if automobile motor fuel costs are assumed to experience real dollar increases from 1980 to 1985, then similar real dollar increases must be assumed for transit motor fuel costs. As a result, the estimated 1980 motor bus service cost of $30 per bus-hour in 1980 dollars, which was assumed under the Milwaukee County short-range transit plan not to undergo a real increase from 1980 to 1985, has been assumed under this estimation of transit system operating costs and subsidy to increase from $30 to $32 per bus-hour under $2.00-per-gallon motor fuel price conditions, and from $30 to $31 per bus-hour under $1.50-per-gallon motor fuel price conditions. It can be noted, however, that use of a $30-per-bus-hour cost for this analysis would not have changed its basic conclusions—specifically, that the ridership difference in Milwaukee County between a $0.40 and $0.50 transit fare under the recommended transit plan would be only 7 percent, not significant; that the revenue difference between the plan as published and a consistent $0.40 fare under that plan in Milwaukee County would be only 4 percent; and that the operating subsidy difference between the plan as published and a consistent $0.40 fare in Milwaukee County under that plan would be about 3 percent. The Milwaukee County Transit System analysis as published used a factor of 294 to convert average weekday trips to annual revenue ridership, and the Commission has historically used a factor of 290, which was used in the other three ridership, revenue, and operating subsidy estimates in this table. The differences, however, caused by these factors are insignificant.*

Source: SEWRPC.