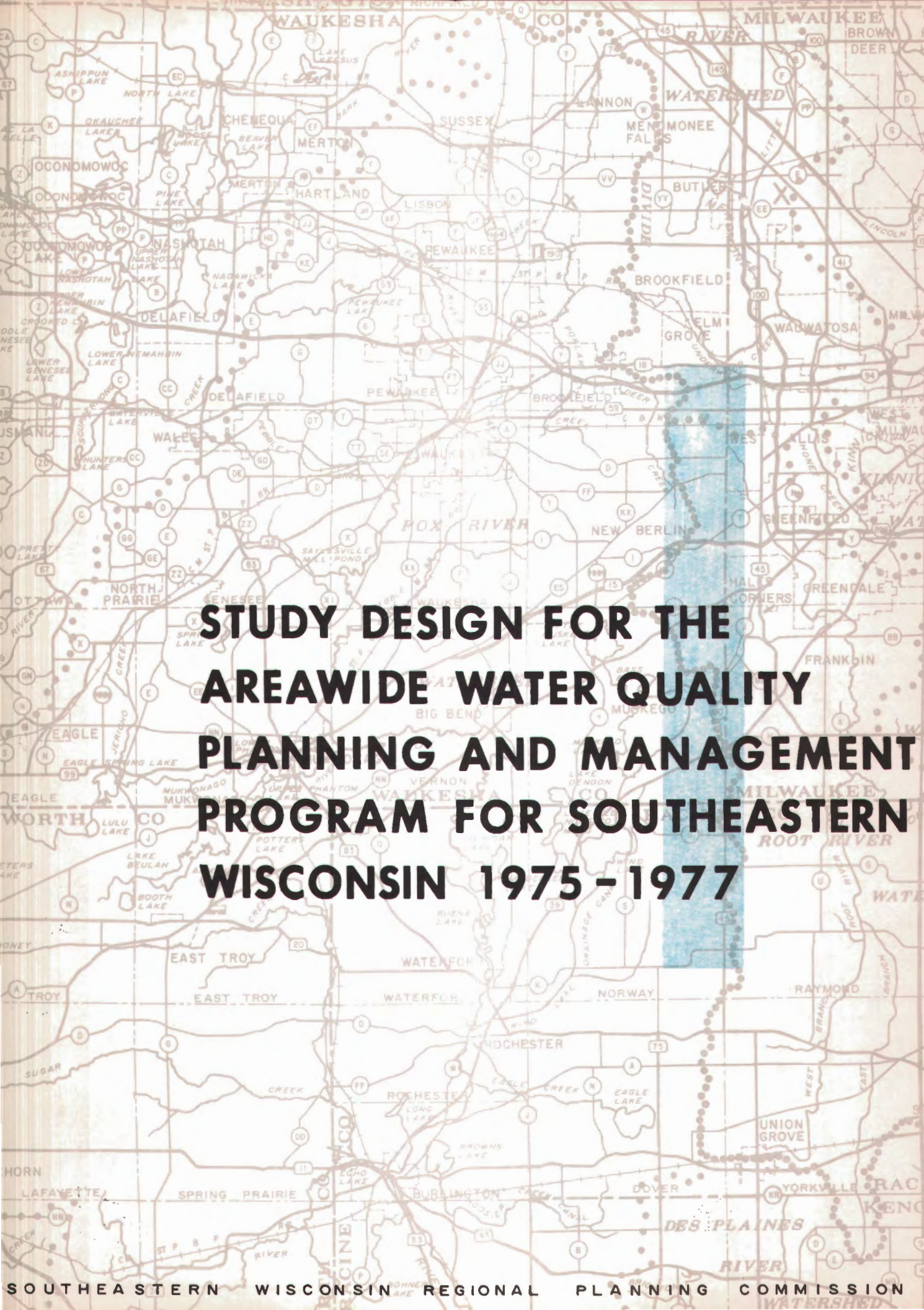

STUDY DESIGN FOR THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM FOR SOUTHEASTERN WISCONSIN 1975 - 1977

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STUDY DESIGN FOR THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM FOR SOUTHEASTERN WISCONSIN: 1975-1977

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
916 N. East Avenue
P. O. Box 769
Waukesha, Wisconsin 53186

The preparation of this publication was financed through a planning grant from the U. S. Environmental Protection Agency under the provisions of Section 208 of the Federal Water Pollution Control Act, as amended.

April 1975

Revised July 1975
Revised August 1975

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Chapter I

INTRODUCTION AND BACKGROUND

INTRODUCTION

Section 208 of the Federal Water Pollution Control Act (P.L. 92-500), as Amended by the U. S. Congress in 1972, provides for the development and implementation of areawide water quality planning and management programs within all of the nation's major metropolitan areas. In response to this Congressional Act, and in accordance with its statutory areawide planning responsibilities and the fundings and recommendations of its previous water quality planning efforts, the Southeastern Wisconsin Regional Planning Commission requested the Governor of the State of Wisconsin to designate the seven-county Southeastern Wisconsin Region as a water quality management planning area and the Southeastern Wisconsin Regional Planning Commission as the water quality management planning agency for that area, all pursuant to the procedural requirements set forth in Section 208 of the Act. Substantiating information relating to the planning area and planning agency designations were set forth in a document prepared by the Commission in the Spring of 1974.[1]

On September 27, 1974, Governor Patrick J. Lucey formally designated the seven-county Southeastern Wisconsin Region and the Southeastern Wisconsin Regional Planning Commission pursuant to the terms of Section 208 of the Act. This designation was made after a public hearing concerning the matter held jointly by the Wisconsin Department of Natural Resources and the Southeastern Wisconsin Regional Planning Commission on June 18, 1974. On December 26, 1974, the Administrator of the U. S. Environmental Protection Agency formally approved the

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[1]See "Substantiating Information for Area and Planning Agency Designation Under Section 208 of the Federal Water Pollution Control Act Amendments, 1972," SEWRPC and Wisconsin Departments of Natural Resources and Administration, May 1974.

two designations and authorized the Commission to proceed with the preparation of an application for federal funds in support of the conduct of the proposed Section 208 areawide water quality and management planning program for the Region.

On March 6, 1975, the Southeastern Wisconsin Regional Planning Commission authorized the preparation of the necessary study design for the proposed Section 208 planning and management program, such study design being envisioned as the basic supporting document for a federal grant application for the program. In addition, the Commission acted to create a Technical and Citizens Advisory Committee on Areawide Water Quality Planning and Management. This Committee is to be comprised of Federal, state, and local public officials; knowledgeable engineers and planners; and concerned citizen leaders from throughout the Region. The Commission charged the Committee with the task of assisting the Commission in the formulation of the areawide water quality planning and management program, and with monitoring the conduct of that program once it is mounted. A roster of current Committee members is set forth in Appendix A.

Accordingly, this study design is intended to provide a working outline of the Section 208 water quality planning and management program for the Region and to set forth a recommended time schedule, budget, and organizational structure for the program. It should be emphasized that this study design is envisioned as a working document designed initially to provide a basis for the approval of the necessary federal grant and for the initiation of the required work program. It is envisioned that, as a Section 208 "plan of work," the document may be supplemented from time-to-time during the actual conduct of the work program as the unfolding work may dictate.

BASIC DEFINITIONS

Because an areawide water quality planning and management program mounted under Section 208 of the Federal Water Pollution Control Act must satisfy certain federal and state, as well as regional and local, objectives, and since the federal and state objectives are expressed in terms having special meaning under the Act, a definition of certain terms is in order prior to any further consideration of the proposed Section 208 planning program for southeastern Wisconsin. Accordingly the following definitions of key terms used throughout the study design are provided.

Conveyance Facilities--With respect to sanitary wastes, conveyance facilities consist of gravity flow sewers, force mains, sewage pumping and lift stations, and related appurtenances used to collect and convey sewage to sewage treatment facilities. With respect to storm water, conveyance facilities consist of gravity flow sewers, pumping stations and defined drainage channels and related appurtenances used to collect storm water runoff and convey it to a point of discharge to a surface water body.

Effluent Limitations--Any restriction established by the State of Wisconsin or the U.S. Environmental Protection Agency on the quantity, rates, and/or concentrations of chemical, physical biological, and other constituents which are or are proposed to be discharged from point sources of pollution directly or indirectly into any surface and ground waters, including schedules of compliance with discharge abatement orders. There are two general categories of effluent limitations. The first category consists of standard effluent limitations for industries and publicly owned and operated waste treatment facilities which are intended to be applied uniformly on a nationwide basis. These uniform or national effluent limitations are not related specifically to the waste assimulative capacity of the receiving body of water. The second category of effluent limitations are those additional

restrictions set forth for a given waste discharge when it is found after careful study that the body of water to which the waste is to be discharged will not meet the applicable water quality standards for that body of water if only uniform state or national effluent limitations are applied. Thus, the second category of effluent limitations represents additional restrictions applied where necessary to waste discharges on a case-by-case basis following waste water quality management planning efforts.

Effluent Limited Segments--Any reach of a surface water body where water quality is currently meeting, and is expected to continue to meet, applicable water quality standards, or where it is anticipated that the water quality standards will be met after the application of required uniform state or national effluent limitations.

Land Uses--The generalized human activities that group together to form the overall pattern of urban, suburban, and rural development considered at a regional scale. Particular emphasis is placed on those aspects of land use which through their individual or aggregate effects are regional in scope, which interact strongly with the need for major utility, recreational, and transportation facilities, and which also have a major impact on the natural resource base. These include large land consuming uses, such as agricultural, regional park and open space reservations; woodlands, wetlands, and surface waters; residential uses; and major commercial and industrial centers.

Maximum Daily Load--The total maximum daily load of pollutants, including thermal loads, allowable for each specific reach of a surface body of water where water quality standards are being violated, or anticipated to be violated.

Nonpoint Source--The generalized or areawide discharge of waste water into a body of water which cannot be ascribed to a discrete, specific source

location. Thus, the term "nonpoint source" refers to the origin of any pollutant not identifiable as a point source. Nonpoint sources most commonly consist of urban and agricultural runoff which carry sediment and certain chemicals which act as water pollutants. It is important to recognize in this respect, that the distinction between point and nonpoint sources of pollution cannot always be sharply defined. For example, urban runoff while in concept a nonpoint source of pollution, when collected in piped storm sewerage systems may be discharged to bodies of water at discrete sites, and thereby can be regarded as a point source of pollution, as can separate and combined sewer overflow outfalls. Such urban runoff, however, when carried in roadside ditches and numerous interrelated swales and water courses, may have to be regarded as nonpoint source.

Permit--The permit issued by the State of Wisconsin or the U. S. Environmental Protection Agency for the discharge of any pollutant or combination of pollutants directly or indirectly to waters of the State.

Planning Area--The area designated by the Governor and approved by the U. S. Environmental Protection Agency for the conduct of a Section 208 water quality management planning program. In southeastern Wisconsin this area consists of the seven Counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha.

Point Source--A specific, discrete site at which waste water is collected and discharged into a body of water and which thereby readily lends itself to treatment, elimination, or other control in order to abate related water pollution. Point sources consist of any discernible confined and discrete conveyances, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal

feeding operation, or vessel or other floating craft at which pollutants are concentrated and from which such pollutants are or may be discharged directly or indirectly to surface or ground waters of the State.

Pretreatment Standards--Standards for the introduction of pollutants into publicly-owned waste treatment works. Such standards are applicable to those pollutants that are determined not to be susceptible to treatment by such treatment works, or which would interfere with the operation of such treatment work.

Regional Planning--Comprehensive planning for a geographic area larger than a county but smaller than a state, united by economic interests, geographic, or common areawide development problems.

Sewage--The spent water of a community consisting of a combination of liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, or storm water which may be unintentionally present.

Sewerage Facilities--The facilities required for the collection, transportation, treatment and disposal of storm water, municipal sewage, and industrial waste.

Sludge--Solids removed from waste water during treatment.

Waste Treatment Facilities--An arrangement of devices and structures used in the storage, treatment, recycling, and reclamation of storm water, municipal sewage, and industrial wastes of a liquid nature; also any other method or system for preventing, abating, reducing, storing, treating, separating, or disposing of sewage.

Waste Treatment Management Agency--An agency designated by the Governor and charged in an approved Section 208 water quality management plan with carrying out land use controls or waste treatment recommendations included in that plan.

Waste Treatment Planning Agency--An organization designated by the Governor and approved by the U. S. Environmental Protection Agency to conduct a Section 208 water quality planning and management program. With respect to the seven-county Southeastern Wisconsin Region, the planning agency is the Southeastern Wisconsin Regional Planning Commission.

Water Pollution--A condition in which the quality of water in a lake or stream is adversely affected by waste discharges from human activities or sources so that one or more beneficial uses of the lake or stream is impaired or eliminated. It is recognized that water quality may as a result of natural causes not meet the quality standards attendant to specified water use objectives. Although such natural causes might be inventoried in the Section 208 planning effort, it is not intended that recommendations will be developed for their control.

Water Quality Limited Segments--Any reach of a surface water body where it is known that the existing water quality does not meet applicable water quality standards, and where it is anticipated that such standards will not be met even after the application of uniform state or national effluent limitations.

Water Quality Standards--The water use objectives and accompanying water quality standards established by the Wisconsin Department of Natural Resources.

Water Quality--The physical, chemical, radiological, and biological conditions of the water determined through the analysis of data and the assessment of the quality and diversity of existing aquatic life. To a large extent the quality of water determines its potential use for propagation of fish and other wildlife, recreation, navigation, and as a source of industrial and domestic water supply.

NEED FOR REGIONAL PLANNING

The need for regional planning has been brought about by certain important social and economic changes which, while national phenomena, have far-reaching impacts on the problems facing local government. These changes include: rapid population growth and urbanization; increasing agricultural and industrial productivity, income levels, and leisure time; generation of mass recreational needs and pursuits; increasingly intensive use and consumption of natural resources; development of extensive electric power and communications networks; and development of limited-access highway systems and mass automotive transportation.

Under the impact of these changes, entire regions, such as southeastern Wisconsin, are becoming mixed rural-urban areas. This, in turn, is creating new and intensified areawide development problems of an unprecedented scale and complexity. Rural, as well as urban, people must increasingly concern themselves with these problems or face irreparable damage to their land and water resources and a decline in the overall quality of their lives.

The areawide problems which necessitate a regional planning effort in southeastern Wisconsin all have their source in the character of the urbanization occurring within the Region. These areawide problems include, among others: inadequate drainage and mounting flood damages; underdeveloped sewerage and inadequate sewage disposal facilities; impairment of water supply; increasing water pollution; deterioration and destruction of the natural resource base; rapidly increasing demand for outdoor recreation and for park and open-space reservation; inadequate transportation facilities; and, underlying all of the foregoing problems, rapidly changing and unplanned land use development. These

problems are all truly regional in scope since they transcend the boundaries of any one municipality and can only be resolved within the context of a comprehensive regional planning effort involving, on a cooperative basis, all levels of government concerned.

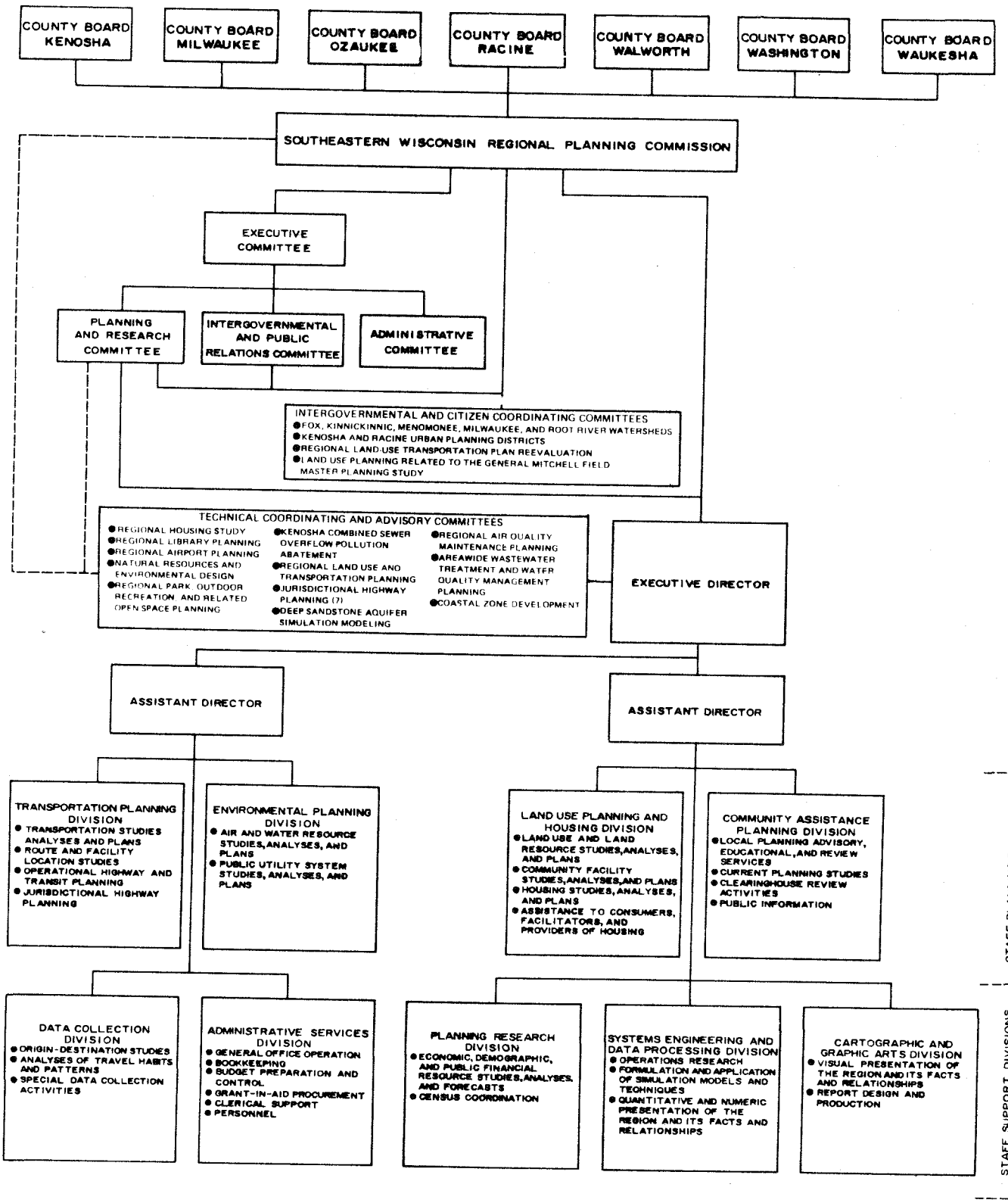
THE REGIONAL PLANNING COMMISSION

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) represents an attempt to provide the necessary areawide planning services for one of the large urbanizing regions of the nation. The Commission was created in August 1960, under the provisions of Section 66.945 of the Wisconsin Statutes, to serve and assist the local, state, and federal units of government in planning for the orderly and economical development of southeastern Wisconsin. The role of the Commission is entirely advisory; and participation by local units of government in the work of the Commission is on a voluntary, cooperative basis. The Commission itself is composed of 21 citizen members, who serve without pay, three from each county within the Region.

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

Figure 1

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION EXISTING STAFF AND COMMITTEE STRUCTURE



Source: SEWRPC.

THE REGIONAL PLANNING CONCEPT IN SOUTHEASTERN WISCONSIN

Regional planning, as conceived by the Commission, is not a substitute for, but a supplement to, local, state, and federal planning efforts. Its objective is to aid the various levels and units of government in finding solutions to areawide developmental and environmental problems which cannot be properly resolved within the framework of a single municipality or a single 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 plans for the physical development of the Region, these plans being limited to those 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, however, the preparation of alternative spatial designs for the use of land and for the supporting transportation and utility facilities.
3. Plan Implementation--promotion of plan implementation through the provision of a center for the coordination of the many planning and plan implementation activities carried on by the various levels and agencies of government operating within the Region.

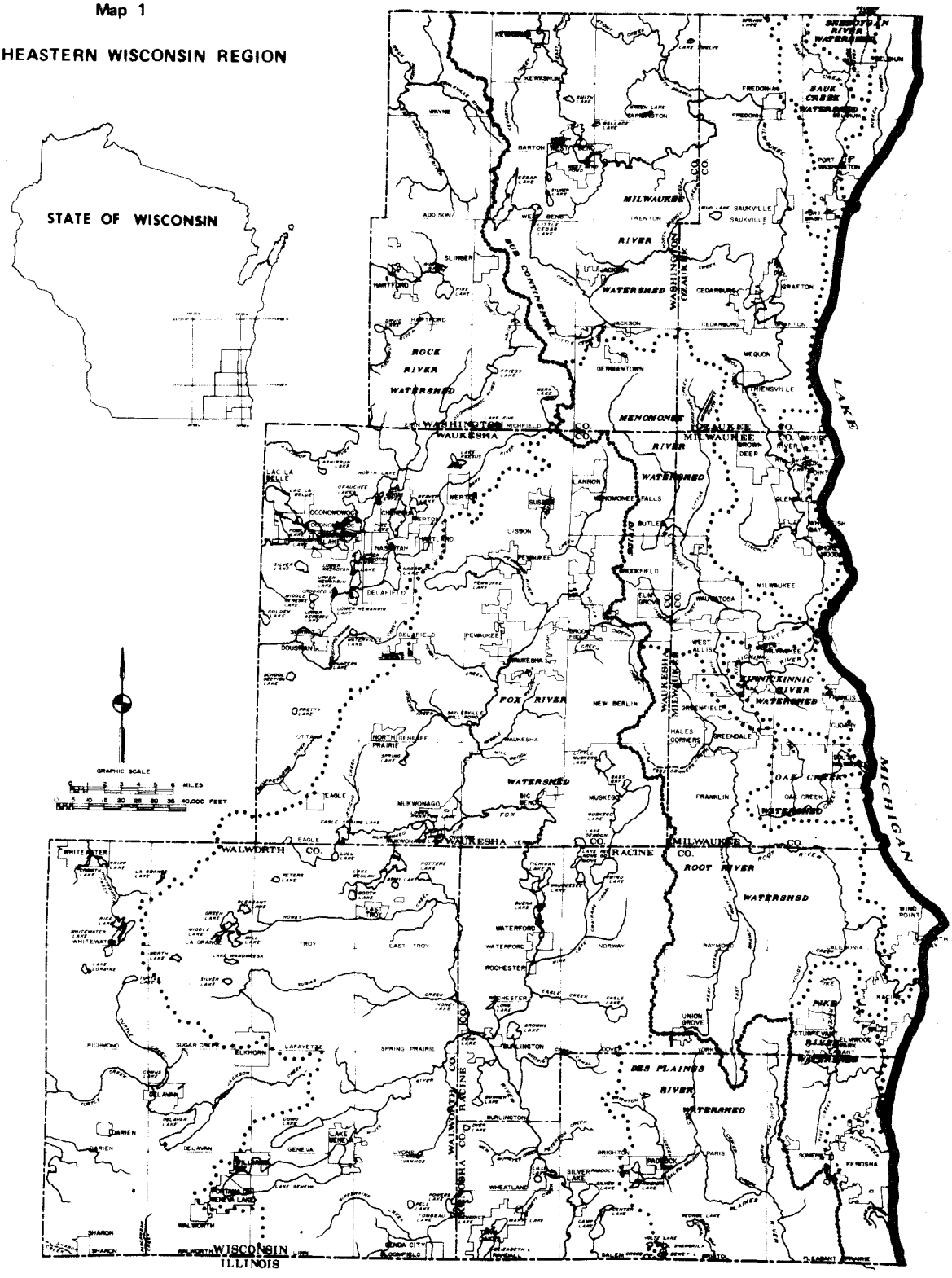
The work of the Commission is, therefore, visualized as a continuing planning process providing outputs of value to the making of development decisions by public and private agencies and to the preparation of plans and plan implementation programs at the local, state, and federal levels of government.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

THE REGION

The Southeastern Wisconsin Planning Region, as shown on Map 1, is comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties in southeastern Wisconsin. Exclusive of Lake Michigan, these seven counties have a total area of 2,689 square miles and together comprise about 5 percent of the total area of the State of Wisconsin. About 40 percent of the state population, however, resides within these seven counties, which contain three of the seven and one-half standard metropolitan statistical areas in the state. The Region contains approximately one-half of all the tangible wealth in the State of Wisconsin as measured by equalized valuation and represents the greatest wealth-producing area of the state, and about 42 percent of the state labor force is employed within the Region. It contributes about twice as much in state taxes as it receives in state aids. The seven-county Region contains 154 local units of government, exclusive of school and other special purpose districts, and encompasses all or parts of 12 major natural watersheds. The

Map 1

SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC

Region has been subject to rapid population growth and urbanization and, in the decade from 1960 to 1970 accounted for 40 percent of the total population increase of the entire state.

Geographically the Region is located in a relatively good position with regard to continued growth and development. It is bounded on the east by Lake Michigan, which provides an ample supply of fresh water for both domestic and industrial use, as well as being an integral part of the major international transportation network. It is bounded on the south by the rapidly expanding northeastern Illinois metropolitan Region and on the west and north by the fertile agricultural lands and desirable recreational areas of the rest of the State of Wisconsin. Many of the most important industrial areas and heaviest population concentrations in the Midwest lie within a 250-mile radius of the Region, and over 35 million people reside within this radius, an increase of nearly 5 million persons over the 1960 level.

COMMISSION WORK PROGRAMS

Initial Work Program

The initial work program of the Commission was directed entirely toward basic data collection. It included six basic regional planning studies, which were initiated in July 1961 and completed by July 1963: a statistical program and data processing study, a base mapping program, an economic base and structure study, a population study, a natural resources inventory, and a public utilities study.

All of these initial studies were directed toward providing a basic foundation of planning and engineering data for regional planning and were documented in six published planning reports. None of these studies involved the preparation of plans. Their findings, however, provided a valuable point of departure for all subsequent Commission work.

Regional Land Use-Transportation 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 of 1963 and completed in December of 1966. This program produced two key elements of a comprehensive plan for the physical development of the Region: a land use plan and a transportation (highways and transit) plan. The findings and recommendations of the regional land use-transportation study have been published in the three-volume SEWRPC Planning Report No. 7, Regional Land Use-Transportation Study.

The regional land use and transportation plans were formally adopted by the Commission in December 1966. In March 1967, these plans were certified to the then existing 153 local units of government within the Region and to various state and federal agencies concerned with the physical development of the Region. All seven county boards adopted the recommended transportation plan in 1967. All but the Ozaukee County Board adopted the recommended regional land use plan in 1967. Since then, the plan has been adopted or endorsed by the governing bodies of 10 of the 28 cities, 10 of the 54 villages, and 13 of the 65 towns within the Region. These plans have also been adopted or endorsed by numerous agencies of government since 1967, including the State Highway Commission of Wisconsin and the Milwaukee County Expressway and Transportation Commission.

The regional land use-transportation study has provided many important inputs to other regional and subregional plans in general, and water quality-related plan elements in particular. For example, the regional sanitary sewerage system plan recommendations for southeastern Wisconsin, especially those recommendations with respect to public sanitary sewer service areas, are inextricably related to the rural-to-urban land use conversion recommendations and natural resource protection measures set forth in the adopted regional land use plan. At the same time,

subregional planning programs, as exemplified by comprehensive watershed plans, are intended to build upon and refine the regional land use plan. For example, these watershed plans include refinements of land use plan environmental corridor delineations, with those refinements being based on supplemental, detailed natural resource base data--woodlands, wetlands, wildlife habitat, floodlands--acquired under the watershed planning programs.

Prior to synthesis of the regional land use plan, the Commission conducted an intensive inventory of the Region's natural resource base and man-made features. Key portions of this inventory information are updated and refined under the continuing regional land use-transportation study. This data base has been invaluable to the preparation of other regional and subregional plans in general, and water quality-related plan elements in particular. Inventories that are useful in water quality planning efforts include those dealing with water quality, streamflow, soils, water supply systems, sanitary sewerage systems, land use, population, commercial-industrial activity, and planning law. Particularly important among these work elements with respect to water quality management are the detailed operational soil survey of the Region documented in SEWRPC Planning Report No. 8, Soils of Southeastern Wisconsin, and the regional stream water quality inventory documented in SEWRPC Technical Report No. 4, Water Quality and Flow of Streams in Southeastern Wisconsin, both completed in 1966 and both providing valuable data for water quality management planning.

Subsequent to the completion and adoption of the regional land use and transportation plans, the Commission initiated a continuing regional land use-transportation planning process. Under this continuing process the basic planning and engineering data collected in, and the forecasts prepared under,

the initial regional land use-transportation study are continuously updated and revised so that the full value of these data and forecasts can be realized and development decisions within the Region made intelligently based upon current factual information. The plans prepared in the initial study are periodically updated and revised to reflect changing conditions within the Region. Information and guidance are provided to public decision makers, and additional detailed studies are undertaken to further support, encourage, and direct plan implementation. A particularly significant objective of the continuing regional land use-transportation study is to provide for the continued integration of the land use and transportation planning and development efforts within the Region with other elements of the comprehensive regional planning effort, including the preparation of water resource development, sewerage and water supply, park and open space, housing, and airport plan elements.

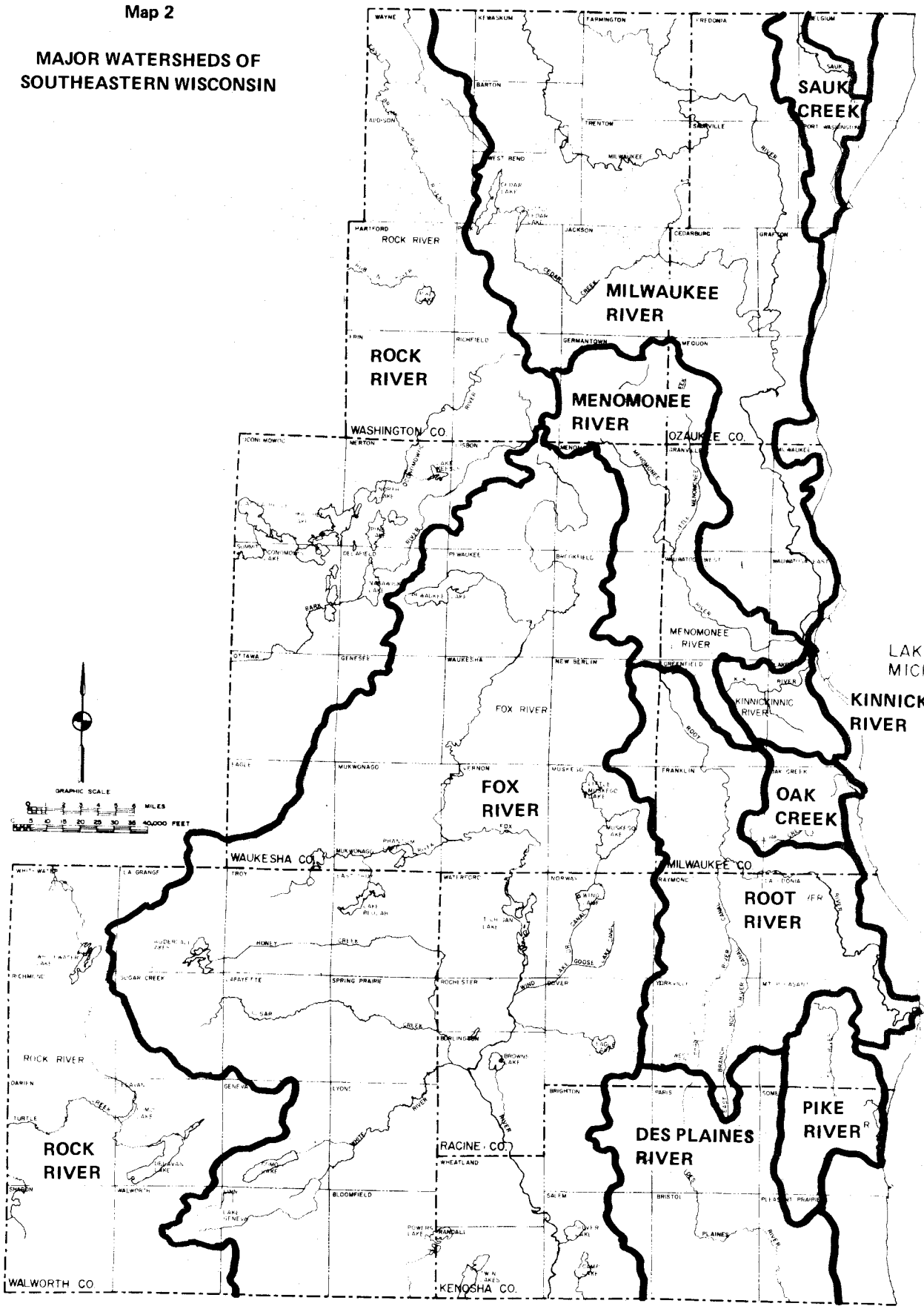
Comprehensive Watershed Studies

The Commission regional planning program very early recognized the significance of existing and potential future water-related resource problems, including flooding and water pollution. The natural watershed was selected by the Commission as the basic water and water-related resource planning unit. There are 11 such major watersheds within the Region (see Map 2). Comprehensive watershed plans have been completed for the Root, Fox, and Milwaukee River watersheds, and are under preparation for the Menomonee and Kinnickinnic River watersheds.

The basic purpose of watershed planning programs, as developed within the context of the overall regional planning program, is to permit public evaluation and choice of alternative water-resource development policies and plans and, through the preparation of a long-range plan for the development of water-related community facilities, to provide for the coordination of local, state, and federal

Map 2

MAJOR WATERSHEDS OF SOUTHEASTERN WISCONSIN



Source: SEWRPC.

water resource management programs within the Region and its watersheds. The more specific objectives of the watershed planning programs include the abatement of flood damage; the protection of floodways and floodplains from incompatible development; the abatement of water pollution and the protection of water supply; the preservation of land for park and related open space; the preservation of woodlands, wetlands, wildlife habitat, and prime agricultural lands; and the promotion of the wise and judicious use of the Region's limited land and water resources. In addition, the watershed plans serve to refine and adjust the regional land use plan, particularly in the riverine areas, and help achieve a more complete integration of land and water resource planning.

Root River: The Root River watershed study was the first comprehensive watershed planning program and the second major work program actually directed toward the preparation of long-range development plans to be undertaken by the Commission. This study was initiated in July 1964 and completed in July 1966, with the findings and recommendations being published in SEWRPC Planning Report No. 9, A Comprehensive Plan for the Root River Watershed, and in supporting SEWRPC Technical Report No. 2, Water Law in Southeastern Wisconsin. The comprehensive watershed plan documented in the planning report contains specific recommendations for the abatement of the flooding, water quality, and related land use and natural resource conservation problems in this 197-square mile watershed.

The Commission adopted the comprehensive plan for the Root River watershed on September 22, 1966. As of January 1, 1975, the recommended plan has been formally adopted by the Milwaukee and Racine County Boards of Supervisors; by the Metropolitan Sewerage Commission of the County of Milwaukee and the Sewerage Commission of the City of Milwaukee; by the Common Councils of the Cities of Franklin, Oak Creek, and Racine; and by the Town Board of the Town of Mt. Pleasant.

On February 5, 1971, the Root River watershed plan was certified by the Wisconsin Department of Natural Resources to the U. S. Environmental Protection Agency as the state-approved water quality management plan for the Root River basin, and on September 14, 1971, the U. S. Environmental Protection Agency approved the Root River watershed plan. Thus, the Root River watershed plan currently stands as an approved basin plan which is being utilized by the state and federal agencies in support of the review and award of federal grants-in-aid for sewerage and water quality control facility construction. Substantial progress has been made toward implementation of this plan as documented in the Commission series of annual reports.

Fox River: The Fox River watershed study was the second comprehensive watershed planning program and the third major work program directed toward the preparation of long-range development plans to be undertaken by the Commission. This study was initiated in November 1965 and completed in February 1970. The findings and recommendations were published in SEWRPC Planning Report No. 12, A Comprehensive Plan for the Fox River Watershed, Volume One, Inventory Findings and Forecasts, and Volume Two, Alternative Plans and Recommended Plan. The comprehensive watershed plan documented in this report contains recommendations for the abatement of the flooding, water quality, water supply, recreation, and related land use and natural resource conservation problems of this watershed. The study also produced special lake use reports for selected major lakes of the watershed.

The Fox River watershed study differed from the Root River study in that it was not conducted for an entire watershed, but only for the headwater portion of the Fox River basin. The attention of the Commission was focused primarily on the 942 square miles of the watershed lying in Wisconsin, but the Commission

remained cognizant of the relationship of this headwater area to the 1,640-square mile portion of the Fox River watershed located in Illinois.

The Commission adopted the comprehensive plan for the Fox River watershed on June 4, 1970. As of January 1, 1975, the Fox River watershed plan has been formally adopted by the Kenosha, Milwaukee, Racine, Walworth, and Waukesha County Boards of Supervisors; by the Common Councils of the Cities of Burlington, Waukehsa, New Berlin, and Brookfield; by the Village Boards of the Villages of Rochester, Sussex, Pewaukee, Silver Lake, and Menomonee Falls; by the Town Boards of the Towns of Waterford, Lisbon, Pewaukee, and Brookfield; by the Kenosha County Soil and Water Conservation District; and by the Lake Pewaukee Sanitary District. The plan has also been formally endorsed or acknowledged by the U. S. Department of Housing and Urban Development; the U. S. Department of Agriculture, Soil Conservation Service; the U. S. Department of Transportation, Federal Highway Administration; the U. S. Department of the Interior, Geological Survey; and the Wisconsin Department of Transportation, State Highway Commission.

On June 11, 1971, the Wisconsin Natural Resources Board approved the comprehensive Fox River watershed plan, and on July 21, 1971, certified the plan to the U. S. Environmental Protection Agency as the interim basin plan for the Fox River basin in Wisconsin. In reviewing the plan, the Environmental Protection Agency indicated that before formal federal approval would be forthcoming, two issues relating to the timetable for plan implementation should be addressed, one dealing with the nutrient removal requirements in the plan and the other with implementation of the proposed areawide sewerage system in the upper watershed.

In response to this request by the Environmental Protection Agency, the Wisconsin Department of Natural Resources, the Regional Planning Commission, and

the local units of government concerned cooperatively prepared a specific plan implementation schedule that included timely phosphorus removal recommendations for the entire watershed and a recommendation that the plan be amended to include two major sewage treatment plants for the upper watershed area. On September 13, 1973, the Commission took formal action to amend the Fox River watershed plan to include the two-sewage-treatment-plant alternative in lieu of the one-sewage-treatment-plant alternative for the upper watershed area in the adopted plan, and to further include as part of the adopted plan the Revised Implementation Schedule for Meeting Water Quality Objectives and Waste Treatment Requirements for the Fox-Illinois River Watershed, published in August 1973 by the Wisconsin Department of Natural Resources. On January 9, 1974, the Wisconsin Natural Resources Board certified the plan amendment to the Environmental Protection Agency, and on April 5, 1974, that agency gave full approval to the Fox River comprehensive plan as the water quality management plan for the Fox River basin. Progress toward implementation of the amended plan is documented in the Commission series of annual reports.

Milwaukee River: The Milwaukee River watershed study was the third comprehensive watershed planning program undertaken by the Commission and the fourth major work program directed toward preparation of a long-range physical development plan. The study was initiated in October 1967 and was completed in October 1971. The findings and recommendations were published in SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volume One, Inventory Findings and Forecasts, and Volume Two, Alternative Plans and Recommended Plan. Like the plan for the Fox River watershed, the plan for the Milwaukee River watershed contains recommendations for the abatement of the flooding, water

quality, water supply, recreation, and related land and natural resource conservation problems of this important watershed. The study also produced special lake use reports for selected major lakes of the watershed. Of particular importance to the Section 208 water quality planning and management program are the recommendations for the abatement of water pollution from combined sewer overflows in the entire Milwaukee Metropolitan area.

The Milwaukee River watershed study differed from the Root and Fox River watersheds in that a significant portion--about 38 percent--of the headwater area of the 694 square-mile watershed is located outside and north of the seven-county Region. It was evident from the beginning that the entire watershed should be included in any comprehensive planning program. This meant including in the study the considerable portions of the watershed lying outside of the Region in Fond du La and Sheboygan Counties, as well as the very small area of the watershed lying in Dodge County. Fond du Lac and Sheboygan Counties were accordingly requested to join in the work of the Watershed Committee, and their consent and participation marked the first time that neighboring counties formally and actively participated in Commission planning programs.

The comprehensive Milwaukee River watershed plan was formally adopted by the Commission in March 1972. As of January 1, 1975, the plan had been formally adopted by the Milwaukee, Ozaukee, Sheboygan, and Washington County Boards of Supervisors; by the Common Council of the City of Milwaukee; by the Village Boards of the Villages of River Hills and Saukville; by the Town Board of the Town of Fredonia; by the Sewerage Commission of the City of Milwaukee and the Metropolitan Sewerage Commission of the County of Milwaukee; by the City of Milwaukee Board of Harbor Commissioners; and by the Milwaukee County Park Commission. The watershed plan has also been formally endorsed or acknowledged by such important state and

federal agencies as the Wisconsin Board of Soil and Water Conservation Districts; the Wisconsin Board of Health and Social Services; the Wisconsin Department of Transportation; the U. S. Department of Agriculture, Soil Conservation Service and Farmers Home Administration; the U. S. Department of Housing and Urban Development; the U. S. Department of the Interior, Geological Survey and Bureau of Outdoor Recreation; and the U. S. Department of Transportation, Federal Highway Administration.

The Wisconsin Natural Resources Board on July 26, 1972, approved the Milwaukee River watershed plan, and on August 3, 1972, certified the plan to the U. S. Environmental Protection Agency as the approved water quality management plan for the basin. On March 19, 1973, the latter agency approved the plan, noting that the plan "...is certainly without equal in the State of Wisconsin with respect to comprehensive and quality of planning."[2] Thus, the Milwaukee River watershed plan currently stands as an approved basin plan which is being utilized by the state and federal agencies in support of the review and award of federal grants-in-aid for sewerage and water quality control facility construction.

Menomonee River: The Menomonee River watershed study is the fourth comprehensive watershed planning program to be undertaken by the Commission. It is, however, the first such study to be conducted by the Commission for a watershed which is not only extensively urbanized and which is expected to become almost entirely urbanized in the near future. Although the 136-square mile watershed encompasses only 5 percent of the area of the Region, 348,000 people, or about 20 percent of

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[2]Letter from Francis T. Mayo, Regional Administrator, U. S. Environmental Protection Agency, to L. P. Voight, Secretary, Wisconsin Department of Natural Resources, dated March 19, 1973.

the 1970 population of southeastern Wisconsin, resides within the watershed.

The Menomonee River watershed study was initiated upon the specific request of local units of government within the watershed as a result of a growing concern on the part of local public officials and citizen leaders over increasing problems of flooding, water pollution, park and open-space needs, industrial water supply, and changing land use. All of these problems interact so as to adversely affect the quality of urban life and so as to cause further deterioration and destruction of the natural resource base of the watershed.

Concern over what seemed at first to be local problems within subareas of the watershed was followed by a growing awareness among public officials that the causes and effects of these problems transcend local municipal boundaries and are related to the entire stream network and tributary drainage areas. The study was initiated on July 18, 1967, when the Common Council of the City of Wauwatosa formally requested the Commission to undertake the comprehensive study, looking to the ultimate resolution of the aforementioned water resource and water-related problems. The Commission accordingly, on March 7, 1968, formed the Menomonee River Watershed Committee, comprised of knowledgeable state and local public officials and citizen leaders from throughout the watershed. This Committee was created to assist the Commission in its study of the problems of the Menomonee River watershed. The prospectus prepared by this Committee was endorsed by the Commission in November 1969; published; and in accordance with the advisory role of the Commission, transmitted to the government agencies concerned for their consideration and action. All four county boards concerned--Milwaukee, Ozaukee, Washington, and Waukesha--as well as the Wisconsin Department of Natural Resources, formally endorsed the prospectus and agreed to provide the state and local funds

necessary for execution of the planning program. The U. S. Department of Housing and Urban Development and the U. S. Environmental Protection Agency also endorsed the prospectus and agreed to provide the federal funds necessary for execution of the program. All the necessary commitments from these local, state, and federal agencies were received early in 1972.

Work on the Menomonee River watershed study began in March 1972 and is scheduled to be completed late in 1975. At the present time all major inventories and analyses to be conducted under the study have been completed, and work has progressed into the alternative plan preparation stage. As in the case of previous Commission watershed studies, this study will result in the preparation of a comprehensive watershed plan that will provide important input to the preparation of a Section 208 water quality plan, including in particular recommendations relating to the abatement of pollution from nonpoint sources.

Kinnickinnic River: On March 20, 1973, the City of Milwaukee formally requested the Commission to undertake a comprehensive study of the Kinnickinnic River looking to the ultimate resolution of the serious and costly flooding and water pollution problems within that watershed. The Commission acted late in 1973 to form the Kinnickinnic River Watershed Committee to assist the Commission in its study of the Kinnickinnic River watershed problems. In November 1974, the Committee completed work on the Kinnickinnic River watershed planning prospectus, which prospectus identifies flooding and surface water pollution as the two major water resource-related problems in the watershed and which, consequently, require an areawide comprehensive effort for sound resolution. It is anticipated that the Kinnickinnic River watershed will be mounted late in 1975 or early in 1976, and will thus in part be conducted concurrently with the Section 208 water quality planning program. It is anticipated that the two programs will complement each

other with particular respect to the determination of water quality conditions along the Kinnickinnic River and its tributaries and the resolution of pollution problems resulting from nonpoint source discharges.

Regional Sanitary Sewerage System Planning Program

Recognizing the importance of sanitary sewerage to regional development, the Commission in 1969 initiated a regional sanitary sewerage system planning program. This program was completed in May 1974 with the formal adoption of the plan by the Commission (see SEWRPC Planning Report No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin). Technical and policy guidance in preparation of the regional sanitary sewerage system plan was provided by an advisory committee comprised of 24 distinguished public works officials and sanitary engineers representing the major universities and certain state and federal, as well as local, units of government within the Region.

The regional sanitary sewerage system plan was initially envisioned as a plan to provide recommendations for the extension of major trunk sewers in the urbanizing areas of the Region in order to meet planning requirements set forth in the 1960s by the U. S. Department of Housing and Urban Development. During the plan preparation period, however, as the federal government began to take stronger action with respect to water quality planning and management, the plan evolved into a broader effort to provide definitive recommendations for the identification of all waste treatment works necessary in the Region for the period 1970-1990. As such, the plan attempted in part to satisfy evolving federal planning guidelines with respect to waste water planning, although it was recognized in the plan that not all of the new federal guidelines, and in particular not all of the Section 208 planning requirements, could be met through the regional sanitary sewerage system planning effort.

Briefly, the recommended regional sanitary sewerage system plan is comprised of five major elements: sewer service areas, sewage treatment facilities, trunk sewers, abatement of combined sewer overflows, and auxiliary elements applicable in general to all recommended sewage conveyance and treatment systems. With respect to sewer service areas, the plan recommends that centralized sanitary sewer service be extended to a total of 670 square miles, or about 25 percent of the Region. With respect to sewage treatment facilities, the plan recommends that sewage treatment be provided to a total of 52 public facilities, and that in order to meet the established water use objectives and supporting water quality standards, 41 of the 52 facilities provide an advanced level of treatment. Twenty-two existing public sewage treatment facilities and 29 existing private sewage treatment facilities would be abandoned upon implementation of the plan. With respect to trunk sewers, the plan recommends the general alignment and approximate size of those intercommunity trunk sewers required to extend trunk sewer service from the recommended treatment plant into the recommended sewer service areas, as well as to permit the relocation of certain sewage treatment facilities and the abandonment of other sewage treatment facilities. With respect to the abatement of pollution from combined sewer overflows, the plan recommends proceeding with implementation of the Milwaukee River watershed plan recommendation to conduct a preliminary engineering study, including further consideration of the construction of a combination deep tunnel mined storage/flow-through treatment system to collect, convey, and adequately treat all combined sewer overflows in Milwaukee County. In the Kenosha and Racine areas, the plan recommends that definitive recommendations concerning which of the remaining combined sewer areas should be

separated and which should receive specialized sewage treatment facilities be held in abeyance until the completion of combined sewer overflow research and demonstration studies in those communities. Finally, the plan includes several auxiliary plan elements, including the mounting of clear water elimination efforts; the elimination of nearly 600 known points of sewage flow relief in the Region; the full metering of all sewage flows, including bypassed flows; the undertaking of special studies for sludge handling, disposal, or recycling; and the conduct of a continuing water quality monitoring program.

The regional sanitary sewerage system plan was formally adopted by the Commission on May 13, 1974. Since that time, it has been formally adopted by the County Boards of Walworth and Washington Counties; the Common Councils of the Cities of Milwaukee, Delavan, Elkhorn, and Racine; the Village Boards of the Villages of Brown Deer, Butler, Nashotah, River Hills, Kewaskum, Hartland, Fox Point, Whitefish Bay, Grafton, and Newburg; the governing boards of the Allenton Sanitary District and Delavan Lake Sanitary District; and the Sewerage Commission of the City of Milwaukee and the Metropolitan Sewerage Commission of the County of Milwaukee. In addition, the plan has been reviewed and endorsed by the Wisconsin Departments of Administration and Local Affairs and Development and by the U. S. Department of Agriculture, Farmers Home Administration; the U. S. Department of the Interior, Geological Survey; and the U. S. Department of the Army, Corps of Engineers. Finally, the Commission was notified on March 6, 1975, that the Wisconsin Department of Natural Resources intends to certify the regional sanitary sewerage system plan to the U. S. Environmental Protection Agency as an interim plan to serve until the Section 208 water quality management plan is completed.

Urban District Planning Programs

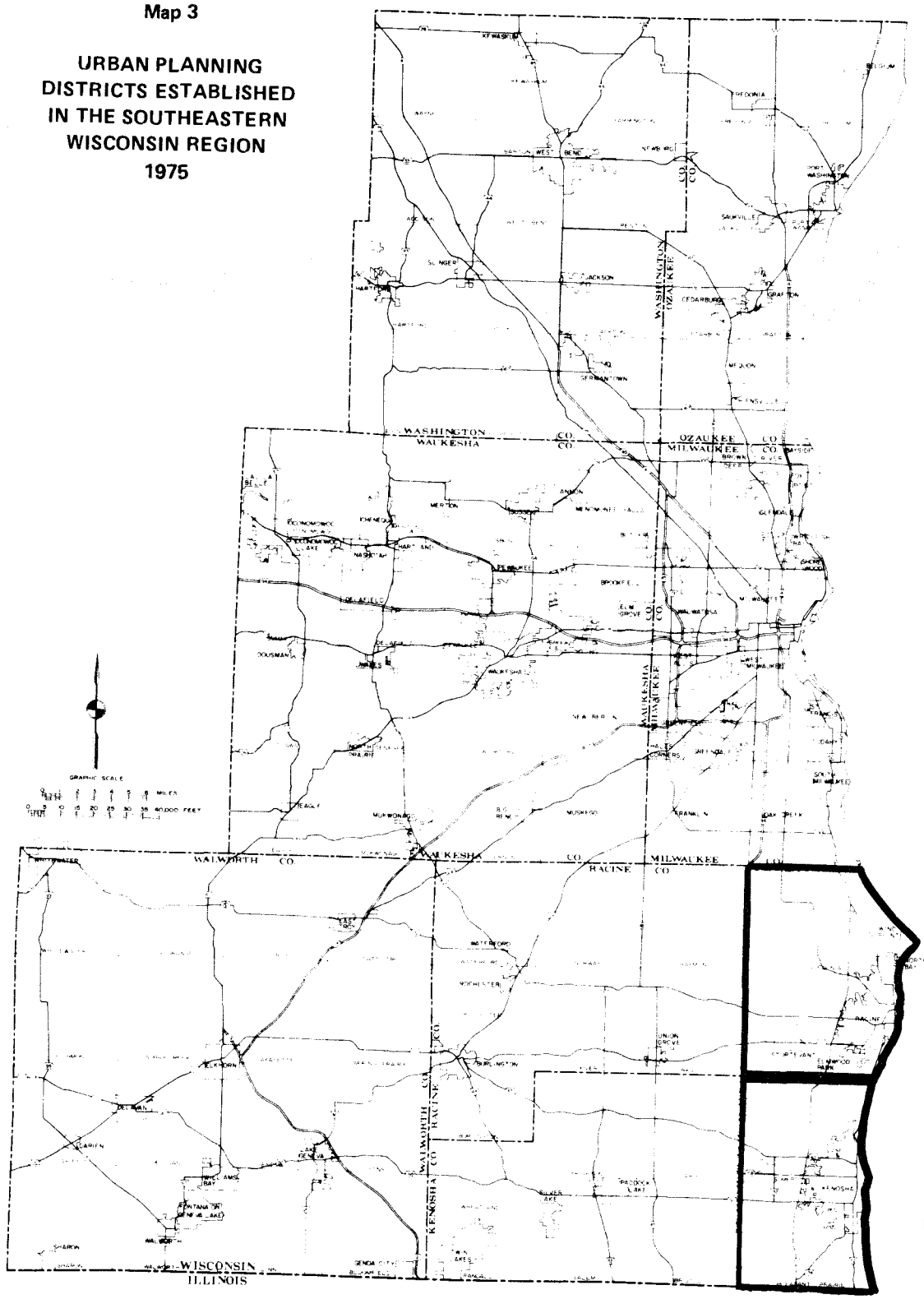
The Commission's planning program envisions the establishment of planning districts for the purpose of carrying the regional plans into the greater depth and detail necessary to provide a sound framework for local planning and for plan implementation. These planning districts consist of two types, the first of which is delineated on the basis of topography or topographically-related development problems as exemplified by the watersheds and accompanying planning studies as discussed above. The boundaries of the second type of planning district are delineated in relation to areas of intensive urban development which have certain common problems. To date, two such urban planning districts have been established in the Southeastern Wisconsin Region, one each in Kenosha and Racine Counties.

Kenosha Urban Planning District: The Kenosha Urban Planning District consists of all that part of Kenosha County lying easterly of IH 94 and is comprised of the City of Kenosha and the Towns of Pleasant Prairie and Somers (see Map 3). The Commission, at the request of the local units of government concerned, established the district and accompanying comprehensive planning program in order to provide a community development plan containing recommended proposals for land use, transportation, community facility, and public utility development to meet the needs of the District to the year 1990. This planning program was completed in 1967 and is fully documented in SEWRPC Planning Report No. 10, A Comprehensive Plan for the Kenosha Planning District, Volumes One and Two.

Of particular importance to the Section 208 water quality management planning program are those plan recommendations which directly relate to land use development; to storm water retention and drainage; and to sanitary sewage conveyance and treatment. The comprehensive plan for the Kenosha Urban Planning

Map 3

URBAN PLANNING DISTRICTS ESTABLISHED IN THE SOUTHEASTERN WISCONSIN REGION 1975



Source: SEWRPC.

District was adopted by the Regional Planning Commission on June 1, 1972, and was adopted by the City of Kenosha on October 16, 1972.

Racine Urban Planning District: The Racine Urban Planning District consists of all that portion of Racine County east of IH 94. The area is comprised of the City of Racine; the Villages of Elmwood Park, North Bay, Sturtevant, and Wind Point; and the Towns of Caledonia and Mt. Pleasant. The Commission was requested to establish the District and conduct the comprehensive planning programs as a result of an intermunicipal agreement brought about by problems relating to the proper extension of sanitary sewerage and water supply facilities. The comprehensive plan for the Racine Urban Planning District is fully documented in SEWRPC Planning Report No. 14, A Comprehensive Plan for the Racine Urban Planning District, Volume One, Inventory Findings and Forecasts; Volume Two, The Recommended Comprehensive Plan; and Volume Three, Model Plan Implementation Ordinance.

Of particular importance to the Section 208 water quality management plan are those recommendations relating to land use development; to storm water retention and drainage; and to sanitary sewage conveyance and treatment. It should be noted that because the comprehensive planning program for the Racine Urban Planning District and the regional sanitary sewerage system planning program were conducted concurrently, the sanitary sewerage system recommendations contained in the plan are identical to those contained for the subareas of the Region contained in the regional sanitary sewerage system plan discussed above.

To date, no action has been taken to formally adopt the comprehensive plan for the Racine Urban Planning District, pending the conclusion of inter-municipal sewer service negotiations currently underway that would seek to fully implement the plan recommendations.

Regional Air Quality Maintenance Planning Program

In 1973 during Commission consideration of a major reevaluation program relating to the previously adopted regional land use and transportation plans, the need to more specifically consider the impacts of regional plans on ambient air quality within the Region became apparent. In addition, new federal requirements relating to air quality control planning and management led to the proposal that the seven county Southeastern Wisconsin Region Intrastate Air Quality Control Region also be designated an Air Quality Maintenance Area. The combination of these events led to the development in 1974 of a comprehensive regional air quality planning program. The major elements of the regional air quality maintenance planning program for southeastern Wisconsin were set forth in the Regional Air Quality Maintenance Planning Program Prospectus published in July 1974. This program is currently underway, being funded in part by the U. S. Environmental Protection Agency and in part by the Wisconsin Departments of Natural Resources and Transportation. Since the Commission has taken on the responsibility, in conjunction with the concerned state agencies, to conduct the regional air quality maintenance planning program for southeastern Wisconsin, the data inputs relating to forecast population growth and change and land use development utilized in that program will be fully consistent with the data inputs utilized in the Section 208 water quality management planning program. Furthermore, those elements of the regional air quality maintenance planning program that relate to water quality will be integrated into the Section 208 water quality management planning program. For example, wash out or dry fallout of particulate matter from the atmosphere to the land surface as forecast under the regional air quality maintenance plan will be integrated into the analysis and forecast phase of the regional air quality planning program.

Water Quality Related Research Efforts

The Commission is currently participating in three important water quality related research efforts: the Menomonee River pilot watershed study, being

conducted by the International Joint Commission; the Washington County sediment and erosion control program; and a deep sandstone aquifer simulation modeling program.

Menomonee River Pilot Watershed Study: In April 1972 the governments of Canada and the United States signed a Great Lakes Water Quality Agreement and requested that the International Joint Commission (IJC) investigate pollution of the Great Lakes from various land use activities. The IJC then established the Great Lakes Water Quality Board to carry out the provisions of the Great Lakes Water Quality Agreement, which Board in turn created an international reference group on Great Lakes pollution from land use activities for the purpose of carrying out detailed studies relating to the effect of land use on water quality.

Included in the detailed studies of the reference group are a series of intensive studies of a small number of watersheds within the Great Lakes basin. These watersheds were carefully selected to permit extrapolation of the data and findings of the studies to the entire Great Lakes basin, and to relate water quality degradation found at river mouths to specific land uses in the tributary areas. The Menomonee River watershed in the Southeastern Wisconsin Region was selected as one of the seven watersheds to be studied, with particular emphasis upon the impact of urban land uses on Great Lakes water quality. Work on the Menomonee River pilot watershed study was initiated in 1973, with full funding of the project by the U. S. Environmental Protection Agency becoming available in May 1974. The project is scheduled for completion in early 1978.

The principal objectives of the pilot Menomonee River watershed are:

1. To determine the levels and quantities of major and trace pollutants, including but not limited to nutrients, pesticides, and sediments reaching and moving in stream systems tributary to the Great Lakes.
2. To identify the sources and evaluate the behavior of pollutants from an urban complex, with particular emphasis of the potential impact of residential, commercial, and industrial land use development, including

supporting utility and transportation facilities, and of construction activities associated with rapid urbanization, on stream water quality.

3. To develop the predictive capability necessary to facilitate extension of the findings of the Menomonee River pilot watershed study to other urban settings, leading to an eventual goal of permitting the accurate estimation of pollutant inputs from urban sources for the entire Great Lakes basin.

As is evident from the foregoing objectives, the Menomonee River pilot watershed study is an important research endeavor, with emphasis on the effect of land use on Great Lakes water quality. The project is a joint endeavor between the Wisconsin Department of Natural Resources; the University of Wisconsin System, Water Resources Center; and the Regional Planning Commission. The Commission staff contribution to the conduct of the study includes project management, data provision, and systems analysis. Although the Menomonee River watershed pilot study is not scheduled for completion until 1978, after completion of the initial Section 208 water quality management plan for the Region, it is possible that some of the preliminary findings of the research effort will be available for use in the Section 208 planning program. In addition, systems analysis experience gained by the Commission staff in the pilot study should be an aid in conducting the Section 208 effort.

Washington County Sediment and Erosion Control Program: In another research effort funded by the U. S. Environmental Protection Agency, the Commission is participating with the State Board of Soil and Water Conservation Districts, Washington County, and selected local units of government in Washington County in the conduct of a sediment and erosion control study. The basic purpose of the program is to develop more effective techniques for reducing pollution caused by sediment, with emphasis

given to the development of regulatory mechanisms. The program will include extensive monitoring of "before" and "after" situations to determine the impact of both urban and rural sediment control projects upon sediment pollution in streams. As in the case of the Menomonee River watershed pilot study discussed above, it is hoped that Commission participation in this major research effort will provide a basis for incorporating study findings directly into the Section 208 water quality management planning effort.

Sandstone Aquifer Modeling Program: In a cooperative research effort with the Wisconsin and U. S. Geological Surveys and with the major water utilities in the Region which use groundwater as a source of supply, the Commission is conducting a deep sandstone aquifer modeling program. The principal reason for undertaking a deep sandstone aquifer modeling program research project is the increasing utilization of groundwater in the seven-county Region and the resulting decline in the potentiometric surface of the deep sandstone aquifer--a prolific groundwater reservoir lying beneath the entire Region. The deep sandstone aquifer model--a digital computer program--developed under this program will be an invaluable aid in dealing with the complex groundwater system. Proper planning for use of the deep aquifer will be facilitated with the aquifer model and will include consideration of coordinated use of both the shallower dolomite and interconnected sand and gravel aquifers and the deeper sandstone aquifer, proper spacing of wells, possible withdrawal rates to prevent excessive interference between wells and to minimize declines in water levels, and protection of aquifer recharge areas through land use controls. Any findings of this program which may bear upon land use development and surface water quality will be fully integrated into the Section 208 water quality management planning program.

Community Assistance Program

The Commission since its inception has believed that a strong community assistance program is essential, not only to ensure wide dissemination of the data assembled under the regional planning program, but also to further understanding and implementation of adopted regional and subregional plan elements. Toward this end the Commission has carried on a community assistance program that has included the preparation of local planning guides, as discussed in more detail below, and model land use control ordinances; sponsorship of planning conferences and workshops; publication of a bimonthly newsletter; the extension of functional guidance and advice to local communities upon request; and the provision of project planning services and resident staff services at cost to local units of government, also upon request.

Of particular importance to the Section 208 water quality management planning program are the following types of community assistance activities:

1. The preparation of land use control ordinances designed at least in part to abate water pollution. Recent efforts toward this end are the City of Muskego Subdivision Control Ordinance, which includes specific provisions aimed at ensuring consideration of erosion control and sedimentation as part of the subdivision development process; and the Walworth County Zoning and Shoreland Zoning Ordinances, both of which contain numerous provisions relating to the regulation of both urban and rural activities so as to reduce undesirable runoff and concomitant surface water pollution.
2. The preparation of municipal ordinances designed to prohibit the introduction of undesirable matter into sanitary sewerage systems, including ordinances prohibiting the introduction of groundwater from sump pump systems into sanitary sewerage systems.

3. The conduct of conferences and meetings concerning water quality management. The most recent example of this type of community assistance effort was the Regional Conference on Sanitary Sewerage System User and Industrial Waste Treatment Recovery Charges held by the Commission on July 18, 1974.

4. The conduct of special water quantity and quality related studies for local units of government upon request. Recent examples of this type of effort include the drainage and water level control plan for the Rochester-Waterford-Wind Lake areas of the Lower Fox River watershed, as documented in SEWRPC Community Assistance Planning Report No. 5, and the floodland information report prepared for the City of Hartford, as documented in SEWRPC Community Assistance Planning Report No. 4.

Planning Guides

The Commission has established a series of local planning guides that are intended to constitute manuals of local planning practice and, as such, to improve the overall quality of planning within the Region and to promote sound community development properly coordinated on a regionwide basis. The guides discuss the planning and plan implementation principles involved in the particular subject matter, contain examples of good planning practice, and provide the local elected officials and technicians with model ordinances and forms to assist them in their everyday planning efforts.

To date, six such guides have been published by the Commission: a Land Development Guide (1963); an Official Mapping Guide (1964); a Zoning Guide (1964); Organization of Planning Agencies (1964); Floodland and Shoreland Development Guide (1968); and Soils Development Guide (1969). The latter two guides in particular have important implications for water pollution control and water

quality management efforts throughout the Region. The planning and plan implementation principles discussed in these two guides deal directly with the need to properly adjust urban land use development to the natural resource base, and to regulate both rural and urban development to minimize adverse impacts on water quality.

Other Planning Programs

In addition to the foregoing major work programs, the Commission has undertaken other regional and subregional planning programs to prepare additional elements of the evolving comprehensive plan for the seven-county Region. These include a regional library system planning program, a regional housing study, a regional airport system planning program, and a regional park, outdoor recreation, and related open space planning program.

Documentation

The foregoing summary of the overall Commission work program includes appropriate references to Commission publications documenting the findings and recommendations of the various studies. A more complete list of Commission publications, including references to maps and related materials available from the Commission, is included in Appendix B.

PURPOSE OF STUDY DESIGN

As already noted the major purpose of this study design is to provide a working outline of a proposed Section 208 water quality planning and management program for southeastern Wisconsin to serve as a basis for the award of a federal grant in support of the program from the U. S. Environmental Protection Agency and as a basis for initiating the work program. It is not contemplated that this study design should be complete in every respect. Rather this study design is intended to serve as an initial "plan of work" required by the U. S.

Environmental Protection Agency, with the understanding that this plan of work may be amended from time-to-time as the need arises. Accordingly, the next four chapters of this study design set forth a statement of the general objectives and purpose of conducting the Section 208 areawide water quality planning and management program; outline the major work elements of the program; set forth an organizational structure for the program; and set forth a recommended budget for the program. The final chapter is a summary and conclusion.

Chapter II

GENERAL OBJECTIVES AND PURPOSE OF AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM

INTRODUCTION

The Commission work program as described in summary form in the previous chapter of this study constitutes a major comprehensive planning effort and commitment of public resources over the last decade to the conduct of water quality related studies and the preparation of regional and subregional plan elements which provide local, areawide, state, and federal units and agencies of government with recommendations for land use development and water pollution control. In general, the Section 208 water quality planning and management planning program for southeastern Wisconsin is intended to update, extend, and refine the previous studies and plans completed by the Commission, and in so doing fully meet the requirements of Section 208 of the Federal Water Pollution Control Act, as amended.

More specifically, the areawide water quality planning and management program for southeastern Wisconsin is intended to provide for the full integration of Commission regional water quality management planning with regional land use planning; to provide for the conduct of a refined areawide water quality and quantity monitoring and modeling program; to prepare an areawide point source pollution abatement plan element through revision and refinement as may be found necessary of the previously prepared and adopted comprehensive watershed plans and regional sanitary sewerage system plan; to prepare an areawide nonpoint source pollution abatement plan element, building upon previous Commission watershed planning efforts; to prepare a practical areawide water quality management plan element, building upon previous Commission plan implementation recommendations with respect to land use development and water quality management;

to conduct, within the purview of an areawide water quality planning and management program, subarea facilities planning for municipal waste water conveyance and treatment facilities anticipated to be constructed within a five-year period following completion of the Section 208 plan; and to provide for the establishment of a continuing areawide water quality planning and management program for southeastern Wisconsin. Each of these specific program objectives is discussed briefly below, with the major work elements of the program relating to the achievement of these objectives being described in the next chapter of this study design.

It should be recognized by all concerned that the new Section 208 water quality management planning program is being introduced into an ongoing stream of planning and plan implementation efforts by many units and agencies of government. Such efforts should not be needlessly disrupted pending the completion of the Section 208 plan. The Commission's adopted watershed and regional sanitary sewerage system plans will serve as a base and point of departure for the Section 208 planning effort and will continue to remain in effect throughout the 208 planning period. Consequently, communities in the Region should be able to confidently proceed with plan implementation actions, particularly with respect to the abatement of water pollution from point sources.

INTEGRATE WATER QUALITY MANAGEMENT PLANNING WITH LAND USE PLANNING

As an integral part of the continuing regional land use-transportation study, funded cooperatively by the constituent counties of the Region, the Wisconsin Department of Transportation, and the U. S. Departments of Transportation and Housing and Urban Development, the Commission is currently preparing a revised and updated regional land use plan, as well as a revised and updated regional transportation plan. It is anticipated that the new regional land use plan,

which is to be prepared for the target year 2000, will be completed and ready for public evaluation in early Fall 1975. It is envisioned that this new regional land use plan will provide nearly all of the land use input necessary for the preparation of the Section 208 water quality management plan.

Because the Commission is the official comprehensive, areawide, planning agency for southeastern Wisconsin and is charged by State Statute with the responsibility of preparing a regional land use plan, there is, then, no need to conduct extensive, duplicative land use planning efforts under the Section 208 water quality management planning program. It is anticipated, however, that some costs will be incurred for land use planning, per se, in the water quality management planning program, primarily with respect to the precise delineation of future sewer service areas in subarea facility planning and with respect to the preparation of a nonpoint source pollution abatement plan element, where more detailed rural land use planning efforts may be required. Because, however, the areawide land use planning in southeastern Wisconsin is being conducted by the same agency charged with the responsibility of the preparation of Section 208 water quality management planning, there will be no duplication of land use planning effort, thus not only ensuring that the regional land use planning efforts and the regional water quality management planning efforts are fully integrated and consistent but effecting certain economies and efficiencies in the planning effort as well.

The land use development proposals contained in the new regional land use plan will be evaluated in terms of their possible impacts on water quality. Especially important in undertaking this evaluation will be new information generated in the Section 208 areawide planning process, particularly those aspects related to urban nonpoint source pollution and storm water management. Special

attention will also be given to the sizing of trunk sewers for new development, the under-utilization of existing capacity which might be found in the Region's sewerage systems, and the assessment of the impacts of trunk sewer location on sensitive environmental areas.

CONDUCT WATER QUALITY AND QUANTITY MONITORING AND MODELING

As an integral part of its previous water resources planning programs, the Commission has, in cooperation with the Wisconsin Department of Natural Resources, monitored stream water quality annually at 87 sampling locations throughout the Region. This annual monitoring effort has been supplemented by more intensive, short-term water quality monitoring investigations for selected stream reaches and for certain inland lakes at various times. It is essential that this water quality monitoring program not only be continued but be expanded if the data required to intelligently relate agricultural and urban runoff and the point sources of pollution throughout the Region to stream, lake, and ground water quality, and to simulate stream water quality conditions under future, as well as existing land use conditions, is to be assembled. It is envisioned in this respect that one of the specific outputs of the Section 208 planning program for southeastern Wisconsin will be the publication of a Commission technical report analyzing the stream and lake water quality data collected over the past decade; assessing existing stream and lake water quality conditions; and determining what, if any, trends in stream and lake water quality have been established over the past 10 years.

In addition, it is envisioned that the Section 208 water quality management planning program will provide for the further development of the water quality and quantity modeling capability of the Commission. To date the Commission has developed water quality models capable of simulating dissolved oxygen conditions

in selected reaches of certain major streams of the Region. The Commission has developed a generalized model for estimating dissolved oxygen conditions for typical small stream reaches within the Region. Finally, the Commission has also developed a water quanitity modeling capability for determing flood flows and delineation floodlands along stream reaches. In this respect, it should be noted that water quality and water quantity modeling efforts are interrelated. Accordingly, it is envisioned that the Section 208 planning program will include the further development of both water quality and quantity modeling capability within the Region.

All of these various water quality and quantity simulation activities need to be further expanded and developed to provide a better capability to determine the effects of community development decisions, on future stream and lake water quality, as well as to provide the capability to analyze potential effects of the expenditure of large amounts of public monies for alternative water quality and quantity management facilities to serve existing and anticipated rural and urban development, and to abate existing water quality and quantity problems of the Region. It is, therefore, intended that a major objective of the Section 208 water quality management planning program for southeastern Wisconsin is to further expand and improve the Commission's water quality and quantity data collection capability and the Commission's water quality and quantity simulation modeling efforts.

PREPARE AREAWIDE POINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT--UPDATE AND EXTEND REGIONAL SANITARY SEWERAGE SYSTEM PLAN

As noted earlier, the regional sanitary sewerage system plan adopted in 1974 included many of the requirements of a Section 208 water quality management planning program. The plan, for example, identified waste water

treatment works necessary in the Region for an approximately 20-year period, as well as related major intercommunity waste water collection systems. The forecasts of future population growth and change in the Region, and the concomitant forecast of sewage flow, which served as important inputs to the preparation of the regional sanitary sewerage system plan, were all based upon the Commission adopted regional land use plan for 1990. Since a new regional land use plan for the year 2000 will be completed by the Commission during the early months of the Section 208 planning program, an opportunity is provided to fully update all of the plan recommendations contained in sewerage system plan to the year 2000. In this respect, it is not envisioned that major changes in the plan recommendations for municipal waste water conveyance and treatment facilities set forth in sewerage system plan will result from this review and update, and it is not the Commission's intent to reopen many of the major systems planning decisions settled in the preparation of the regional sanitary sewerage system plan. Rather, this review and update effort is intended to constitute an analyses of the impact of the new regional land use plan and accompanying growth and change forecasts on the recommendations included in the regional sanitary sewerage system plan and the refinement of that plan as may be found necessary. Consequently, while it is anticipated that future population forecasts and, consequently, sewage flows and sewer service areas, will change somewhat from those included in the regional sanitary sewerage system plan, it is not envisioned that major concepts incorporated in the system plan will be changed.

In addition to reviewing and updating the regional sanitary sewerage system plan, it will be necessary to extend that plan to include more specific recommendations relating to such areas as industrial waste discharges and industrial waste pretreatment requirements and the handling, disposal, and recycling of

solid wastes removed or produced in the municipal waste treatment process. The foregoing subject areas, while addressed in the regional sanitary sewerage system planning effort, will need to be extended as part of the Section 208 planning program.

PREPARE AREAWIDE NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT

Previous Commission watershed planning efforts have included recommendations pertaining to stream and lake water quality protection through the application of sound soil and water conservation practices to agricultural lands in order to control runoff from agricultural and rural sources. Such recommendations resulted from findings in the watershed studies that about half of the phosphorus input to the lakes and streams of the Region, excluding Lake Michigan, originates from agricultural lands. Phosphorus movement from such agricultural lands is almost exclusively due to its association with eroded soil particles carried by surface runoff. Some of the phosphorus input to the lakes from farmlands is carried by spring snowmelt and rainfall runoff from manure spread on frozen ground during the preceding winter. Soil erosion caused by summer rainfall may also contribute phosphorus to the lakes, as a constituent of or adsorbed on eroded soil particles. For these reasons, the elimination of the practice of spreading manure on frozen ground coupled with the installation of good soil and water conservation practices that prevent erosion appear to be the most effective means of controlling pollution from agricultural runoff in southeastern Wisconsin.

The Commission anticipates developing additional information under the Section 208 planning program to further delineate and quantify the agricultural areas throughout the Region for which such practices should be developed, as well as cause the installation of storm water runoff facilities and manure

holding facilities for identified major concentrated sources of agricultural wastes, such as feed lots. In addition, attention will be given to the magnitude of pollution caused by construction activities, silviculture, and mining in the Region. It is not anticipated that attention need be given to salt water intrusion within this Region.

In addition to the foregoing, attention will be focused on pollution attributable to storm water drainage. In particular, the Commission proposes to include in the program the development of an urban storm water management guide. This guide would address all facets of the urban storm water drainage in the Region and constitute a manual of engineering practice for the abatement of both the water quality and quantity problems associated with such drainage. The guide would identify the legal and fiscal, as well as physical, problems involved in urban storm water management; review the state of the art of storm water management; inventory regional storm water management problems; propose storm water management objectives, principles, and standards; and select engineering design criteria and analytical procedures and illustrate their application in one or more subareas of the Region.

PREPARE AREAWIDE MANAGEMENT PLAN ELEMENT

The central requirement of Section 208 of the Federal Water Pollution Control Act, as amended, is the development of management recommendations designed to carry out the point and nonpoint source pollution abatement recommendations included in the areawide water quality management plan. Section 208 specifically requires the designation of one or more planning agencies to carry out the plan. The Commission as a matter of policy has always included in each of its adopted plan elements a separate chapter dealing with plan implementation, and specifically including implementing recommendations with

respect to the various federal, state, areawide, and local units and agencies of government concerned. The preparation of an areawide management plan element of a Section 208 plan will thus present an opportunity for the refinement and extension of this Commission practice. It is envisioned in this respect that the Section 208 management plan recommendations for southeastern Wisconsin will include the designation of a number of management agencies both with respect to control of pollution from point sources and with respect to control of pollution from nonpoint sources. Particular emphasis will have to be placed on the designation of management agencies in those instances where the plan will recommend that a number of local units of government cooperatively act to carry out a single physical plan recommendation. Where specific authority to carry out such recommendations is lacking, the Section 208 plan will provide suggested legislation. In addition, the management plan element is intended to include a financial program including guidelines with respect to user charges and industrial cost recovery. It is envisioned that the financial program would be regional in nature and scope, with the development of specific financial management plans for logical subareas of the Region to be the responsibility of those management agencies designated in the Section 208 plan, coordinated, however, by the overall areawide program.

CONDUCT SUBAREA FACILITIES PLANNING

The federal Water Pollution Control Act envisions that, where Section 208 planning activities are underway, such efforts should include facilities planning normally provided for on an individual community basis under Section 201 of the Act. Such facilities planning is carried out with respect to municipal waste water conveyance and treatment facilities, and is intended to refine and detail the areawide plan recommendations as an important step toward the preparation of

construction drawings and specifications prior to the awarding of a waste treatment works construction grant. In addition, facilities plans include the preparation of environmental assessments with respect to the facilities being proposed, as well as a description of the selected waste treatment systems, infiltration and inflow documentation, identification of effluent discharge limitations, and conduct of a public hearing held on the facilities planning effort. Thus facilities planning is one of the most important steps in systems plan implementation.

As shown in Table 1, there are a total of 19 facilities planning projects already funded or committed by the Wisconsin Department of Natural Resources within the Southeastern Wisconsin Region. It is the intent of the Section 208 federal water quality planning management program to fully integrate the results of these facilities planning efforts in the Section 208 plan, and to coordinate the preparation of such plans as necessary. Of particular importance in this respect is the facilities planning project now underway to determine the most cost effective solution to the problems of abating pollution from combined sewer overflows in the Milwaukee area. This facilities planning project, which is a preliminary engineering study, is being carried out with a Section 201 grant in accordance with a prospectus prepared by the Regional Planning Commission for the Milwaukee-Metropolitan Sewerage Commissions. In addition to including already funded or committed facilities plans in the Section 208 program, then, it is an objective of the Section 208 planning effort to include additional facilities plans for those remaining recommended waste treatment and conveyance facilities that will likely be needed within five years from the time of completion of the Section 208 plan. As discussed in more detail in a later section of this report, federal Section 208 financial limitations preclude the actual conduct of

Table 1

EXISTING AND COMMITTED SECTION 201 FACILITIES
PLANNING PROJECTS IN THE SOUTHEASTERN WISCONSIN REGION

Section 201 Applicant	Project Name	Estimated Facility Construction Cost
Caddy Vista Sanitary District.....	Trunk Sewer Connection to Milwaukee-Metropolitan Sewerage System	$ 300,000
Delafield-Hartland Water Pollution Control Commission.....	New Areawide Wastewater Treatment Plant and Trunk Sewer	9,000,000
Jackson, Village of.....	New Wastewater Treatment Plant	900,000
Milwaukee-Metropolitan Sewerage Commissions.....	Menomonee Falls Trunk Sewer Connection	4,000,000
	Menomonee River Parkway Trunk Sewer	12,000,000
	Combined Sewer Overflow Preliminary Engineering Study	300,000,000
	Northeast Area Infiltration/Inflow Study	Not Applicable
	Northeast Trunk Sewer	55,000,000
	Northwest Area Infiltration/Inflow Study	Not Applicable
	West Area Infiltration/Inflow Study	Not Applicable
	Hales Corners Trunk Sewer	4,500,000
Oconomowoc, City of.....	New Areawide Wastewater Treatment Plant	4,600,000
Pewaukee, Village of.....	Pewaukee-Brookfield Trunk Sewer	2,500,000
Racine, City of.....	Wastewater Treatment Plant Expansion	15,000,000
Sturtevant, Village of.....	Mt. Pleasant-Sturtevant-Racine Trunk Sewer	4,600,000
Sussex, Village of.....	Interim Additions to Wastewater Treatment Plant	1,840,000
Union Grove, Village of....	New Wastewater Treatment Plant and Trunk Sewer	2,500,000
Waukesha, City of.....	Wastewater Treatment Plant Expansion	6,000,000
West Bend, City of.....	Wastewater Treatment Plant Expansion	3,500,000

Source: Wisconsin Department of Natural Resources and SEWRPC.

facilities planning with Section 208 monies. Accordingly, all necessary facilities planning will be conducted with available Section 201 monies. All Section 201 work programs will be subject to review and monitoring by the Commission as the Section 208 planning agency in order to assure full coordination with the Section 208 planning effort.

ESTABLISHMENT OF CONTINUING AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM

The final major objective of the Section 208 planning effort for southeastern Wisconsin is to provide the mechanism for the establishment of a continuing, areawide water quality planning and management program for the Region. It has been Commission policy in the past to provide such continuing planning efforts so as to monitor development and provide a basis for plan reappraisal and refinement as needed in future years. A primary example of such a continuing planning effort. is the continuing regional land use and transportation study, established in 1967. The Section 208 plan will, then, specifically address this matter, outlining the necessary continuing work program, and recommend an organizational structure and budget for such program.

Chapter III

MAJOR ELEMENTS OF THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM

INTRODUCTION

This chapter sets forth the major elements of the proposed Section 208 water quality planning and management program for the seven-county Southeastern Wisconsin Region. The chapter is intended to establish the general scope and content of the planning program required to produce a Section 208 water quality management plan for the Region, and to thereby provide recommendations for the abatement of pollution from both point and nonpoint sources so that the established water use objectives and supporting water quality standards will be met in a timely manner. The work program has been prepared in sufficient detail to permit the development of initial cost estimates for budgetary and grant application purposes; to establish a practical time sequence and schedule for the necessary work; and to develop an organizational structure for the proposed work, including a determination of staff requirements. The outline is intended to constitute the initial plan of work as required by the U. S. Environmental Protection Agency for Section 208 planning programs and, as such, is a study design. As indicated in Chapter I, however, it is envisioned that the plan of work may be revised from time-to-time during the actual conduct of the work program as necessary.

The outline is based upon the following assumptions:

1. That the primary purpose of the Section 208 areawide water quality planning and management program will be the development of a sound and workable plan to control water pollution from both point and nonpoint sources within the Region, meeting established water use objectives and supporting water quality standards in a cost effective manner and in so

doing promoting implementation of broader regional plan elements, and furthering the protection and wise use of the Region's natural resource base. In addition, the Section 208 planning program shall provide, in so far as possible, planning and engineering data which can contribute to broader regional resource planning and plan implementation, as well as to specific implementation of the Section 208 plan elements.

2. That the areawide water quality management plan produced by the Section 208 planning program will be in sufficient depth to provide a sound basis for the review by the Commission of federal grant applications for water quality related facility improvements, as well as a basis for planning and design of private and municipal waste water collection and treatment facilities, and for the administration of the pollutant discharge permit system authorized by the Federal Water Pollution Control Act and administered in Wisconsin by the Department of Natural Resources.
3. That effective solutions to the water resource problems of the Regional and full realization of its development potential can be achieved only by considering all important aspects of the natural resource base, together with all significant human modifications and uses thereof. This requires that the Section 208 planning program be comprehensive in both functional scope and geographic area, fully recognizing the interrelationship of the land and water use problems of natural drainage basins, as well as the need to consider the entire Region as a rational planning unit. The latter will require that the Section 208 planning program be conducted for the seven county Southeastern Wisconsin Region and for that portion of the Milwaukee River watershed lying in Dodge,

Fond du Lac, and Sheboygan Counties (264 square miles), such additional area constituting the headwater area of the Milwaukee River watershed, its consideration being essential to sound water quality management planning for the lower watershed.

4. That the program will utilize the latest planning and engineering techniques in developing a comprehensive, coordinated water quality management plan for the entire Southeastern Wisconsin Region.
5. That the task of establishing a comprehensive water quality management planning program, collection and analysis of basic data under such a program, the formulation of individual plan elements, the synthesis of the recommended plan, and plan implementation all require close and continuing cooperation among the various levels and agencies of government concerned with, and involved in, land and water use problems of the Region.
6. That full use will be made of all existing and available surveys, studies, reports, and other data, including past regional and subregional planning studies, which may influence or affect the proposed work program, and that additional data collection activities will be conducted only as necessary to develop original data essential to preparation of a sound areawide water quality management plan. Thus, to the maximum extent possible, emphasis in the program will be on problem analysis and on plan formulation, test, and evaluation, rather than on data collection.
7. That, although time is of the essence, the breadth of the study and its intensity must not be sacrificed for the expediency of affecting temporary, short-range solutions to the problems of the Region.

It is intended that the proposed Section 208 planning program will culminate in the preparation and adoption of an areawide water quality management plan providing for the abatement of pollution from both point and nonpoint sources. In addition, it is intended that the plan will include specific recommendations for the designation of management agencies as required by the Federal Water Pollutio Control Act. In this respect, it is intended by the Commission that the Section 208 plan will fully supercede the adopted regional sanitary sewerage system plan and those portions of the adopted comprehensive watershed plans which deal directly with water pollution abatement.

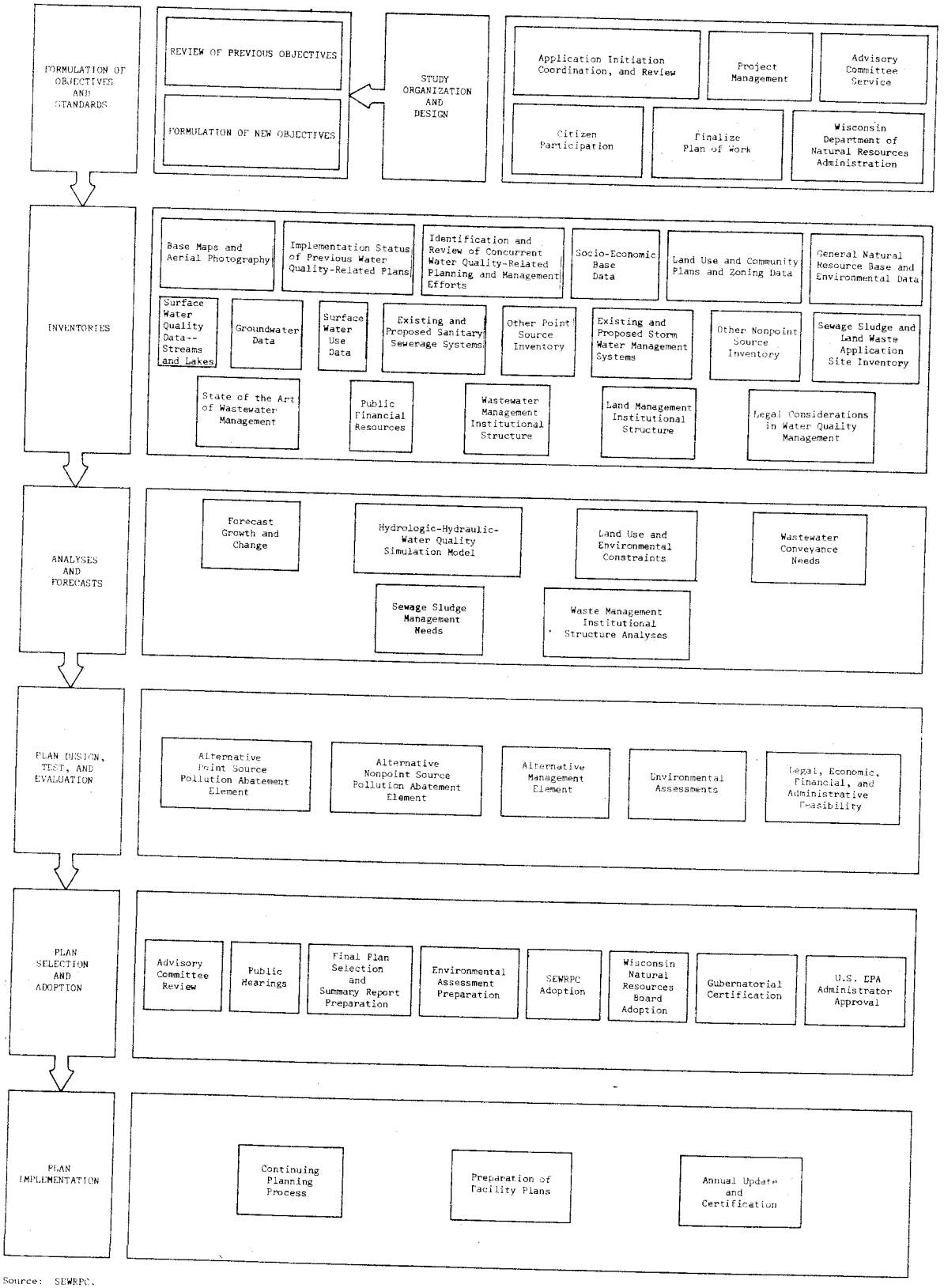
The proposed program is to employ a seven-step planning process developed by the Commission, through which the principal functional relationships existing in the Region that affect water quality can be accurately described both graphically and numerically; flows and quality conditions in the surface water system simulated; and the effect of different courses of action with respect to land use and water quality management tested and evaluated. The seven steps involved in this planning process are: 1) study organization and design; 2) formulation of objectives, principles, and standards; 3) inventory, or data collection; 4) analyses and forecasts; 5) preparation, test, and public evaluation of alternative plans; 6) plan selection and adoption; and 7) plan implementation, including the establishment of a continuing planning process and the preparation of precise facility plans. The major phases of the Section 208 water quality management planning program for southeastern Wisconsin are identified in Figure 2.

STUDY ORGANIZATION AND DESIGN

The first step in the Section 208 planning process for southeastern Wisconsin actually began with the formal designation of the Commission as the Section 208 planning agency for the Region on December 26, 1974. From that point on, considerable effort has been expended by the Commission and its staff in preparing

Figure 2

MAJOR PHASES OF THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM FOR THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

for the actual conduct of the Section 208 planning program, including the preparation of this initial plan of work document. Accordingly, the study organization and design work elements include as subelements the initiation, coordination, and review of the Section 208 grant application to the U. S. Environmental Protection Agency; internal project management, which is an ongoing function throughout the life of the program; advisory committee organization and service; citizen participation; finalization of the plan of work; and Wisconsin Department of Natural Resources Administration. Each of these individual subelements of study organization and design is discussed below.

Application Initiation, Coordination, and Review

The first step in the process of mounting a Section 208 planning program for southeastern Wisconsin consists of the procedures necessary to actually gain approval of a water quality management planning grant under Section 208 from the U. S. Environmental Protection Agency. This work step involves reacting to comments of state and federal agencies and the general public pertaining to the designation of the Region and the Commission under Section 208, the preparation of the actual application forms and the initial plan of work document; the conduct of staff level meetings between the Commission and the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency; arrangements for interagency staff participation in the work program; preparation of suggested committee rosters for review and approval by the Commission Executive Committee; the holding of public informational meetings and hearings concerning the Commission application for Section 208 funds and the proposed initial plan of work; and the actual submittal of the grant application to the U. S. Environmental Protection Agency.

Project Management

This function, which will continue throughout the life of the project, includes the preparation, review, and reevaluation from time-to-time of the plan of work; recruitment and orientation of necessary resident staff; the solicitation, review, and selection of proposals for consultant contracts and the monitoring of consultant work activities; the preparation of progress reports, both with respect to technical work and budget; the review and coordination of staff and consultant activities; professional development of staff; and other ongoing project management activities. In addition, this function will include coordination of the Section 208 planning effort in southeastern Wisconsin with similar efforts in adjacent urban regions. To date, one such additional effort has been mounted, that for northeastern Illinois by the Northeastern Illinois Regional Planning Commission. It is anticipated that coordination will be achieved through exchange of information, periodic interagency staff meetings, and advisory committee membership.

Advisory Committee Service and Citizen Participation

Since its inception the Commission has strived to achieve sound and constructive citizen participation in all of its work programs. This established policy, coupled with requirements for citizen participation under the Federal Water Pollution Control Act, will require an effective citizen participation element in the Section 208 work program. Primary citizen participation is intended to be obtained through citizen membership on a technical and citizen advisory committee, as described below. In addition, the Commission proposes to conduct from time-to-time public informational meetings and public hearings on the work as well as to disseminate information concerning the program through the Commission newsletter and annual report and through supplementary information-type documents, such as news releases. Conferences and/or workshops will also be

scheduled as required. Consideration will also be given, as appropriate, to the use of educational television, newspaper supplements, attitudinal surveys, self-guiding field trips, and primary and secondary school educational materials in an attempt to ensure that all citizens have an opportunity to become informed about the Section 208 planning program for southeastern Wisconsin, as well as an opportunity to make useful inputs to the Section 208 decision making process. Because of its importance, citizen participation is envisioned as an ongoing work element to be continued throughout the life of the program.

As discussed in more detail in the next chapter of this document, it is proposed that the Section 208 planning program for southeastern Wisconsin be guided and monitored by two advisory committees: a local level Technical and Intergovernmental Advisory Committee on Areawide Wastewater Treatment and Water Quality Management Planning, and a state level Intergovernmental Coordinating Committee on Areawide Wastewater Treatment and Water Quality Management Planning in Southeastern Wisconsin. Both of these committees will require considerable staff service, including administrative services such as preparation of meeting agendas and meeting minutes; technical orientation, in terms of written briefings as to prior regional and subregional planning programs and as to the proposed Section 208 program; and assistance in the dissemination of information concerning the Section 208 program throughout the Region. The function of advisory committee service will continue throughout the life of the Section 208 planning program.

It is important to recognize that the proposed advisory committee structure for the Section 208 program will be an integral part of the much broader advisory committee structure of the Commission, a structure carefully designed to provide

for broadly-based public official and citizen participation in the overall regional planning program. At the present time the Commission, which under State Statutes itself has citizen members, has 26 advisory committees involving the participation of over 400 individuals. In addition to planning and engineering technicians and local government representatives, these committees include numerous private citizens who are intended to provide direct citizen input into each of the Commission planning programs. Because the committees are drawn from a cross section of knowledgeable public officials and citizen leaders from throughout the Region, the Regional Planning Commission has participating in its various work efforts persons from all parts of the Region who have a basic understanding of the importance of areawide planning and the resultant plan recommendations. These persons, who are known to the local citizen body normally appear with local members of the Commission itself at the informational meetings and public hearings which the Commission holds on all of its areawide planning programs. Thus, a closer liaison is formed between the local people potentially affected by specific planning recommendations and the Commission. A list of the current Commission advisory committees and their membership is set forth in Appendix C.

Thus, in addition to review by the two advisory committees especially established for this purpose, certain aspects of the Section 208 planning program, particularly including the land use and water quality components, will be subject to review by other Commission advisory committees, such as the Technical Coordinating Advisory Committee on Regional Land Use-Transportation Planning, the Technical Advisory Committee on Natural Resources and Environmental Design, and the individual watershed committees for the Root, Fox, Milwaukee, Menomonee, and Kinnickinnic River watersheds.

Finalize Plan of Work

Under this work element, it is envisioned that the study staff will work with the staffs of the Wisconsin Department of Natural Resources, the U. S. Environmental Protection Agency and the Advisory Committee in finalizing the plan of work and initiating actual work on the program. It is important that the technical staffs of the various local, state and federal agencies concerned develop a common understanding as to the specific purposes of the work program, the way in which the work program is to be conducted, and the specific work program outputs. For this reason, it is anticipated that considerable staff work will be expended once the Section 208 work program is funded for southeastern Wisconsin in finalizing the specific plan of work. This work step will be accomplished by those key Commission staff personnel who will actually be responsible for the conduct of the Section 208 work program.

Wisconsin Department of Natural Resources Administration

Since the Wisconsin Department of Natural Resources is the lead state agency with respect to water quality planning and management, being ultimately responsible for ensuring that all aspects of the Federal Water Pollution Control Act Amendments of 1972 are properly addressed within the State of Wisconsin, it is essential that that Department be actively involved in the Section 208 water quality management and planning program for southeastern Wisconsin from its very inception. For this reason, the U. S. Environmental Protection Agency has requested that a separate work item be funded to provide for direct Department of Natural Resources oversight of the Section 208 planning process in the Region. Accordingly, under this work element it is anticipated that the Wisconsin Department of Natural Resources will provide staff to oversee the conduct and administration of the Section 208 planning program in southeastern Wisconsin; to

coordinate the Section 208 planning effort with other planning and management efforts by the Department, including the administration of the waste discharge permit system and the Section 201 planning studies; and to serve on advisory committees. It is the intent of the Commission that this work element be conducted in such a manner so as to ensure that the Section 208 water quality management plan for southeastern Wisconsin, when completed after extensive advisory committee reviews, citizen participation, and public hearings, will be endorsed by the Wisconsin Natural Resources Board and forwarded to the U. S. Environmental Protection Agency for adoption with such endorsement.

FORMULATION OF OBJECTIVES AND STANDARDS[3]

Since planning is a rational process for formulating and meeting objectives, the formulation of agreed-upon development objectives is a necessary and essential task which must be undertaken before plans can be prepared, evaluated, and adopted. The objectives to be defined must not only be stated clearly and be sound logically, but must also be related in a demonstrable way to alternative plan proposals and system management programs. Only if the objectives are clearly related to physical development and subject to objective tests can a choice be made from among alternatives in order to select that plan which best meets the

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[3]Since 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, the Commission has adopted the following definitions in order to provide a common frame of reference:

1. Objective: a goal or end toward the attainment of which plans and policies are directed.
2. Principle: a fundamental, primary, or generally accepted tenet used to support objectives and prepare standards and plans.
3. Standard: a criterion used as a basis of comparison to determine the adequacy of plan proposals to attain objectives.
4. Plan: a design which seeks to achieve the 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.

agreed-upon objectives. To accomplish this, logically conceived and well expressed objectives must be translated into detailed design standards to provide the basis for plan preparation, test, and evaluation. The formulation of such objectives and supporting standards is a matter of public policy, and as such is dependent upon many non-engineering, as well as engineering considerations.

It is envisioned that under the Section 208 planning program the work element dealing with the formulation of objectives and standards will include two subelements: 1) the review of previously formulated development objectives under prior Commission work programs; and 2) the formulation of new development objectives.

Review of Previous Objectives

Prior Commission planning programs for land use development, sewerage system development, and comprehensive watershed development have each contributed toward the formulation of a body of regional and subregional land use and water resources development objectives together with supporting principles and standards. It will be essential that under the Section 208 planning program all of the previously formulated objectives and standards be reviewed and reconsidered in light of the federal water quality objectives expressed in the Federal Water Pollution Control Act amendments of 1972, and any state objectives expressed in statutory legislation or administrative rules formulated since 1972. Of particular importance in this respect are those objectives and supporting standards specifically relating to water use and water quality.

Formulation of Additional Objectives

It is envisioned that it will be necessary to formulate new regional development objectives and supporting standards under the Section 208 planning program to deal with those substantive areas not previously dealt with under

Commission land and water resources planning programs. Of particular importance in this respect are the formulation of development objectives relating to the control of water pollution from nonpoint sources and to the selection of water quality management agencies.

CONDUCT OF INVENTORIES

Reliable basic engineering and planning data available on a uniform, areawide basis are essential to the formulation of workable regional development and management plans. Inventory, consequently, becomes the first operational step in the planning process growing out of the final plan of work. The data may either have to be collected, that is, obtained by direct measurement as part of the planning program, or may merely have to be acquired from secondary sources, that is, obtained from another agency which has originally collected the information. The following basic inventory operations will have to be conducted as part of the proposed Section 208 water quality management planning program for southeastern Wisconsin. In this respect, it should be noted that the water resources simulation model proposed to be used in the Section 208 planning program is intended to provide the basic structure for the data collection; i.e., nearly all of the data proposed to be collected or collated is required as input to the simulation model.

Base Maps and Aerial Photography

Essential to any consideration of water quality management planning is a knowledge of topographic and cultural features of the Region. Such knowledge can be adequately based only upon topographic and cadastral maps of the required scale and accuracy. Definitive information will be required on such natural features as relief; watershed boundaries; location of streams, lakes, and wetlands; and upon such man-made features as civil division boundary lines, real property boundary lines, highways, railroads, and principal buildings. In addition to

topographic and cadastral maps, planning base maps will be required which permit information collected in the various inventory operations to be related on a continuing basis to the geographic area from which it is taken, and which permit the geographic identification of data by machine methods.

General Base Maps: General base maps of the Region will be required to provide a method for recording and presenting in graphic form the results of the Section 208 planning studies, as well as the natural and man-made features of the Region. Regional base maps, which have been prepared and are kept up to date by the Commission under its general regional planning program, are available for use in the areawide water quality management planning program. These maps are available for each county in the Region at four scales: 1 to 24000, 1 to 48000, 1 to 62500, and 1 to 96000, and can be assembled by mosaic processes to cover various subareas of the Region and the Region as a whole. These base maps can be expanded or reduced in scale for use in various phases of the study and show, among other information: all major lakes, streams, and water course lines; all railroads, streets, and highways; all township, range, and section lines; all civil division boundary lines; and relief by contours having a 10-foot vertical interval. The maps have been compiled to National Map Accuracy Standards utilizing the Wisconsin State Plane Coordinate Grid South Zone as the map projection. Since these maps are prepared and updated under the Commission ongoing regional program, they will be made available to the Section 208 planning program at no cost.

Topographic and Cadastral Maps: Large-scale (1 to 2400 and 1 to 1200) topographic and cadastral maps, based upon a monumented system of horizontal and vertical survey control, which combines the U. S. Public Land Survey and State Plane Coordinate system and permits the accurate coordination of topographic and real property boundary line data, are available for approximately 645 square miles of

the Region, as indicated on Map 4. These maps show relief by contours having a vertical interval of 2 feet. With respect to the preparation of a Section 208 water quality management plan for the Region, these maps provide essential input to the water quality and quantity modeling program, to the precise delineation of recommended areas for the provision of sanitary sewer service, to the selection of specific sites for proposed waste water conveyance and treatment facilities, and to the conduct of the required facilities planning effort. While these maps are presently available for portions of the Region, thus requiring only adaptation to the Section 208 program, it is proposed that additional large-scale topographic maps be obtained as required under the Section 208 planning effort.

The general areas proposed for large-scale topographic mapping under the program are identified on Map 4, although it is not intended that the areas shown on this map are the only areas that could be selected for mapping. The precise determination for areas to be mapped must flow from the analyses to be conducted under the Section 208 areawide planning and related facilities planning programs. The areas shown on Map 4 generally represent groups of communities for which the previously adopted regional sanitary sewerage system plan recommends the development of areawide waste water conveyance and treatment facilities, and which accordingly, are ready for immediate, detailed facilities planning. The conduct of the mapping program is considered by the Commission to be essential to the proper preparation of detailed waste water conveyance and treatment facilities plans, involving groups of neighboring communities. Such maps will be used in the facilities planning process, which process is proposed to be conducted as an integral part of the areawide Section 208 planning program; for delineation of sanitary sewer service areas; for the study of alternative alignments and locations for trunk sewers, pumping stations, and force mains; for the selection of alternative sites for waste water treatment facilities; and for the identification

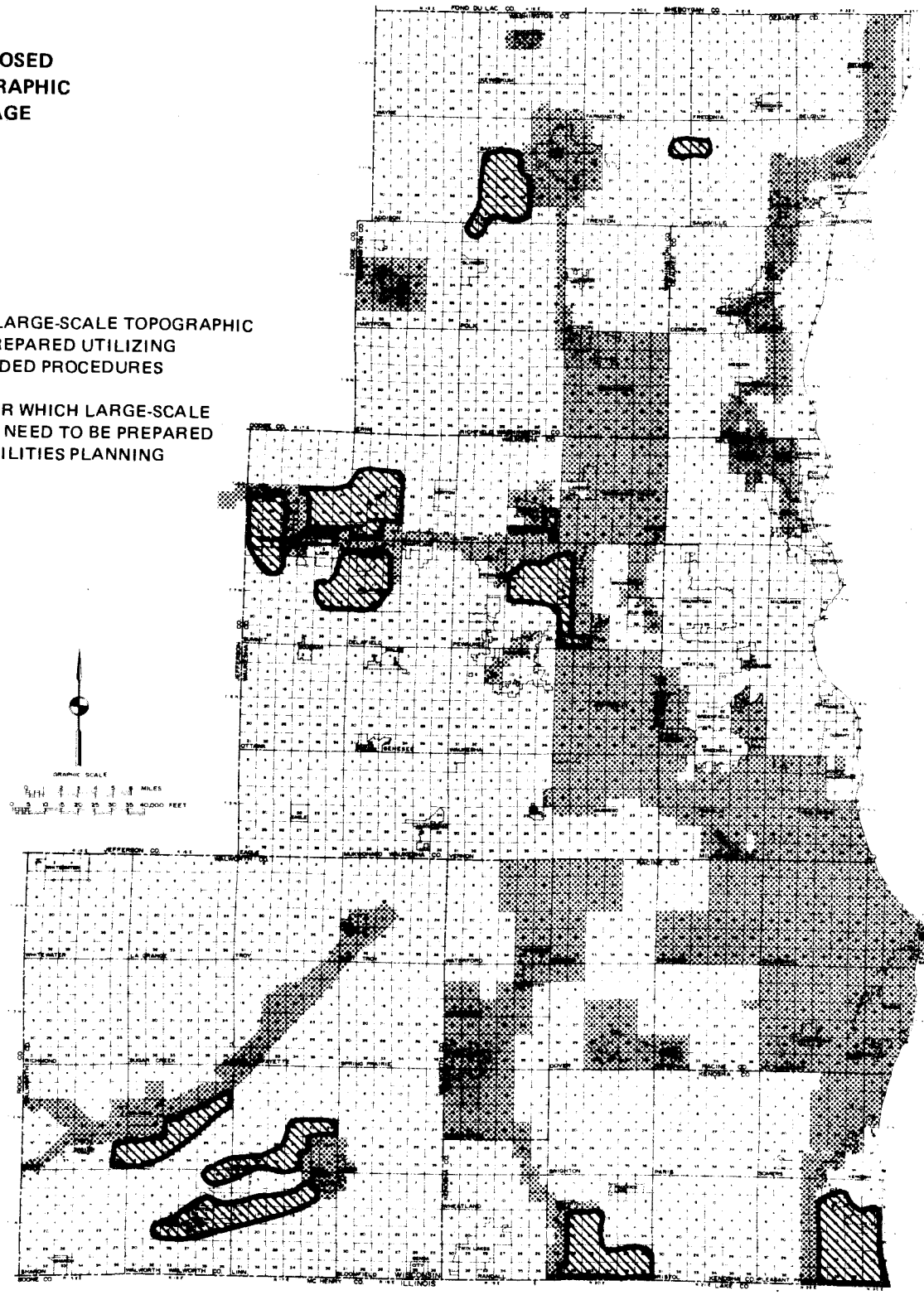
Map 4

EXISTING AND PROPOSED LARGE-SCALE TOPOGRAPHIC MAPPING COVERAGE IN THE REGION APRIL 1975

LEGEND

AREAS FOR WHICH LARGE-SCALE TOPOGRAPHIC MAPS HAVE BEEN PREPARED UTILIZING SEWRPC RECOMMENDED PROCEDURES

GENERAL AREAS FOR WHICH LARGE-SCALE TOPOGRAPHIC MAPS NEED TO BE PREPARED FOR SEWERAGE FACILITIES PLANNING



Source: SEWRPC.

of the most cost effective as well as environmentally sound plans from among the alternatives studied. Experience in the Region to date involving local attempts to implement areawide waste water treatment and conveyance recommendations has demonstrated the need to consider many alternative conveyance alignments and treatment facility locations in order to respond to cost and environmental concerns expressed by local public officials and private citizen groups. The preparation of the needed large scale topographic and cadastral maps will serve to greatly facilitate the preparation of the required waste water treatment and conveyance facility plans, as well as to facilitate the local decision making process needed to successfully carry out areawide plans. Importantly, in addition to providing essential inputs to the preparation of precise waste water conveyance and treatment facility plans, the proposed large-scale maps will also facilitate the hydrologic-hydraulic analyses required as part of the areawide Section 208 planning program.

Aerial Photographs: Current aerial photography at appropriate scales will be required in the Section 208 planning program to provide detailed planimetric data as well as a medium for data analysis and plan preparation. Aerial photography also provides a basis for the collection of definitive current urban and rural land use data. As part of the continuing regional land use-transportation study, the Commission has contracted for new aerial photography in the Region to be accomplished in April 1975. This contract will result in the preparations of ratioed and rectified enlargements at a scale of 1" = 400' from low altitude photography (negative scale 1" = 1600'); and in the preparation of ratioed and rectified enlargements at a scale of 1" = 2000' of high altitude photography (negative scale 1" = 6000'). These new aerial photographs will be made available for the Section 208 planning program at no cost.

Implementation Status of Previous Water Quality Related Plans

As noted earlier in this document, there exist in southeastern Wisconsin a series of interrelated water quality management plans prepared prior to the initiation of the Section 208 planning effort. These include the comprehensive plans for the Root, Fox, and Milwaukee River watersheds, prepared and adopted by the Commission, and the comprehensive plan for the Menomonee River watershed, now nearing completion by the Commission. In addition, this category of plan elements includes the regional sanitary sewerage system plan, the regional land use plan, and the comprehensive plans for the Kenosha and Racine Urban Planning Districts. Each of these previous Commission planning programs culminated in the preparation of a planning report document containing specific plan implementation recommendations. It will be essential under the Section 208 planning effort to mount a specific work effort to inventory the status of implementation of each of these important regional and subregional plans, with particular emphasis on those elements dealing with land use, natural resource base protection, water control facility, storm water drainage, and water pollution abatement. This inventory will include an identification of specific implementation recommendations by plan element; the various steps taken toward implementation by the units and agencies of government assigned implementation responsibilities; and any problems encountered during plan implementation.

Identification and Review of Concurrent Water Quality Related Planning and Management Efforts

A particularly important coordinative work element of the Section 208 planning program for southeastern Wisconsin is the identification and review of all concurrent water quality planning efforts and water quality related management efforts. To the greatest extent possible, the results of these efforts will be directly incorporated into the Section 208 planning program. Every attempt will

be made to avoid any duplication of effort with respect to water quality planning and management. More specifically, the following known water quality related planning and research efforts will be inventoried and reviewed to determine their applicability to Section 208 planning:

1. All Section 201 facilities plans under contract or committed at the time of the inception of the Section 208 planning program (see Table 1).
2. Combined sewer studies in the Region, including the following:
   a. Preliminary engineering study for the abatement of pollution from combined sewer overflows in the Milwaukee-Metropolitan area.
   b. EPA funded research and demonstration project in the City of Racine to evaluate the practicality of flow-through treatment as an alternative to sewer separation and to evaluate the feasibility of treating storm water.
   c. EPA funded research and demonstration project in the City of Kenosha to determine the practicality of providing adequate conveyance capacity and standby treatment capacity at the Kenosha treatment facility rather than at outfall locations to treat the combined sewer overflows.
3. Water quality related research efforts, including the following:
   a. Menomonee River pilot watershed study conducted by the International Joint Commission under the Great Lakes Water Quality Agreement.
   b. Washington County sediment and erosion control study.
4. Wisconsin Department of Natural Resources basin surveys and studies, including public inland lake protection and rehabilitation studies.
5. Wisconsin Department of Natural Resources waste discharge permit system (WPDES).

Socioeconomic Base Data

It will be necessary under the Section 208 planning program to inventory the socio-economic factors which underlie the increasing urbanization and changing land use pattern within the Region. Such an inventory must determine the trends in population and economic activity and to correlate these trends with such factors as the availability of centralized sanitary sewer service and changing agricultural practices. Detailed population and economic base studies of the Region have recently been completed by the Commission under the regional land use-transportation study, including information by small geographic area on the size, composition, and distribution of the population, and will be available to the Section 208 planning program.

Land Use and Community Plans and Zoning Data

Since land use is an important determinant of water use, of the quantity and quality of storm water runoff, and of the demand for and loadings on sanitary sewerage facilities land use data will be required for the successful conduct of the Section 208 planning program. Associate, quantitative data will be required on the existing and proposed amount, type, intensity, and spatial distribution of land use in sufficient depth and detail to enable the establishment of historic development patterns and trends, to provide a basis for the refinement of existing land use plans, and to provide inputs to such water quality planning related functions as the derivation of sewage flow generation rates.

The detailed land use data needed for the proposed Section 208 program will largely be made avilable through the 1975 land use inventory being conducted by the Commission under the continuing regional land use-transportation study, and provided to the Section 208 planning program, at the cost of data collation and handling. This land use inventory will include an identification of the location and areal extent of all known sanitary landfills and dumps in the Region, together with pertinent data concerning the treatment, if any, of the leachate at each site. All available information on the amount and quality of the leachate shall be collated

in order to permit analyses to be made concerning the potential need for, and methods of, treatment.

The utilization of the detailed land use data in the water resources simulation modeling effort under the Section 208 program will require data adaptation for modeling purposes. Accordingly, costs for such data adaptation have been included as a direct cost in the simulation modeling effort.

While the detailed urban and rural land use data collected by the Commission under the regional land use-transportation study should be adequate for use in the simulation modeling effort, certain additional supplementary data will be required for a limited number of selected "typical" urban and rural subwatershed areas within the Region in order to permit reliable estimates to be made of the amount of applied pesticides, herbicides, fertilizers, of the rates of erosion, and generally, of the contribution of pollutants by both urban and rural runoff. These additional inventory efforts have been included under the heading below entitled "Other Nonpoint Source Inventory."

Data concerning local community plans and land use zoning ordinances are important both with respect to a determination as to how such plans and zoning ordinances relate to the areawide land use objectives expressed in the regional land use plan, and with respect to a determination of precise future sewer service areas in the preparation of waste water treatment and conveyance facility plans. It is particularly important that there be a proper relationship between such sewer service areas and the land use control ordinances that direct future land use development in a community.

The detailed community plans and zoning ordinance data needed for the Section 208 program will be made available through a 1975 community plans and zoning ordinance inventory being conducted by the Commission under the continuing regional

land use-transportation study. The data will be made available to the Section 208 planning program, at the cost of data collation and handling. This data will not only be used in the preparation of the areawide Section 208 water quality management plan, but will be made available to consultants retained for the preparation of precise facility plans in certain subareas of the Region.

General Natural Resource Base and Environmental Data

A massive amount of basic data about the natural resource base of the Region has already been collected and developed under other Commission work programs, including definitive data on soils, climate, topography, geology, woodlands, wetlands and wildlife habitat areas. It is envisioned, however, that some additional, limited data collection efforts will be required under the Section 208 program.

With respect to soils, detailed information will be available to the Section 208 planning program from the detailed operational soils survey of southeastern Wisconsin completed for the Commission by the U. S. Soil Conservation Service in June 1966. A special analysis of the soils data, however, will have to be made in order to determine, by subwatershed, the amount of land covered by soils susceptible to varying degrees of erosion based upon known soil characteristics relating to texture, permeability, slope, and stability. Such inventory data, when coupled with estimated rates of erosion and runoff, is essential to the development of alternative erosion control plans as a subelement of the water quality management plan and to the preparation of cost estimates for such plans. In addition, rates and amounts of erosion represent important inputs to the water quality simulation modeling effort. The costs of this analysis have been included under the water resources modeling program.

Climate is particularly important to water quality management planning, influencing such factors as runoff, treatment facility operation, and sludge

disposal. Of particular importance are data on temperature, precipitation, snowfall accumulation, frost depth, and drought. Much of the climatological information required has been collected and compiled by the National Weather Service and by the Commission in its ongoing regional planning programs. It is envisioned, however, that this data base will have to be updated to 1975 under the Section 208 program in order to provide a proper data base for the conduct of the Section 208 planning program, including the water quality simulation modeling, and the preparation of facility design criteria for the proper development and operation of waste water conveyance and treatment facilities.

Topography is important to water quality management planning since it largely determines the drainage patterns and the location of watershed, subwatershed, and subbasin boundaries, as well as the location and alignment of waste water and storm sewer conveyance systems, and the location and configuration of sewage treatment facilities. Much of the needed topographic information has already been collected in the form of topographic maps prepared by the Commission and other units and agencies of government within the Region. As noted earlier, however, some new topographic map preparation will be required to facilitate not only the water quality simulation modeling effort but also the preparation of precise facility plans.

With respect to geology, it is important to note that two geologic factors--surficial deposits and the nature of and depth to bedrock--in combination with certain hydrologic, surface, and cultural considerations establish the potential for land disposal of liquid wastes and influence criteria for waste water conveyance and treatment facility design. The existing geologic data will be collated under the study and utilized in the conduct of the special inventory of solid waste-sludge disposal and liquid waste application sites, as discussed below.

Basic inventories of woodlands, wetlands, and wildlife habitat areas have been conducted and are maintained current under other Commission work programs. It is proposed that these inventories be extended under the Section 208 program to include more specific data collection concerning the identification of endangered or locally threatened species; unique or vulnerable features, such as wildlife refuges or corridors; major and minor eco-systems; and the aquatic biota of receiving streams. In addition, a special inventory effort will have to be conducte to identify archeological, historical, scientific, and cultural sites and areas. To the maximum extent possible, existing Commission data with respect to historic and cultural sites will be utilized in this special inventory.

Surface Water Quality Data--Streams and Lakes

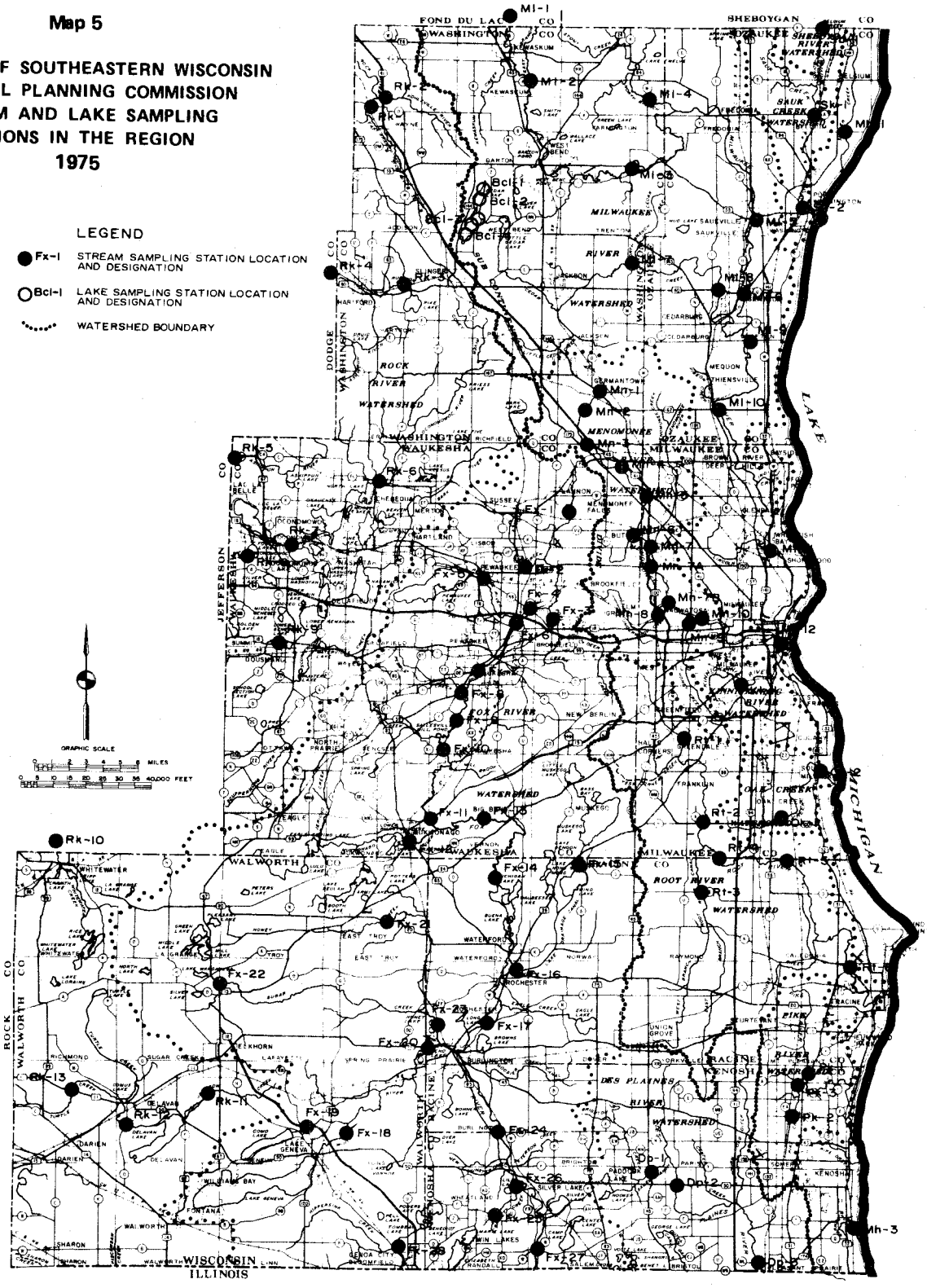
As noted in Chapter I of this document, the Commission has maintained a continuing program in surface water data collection and analysis, beginning with an extensive stream water quality sampling program conducted in 1964. During that time 87 sampling stations were established on 43 streams in the Region (see Map 5). The findings of the initial stream water quality study were published in SEWRPC Technical Report No. 4, Water Quality and Flow of Streams in Southeastern Wisconsin.

A continuing stream water quality monitoring program was mounted by the Commission under a cooperative agreement with the Wisconsin Department of Natural Resources in 1968. Under this continuing program, sampling was done yearly at all 87 sampling stations during the periods of high and low flow, the samples being analyzed for dissolved oxygen, temperature, fecal and total coliform, nitrate nitrogen, nitrite nitrogen, dissolved phosphorus pH, chloride, and specific conductance.

To provide additional information on the diurnal fluctuations of stream water quality in the Region, the monitoring program was revised in 1970 to provide for

Map 5

LOCATION OF SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION STREAM AND LAKE SAMPLING STATIONS IN THE REGION 1975



Source: SEWRPC.

the collection of six stream water samples over a 24-hour period once yearly during a period of low streamflow at each sampling station, with each sample being analyzed for the following five parameters: dissolved oxygen, temperature, pH, chloride, and specific conductance. In addition, once during the 24-hour period the following four parameters would be analyzed: fecal coliform, nitrate nitrogen, nitrite nitrogen, and dissolved phosphorus.

In order to obtain regional information on additional water quality indicators, the Commission and the Wisconsin Department of Natural Resources agreed to a further modification of the program beginning with the 1972 survey. The overall continuity of the sampling program was maintained by continuing to monitor those parameters included in previous surveys with the following changes: a decrease from six to four per day in the frequency of dissolved oxygen, temperature, and specific conductance measurements; a decrease from six to two per day in the frequency of pH and chloride determinations; an increase from one to two per day in the frequency of fecal coliform, nitrate nitrogen, nitrite nitrogen, and dissolved phosphorus measurements; and the addition of two determinations per day of organic nitrogen, ammonia nitrogen, and total phosphorus. The addition of the three parameters was prompted by the need for more information on nutrients and increased interest in both oxygen demand exerted by ammonia nitrogen and the toxic effect of ammonia nitrogen. Thus, the stream water quality monitoring program, as revised in 1972, provides for four measurements over a 24-hour period once yearly. These are made during a period of low flow at each of the 87 stations for each of the following three parameters: dissolved oxygen, temperature, and specific conductance. Two determinations are made at each station over the same 24-hour period of each of the following nine parameters: pH, chloride, fecal coliform, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, organic nitrogen, dissolved phosphorus, and total phosphorus.

Over 10 years have elapsed since the conduct of the 1964 initial bench mark stream water quality survey by the Commission. Accordingly, it is proposed that all of the water quality data collected over the past 10 years be analyzed and the findings of the analysis set forth in a technical report published under the Section 208 planning program. The principal objective of this analysis is to present all of the pertinent water quality data collected to date; provide, based upon that data, an assessement of long-term trends in stream and lake water quality in the Region; evaluate the existing level of water quality against the adopted water use objectives and supporting water quality standards to determine to what extent those objectives are being met; and to identify any needed changes in the continuing sampling program--including any needed revision to, and expansion of, the number of water quality indicators included in the program, modifications in the frequency of sampling, adjustment of the location of sampling stations, and the provision of more extensive stream flow measurements--in light of the adopted water use objectives and standards and data needs revealed by the analysis. It is further proposed that during the term of this analysis the existing stream water quality monitoring program be continued under the Section 208 program.

In addition, as discussed later in this document, certain intensive short-term water quality monitoring efforts will be required to provide supplementary data for the calibration and testing of the water quality simulation model.

In addition to the aforementioned inventories concerning surface water quality, certain hydrologic and hydraulic investigations will be necessary if the areawide water quality management plan is to be properly adjusted to the natural resource base. Data will have to be acquired on the essential aspects of the origin, distribution, movement, and storage of surface water within the Region and must focus not only on the natural conditions of stream flow and lake levels, but also

on related changes in land use and public facility development significantly affecting the hydraulic behavior of the surface water system. These data should include information on stream flow with particular attention of quantification of low, average, and high stream flows, and data on the hydraulic characteristics of the perennial waterways, including water surface profiles and related areas of inundation. All streams and water courses now being used or likely to be used for waste disposal shall be located, identified, and included in the necessary hydrologic and hydraulic inventories. Data will be required on flow meander patterns, bedslopes, and channel cross sections for selected channel stream reaches not only as input to the simulation modeling effort, but also to determine the effect on stream erosion, and will be based, in part, upon data made available through the large-scale topographic maps proposed to be prepared under the program.

To the maximum extent possible, historic stream flow data provided by the stream flow gaging program conducted within the Region by the Commission in cooperation with federal, state and local agencies of government will be used in the necessary hydrologic analyses. The location of all stream flow gages within the Region are shown on Map 6. As discussed in a later section of this document, a supplementary stream flow gaging program will be required to collect additional stream flow data for selected, presently ungaged, channel reaches in order to properly calibrate the water quality simulation model.

In addition to the above-described work effort with respect to stream water quality monitoring and analyses, a special lake water quality monitoring and analysis program will be mounted under the Section 208 planning program for southeastern Wisconsin. It is intended that this lake water quality monitoring program be fully coordinated with the efforts of the Wisconsin Department of Natural Resources under the inland lake renewal program being conducted pursuant to authority granted the Department in Chapter 33 of the Wisconsin Statutes, and

Map 6

LOCATION OF U.S. GEOLOGICAL SURVEY STREAM GAGING STATIONS IN THE REGION: 1975

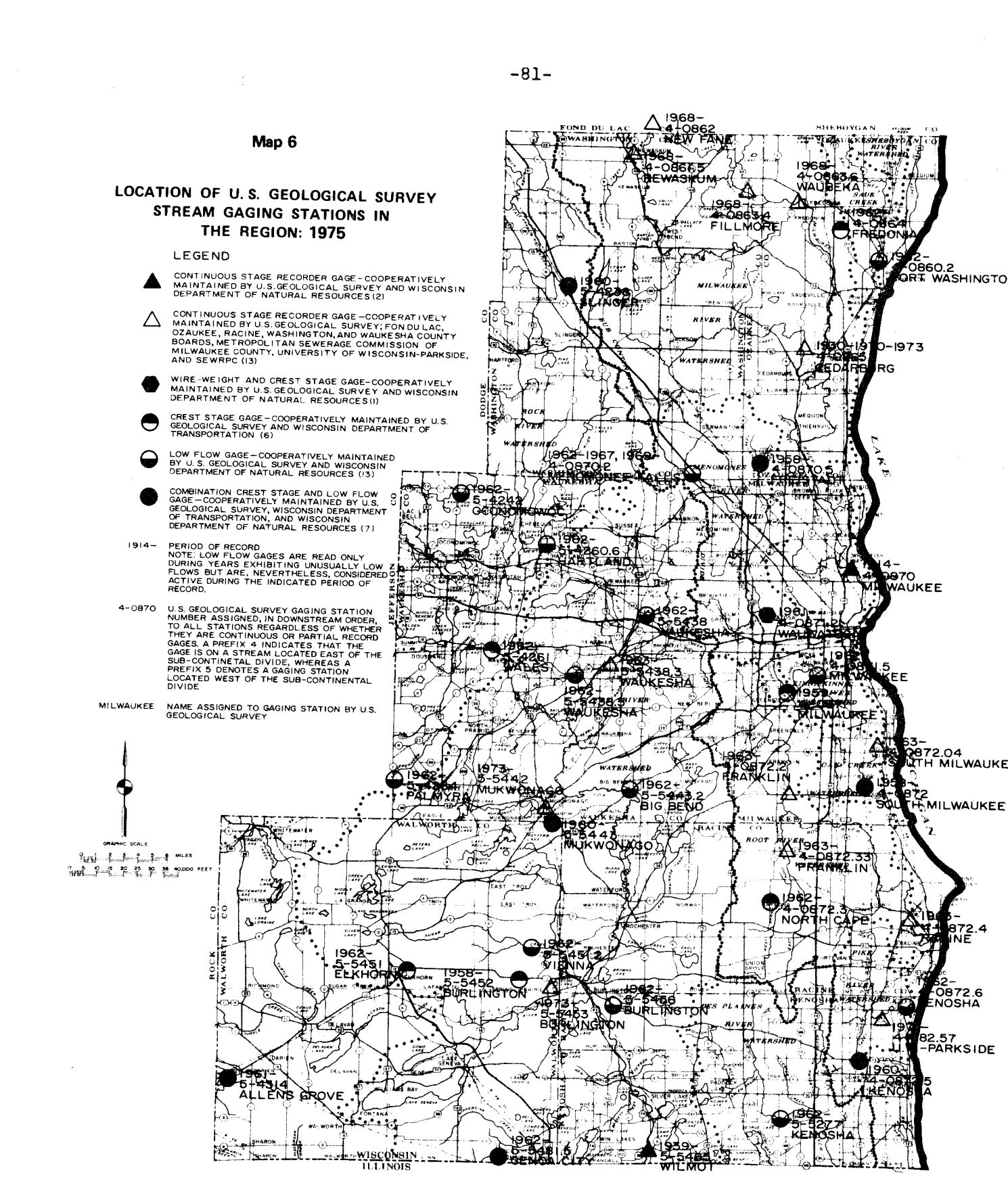
LEGEND

- ▲ CONTINUOUS STAGE RECORDER GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY AND WISCONSIN DEPARTMENT OF NATURAL RESOURCES (2)
- △ CONTINUOUS STAGE RECORDER GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY; FON DU LAC, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTY BOARDS, METROPOLITAN SEWERAGE COMMISSION OF MILWAUKEE COUNTY, UNIVERSITY OF WISCONSIN-PARKSIDE, AND SEWRPC (13)
- ⬢ WIRE-WEIGHT AND CREST STAGE GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY AND WISCONSIN DEPARTMENT OF NATURAL RESOURCES (1)
- ◒ CREST STAGE GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY AND WISCONSIN DEPARTMENT OF TRANSPORTATION (6)
- ◒ LOW FLOW GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY AND WISCONSIN DEPARTMENT OF NATURAL RESOURCES (13)
- ● COMBINATION CREST STAGE AND LOW FLOW GAGE - COOPERATIVELY MAINTAINED BY U.S. GEOLOGICAL SURVEY, WISCONSIN DEPARTMENT OF TRANSPORTATION, AND WISCONSIN DEPARTMENT OF NATURAL RESOURCES (7)

1914- PERIOD OF RECORD
NOTE: LOW FLOW GAGES ARE READ ONLY DURING YEARS EXHIBITING UNUSUALLY LOW FLOWS BUT ARE, NEVERTHELESS, CONSIDERED ACTIVE DURING THE INDICATED PERIOD OF RECORD.

4-0870 U.S. GEOLOGICAL SURVEY GAGING STATION NUMBER ASSIGNED, IN DOWNSTREAM ORDER, TO ALL STATIONS REGARDLESS OF WHETHER THEY ARE CONTINUOUS OR PARTIAL RECORD GAGES. A PREFIX 4 INDICATES THAT THE GAGE IS ON A STREAM LOCATED EAST OF THE SUB-CONTINETAL DIVIDE, WHEREAS A PREFIX 5 DENOTES A GAGING STATION LOCATED WEST OF THE SUB-CONTINENTAL DIVIDE

MILWAUKEE NAME ASSIGNED TO GAGING STATION BY U.S. GEOLOGICAL SURVEY



Source: SEWRPC.

the Department's ongoing lake water quality research program conducted by the Bureau of Research. To date under the inland lake renewal program, the Department has committed and fully funded lake water quality studies for the following six lakes in southeastern Wisconsin: Big Cedar, Little Cedar, and Silver in Washington County; Potter and Como in Walworth County; and Twin in Kenosha County. The lake water quality studies being conducted with respect to these lakes are both detailed and comprehensive, including monthly in-lake monitoring, measurement of inflow-outflow quantity and quality, monitoring of runoff events, and determination of impact of on-site soil absorption sewage disposal systems. It is anticipated that the data being collected for these lakes under the inland lake renewal program will be made available directly to the Section 208 water quality planning and management program for southeastern Wisconsin.

In addition, it is envisioned that, utilizing a combination of Section 208 planning funds, inland lake renewal program funds, and Department of Natural Resources Bureau of Research funds, such detailed lake water studies can be mounted for up to 14 additional lakes in southeastern Wisconsin. Criteria will be developed for the selection of which lakes in the Region to study and would include such factors as the aquatic life, trophic status, lake depth, position of lake in the hydraulic system, and nature of the tributary drainage area. Representative lakes will be selected in order to provide a basis for making generalized assumptions concerning lake water quality and lake subwatershed conditions to meet input data requirements for operation of the water quality model. All lake water quality monitoring data and analyses conducted under such studies would be made available both to the SEWRPC 208 planning program and the Wisconsin Department of Natural Resources inland lake renewal program, and thus would be extremely

useful not only in the preparation of the Section 208 water quality management plan, but in the preparation of the more detailed lake renewal and rehabilitation plans.

Groundwater Data

In view of the degree of dependence of certain areas of the Region upon groundwater as a source of supply and the possible effects of the water quality management plan and its recommended improvements upon the quantity and quality of groundwater, as well as the effects of groundwater upon infiltration rates of sewerage systems, the basic geology and hydrology of the groundwater supply underlying the Region must be established. Most lake levels and practically all non-flood stream flows within the Region are maintained by groundwater discharges. All influent and effluent stream reaches are, therefore, proposed to be identified and mapped. All groundwater recharge areas related to aquifers used as a source of municipal supply therefore especially requiring protection will be mapped, along with areas possessing geologic conditions conducive to groundwater pollution. Seasonal and long-term changes in groundwater levels will be investigated; and areas presenting potential problems in the construction, maintenance and operation of sewerage systems because of high water tables identified.

Surface Water Use Data

Data concerning the use of surface water has important implications for water quality management particularly during periods of low flow. Under previous Commission watershed planning programs, data on major surface water uses, such as industrial cooling and agricultural irrigation, were acquired. It will be necessary under the Section 208 planning program to not only update the data so collected, but also to extend that data base to include the entire Region. Accordingly, a special inventory effort, will have to be mounted to obtain data

on the number and location of all major users of surface water, together with estimates at the quantities of water used and the time distributions of that use. It is essential to obtain these data in order to determine to what extent, if any, water uses may be in conflict with both the established water use objectives for a given stream or lake and measures required to achieve those objectives.

Existing and Proposed Sanitary Sewerage Systems

An extensive inventory of existing and locally proposed sanitary sewerage facilities was conducted by the Commission as part of the regional sanitary sewerage system planning effort. Under that inventory, all existing sanitary sewerage systems were mapped on a uniform basis by county at a scale of 1" = 2000'. The sizes of all trunk sewers and of all combined sewers were recorded on the maps; and, if available from local records, sewer slopes and invert elevations were shown at critical points in the system. In addition, existing and committed future service areas were determined and mapped along with existing combined sewer service areas. Individual subsystem plans were also acquired at various larger map scales from the individual cities, villages, and special purpose sewerage districts in the Region. The subsystem maps indicate the location of all existing sanitary sewers, sewage pumping and lift stations, and sewage treatment plants, together with other pertinent data.

In addition to the mapped sewerage system data, certain additional data were acquired and tabulated, including: name of operating agency, community served, area served in square miles, treatment levels provided, location of disposal of treatment plant effluent, date of original construction of sewage treatment plant and of major additions, treatment plant design capacities and loadings, population

served, average per capita flow, population equivalent served, and reserve hydraulic capacity of the treatment plant. In addition, data were collected of the location of known sewage overflow points and the location and capacity of sewage pumping and lift stations. Finally, the inventory included a collection of all locally prepared sanitary sewerage system plans and engineering reports.

It is intended that the basic system inventories conducted under the regional sanitary sewerage system planning program be fully updated under the Section 208 water quality management planning program. As such, the updated inventory will include updating of at least the following information:

1. The location, configuration, and capacity of major trunk sewers serving a given area through which other service areas may be connected to a treatment facility to form an areawide system, and the location and capacity of appurtenant pumping and lift stations and force mains.
2. The location of all points of sanitary sewage flow relief, including permanent relief pumping stations, portable relief pumping stations, crossovers, bypasses, and combined sewer outfalls.
3. The location, type, and level of treatment capacity, hydraulic and organic loading, and means of effluent and sludge disposal for all public sewage treatment plants serving centralized sanitary sewerage systems.
4. The size and extent of existing, committed, and proposed future sewer service areas and the estimated populations served in such areas.
5. The administrative structure and financing arrangements for each municipal sanitary sewerage system.
6. All local sewerage system and facilities plans, including infiltration and inflow studies and analyses.

7. Effluent limitations for each sewage treatment facility as established under the Wisconsin pollution discharge elimination system.

With respect to the inventory of the hydraulic loadings at individual sewage treatment plants, it is proposed that special investigations be made for each municipal sanitary sewerage system served as to the specific components of sewage flow. Such components include spent municipal water supply, spent private water supply that is discharged to municipal sanitary sewerage systems, groundwater infiltration, and storm water inflows. It is further proposed that this inventory effort will be conducted in a manner similar to the inventory completed by the Commission under the regional sanitary sewerage system plan. Under this program, this inventory effort was confined to seven selected communities in the Region. Under the Section 208 planning program, it is proposed that this inventory be extende to all of the municipal sanitary sewerage systems in the Region. This inventory effort will include as a necessary element, the collection of data for the base year 1975 concerning existing public water supply systems, as well as an identification of major areal concentrations of sewered development served by private water supply systems.

This inventory of sewage flows must also include an estimate of sewage flows bypassed at all known sewage flow relief points in municipal sanitary sewerage systems, including relief pumping stations, cross-overs, and bypasses. In order to estimate bypassed sewage flows, it will accordingly be necessary to determine not only the location of all points of sewage flow relief but also their approximate size, as measured by pipe diameters or pumping station capacities. In addition, it will be necessary to estimate the frequency and duration of bypassed flows.

Other Point Source Inventory

In addition to identifying as point sources all sewage treatment facilities serving public centralized sanitary sewerage systems, as well as all points of

sewage overflow on those systems, an inventory will be conducted to identify all other point sources of pollution. These other sources consist primarily of public or private sewage treatment facilities serving isolated land use enclaves and specialized industries; together with outfalls for industrial cooling and wash waters and industrial wastes. Toward this end, it will be necessary to determine the location, owner, type and level of treatment, capacity, hydraulic loading, and means of effluent and sludge disposal for all such isolated public or private sewage treatment facilities. In addition, a special inventory will be conducted of all known industrial pretreatment facilities from which waste is discharged to a municipal sewerage system. The nature and quantity of waste pretreated will be determined, as well as the method of disposal of toxic wastes generated in the pretreatment process. Finally, a special inventory will be conducted of all known sewage holding tanks for the purpose of analyzing long-term raw sewage conveyance and disposal needs. While not a point source of pollution per se, sewage holding tanks represent discrete sources of raw sewage akin to such point sources as industrial pretreatment facilities. It is envisioned that the identification of all additional point sources, including industrial waste pretreatment facilities and sewage holding tanks, will be done through existing secondary sources, including river basin survey reports and past pollution abatement orders of the Wisconsin Department of Natural Resources, permits issued under the Wisconsin pollution discharge elimination system, effluent monitoring reports, sewage holding tank permits, and records of local public works and building inspection departments.

Existing and Proposed Storm Water Management Systems

Of particular importance to water quality management planning in southeastern Wisconsin is an inventory of all existing urban storm water drainage systems, including piped storm sewers and identified open channels which provide for urban storm water drainage. It is believed that inadequate storm water drainage systems contribute significantly to capacity problems of existing separate sanitary sewerage systems, robbing such systems of their capacity for normal sanitary wastes and causing sewage flow bypassing and backup. Accordingly, it is proposed that under

the Section 208 planning program, a significant inventory effort be mounted with respect to urban storm sewers and identified drainage channels. This inventory shall locate all urban storm sewer outfalls, delineate the tributary drainage areas, and map the tributary drainage systems in sufficient detail to permit good estimates to be made of the frequency, amount, and probable quality of the discharges. Known areas of inadequate drainage and attendant street and basement flooding shall also be identified and delineated. It is envisioned that this work effort will build upon a previous Commission inventory effort in 1963, where existing piped storm water drainage systems in the Region were identified. In general, the development of urban storm water drainage facilities in the Region has been nonsystematic and highly localized in nature, with reliance upon the streams and water courses in either a natural or modified state as the principal outlet. The conduct of this important inventory will provide an input to the analysis of pollution from nonpoint sources.

Other Nonpoint Source Inventory

Because nonpoint sources of water pollution are generalized discharges of waste and because they cannot, by definition, be traced to a specific discrete source, they are more difficult to inventory than are point sources of pollution. Nonpoint source pollutants are contained in urban, agricultural, and silviculture storm water runoff. The pollutants contained in such runoff include:

1. Automotive related pollutants such as oil; gas; rubber, asbestos, and metal particles; and deicing salts and sands from streets, highways and parking area.
2. Eroded soil particles resulting in rural areas primarily from a lack of good soil and water conservation practices attendant to farm operation, and in urban areas primarily from a lack of good soil conservation practices during construction.

3. Air pollution settling out with or without precipitation.
4. Herbicides, insecticides, and plant nutrients used in lawn and garden culture.
5. Herbicides, insecticides, and plant nutrients in runoff and eroded soil materials from agricultural and silvicultural lands.
6. Biochemical oxygen demand, nutrients and pathogenic organisms from liquid waste disposal areas, sewage sludge, and industrial pretreatment residues disposal areas and sanitary land fills.
7. Biochemical oxygen demand, nutrients and pathogenic organisms from intensive animal feed lots and manure storage areas.

It is proposed that the following special studies relating to nonpoint sources of pollution be conducted under the Section 208 planning program for southeastern Wisconsin:

1. On a sample basis, data will be collected on the quality and amount of runoff from streets and highways. Sampling programs shall be designed to permit correlation of such data with data on the area and slope of pavement, on attendant maintenance practices, including the average application rates of salting and sanding for snow and ice control, on the type of land use served by the streets and highways, and on traffic volumes. The Commission regional land use inventory will provide the data necessary to determine the area of pavement and land use. A special inventory effort will be required to determine typical pavement maintenance practices.
2. On a sample basis, data will be collected on the quality and amount of runoff from special use areas, such as sanitary land fills, construction sites, mining sites, and storage areas for such items as salt, coal, and fly ash. The regional land use inventory will provide data

concerning the location and areal extent of mining activity within the Region. Special inventories will have to be conducted with respect to the location and extent of special storage areas in the Region. In addition, average annual estimates for lands disturbed for construction activity will have to be made.

3. On a sample basis, data will be collected concerning the chemical elements of air pollution. Such data will be collected from precipitation samples at U. S. Weather Service recognized weather observation stations within the Region. Additional precipitation sampling sites will also be required to provide data for those portions of the Region not adequately covered under the existing sampling system. Special sampling will also be conducted for pollution settling without the aid of precipitation.

4. On a sample basis, data will be collected on the quality and amount of runoff from open lands in urban areas, such as residential lawns, parks, and golf courses. The sampling program shall be designed to permit correlation of such data with the park and lawn maintenance practices, including the type, frequency, and amounts of fertilizer and chemical applications.

5. On a sample basis, data will be collected on the quality and amount of runoff from agricultural lands, including runoff from lands utilized for orchards, forestry, grain crops, cash crops, and lands drained by underground tile lines. This program shall be designed to permit correlation of such data with data concerning typical agricultural operations, including the types, frequencies, and amounts of fertilizer and chemical applications.

6. A special inventory will have to be conducted to determine the location and extent of all intensive animal feeding operations, including dairy herds, beef cattle, fowl, and horses. In addition to the location and size of the feeding operations, the size of the animal populations will have to be determined. On a sampling basis, data will be collected on the quality and amount of runoff from intensive feeding areas in such a manner as to permit correlating with maintenance practices.

Runoff samples collected will be tested, as appropriate, for the following pollutants: total and fecal coliform; total, suspended, and dissolved solids; temperature; pH; biochemical oxygen demand, chemical oxygen demand; dissolved oxygen; total and soluble phosphorus; chloride; sodium; potassium; and caldium; magnesium; sulphur, arsenic; iron; copper; lead; zinc; chromium; mercury; cadmium, selenium; boron; and fluorine; asbestos; oil; and pesticides and herbicides. Wherever possible it is intended to utilize existing data and research findings so as to minimize the amount of actual new data collection.

Sewage Sludge and Land Waste Application Site Inventory

The previously adopted regional sanitary sewerage system plan will be refined and detailed with respect to its studies and recommendations relating to the management of solid wastes generated as a byproduct of the sewage treatment plants, industrial liquid waste pretreatment plants, and water treatment plants, and the land disposal of liquid effluent. Accordingly, it is proposed that an inventory be conducted of all existing and proposed solid waste disposal sites identifying those waste disposal sites suitable for sewage sludge, industrial liquid waste pretreatment process residuals and water treatment plant sludge disposal; of all sites used for liquid waste disposal and of sites having characteristics suitable for such disposal. An analysis will be

undertaken to determine the potential for land disposal of liquid effluent with respect to each municipal waste discharge. Those communities having a potential for land application of sewage effluent will be identified.

State of the Art of Waste Water Management

Technological advancement in waste water collection, conveyance, and treatment has undergone acceleration in recent years. Public concern for restoring and maintaining environmental quality, evidenced through legislation such as the Federal Water Pollution Control Act Amendments of 1972, has stimulated substantial increases in state and federal funding in research of waste water management and waste water pollution abatment. As a result of this research and surge of activity, many new or refined waste water management concepts, materials, processes, and procedures have been propounded in the technical literature. Substantiation of the feasibility of these proposed advances in the art of waste water management ranges from laboratory experience to full-scale operational experience.

It is important that the areawide water quality management plan for southeastern Wisconsin be based upon and incorporate the best current technology. It is even more important, however, that the technological recommendations for reasonable assurances of meeting expected performance at the costs used in the plan formulation and selection. It is necessary, therefore, to review the state of the art of waste water management to assure that the plans are consistent with current advances in practice and to distinguish between tested and proven technology and unproven concepts which have a risk of failure in performance or cost. The inventory and review of the state of the art of waste water management will specifically include the subareas of sewage collection, conveyance, and treatment; industrial waste pretreatment; combined sewer overflow pollution abatement; agricultural runoff control; and urban storm water runoff control. With

respect to waste treatment, however, such research will be limited to those treatment processes that are applicable to the Region, given its soils and climate.

Public Financial Resources

The ability of local units of government to finance recommendations for waste water management, including recommendations with respect to both point and nonpoint sources of pollution, is an important aspect of plan evaluation. Accordingly, an inventory will be conducted of the public financial resources available for meeting waste water management needs, and will include consideration of past efforts at the local governmental level, as well as the utilization of available state and federal funds. The inventory will also include the utilization of special fees, user charges, and industrial waste recovery charges by management agencies in the Region. The inventory data will provide a basis for assessing the financial feasibility of the recommended plan.

Wastewater Management Institutional Structure

Under the previously conducted regional sanitary sewerage system planning program, an inventory was conducted of the wastewater management institutional structure currently operating in the Region. This inventory included the identification of all wastewater management agencies, their areas of jurisdiction and relationship to the local governmental structure, any intergovernmental agreements relating to wastewater management, administrative data, and financial data. Under the Section 208 planning program, it is proposed that this inventory be updated to the base year 1975 in order to provide the basis for an analysis of the existing wastewater management institutional structure, which will in turn provide the basis for management recommendations, including agency designations, in the Section 208 plan.

Land Management Institutional Structure

As part of the continuing regional land use-transportation study, the Commission maintains a file with regard to the existing institutional structure for land management, including the identification of all government agencies having land use control responsibilities in both urban and rural areas. It is proposed that this inventory be updated to the base year 1975 under the Section 208 planning program. The findings of the updated inventory will then be utilized in subsequent analyses in order to provide a basis for the formulation of a land management subelement of the Section 208 plan.

Legal Considerations in Water Quality Management

A knowledge of the legal considerations involved in water quality management is essential in the preparation of a Section 208 water quality management plan. Such legal considerations include land use control law and water law, specifically including sewerage law and drainage law. At the present time, under the regional land use-transportation study the Commission is preparing revised editions of SEWRPC Technical Report No. 2, Water Law in Southeastern Wisconsin, and SEWRPC Technical Report No. 6, Planning Law in Southeastern Wisconsin. Accordingly, it is anticipated that very little additional basic research or inventory effort will be needed under the Section 208 planning program. The available data will, however, need to be collated and made available for use in the Section 208 planning program. In addition, consideration will be given to specific aspects of sewerage law, such as the legal ramifications related to the concept of a "limited access" trunk sewer and to the powers of the Department of Natural Resources to direct land use development through control over trunk sewer extensions.

ANALYSES AND FORECASTS

Inventories provide the factual information about historic and present situations, but analyses and forecasts are necessary to provide estimates of future needs for water quality related facilities and management measures. These future needs must in part be determined from a sequence of interlocking forecasts. Economic activity and population forecasts enable determination of future growth within a region and its subareas, which in turn can be translated into future demands for such items as land use, water use, and water management facilities. These future demands can then be scaled against the existing supply and plans formulated to meet deficiencies.

Forecast Growth and Change

As noted earlier, the Section 208 planning program for southeastern Wisconsin will be prepared within an overall regional planning framework that includes the preparation of a regional land use plan based upon newly revised regional economic and demographic forecasts. It will be necessary under the Section 208 program to relate such forecasts and the regional land use plan to the comprehensive water quality management planning effort. In this respect, it will be necessary to determine more precisely future sewer service areas, including the determination of which urban areas need to be provided with centralized sanitary sewer service and which urban areas can safely rely upon on-site soil absorption sewage disposal facilities. In addition, it will be necessary to prepare small area population forecasts within the overall regional population forecasts in order that estimates of future sewage flow by small areas of the Region can be prepared.

Hydrologic-Hydraulic-Water Quality Simulation Modeling

Need for Modeling: Areawide water quality planning requires a detailed understanding of the behavior of the hydrologic-hydraulic-water quality system[4] of each of the major watersheds contained wholly or partly within the planning region. Water quality at any point and time within the streams, lakes, and impoundments comprising the Region's surface water system may be viewed as being a function of three factors. The first such factor is comprised of the meteorological events which largely determine the amount of water available to transport potential pollutants from the land surface to and through the surface water system. The second factor is the nature and use of the land, with emphasis on those features that affect the quantity and temporal distribution of runoff and the quantity and quality of point and non-point sources of potential pollutants. The third factor is the characteristics of the surface water system which determine the rate and manner in which potential pollutants are either assimilated or transported from the Region.

The ideal way to investigate the region's hydrologic-hydraulic-water quality system would be to make direct measurements or observations of the phenomena involved. Such a direct approach is not generally feasible, however, primarily for three reasons. First, the installation, operation, and maintenance costs of a network of precipitation measurement gages, stream flow gages, water quality monitoring stations, and other monitoring equipment necessary to achieve the scope and detail required for areawide water quality planning are prohibitive. Secondly, even if an ideal data collection system could be established in a watershed, it is highly

[4]A system is defined as a set of interdependent physical units and processes organized or arranged so as to interact in a predictable, regular manner, the understanding or manipulation of which can be used to advance some objective or function.

improbable that the sampling or observation period would include critical natural events such as the extreme low flow periods required for water quality planning purposes. Finally, with respect to evaluating watershed hydrologic-hydraulic and water quality relationships under probable future land and channel conditions, it is apparent that a regional monitoring network would be of little value since measurements and observations would only reflect existing conditions.

It follows, therefore, that achievement of the necessary detailed understanding of the spatial and temporal fluctuations in the quantity and quality of watershed surface water resources under both existing and hypothetical future watershed development conditions requires application of some planning technique which can supplement and build upon a necessarily limited base of water resources data. That planning technique must have the capability of quantifying the hydrologic hydraulic-water quality impact of existing and alternative future conditions with a degree of accuracy sufficient to make decisions concerning the location, type, and size of costly water quality and water quality-related structures and facilities and the nature and extent of water quality related land management measures.

Hydrologic-hydraulic-water quality simulation,[5] accomplished with a combination of interrelated digital computer programs, has proven to be an effective planning technique. Although systems may be simulated by means of programs executed on digital computers, by electric analogs, and by actual physical models, digital computer simulation has been utilized most extensively in water resources planning by private consulting firms and by governmental agencies, including the Commission,

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[5]Simulation is defined as reproduction of the important behavioral aspects of a system. It should be emphasized that simulation, as used in comprehensive area-wide water quality planning, does not normally achieve, nor need to achieve, exact duplication of all aspects of system behavior.

since the early 1960's when private and public engineering and planning organizations began to gain access to digital computers and user-oriented languages needed to program them.

Description of the Model: The principal hydrologic-hydraulic-water quality model (HHWQM) selected for use in the areawide water quality planning program is a continuous simulation device having the capability to accommodate point and non-point sources and rural and urban land uses. The model,[6] which will be operated on the Commission's IBM 370/125 computer system, is available through the consulting firm Hydrocomp, Incorporated and has been under development since the early 1960's when pioneer work in hydrologic-hydraulic modeling was initiated at Stanford University.[7] Water quality simulation capability was added to the flow simulation capability of the model in 1972 by the Hydrocomp firm.

The HHWQM consists of two submodels, a land submodel and a channel submodel that are linked and operated in accordance with the schematic representation shown in Figure 3. The function of the land submodel is to calculate the quantity and temporal distribution of runoff from the land surface to the surface water system and to then determine the associated quantity of potential pollutants such as sediment, pesticides, and organic oxygen-demanding materials, that are transported with the runoff from the land to the surface water system. Although output from the land submodel is intended primarily to serve as input to the channel submodel, the land model output is readily available to permit examination of the quality of land runoff prior to its entry into the surface water system.

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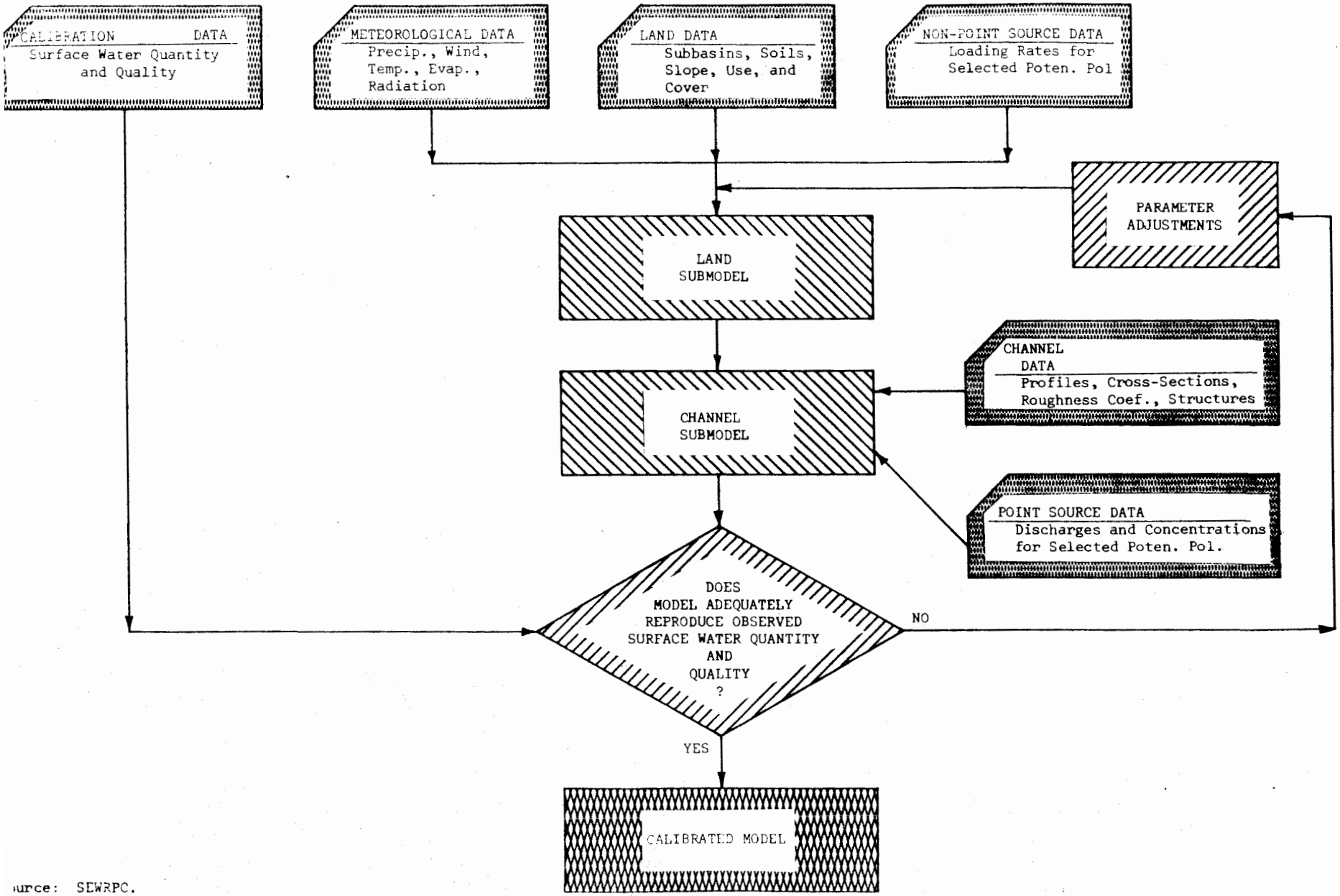
[6]Hydrocomp, Inc., "Hydrocomp Simulation Programming Operations Manual," Revised February 1972.

[7]See: Crawford, N. H. and Linsley, R. K., "Digital Simulation in Hydrology: Stanford Watershed Model IV," Technical Report No. 39, Department of Civil Engineering, Stanford University, July 1966.

STRUCTURE AND CALIBRATION OF THE HYDROLOGIC-HYDRAULIC WATER QUALITY MODEL



Source: SEWRPC.

The purpose of the channel submodel is to intercept the computed runoff from the land and to route it through the surface water system so as to permit the determination of stage, discharge, and velocity as a function of time throughout the system. After simulation of the hydraulic behavior of the channel system, the channel submodel simulates the spatial and temporal variation in the concentration of potential pollutants that have been discharged to the surface waters either from point or non-point sources and are transported in the channel system.

Input Data Requirements: Operation of the HHWQM requires development of a data base consisting of the following five distinct types of information: meteorological data, land data, non-point source data, channel data, and point source data. As illustrated in Figure 3, the meteorological, land, and non-point source data are input to the land submodel, while the channel and point source data, along with the output from the land submodel, are input to the channel submodel.

A distinction should be drawn between input data and calibration-testing data. The five categories of data identified above constitute the input data for the HHWQM and constitute the data base needed to operate the model. Calibration testing data, which are discussed in a subsequent section, are not required to operate the model, but are used to calibrate and test the model after it has been run.

Required meteorological data consists of hourly and daily precipitation amounts; daily wind movement; daily maximum, minimum, and dewpoint temperature; daily evaporation rates; and daily solar radiation. In the context of the HHWQM, land data refers to those land features or characteristics having an areal extent and having a significant effect on the conversion of precipitation on the land surface to runoff into the stream system. Key land data types include subbasin delineations, soil type, land slope, and land use-cover. Non-point source data consists primarily of the rates at which various potential pollutants are applied to or fall on

the land surface in both rural and urban areas, thus becoming available for wash-off to the surface water system under rainfall or snowmelt conditions. The HHWQM requires surface loading rates for water quality constituents such as organic substances, fertilizers, and pesticides.

Required channel data consists of those characteristics and parameters that affect velocity, stage, and discharge rate in the stream system. Basic hydraulic data requirements include channel profiles, channel-floodplain cross sections, roughness coefficients, and information on selected hydraulic structures, primarily dams and lake outlet control structures. Point source data are intended to characterize the effluent discharged to the surface water system by municipal sewage treatment plants and major industrial dischargers. The volumetric flow rate and the concentration of selected potential pollutants such as organic matter, nutrients, and toxic metals in point source discharges must be quantified for input to the channel submodel.

Calibration-Testing Data Requirements: Successful use of a complex analytic tool like the HHWQM requires that it be calibrated with and tested against surface water quality and quantity data. The data required to calibrate and test the model consists of streamflow measurements and coincident determinations of the concentration of selected water quality parameters in streams, lakes, and impoundments. These data will be obtained under a series of intensive, short term field surveys intended to completely characterize both the flow and quality of the surface waters at selected locations in the Region. In terms of the type of information collected and the frequency of the observations or sampling, the calibration and testing data are identical. As discussed below, they differ only in the way in which they are used during the calibration and testing phases of the modeling program.

Model-Related Work Elements: The model-related work elements include data base development, model calibration and testing, and model application.

1. Data Base Development

The objective of this work element is to provide the five types of data needed to operate the HHWQM. This work element will involve the acquisition, collation, and coding of data in formats suitable for direct input into the model. In addition, data base development includes the instream monitoring activities intended to obtain the data required for model calibration and testing purposes.

a. Meteorological Data

A portion of the meteorological data base for the seven-county planning region has already been acquired and coded for modeling purposes under the Commission's on-going water resources planning program. This core data base will be expanded so as to include the remainder of data required to apply the model to the Region and contiguous areas. The data base will also be supplemented with additional meteorological data acquired during the planning program. These additional data will be used in the model calibration and testing phase of the program.

b. Land Data

Development of the land data portion of the data base will begin with the subdivision of the entire region, and certain contiguous hydrologically-hydraulically connected areas, into relatively small--on the order of several square miles--subbasins. The land slopes prevalent in each subbasin will be determined and Commission soils and land use data will be used to characterize the soil types and

land uses within each subbasin. Based on a commonality of land slope, soil type, land use-cover, and proximity to meteorological stations, contiguous subbasins will be aggregated into land segments. Land segment types found in the Region will be identified and the slope, soil, and land use-cover combinations characteristic of each land use segment will be used to select the values of the direct inputs to the HHWQM.

c. Non-Point Source Data

Based on data derived from the land management practices studies described above under the subsection entitled "Other Non-point Source Inventory," surface loading rates for potential pollutants will be assigned to each land segment and coded for input to the HHWQM. Land use within each segment will provide the key whereby the findings of the land management practices studies can be transferred to the land segments.

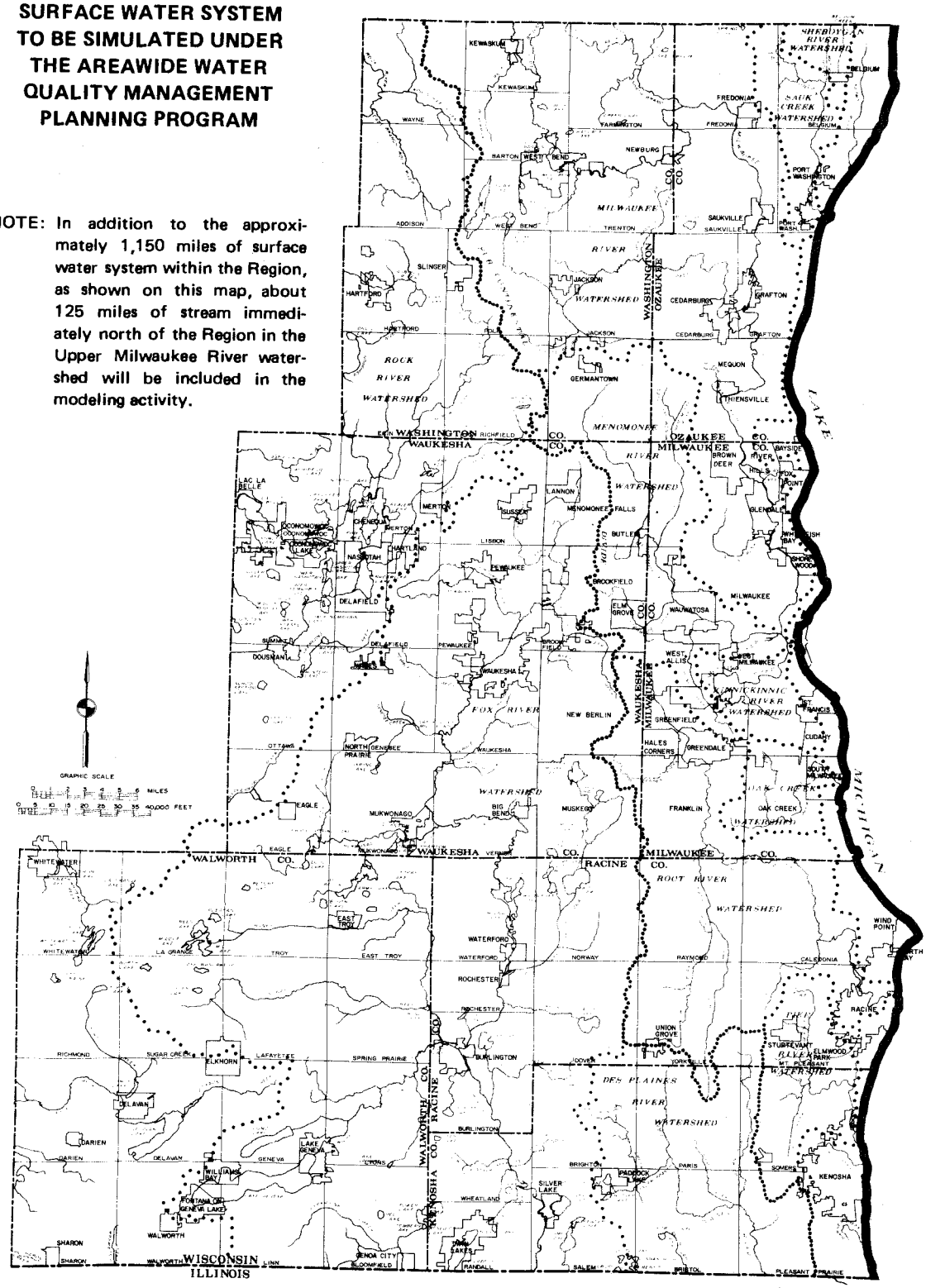
d. Channel Data

The 1,275 mile portion of the stream system within and tributary to the Region (see Map 7) will be subdivided into reaches having similar hydraulic characteristics. These reaches will constitute the basic physical unit used within the channel submodel. Various factors will be used to establish reach limits including flow through time, location of point sources, locations at which water quality output are required, shape of the channel-floodplain cross section, and location of lakes and impoundments. The configuration of the channel and its floodplain will be determined as selected location using a combination of field surveying and photogrammetric methods. Hydraulic structure data acquired under the Commission's Root, Fox, Milwaukee and Menomonee River watershed planning programs will be

Map 7

SURFACE WATER SYSTEM TO BE SIMULATED UNDER THE AREAWIDE WATER QUALITY MANAGEMENT PLANNING PROGRAM

NOTE: In addition to the approximately 1,150 miles of surface water system within the Region, as shown on this map, about 125 miles of stream immediately north of the Region in the Upper Milwaukee River watershed will be included in the modeling activity.



Source: SEWRPC.

supplemented, as needed, with field survey work. Manning roughness coefficients will be assigned to each reach based on field reconnaissance. Reach parameters developed under this work element will be coded for direct input to the channel submodel.

e. Point Source Data

The data required for this portion of the input data base will be acquired from the basic data inventory efforts described earlier in this document. Point source discharges and the corresponding concentration of potential pollutants will be coded under this work element for direct input to the HHWQM.

f. Calibration and Testing Data

Continuous streamflow measurements and coincident stream, lake, and impoundment water quality analyses will be obtained for selected locations on the Region's surface water system under a series of intensive, short term monitoring efforts. Criteria to be used in selection of test areas are described below in the discussion of the model calibration and testing procedure. The surface water calibration--testing data will be coded and entered into a digital computer file from where it can, during the calibration and testing process, be readily retrieved and numerically or graphically compared to results produced by the HHWQM.

2. Model Calibration and Testing

Since the mathematical expressions comprising the HHWQM are approximations of natural phenomena, and since the input data used to quantify and otherwise characterize the hydrologic-hydraulic-water quality system, will be limited, it is necessary to calibrate the model, that is, to compare simulation results with historic fact and make adjustments which

permit the model to better reflect actual occurrences. Land segments or, groups of contiguous land segments in the Region will be selected for the conduct of model calibration and testing procedures. These test areas will be chosen so as to encompass the full spectrum of land slope, soil types, land use-cover, meteorological conditions, diffused source pollution potential, and lake and impoundment types exhibited in and near the Region.

The calibration procedure for a given test area will be conducted as shown on Figure 3 and will be initiated by operating the model for a period of time corresponding to a portion of that time for which calibration-test data are available. The simulated and recorded discharges and water quality levels will be compared, the necessary adjustments will be made in the input parameters, and the model will be rerun. This procedure will be repeated until the desired successful calibration is achieved. Upon completion of the calibration, the model will then be run for the period corresponding to the remainder of the time for which calibration-test data are available. This test procedure is intended to determine if the model can successfully reproduce flow rates and water quality characteristics under conditions different than that for which it was calibrated.

3. Application of the Model in the Areawide Water Quality Planning Program

Upon completion of the calibration and testing process, the model will be ready for use as the principal analytic tool in the areawide water quality planning program, including use in the required segment analysis and the determination of the most cost effective allocation of waste loads between various point and nonpoint pollution discharges. For

purposes of carrying out that analysis, the seven-county planning region and certain hydrologically-hydraulically connected contiguous areas will be subdivided into water quality analysis areas. Use of these analyses areas will permit a systematic examination of the surface water quality of the Region under both existing and alternative future conditions and, equally important, will reduce the computer storage and time requirements per model run so as to be compatible with the Commission's computer system. The analysis areas will consist of entire watersheds or, in the case of large watersheds like the Fox or Milwaukee River basins, the analysis areas will be major subwatersheds.

Depending on the characteristics and requirements of each water quality analysis area, the HHWQM will be used for some or all of the following five functions

1. Evaluation of water quality under existing conditions.
2. Evaluation of water quality under existing trend year 2000 conditions.
3. Evaluation of water quality under year 2000 conditions assuming implementation of the regional land use and sanitary sewerage system plans as these plans relate to the abatement of point sources of pollution but not nonpoint sources.
4. Evaluation of water quality under year 2000 conditions assuming full implementation of the regional land use and sanitary sewerage system plans including recommended measures for control of nonpoint source pollution.
5. Evaluation of water quality under year 2000 conditions with refined point source pollution control alternatives (refined regional sanitary sewerage system plan) and alternative measures for control of non-point source pollution.

The analytic process to be followed in applying the model to the areawide water quality planning program is presented in Figure 4. Although this schematic representation depicts the overall sequence of steps to be followed in applying the HHWQM, it is not intended to be an inflexible, rigid representation of the modeling procedure. An overriding consideration in use of the model will be identification of the most practicable cost effective combination of point and non-point source pollution control measures for achieving established water use objectives.

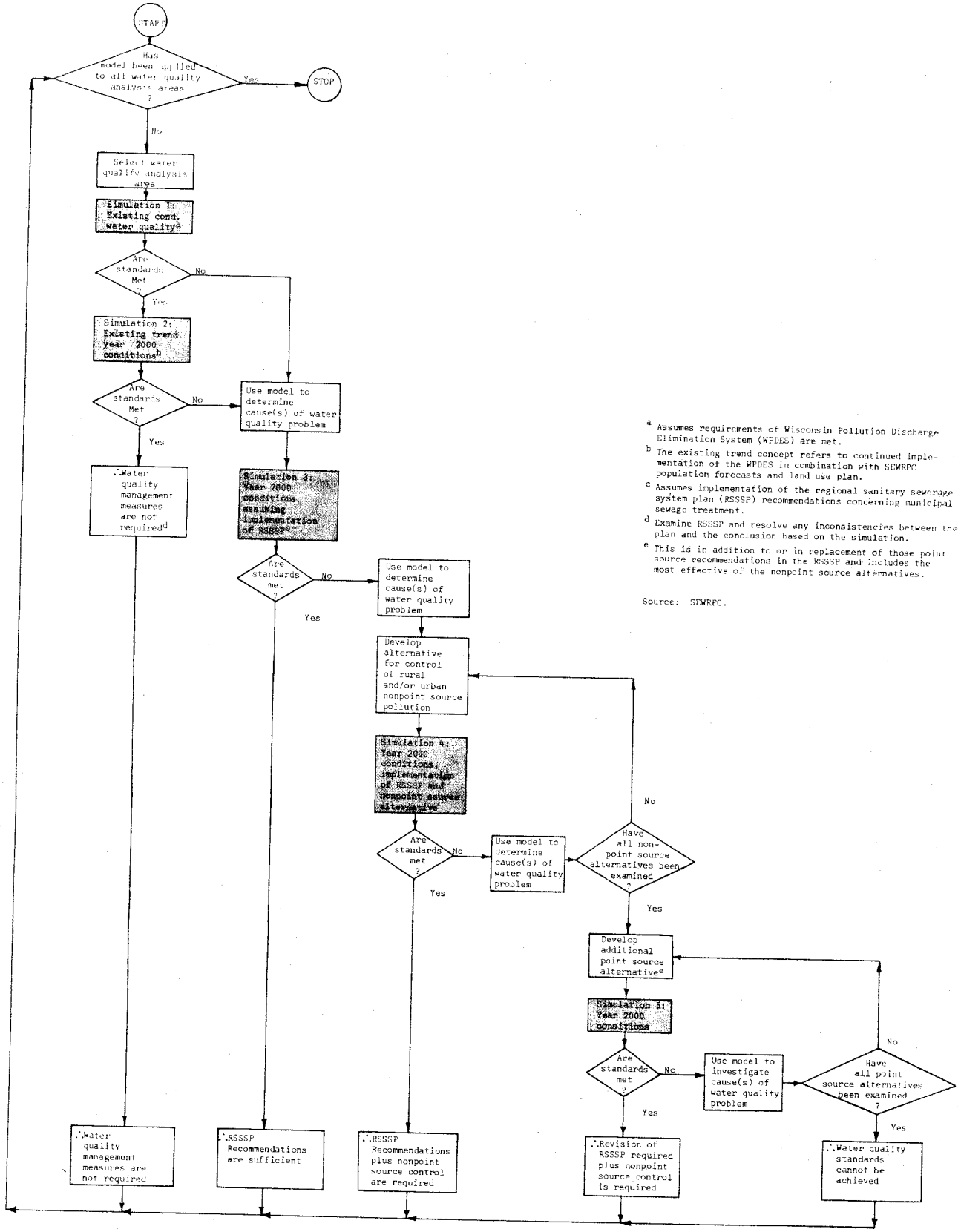
The regional sanitary sewerage system plan recommendations for municipal sewage treatment plants are included in the modeling process as depicted in Figure 4. Prior to using sewerage system plan data or recommended levels of treatment in the modeling process, the data and recommendations will be updated to reflect changes that have occurred subsequent to the sewerage study. Municipal sewage treatment recommendations contained within the regional sanitary sewerage system plan, updated to reflect recent significant changes, will be entered into the modeling process to provide a point of departure for the municipal sewage treatment component of alternative areawide water quality plans.

a. Existing Conditions

Prior to the development and testing of water quality management plan elements, it will be necessary to determine the quality of the Region's surface water system under existing land, channel, and pollutional input conditions, the last of which will assume conformance with the short-term effluent limitations set forth in the point source waste permits issued under the Wisconsin Pollution Discharge Elimination System. Results of the existing-condition water quality evaluation will be

Figure 4

APPLICATION OF THE HYDROLOGIC-HYDRAULIC-WATER QUALITY MODEL
TO
AREAWIDE WATER QUALITY PLANNING



[a] Assumes requirements of Wisconsin Pollution Discharge Elimination System (WPDES) are met.

[b] The existing trend concept refers to continued implementation of the WPDES in combination with SEWRPC population forecasts and land use plan.

[c] Assumes implementation of the regional sanitary sewerage system plan (RSSSP) recommendations concerning municipal sewage treatment.

[d] Examine RSSSP and resolve any inconsistencies between the plan and the conclusion based on the simulation.

[e] This is in addition to or in replacement of those point source recommendations in the RSSSP and includes the most effective of the nonpoint source alternatives.

Source: SEWRPC.

compared to the adopted water use objectives and supporting standards in order to identify those stream reaches or analysis areas that are already deficient with respect to surface water quality.

Although water quality data obtained under the SEWRPC-DNR sampling program as described earlier in this document will serve as an index to regional surface water quality, that sampling program is temporily and spatially insufficient to indicate all portions of the surface water system that fail to meet the established standards. Equally important, since the sampling program is limited exclusively to instream observations, it will not, in and of itself, provide a means for determining in the source of the pollution problems that may be identified. In contrast, inasmuch as the HHWQM includes as input all point and nonpoint waste sources, it is possible to use the model to test which sources are principal contributors to substandard water quality.

This first application of the model to each water quality analysis area will require the acquisition and coding of land data, nonpoint source data, channel data, and point source data that are representative of existing conditions in the analysis area. This existing condition input data will be input to the HHWQM along with several decades of historic meteorological data that is statistically representative of that which has occurred and may be expected to occur in or near the water quality analysis area. The results of the simulation will be several decades of streamflow and water quality data that are statistically representative of that which would be expected under existing land, channel, and pollution input conditions. This model output will be analysed and compared to the established water quality standards.

b. Year 2000 Conditions Based on Existing Trends

If the above simulation indicates that the surface waters in a given water quality analysis area satisfy the water quality standards, the HHWQM will then be used to simulate the response of the area to existing trend year 2000 conditions. The existing trend concept combines continued implementation of the WPDES permit system short term effluent limitations in combination with the SEWRPC population forecasts and land use plan. Application of the model will require the coding of land data, nonpoint source data, channel data, and point source data representative of existing trend year 2000 conditions. This data, plus statistically representative meteorological data used in earlier model runs, will be used to generate a streamflow-water quality data series for comparison to the established water quality standards. If the standards are satisfied for a particular water quality analysis area, no pollution abatement measures--other than those short-term effluent limitations explicit in the WPDES permits--will be required.

c. Year 2000 Conditions with Adopted Regional Sewerage System Plan

Certain water quality analysis areas will not satisfy the water quality standards under existing trend conditions and, therefore, the HHWQM will be used to simulate the response of such areas to year 2000 conditions assuming implementation of previously adopted regional sanitary sewerage system plan recommendations concerning municipal waste water treatment facilities. Land data, nonpoint source data, channel data, and point source data representative of the stated conditions, in combination with statistically representative meteorological data used in earlier applications of the HHWQM, will be input to the model. The resulting

streamflow-water quality series will be compared to the water quality standards supporting the adopted water use objectives. If the anticipated surface water quality in a given water quality analysis area meets the standards, no additional water quality management measures will be examined.

d. Year 2000 Conditions with Regional Sewerage System Plan and Control of NonPoint Source Pollution

Alternative measures for control of nonpoint source pollution will be examined for those water quality analysis areas that fail to meet the established standards under year 2000 conditions assuming implementation of the regional sanitary sewerage system plan. In rural areas, the alternative nonpoint source pollution control measures may include modifications in cattle feed lot operations and manure handling procedures, recognized soil and water conservation measures, and alterations in the type and application of chemical fertilizers and pesticides. Urban area nonpoint source pollution control measures might include improved erosion and sediment control for construction sites, modifications in the type and application of chemical fertilizers and pesticides, alterations in street cleaning procedures, and treatment of storm water runoff prior to its entry into the surface water system.

Application of the model will require coding of land data, non-point source data, channel data, and point source data so as to represent year 2000 conditions, implementation of the regional sewerage system plan, and application of the alternative non-point source pollution control measures. This data, plus meteorological data used in earlier model runs, will be input to the HHWQM and a streamflow-water quality series

will be produced for comparison to established water quality standards. Assuming that the standards can be satisfied, the model will be used to determine the most effective non-point source pollution control measure.

e. Revised Sewerage System Plan and Control of Non-Point Source Pollution

It is possible that the combination of the regional sewerage system plan recommendations for control of point sources and the aforementioned non-point source pollution control measures will be inadequate to satisfy the established water quality standards. In this situation, alternatives will be developed that combine the most effective non-point source pollution control measures with new point source pollution control measures that differ from those in the sewerage system plan. These revised point source measures might include higher levels of treatment or changes in the locations of the treatment facilities and their points of discharge, including incorporating the 1983 Statutory goal of no discharge of pollutants. Land data, non-point source data, channel data, and point source data representatives of each such alternative will be coded and input to the HHWQM along with meteorological data. The resulting simulated series of streamflow-water quality data will be examined relative to the water quality standards. Although all technically feasible alternatives will be examined, it is conceivable that this final application of the model may indicate that the adopted quality standards cannot be achieved in certain water quality analysis areas.

Land Use and Environmental Constraints

While the primary land use analysis and planning effort under the Section 208 planning program will involve adaptation of the new year 2000 regional land use plan to the water quality management planning effort, it will be necessary to conduct

additional land use and environment-related analyses in order to determine any adverse impacts upon environmentally sensitive areas caused by pollutants from both point and nonpoint sources. In this respect, the environmentally sensitive areas inventoried above will need to be related to the location of all point source discharges to determine if there are any adverse impacts of such discharges upon the environmentally sensitive areas. In addition, from a nonpoint source pollution point of view, special analyses will have to be undertaken to determine if nonpoint source pollutants are reaching environmentally sensitive areas in such quantities as to threaten the continued viability of such areas. Such environmentally sensitive areas include aquifer recharge areas, certain wetlands, certain woodlands, unique wildlife habitat areas, and unique aquatic life segments and areas. In this respect, particular attention will be given to the adverse impacts of point and nonpoint source pollutants upon the primary environmental corridors of the Region.

Waste Water Conveyance Needs

Utilizing the land use and population data collected and collated under the Section 208 planning program, analyses will need to be conducted to determine major intercommunity waste water conveyance needs, including the identification of preliminary alignments of intercommunity trunk sewers. This analytical step will include the selection of engineering design criteria to provide a basis for the preliminary systems level design and cost estimates related to such conveyance facilities. This analysis will also fully take into account the sewage flow data obtained under the Section 208 planning program, as well as any available infiltration and inflow data obtained throughout the Region under Section 201 and related planning efforts. Finally, this analysis will include a determination of raw sewage conveyance and disposal needs with respect to the transfer of sewage from holding tanks to wastewater treatment facilities.

Sewage Sludge Management Needs

One of the outputs of the Section 208 plan for southeastern Wisconsin will be an analysis of the management needs of the Region as related to waste water sludge reduction, handling, and disposal. Such an analysis is particularly important and timely because, with the advent of more advanced methods of waste treatment, the quantity of residual solid wastes, or sludge, may be expected to increase dramatically.

There are many alternative methods of handling and disposing of residual materials from waste water treatment plants. Each method has certain advantages and disadvantages and each can be made to work well under a given set of conditions. Accordingly, it will be necessary under the Section 208 planning program to provide for an indepth review of all potential methods of sludge handling and disposal, including wet oxidation; incineration of dried sludge; resource recovery, including the preparation of commercial fertilizers, such as practiced at the Jones Island sewage treatment plant of the Milwaukee-Metropolitan Sewerage Commissions; composting; and disposal on land with hauling by pipe line, truck, or rail. It is important that each of these alternative methods of sludge handling and disposal be thoroughly investigated with particular emphasis upon the applicability of each method to all, or portions of, the Southeastern Wisconsin Region. In this respect, it should be noted that the Milwaukee-Metropolitan Sewerage Commissions currently have underway a solids management study with respect to sludge handling and disposal at both the Jones Island and South Shore treatment facilities. Any sludge management studies conducted under the Section 208 planning program will not duplicate this effort, but rather will incorporate it.

In considering the applicability of alternative sludge handling and disposal methods to southeastern Wisconsin, careful consideration will be given to any

economies to be achieved through centralization of sludge disposal. For example, consideration will be given to determining if sludge disposal from clusters of small sewage treatment plants located in a given subarea of the Region could be more effectively managed through a combined operation rather than an individual operation, exploring the attendant intermunicipal sludge disposal or resource recovery sites needs. It is further envisioned that the system level regional analysis relating to sludge handling and disposal to be performed in this portion of the Section 208 planning program will, as appropriate, be supplemented by more detailed sludge handling and disposal investigations as part of any local facility planning efforts. To the extent possible and feasible, however, specific recommendations for sludge disposal at individual treatment plants will be made in the Section 208 planning process.

Waste Management Institutional Structure Analyses

Based upon the inventory data collected pertaining to the existing management structure for both waste water management and land use management, analyses will be conducted to determine the extent to which the existing management structure is capable of fully carrying out any potential Section 208 water quality plan recommendations. Each management agency should be analyzed to determine its ability to regulate and manage both point and nonpoint sources of pollution within its jurisdictional area, to regulate the location and construction of any facilities which may result in waste discharge and, in general, to implement the waste water management plan elements. The analyses will also include the identification of any voids in the management structure which may need to be filled through the creation of any new management agencies and/or through securing additional powers for existing management agencies. The results of this analyses will form the basis for the preparation of the management element of the Section 208 water

quality plan. It is intended that this work element include specific consideration of the capability of county soil and water conservation districts to implement non-point source pollution control land use recommendations, as well as the ability of cities and villages to implement non-point source pollution control recommendations in urban areas.

PLAN DESIGN, TEST, AND EVALUATION

Alternative areawide water quality management plans will be prepared for evaluation, which evaluation will provide the basis for the selection of a final Section 208 plan for adoption and implementation. It is envisioned that the areawide water quality management plan for southeastern Wisconsin will consist of three major elements: a point source pollution abatement element; a nonpoint source pollution abatement element; and a management element. As appropriate, alternative plans and strategies will be considered for each element, building upon previously completed water quality related plan elements for the Region.

Alternatives will be developed with respect to the point source plan element as appropriate for the following subelements: waste water flow reduction; water re-use; sewer service areas; sewage treatment plants, including both public and private treatment facilities and recommended effluent limitations with respect to such facilities; industrial waste pretreatment; major trunk, relief, and intercepting sewers; pretreatment requirements; and solids management program, including the handling, recycling, and disposal of sludge.

Alternatives will be developed with respect to the nonpoint source plan element as appropriate for the following subelements: urban runoff, including storm water management recommendations and the development of a manual for municipal stream water management; agricultural runoff, including recommendations with respect to control of water pollution from feed lots; combined sewers, incorporating the findings of the combined sewer studies in the Kenosha, Racine, and Milwaukee areas;

solid waste disposal, including recommendations for control of water pollution from solid waste disposal sites; construction activities; and mining activities.

With respect to the management element of the Section 208 plan, it is envisioned that alternatives will be considered with respect to management agency designations for the point and nonpoint source plan elements and to alternative financial programs, including considerations relating to user charges and industrial cost recovery.

PLAN SELECTION AND ADOPTION

After full consideration of all alternative plan elements by the advisory committees and the Commission, a series of public informational meetings and formal public hearings will be held. Following such meetings and hearings, one comprehensive water quality management plan will be chosen from among the alternatives presented. This plan will be adopted and transmitted to the local, state and federal agencies concerned for adoption and implementation. The plan is intended to be used as the basis for designation of management agencies in the Region by the Governor. In general, it is intended that the Section 208 areawide water quality management plan is to be used to guide the long-range development of water quality management facilities within the Region through the cooperative adoption of the plan by all agencies and units of government concerned.

The final plan shall include a complete point source pollution abatement element, a complete nonpoint source pollution abatement element, and a management element, and is intended in this respect to meet all of the specific planning requirements of Section 208 of the Federal Water Pollution Control Act. The final plan shall also include an environmental assessment. The plan shall specifically include a priority improvement program with respect to waste treatment works construction in the Region. It is envisioned that the final selected Section 208 water quality management plan for the Region will consist of a series

of documents, necessarily technical in nature, but will be summarized in a final planning report.

PLAN IMPLEMENTATION

After preparation of the final Section 208 water quality management plan, recommendations shall be made relating to the establishment of a continuing water quality management program for southeastern Wisconsin. Such recommendations shall specifically include organizational and staffing elements for the program and shall suggest a recommended budget for the program, including documentation as to a sustaining source of funding for such a program.

In addition, the program shall include the preparation of precise plans for certain waste water conveyance and treatment facilities included in the areawide water quality management plan. Because of the substantial commitment to previous water quality related plan recommendations in the Region, as set forth in the adopted regional sanitary sewerage system plan, it is envisioned that the process of preparing precise facility plans will begin at the inception of the Section 208 program and run concurrently with the preparation of the Section 208 plan.

The federal regulations governing the Section 208 planning program envision the utilization of Section 208 planning monies to prepare the necessary precise facility plans. Funding limitations with respect to Section 208 have, however, caused the U. S. Environmental Protection Agency to continue to fund the preparation of precise facility plans under the authority and monies granted to it under Section 201 of the Act. Accordingly, no precise facility plans for subareas in the Southeastern Wisconsin Region will be funded directly with Section 208 monies. Rather, an agreement has been reached whereby the U. S. Environmental Protection Agency and the Wisconsin Department of Natural Resources will make available to communities in the Southeastern Wisconsin Region a total of $2.5 million during

the period July 1, 1975, through June 30, 1977, for this purpose. These Section 201 planning monies are intended to be in addition to those needed to fund facility plans set forth in Table 1 of this report. It is anticipated that those proposed facilities planning projects listed in Section A of Table 2 of this report will be able to be funded with the available $2.5 million of Section 201 monies during the two-year Section 208 planning period. It is envisioned that all of the precise facilities planning work will be accomplished by local engineering staffs or consultants chosen by the implementing agencies concerned. It is intended that these precise facilities plans fully meet all requirements relating to infiltration and inflow, cost effectiveness, and environmental assessment required under the Section 201 planning program. Those proposed facilities planning projects listed in Section B of Table 2, while needed and warranted at this time, will likely have to await federal funding after June 30, 1976. The division of projects between Sections A and B in Table 2 was made on the basis of the recently reestablished statewide priority list with respect to U. S. Environmental Protection Agency construction grant funding, with those projects having a relatively high priority listed in Section A and those projects having a lesser priority listed in Section B.

In order to assure complete coordination between the facilities plans to be funded with Section 201 planning monies and the areawide water quality management plan being prepared with Section 208 monies, the U. S. Environmental Protection Agency, the Wisconsin Department of Natural Resources, and the SEWRPC have agreed upon a Section 201 grant approval process whereby the Commission, as the Section 208 planning agency, would have responsibility for reviewing and providing input to the detailed plan of work for the facilities planning program; for providing basic data concerning population forecasts, sewer service areas, general location of treatment facilities, and land use implications, including

Table 2

PROPOSED FACILITIES PLANNING PROJECTS TO BE UNDERTAKEN
IN CONJUNCTION WITH THE
SECTION 208 PLANNING PROGRAM FOR THE SOUTHEASTERN WISCONSIN REGION

Section A

Community	Project Name	Estimated Facility Construction Cost
Milwaukee Metropolitan Subregional Area		
Milwaukee-Metropolitan Sewerage Commissions....	Solids Management Program	Not Available
	Jones Island-Overall Plant Rejuvenation	$ 10,700,000+
	Underwood Creek Trunk Sewer	3,900,000
	Root River Trunk Sewer	6,270,000
	Muskego Trunk Sewer	7,500,000
Germantown.....	Trunk Sewer Milw-Metro Connection	1,769,000
Muskego.....	Trunk Sewer Milw-Metro Connection	4,552,000
Thiensville.....	Trunk Sewer Milw-Metro Connection	Not Available
Upper Milwaukee River Subregional Area		
Saukville.....	Wastewater Treatment Plant Expansion	280,000
Upper Fox River Subregional Area		
Pewaukee Lake Sanitary District.....	Trunk Sewer	500,000
Lower Fox River Subregional Area		
Mukwonago.....	Replacement Wastewater Treatment Plant	2,156,000
Town of Salem Sewer Utility District No. 2..	New Wastewater Treatment Plant and Trunk Sewer	149,200
Western Racine County Sewerage District.....	Wastewater Treatment Plant Expansion	90,000
Town of Norway Sanitary District.....	New Wastewater Treatment Plant	1,000,000

-Continued-

Table 2
-Continued-

Section A		
Community	Project Name	Estimated Facility Construction Cost
Upper Rock River Subregional Area		
Slinger.....	Wastewater Treatment Plant Expansion	$ 1,300,000
Lower Rock River Subregional Area		
Walworth County Metropolitan Sewerage District.....	New Wastewater Treatment Plant and Trunk Sewers	11,146,800
Walworth.....	Replacement Wastewater Treatment Plant	762,000
Whitewater.....	Replacement Wastewater Treatment Plant	7,422,100
Sharon.....	Wastewater Treatment Plant Expansion	47,700
	TOTAL	$ 57,341,100

-Continued-

Table 2
-Continued-

Section B		
Community	Project Name	Estimated Facility Construction Cost
Milwaukee-Metropolitan **Subregional Area**		
Milwaukee-Metropolitan Sewerage Commissions....	Franklin-Rawson Homes Trunk Sewer	$ 600,000
New Berlin.....	Trunk Sewers	1,200,000
Kenosha-Racine Subregional Area		
Caledonia.....	Trunk Sewer	1,300,000
Kenosha-Somers.....	Parkside Area Trunk Sewer	9,500,000
Kenosha.....	Combined Sewer Overflow Engineering Study	Not Applicable
Upper Milwaukee Subregional Area		
Newburg.....	Sewage Treatment Plant Expansion	200,000
Fredonia.....	Sewage Treatment Plant Expansion	200,000
Tri-Lakes Sanitary Districts--West Bend	Trunk Sewers	1,300,000
Cedarburg-Grafton.....	Sewage Treatment Plant(s) Expansion	1,200,000
Sauk Creek Subregional Area		
Belgium-Lake Church.....	Trunk Sewer and Sewage Treatment Plant Expansion	1,900,000
Des Plaines River Subregional Area		
Paddock Lake.....	Sewage Treatment Plant Expansion	900,000
Upper Fox River Subregional Area		
Brookfield.....	Sewage Treatment Plant Expansion	4,000,000
Brookfield-New Berlin.....	Poplar Creek Trunk Sewer	1,300,000

-Continued-

Table 2
-Continued-

Section B		
Community	Project Name	Estimated Facility Construction Cost
Lower Fox River Sub-regional Area		
Town of Waterford Sanitary District No. 1.....	Trunk Sewer	$ 2,500,000
Genoa City.....	Sewage Treatment Plant Expansion	250,000
Town of Dover Sewer Utility District.....	Sewage Treatment Plant	300,000
Town of East Troy Sanitary District No. 2.....	Trunk Sewer	600,000
Village of East Troy.....	Sewage Treatment Plant Expansion	600,000
Town of Lyons Sanitary District No. 2.....	Sewage Treatment Plant	600,000
City of Lake Geneva.....	Sewage Treatment Plant Expansion and Trunk Sewers--Geneva and Como Lakes	12,200,000
Upper Rock River Sub-regional Area		
Allenton Sanitary District.....	Sewage Treatment Plant Expansion	300,000
Middle Rock River Sub-regional Area		
Village of Dousman.....	Sewage Treatment Plant Expansion	700,000
Lower Rock River Sub-regional Area		
Village of Williams Bay...	Sewage Treament Plant Expansion and Trunk Sewer	2,200,000
Village of Fontana.....	Sewage Treatment Plant Expansion and Trunk Sewer	4,200,000
	TOTAL	$53,150,000

Source: Wisconsin Department of Natural Resources and SEWRPC.

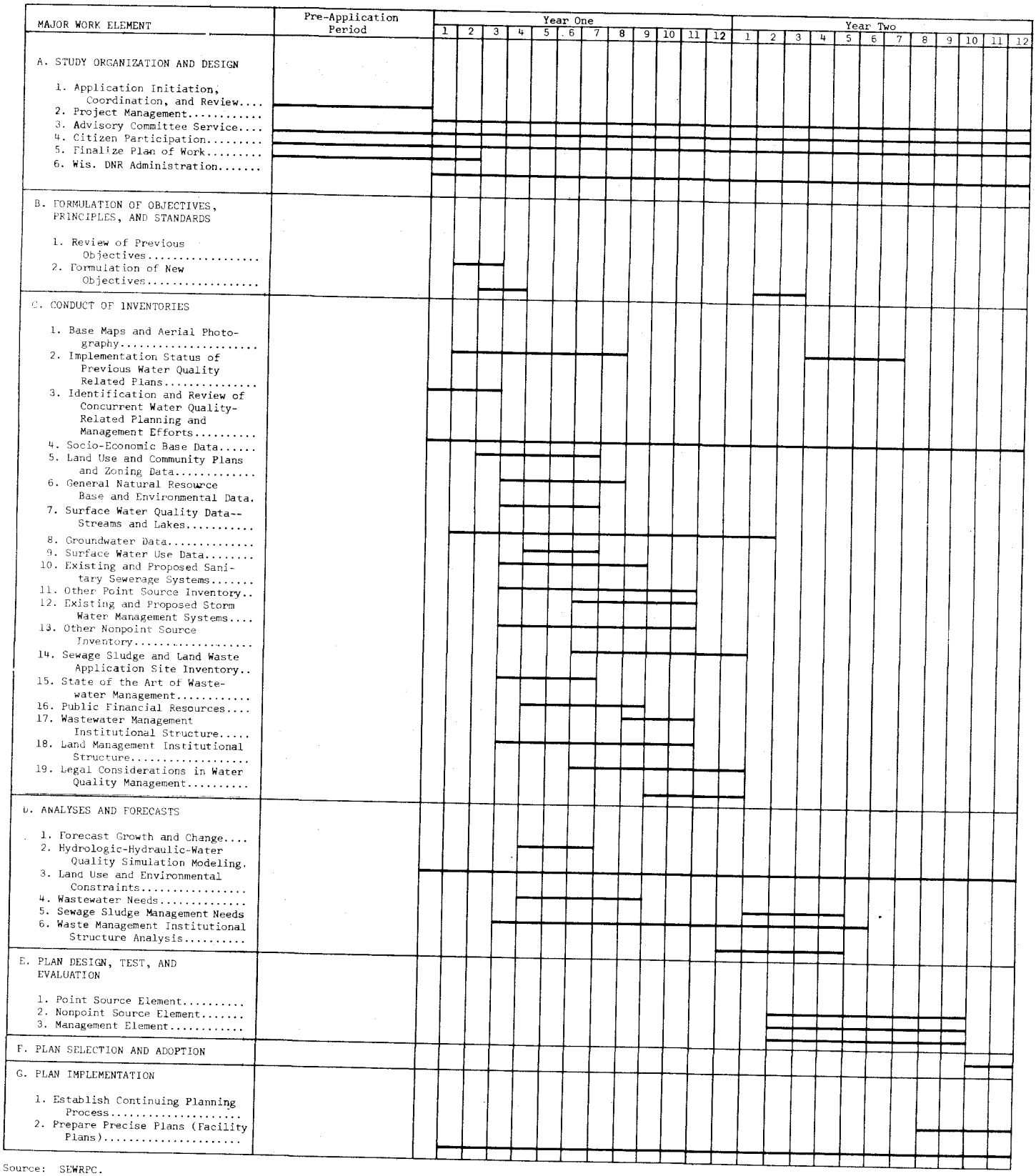
the identification of environmentally sensitive areas. In addition, the Commission, as the Section 208 planning agency, would review and comment upon the preliminary Section 201 facilities plan prior to its acceptance by the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency.

TIME SCHEDULE

An estimated time schedule for the accomplishment of the major elements of the Section 208 planning program is shown in Figure 5. This schedule is subject to revision upon completion of the detailed plan of work. The study organization and cost estimates presented in the following chapters of this document are predicated upon this initial recommended time schedule.

Figure 5

TIMING OF MAJOR WORK ELEMENTS OF THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM FOR THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

Chapter IV

ORGANIZATION FOR THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM

INTRODUCTION

The proposed Section 208 water quality planning and management program outlined in the preceding chapter of this document necessarily concerns a number of levels, units, and agencies of government. Accordingly, the organizational structure for the proposed program for southeastern Wsiconsin must provide for the active participation of these levels, units, and agencies of government and thereby provide a cooperative, intergovernmental approach to the areawide problems to be addressed in the Section 208 planning program. The following discussion considers various aspects of the proposed organizational structure, including staff and consultant requirements, committee structure, public participation, and space and equipment requirements.

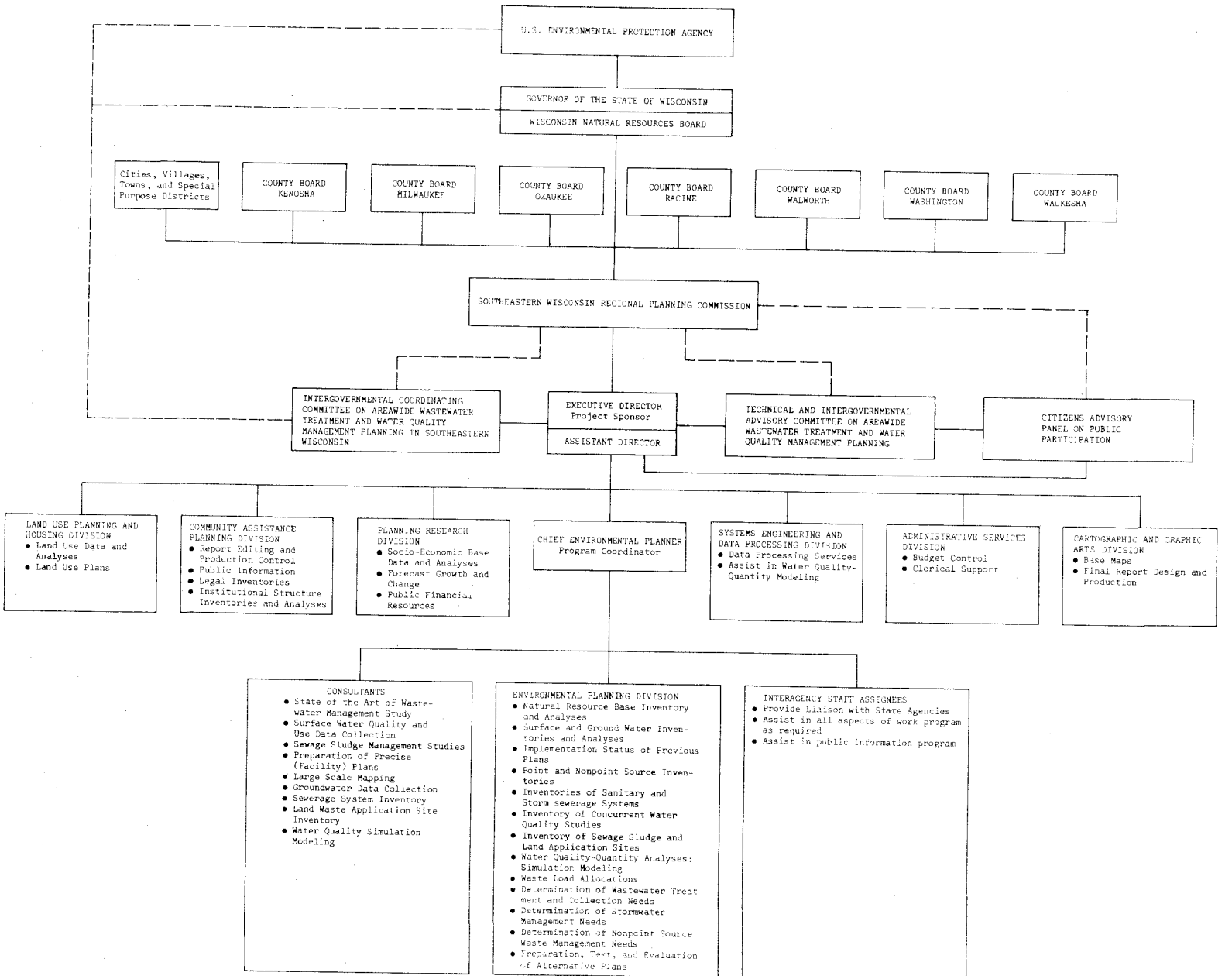
STAFF AND CONSULTANT REQUIREMENTS

The proper execution of the Section 208 water quality planning and management program for southeastern Wisconsin will require a staff trained and experienced in many different skills, professions, and disciplines, including among others economics, land use planning, resource conservation, soils, hydrology, hydraulic, sanitary and civil engineering and law. The complexity of the water resource problems existing in the Southeastern Wisconsin Region, coupled with conflicting interests in, and demands on, the water resource base, make an interdisciplinary approach to the Section 208 planning work particularly important.

The proposed organizational structure for the Section 208 water quality planning and management program for southeastern Wisconsin is set forth in Figure 6. The Southeastern Wisconsin Regional Planning Commission, as the officially designated Section 208 planning agency, has the primary responsibility

Figure 6

ORGANIZATIONAL STRUCTURE FOR THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM FOR THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

to prepare and adopt a Section 208 water quality management plan for the Region. The Commission is, then, the primary agency responsible for securing a Section 208 planning grant, mounting and organizing the necessary Section 208 work program, securing the necessary intergovernmental coordination and citizen participation in the conduct of the required work program, and, through this process, selecting and adopting an areawide wastewater treatment and water quality management plan.

Because of the importance of conducting the Section 208 planning work within the comprehensive regional planning framework already established by the Commission, because of the previous extensive Commission and Commission staff experience in water quality management planning, and because of the importance attached by the Commission to providing for a continuing planning process lodged in an officially recognized governmental planning agency, it is proposed that the necessary interdisciplinary staff be assembled as an integral part of the Southeastern Wisconsin Regional Planning Commission. This staff would build upon the existing staff capabilities of the Commission as reflected in the already completed and adopted water quality management plans, such as the Commission's regional land use, comprehensive watershed, and regional sanitary sewerage system plans. Basic responsibility for execution of the Section 208 planning work would reside in the Commission's Executive Director. The Commission's Chief Environmental Planner, reporting to the Executive Director, would be responsible for project coordination and direction of the staff of the Commission's Environmental Planning Division, any assigned interagency staff from other agencies, and any consultants which would be required.

Based upon the cost estimates of conducting each step in the proposed program, which cost estimates are presented in the next chapter of this document, it is estimated that the total in-house work will require about 180 SEWRPC staff

units. A staff unit is defined as consisting of a senior engineer or planner, an engineer or planner, and support staff--typists, analysts, aides, draftsmen, programmers, and others--equivalent to three full time persons, all working for one month. If the work is to be accomplished within the two-year planning period, the 180 staff units converts to approximately the equivalent of 38 full-time employees, although some of the required work may be contracted out to consultants beyond that indicated in the work schedule, thus reducing in-house staff needs. It is envisioned that some of these employees will be current Commission staff members, and that the remaining staff needed will be hired specifically for the Section 208 planning program. In particular, additional senior staff level personnel will be required in the areas of hydrology, hydraulic and sanitary engineering, water quality modeling, and engineering management. In addition, it is proposed that the staff complement for the Section 208 program will include at least one senior level assigned staff individual each from the Wisconsin Departments of Natural Resources and Administration. The assignment of staff to the Section 208 planning program by the Wisconsin Department of Natural Resources is particularly important because of the role that the Department must play in securing not only formal adoption and endorsement to the Section 208 plan at the state and federal levels of government, but in promoting long-term plan implementation measures.

In addition to the supplemental staff required to conduct the work program, it is envisioned that consultants will be retained to conduct various aspects of the work program. In this respect, it is proposed that consultants be retained to conduct all or portions of the required work in the areas of large scale base map preparation; surface water quality data collection; groundwater data collection; surface water use data collection; sewerage system inventory; other nonpoint source inventory; land waste application site inventory; the

state of the art of wastewater management study; the solids handling management study; the water quality simulation modeling effort; and in the preparation of precise (facility) plans for wastewater treatment works and conveyance facilities.

COMMITTEE STRUCTURE

It is proposed that two advisory committees be made integral parts for the organization of the study; namely, a Technical and Intergovernmental Advisory Committee on Areawide Wastewater Treatment and Water Quality Management Planning, and an Intergovernmental Coordinating Committee on Areawide Wastewater Treatment and Water Quality Management Planning in Southeastern Wisconsin. The first of these committees was established by the Commission on March 6, 1975, and the membership on this committee is set forth in Appendix A. The second committee would be formed once the program was mounted and under way. The recommended purpose of each committee in relation to the proposed Section 208 water quality management planning program for the Region is as follows:

1. Technical and Intergovernmental Advisory Committee on Areawide Wastewater Treatment and Water Quality Management Planning

   The basic purpose of the Technical and Intergovernmental Advisory Committee on Areawide Wastewater Treatment and Water Quality Management Planning is to actively involve, through technical level representatives and elected officials, the various governmental, business, and technical agencies and universities within the Region in the planning process, and to thereby assist the Commission in determining and coordinating basic technical policy involved in the conduct of the proposed program and in the resultant Section 208 plans and implementation measures. Membership of this committee is currently comprised of senior level technical representatives of appropriate federal and state areas of

government including representatives of industries concerned with treatment and management. It is proposed that this Committee be expanded to include other major wastewater treatment management agencies; county planners; federal agencies, including the U. S. Environmental Protection Agency; the U. S. Army Corps of Engineers; the U. S. Department of Housing and Urban Development; and the Northeastern Illinois Planning Commission, the designated 208 planning agency for northeastern Illinois. This Committee will have a particularly important role in directing and overseeing all of the technical work involved in preparation of the Section 208 plan and, in general, formulating technical policy direction for the study. In addition, the Committee members will be called upon to assist in familiarizing the political, business, industrial, and private citizen leadership within the Region with the Section 208 planning program and its findings and recommendations, and in further fostering understanding of basic wastewater treatment planning objectives and implementation procedures.

2. Intergovernmental Coordinating Committee on Areawide Wastewater Treatment and Water Quality Management Planning in Southeastern Wisconsin

The basic purpose of the Section 208 Intergovernmental Coordinating Committee on Areawide Wastewater Treatment and Water Quality Management Planning in Southeastern Wisconsin would be to involve key policy making officials from appropriate federal, state, areawide, and local

units of government concerned with the Section 208 planning program. It is proposed that this committee be composed of senior policy making representatives from the U. S. Environmental Protection Agency; the Wisconsin Departments of Agriculture, Administration, Local Affairs and Development, Health and Social Services, and Natural Resources; the joint Milwaukee-Metropolitan Sewerage Commissions; and the three cities in the Region recognized by the U. S. Bureau of the Census as central cities--Kenosha, Milwaukee, and Racine, as well as from the Regional Planning Commission staff. This committee will have the responsibility to review all aspects of the Section 208 planning effort having important interagency policy implications proposed by the interagency staff and approved by the Technical and Intergovernmental Advisory Committee. Areas of particular concern to this committee will include goals and objectives, water quality and related wastewater treatment needs, alternative plans, the recommended plan, and plan implementation measures, including management agency designations. In addition, this committee would be charged with the responsibility of assuring the long term financial feasibility of the recommended Section 208 wastewater treatment and management plan for southeastern Wisconsin, and toward this end would be charged with the specific responsibility of determining intraregional priorities with respect to the funding of wastewater treatment and related sewerage facility construction, and for integrating and coordinating these intraregional priorities with those established for other regions within the State of Wisconsin. In addition, this committee would have the responsibility of assuring that the financial resource available from all sources for

wastewater treatment and related sewerage facility construction within Wisconsin are carefully husbanded so as to assure long term financial stability in implementing the Section 208 plan for southeastern Wisconsin. In so doing, this committee would of necessity have to recognize that such long term financial stability for plan implementation can only result from a recognition that allocations of available resources must be based upon carefully documented needs founded in sound planning studies. In this connection it is intended that federal funds available to Wisconsin under the EPA waste treatment works construction program will be allocated to the Region on the basis of needs documented in such planning studies and reflected in the annual survey of waste treatment works construction needs conducted by the U. S. Environmental Protection Agency. Such allocations will reflect a proportional distribution of federal waste treatment works construction grant funds to the Region in a manner similar to the way in which such funds are allocated to the several states in the nation. In addition, the U. S. Environmental Protection Agency and the Wisconsin Department of Natural Resources will notify the Committee of the amount of such allocation at the earliest possible time for each fiscal year. The Agency and the Department will also be responsible for providing the committee with projected estimates of anticipated federal funds to be made available for use within the Region for a period coinciding with the five-year plan implementation schedule required by EPA under 40 CFR Chapter 1, Part 35, Subpart F.

PUBLIC PARTICIPATION

Public participation will be essential to the conduct of the Section 208 planning program for southeastern Wisconsin. It is envisioned that such public participation will be provided for in at least the following ways:

1. The initial public hearing on the Section 208 area and agency designation, held on June 18, 1974.
2. A proposed public informational meeting and public hearing on the draft plan of work.
3. A series of news releases presenting information on the progress of the study and its recommendations, and informing people as to where they can get additional information.
4. Periodic articles in the SEWRPC newsletter, which is widely distributed throughout the Region.
5. Conferences and/or workshops on various aspects of the program.
6. Public informational meetings and/or hearings on the Section 208 areawide plan elements.
7. Public informational meetings and/or hearings on precise wastewater treatment conveyance facility plans for the various local communities.

In addition to the foregoing, consideration will be given, as appropriate, to the use of educational television, newspaper supplements, attitudinal surveys, self-guiding field trips, and primary and secondary school education materials in an attempt to ensure that all citizens have an opportunity to become informed about the Section 208 planning program for southeastern Wisconsin, as well as an opportunity to make useful inputs to the Section 208 decision-making process.

In an effort to provide guidance in the conduct of the public participation element of the Section 208 planning program for southeastern Wisconsin, and to

provide maximum opportunity for representatives of citizen interest groups to become familiar with and to influence the SEction 208 planning program, it is proposed that there be created a Citizens Advisory Panel on Public Participation. It is envisioned that this panel would include appropriate representatives of broadly based citizen interest groups, such as the League of Women Voters, farmers organizations, manufacturers organizations, chambers of commerce, and environmental groups. Maximum opportunity would be offered to all such groups in the Region to participate on the advisory panel. It is further envisioned that this advisory panel would meet approximately quarterly throughout the life of the Section 208 planning program. Such quarterly meetings would provide a basis for briefing on the progress of the program, and offer an opportunity for members of citizen interest groups of all types to raise questions about, and thereby influence the basic directions of, the Section 208 planning program. In addition, this panel would be requested to react to proposed public information efforts, including those listed above.

SPACE AND EQUIPMENT REQUIREMENTS

It is proposed that the Section 208 resident planning staff be housed in the Commission offices at the Old Courthouse in Waukesha, Wisconsin. This location is convenient to the entire planning Region and is served with public transit. The cost estimates for the program set forth in the next chapter include allocations for a proportionate share of the overhead costs, including rent and utilities. It is anticipated that additional office furniture, equipment, and supplies will be rented, leased, or purchased, as appropriate. It is further anticipated that at least one vehicle will be purchased to provide transportation for employees assigned to the program.

All of the necessary data processing work will be accommodated within the already established Commission Data Processing Center. The Commission currently possesses an IBM System 370, Model 125 Computer, with appropriate storage and printing capability. It is anticipated that the modeling effort for the Section 208 planning program will require the installation of an IBM System 370, Model 135 Computer.

Chapter V

ESTIMATED COSTS FOR THE AREAWIDE WATER QUALITY PLANNING AND MANAGEMENT PROGRAM

COST ESTIMATES

An estimate of the cost of the needed Section 208 areawide water quality planning and management program for southeastern Wisconsin is set forth in Table 3. This cost estimate is based upon, and is directly related to, the scope of work, time schedule, and study organization set forth in the preceding chapters of this document. Cost estimates presented for each identified major work element were prepared by those Commission staff members having experience and competence in the subject area, in coordination with the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency.

The total estimated cost of carrying out the Section 208 areawide water quality planning and management program for southeastern Wisconsin is about $2.6 million. Of this total, about $1.5 million would be utilized for in-house staff salaries, fringe benefits, and related overhead costs. The remaining $1.1 million would be utilized to hire various consultants for the program. These costs do not include the $2.5 million to be made available for Section 201 planning efforts in the Region over the period July 1, 1975 to June 30, 1977.

In considering these cost estimates, it should be recognized that they are subject to change upon the finalization of the plan of work once the Section 208 program is mounted. Consequently, the cost estimates presented in Table 3 must be considered tentative with respect to allocation of total fund requirements among the various work subelements. Changes in the anticipated allocation must be expected upon completion of the detailed plan work. Overall program costs, however, will not vary from those estimated.

Table 3

COST ESTIMATES--AREAWIDE WATER QUALITY
PLANNING AND MANAGEMENT PROGRAM FOR SOUTHEASTERN WISCONSIN

Work Element	Estimated Cost			
	In-House Staff			
	Number of Staff Units[a]	Equivalent Cost	Consultants	Total
A. STUDY ORGANIZATION AND DESIGN				
1. Application Inititation, Coordination, and Review..	--	$ (16,160)	$ --	No charge
2. Project Management.....	4	30,800	--	30,800
3. Advisory Committee Service..	4	30,800	--	30,800
4. Citizen Participation.....	6	49,300	--	49,300
5. Finalize Plan of Work.....	4	30,800	--	30,800
6. Wis. DNR Administration.....	--	40,000	--	40,000
Subtotal.....	18	$ 181,700	$ --	$ 181,700
B. FORMULATION OF OBJECTIVES, PRINCIPLES, AND STANDARDS				
1. Review of Previous Objectives.....	1	$ 7,700	$ --	$ 7,700
2. Formulation of New Objectives.....	1	7,700	--	7,700
Subtotal.....	2	$ 15,400	$ --	$ 15,400
C. CONDUCT OF INVENTORIES				
1. Base Maps and Aerial Photography.....	--	$ --	$ 271,200	$ 271,200
2. Implementation Status of Previous Water Quality Related Plans.....	1	7,700	--	7,700
3. Identification and Review of Concurrent Water Quality Related Planning and Management Efforts.....	2	15,400	--	15,400
4. Socio-Economic Base Data....	1	7,700	--	7,700
5. Land Use and Community Plans and Zoning.....	4	30,800	--	30,800
6. General Natural Resource Base and Environmental Data.....	2	15,400	--	15,400
7. Surface Water Quality Data Streams and Lakes	6	46,200	150,000	196,200

-Continued-

Table 3
-Continued-

Work Element	Estimated Cost			
	In-House Staff			
	Number of Staff Units[a]	Equivalent Cost	Consultants	Total
8. Groundwater Data.....	1	$ 7,700	$ 18,000	$ 25,700
9. Surface Water Use Data.....	1	7,700	12,000	19,700
10. Existing and Proposed Sanitary Sewerage Systems.....	6	46,200	10,000	56,200
11. Other Point Source Inventory.....	1	7,700	--	7,700
12. Existing and Proposed Storm Water Management Systems..	12	92,400	--	92,400
13. Other Nonpoint Source Inventory.....	6	46,200	50,000	96,200
14. Sewage Sludge and Land Waste Application Site Inventory.....	2	15,400	10,000	25,400
15. State of the Art of Wastewater Management.....	1	7,700	50,000	57,700
16. Public Financial Resources..	1	7,700	--	7,700
17. Wastewater Management Institutional Structure.....	1	7,700	--	7,700
18. Land Management Institutional Structure.....	1	7,700	--	7,700
19. Legal Considerations in Water Quality Management..	2	15,400	--	15,400
Subtotal	51	$ 392,700	$ 571,200	$ 963,900
D. ANALYSES AND FORECASTS				
1. Forecast Growth and Change..	2	$ 15,400	$ --	$ 15,400
2. Hydrologic-Hydraulic Water Quality Simulation Modeling.....	48	369,600	318,200	687,800
Data Base Development...	*24*	*184,800*	*301,700*	*486,500*
Meteorological Data...	*2*	*15,400*	*34,200*	*49,600*
Land Data.....	*7*	*53,900*	*--*	*53,900*
Nonpoint Source Data..	*1*	*7,700*	*--*	*7,700*
Channel Data.....	*4*	*30,800*	*200,000*	*230,800*
Point Source Data.....	*1*	*7,700*	*--*	*7,700*
Calibration & Test Data.....	*3*	*23,100*	*60,000*	*83,100*
Model Lease.....	*--*	*--*	*7,500*	*7,500*
Data Processing.....	*6*	*46,200*	*--*	*46,200*
Model Calibration and Testing.....	*5*	*38,500*	*4,500*	*43,000*
Model Application.....	*19*	*146,300*	*12,000*	*158,300*

-Continued-

Table 3
-Continued-

	Estimated Cost			
	In-House Staff			
	Number of Staff Units[a]	Equivalent Cost	Consultants	Total
3. Land Use and Environmental Constraints	2	$ 15,400	$ --	$ 15,400
4. Wastewater Conveyance Needs.	3	23,100	--	23,100
5. Sewage Sludge Management Needs	1	7,700	250,000	257,700
6. Waste Management Institutional Structure Analysis.	2	15,400	--	15,400
Subtotal	58	$ 446,600	$ 568,200	$1,014,800
E. PLAN DESIGN, TEST, AND EVALUATION				
1. Point Source Element	12	$ 92,400	$ --	$ 92,400
2. Nonpoint Source Element	15	115,500	--	115,500
3. Management Element	11	84,700	--	84,700
Subtotal	38	$ 292,600	$ --	$ 292,600
F. PLAN SELECTION AND ADOPTION	6	$ 46,200	$ --	$ 46,200
Subtotal	6	$ 46,200	$ --	$ 46,200
G. PLAN IMPLEMENTATION				
1. Establish Continuing Planning Process	6	$ 46,200	$ --	$ 46,200
2. Coordinate Precise Plans (Facility Plans)	6	46,200	--[b]	46,200
Subtotal	12	$ 92,400	$ --	$ 92,400
Total	185	$1,467,600	$1,139,400	$2,607,000

[a] A SEWRPC staff unit consists of one Senior Engineer-Planner, one Engineer-Planner, and support staff--typist, analysts, aides, draftsmen, programmers--equivalent to three full time persons, all working for one month (see Appendix D).

[b] The Wisconsin Department of Natural Resources has agreed to allocate $2,500,000 to southeastern Wisconsin for facilities planning (see Table 2, Section A).

Source: SEWRPC.

MILESTONES AND DISBURSEMENT SCHEDULE

It is proposed that a disbursement schedule be established and related directly to the anticipated completion of major work elements as set forth in Figure 5, the timing of major work elements chart. This figure contains internally a rational set of milestones related to the seven-step planning process employed by the Commission. It is, accordingly, proposed that a final disbursement schedule be prepared and related directly to those planning milestones. The selection of this figure as the basis for a disbursement schedule also provides a direct way in which to monitor the work proposed to be accomplished.

Chapter VI

SUMMARY

Section 208 of the Federal Water Pollution Control Act, as amended by the U. S. Congress in 1972, provides for the development and implementation of areawide water quality planning and management programs within all of the Nation's major metropolitan areas. On September 27, 1974, the Southeastern Wisconsin Regional Planning Commission was designated as a water quality management planning agency pursuant to the terms of Section 208 of the Act. On December 26, 1974, the Administrator of the U. S. Environmental Protection Agency formally approved that designation and authorized the Commission to proceed with the preparation of an application for 100 percent federal funds in support of the conduct of the proposed Section 208 areawide water quality planning and management program for the Region. This study design was prepared in response to that authorization, and is intended to provide a working outline of the Section 208 water quality planning and management program for the Region, and toward that end sets forth a recommended time schedule, budget, and organizational structure for the program. This study design is envisioned as a working document designed initially to provide a basis for the approval of the necessary federal grant and for the initiation of the required work program. As a Section 208 "plan of work," it is envisioned that this document may be supplemented from time-to-time during the actual conduct of the work program as the unfolding work may dictate.

OBJECTIVES AND PURPOSE OF PROGRAM

In general, the Section 208 water quality planning and management program for southeastern Wisconsin is intended to update, extend, and refine the previous studies and plans completed by the Commission, and in so doing fully meet the requirements of Section 208 of the Federal Water Pollution Control Act. More

specifically, the areawide water quality planning and management program for southeastern Wisconsin is intended to accomplish the following objectives:

1. Provide for full integration of Commission regional water quality management planning with regional land use planning.
2. Provide for the conduct of a refined areawide water quality and quantity monitoring and modeling program.
3. Prepare an areawide point source pollution abatement plan element through revision and refinement, as may be found necessary, of the previously prepared and adopted comprehensive watershed and regional sanitary sewerage system plans.
4. Prepare an areawide nonpoint source pollution abatement plan element, extending previous Commission watershed planning efforts.
5. Prepare a practical areawide water quality management plan element.
6. Conduct subarea facilities planning for municipal wastewater conveyance and treatment facilities anticipated to be constructed within a five-year period following completion of the Section 208 plan (this objective to be achieved through separate Section 201 funding).
7. Provide for the establishment of a continuing areawide water quality planning and management program for southeastern Wisconsin.

MAJOR ELEMENTS OF THE PROPOSED PROGRAM

It is proposed that the Section 208 program employ the seven-step planning process developed by the Commission over the past 15 years. These seven steps as applied to the Section 208 program are as follows:

1. Study organization and design, including the initiation, review, and coordination of the Section 208 application; internal project management; advisory committee service; citizen participation; the

finalization of the plan of work; and Wisconsin Department of Natural Resources administration.

2. The formulation of development objectives and standards, including the review of previously formulated land and water resource oriented development objectives and standards.
3. The conduct of inventories related to: base maps and aerial photography; the implementation status of previous water quality related plans; concurrent water quality related planning and monitoring efforts; socio-economic base; land use and natural resource base; community plans and zoning; surface and groundwater quality data; water use data; point and nonpoint sources of pollution; existing and proposed sanitary and storm sewerage systems; public financial resources; water quality related law; and institutional structure for wastewater and land management.
4. The conduct of analyses and preparation of forecasts, including forecast growth and change in the Region; the conduct of a hydrologic-hydraulic-water quality simulation modeling program; the determination of land use and environmental constraints; the determination of wastewater conveyance needs; the determination of solid waste management needs; and the determination of institutional waste management needs.
5. The design, test, and evaluation of alternative plans, including a point source pollution abatement element, a nonpoint source pollution abatement element, and a management element.
6. The selection and adoption of a final Section 208 plan, together with the preparation of an environmental assessment of the plan.
7. The conduct of plan implementation activities, including the establishment of a continuing planning process and the preparation of precise plans for wastewater conveyance and treatment facilities.

ORGANIZATION FOR THE PROGRAM

It is proposed that the Section 208 water quality planning and management program be conducted by the Southeastern Wisconsin Regional Planning Commission, utilizing in large part the already assembled interdisciplinary staff to conduct the necessary work elements. It is envisioned that the Commission staff will be supplemented through the addition of senior level personnel in the areas of hydrology and water quality modeling, hydraulic and sanitary engineering, and engineering management. It is further proposed that the Wisconsin Departments of Natural Resources and Administration each assign at least one senior level staff member to the Commission for the duration of the study. Finally, it is proposed that consultants be retained to conduct substantially all the required work in the areas of large scale base maps preparation; surface water quality data collection; groundwater data collection; surface water use data collection; other nonpoint source inventory; land waste application site inventory; state of the art of wastewater management; solids handling management; and, importantly, through Section 201 funding in the preparation of precise plans for wastewater treatment works and conveyance facilities. In addition, consultants would be heavily used in the water quality simulation modeling effort.

Two advisory committees are to be made integral parts of the organization for the study. The first committee, a Technical and Intergovernmental Advisory Committee, is to actively involve technical level representatives of appropriate federal, state, and local units and agencies of government, as well as representatives of the Region's major universities and industries. This committee is to directly oversee all of the technical work involved in the preparation of the plan. The second committee, an Intergovernmental Coordinating Committee, is to be comprised of senior policy making representatives from the federal and state agencies concerned, and the major wastewater quality management agencies in the Region. This committee will have the responsibility to

review all aspects of the program having important interagency policy implications, as well as assuring the long-term financial feasibility of the plan.

PROGRAM COSTS

The total estimated cost of carrying out the Section 208 water quality planning and management program is about $2.6 million. Of this total, about $1.5 million would be utilized for in-house staff salaries, fringe benefits, and related overhead costs. The remaining $1.1 million would be utilized to hire various consultants for the program. About $2.5 million of Section 201 monies will be used to prepare precise wastewater treatment and conveyance facilities plans.

APPENDIX A

TECHNICAL AND INTERGOVERNMENTAL ADVISORY COMMITTEE
ON AREAWIDE WASTEWATER TREATMENT AND WATER QUALITY MANAGEMENT PLANNING

Vinton W. Bacon	Professor, College of Applied Science and Engineering, University of Wisconsin-Milwaukee
Robert J. Borchardt	Chief Engineer and General Manager, Milwaukee-Metropolitan Sewerage Commissions
Jon L. Caylor	District Conservationist, U. S. Soil Conservation Service, Kenosha and Racine Counties
Norbert Dettmann	Washington County Board Supervisor
Herbert A. Goetsch	Commissioner of Public Works, City of Milwaukee
Thomas Hentges	Former Racine County Board Supervisor; Former Chairman, Town of Burlington
Harlan D. Hirt	Chief, Planning Branch, Region V, U. S. Environmental Protection Agency
Lester Hoganson	City Engineer, City of Racine
Myron Johansen	Former District Conservationist, U. S. Soil Conservation Service, Ozaukee and Washington Counties
Leonard C. Johnson	Southeast Area Representative, Wisconsin Board of Soil and Water Conservation Districts
Melvin J. Johnson	Chairman, Town of Norway
Raymond J. Kipp	Dean, College of Engineering, Marquette University
Elwin G. Leet	Racine County Agri-Business Agent
O. Fred Nelson	Manager, Kenosha Water Utility
Wayne Persig	District Director, Farmers Home Administration, U. S. Department of Agriculture
Herbert E. Ripley	Health Officer, Waukesha County Department of Health

Donald A. Roensch	Director of Public Works, City of Mequon
Harold Ryan	Washington County Board Supervisor
Mitchell Urbanski	Engineer, American Motors Corporation; Member, Kenosha County Air and Water Pollution Committee
Rodney M. Vanden Noven	Director of Public Works, City of Waukesha
Frank A. Wellstein	City Engineer, City of Oak Creek
Oliver D. Williams	Acting Administrator, Division of Environmental Standards, Department of Natural Resources

APPENDIX B

PUBLICATIONS OF THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

PROSPECTUSES

Regional Planning Program Prospectus (4-62 , 40pp)
Root River Watershed Planning Program Prospectus (2-63, 25pp)
Fox River Watershed Planning Program Prospectus (10-64, 55 pp)
Milwaukee River Watershed Planning Program Prospectus (9-66, 56pp)
Comprehensive Library Planning Prospectus (4-68, 33pp)
Community Shelter Planning Program Prospectus (8-68, 43pp)
Regional Sanitary Sewerage System Planning Program Prospectus (12-68, 44pp)
Racine Urban Planning District Comprehensive Planning Program Prospectus (1-69, 32pp)
Comprehensive Regional Airport Planning Program Prospectus (12-69, 65pp)
Regional Housing Study Prospectus (12-69, 66pp)
Menomonee River Watershed Planning Program Prospectus (11-69, 70pp)
Regional Park, Outdoor Recreation, and Related Open Space Planning Program Prospectus (3-73, 52pp)
Deep Sandstone Aquifer Simulation Modeling Program Prospectus (10-72, 20pp)
Preliminary Engineering Study for the Abatement of Pollution from Combined Sewer Overflow in the Milwaukee Metropolitan Area (7-73, 36pp)
Regional Air Quality Maintenance Planning Program Prospectus (7-74, 55pp)
Kinnickinnic River Watershed Planning Program Prospectus (11-74, 57pp)

PLANNING REPORTS

No. 1 Regional Planning Systems Study (12-62, 73pp)
No. 2 Regional Planning Base Mapping Program (7-63, 23pp)
No. 3 The Economy of Southeastern Wisconsin (7-63, 175pp)
No. 4 The Population of Southeastern Wisconsin (7-63, 100pp)
No. 5 Natural Resources of Southeastern Wisconsin (7-63, 173pp)
No. 6 The public Utilities of Southeastern Wisconsin (7-63, 90pp)
No. 7 The Regional Land Use-Transportation Study
- Volume One, Inventory Findings--1963 (5-65, 192pp)
- Volume Two, Forecasts and Alternative Plans--1990 (10-66, 256pp)
- Volume Three, Recommended Regional Land Use-Transportation Plans--1990 (11-66, 208pp)

No. 8 Soils of Southeastern Wisconsin (6-66, 403pp)
No. 9 A Comprehensive Plan for the Root River Watershed (9-66, 286pp)
No. 10 A Comprehensive Plan for the Kenosha Planning District
- Volume One (2-67, 309pp)
- Volume Two (2-67, 227pp)

No. 11 A Jurisdictional Highway System Plan for Milwaukee County (3-69, 130pp)
No. 12 A Comprehensive Plan for the Fox River Watershed
- Volume 1, Inventory Findings and Forecasts (4-69, 445pp)
- Volume 2, Alternative Plans and Recommended Plan (2-70, 497pp)

No. 13 A Comprehensive Plan for the Milwaukee River Watershed
Volume 1, Inventory Findings and Forecasts (12-70, 514pp)
Volume 2, Alternative Plans and Recommended Plan (10-71, 625pp)

No. 14 A Comprehensive Plan for the Racine Urban Planning District
Volume 1, Inventory Findings and Forecasts (12-70, 265pp)
Volume 2, The Recommended Comprehensive Plan (10-72, 114pp)
Volume 3, Model Plan Implementation Ordinance (9-72, 240pp)

No. 15 A Jurisdictional Highway System Plan for Walworth County (10-72, 131pp)

No. 16 A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin (2-74, 809pp)

No. 17 A Jurisdictional Highway System Plan for Ozaukee County (12-73, 145pp)

No. 18 A Jurisdictional Highway System Plan for Waukesha County (1-74, 171pp)

No. 19 A Library Facilities and Services Plan for Southeastern Wisconsin (7-74, 163pp)

No. 22 A Jurisdictional Highway System Plan for Racine County (2-75, 129pp)

COMMUNITY ASSISTANCE PLANNING REPORTS

No. 1 Residential, Commercial, and Industrial Neighborhoods, City of Burlington and Environs (2-73, 96pp)

No. 2 Alternative Land Use and Sanitary Sewerage System Plans for the Town of Raymond--1990 (1-74, 62pp)

No. 3 Racine Area Transit Development Program 1975-1979 (6-74, 170pp)

No. 4 Floodland Information Report for the Rubicon River, City of Hartford, Washington County, Wisconsin (12-74, 80pp)

No. 5 Drainage for Water Level Control Plan for the Lower Fox River Watershed (3-75)

PLANNING GUIDES

No. 1 Land Development Guide (11-63, 96pp)
No. 2 Official Mapping Guide (2-64, 52pp)
No. 3 Zoning Guide (4-64, 158pp)
No. 4 Organization of Planning Agencies (8-64, 86pp)
No. 5 Floodland and Shoreland Development Guide (1-69, 199pp)
No. 6 Soils Development Guide (8-69, 247pp)

TECHNICAL REPORTS

No. 1 Potential Parks and Related Open Spaces (9-65, 32pp)
No. 2 Water Law in Southeastern Wisconsin (1-66, 92pp)
No. 3 A Mathematical Approach to Urban Design (1-66, 58pp)
No. 4 Water Quality and Flow of Streams in Southeastern Wisconsin (4-67, 342pp)
No. 5 A Regional Economic Simulation Model (10-65, 50pp)
No. 6 Planning Law in Southeastern Wisconsin (10-66, 120pp)
No. 7 Horizontal and Vertical Survey Control in Southeastern Wisconsin (1-68, 155pp)

No. 8 A Land Use Plan Design Model
Volume 1, Model Development (1-68, 102pp)
Volume 2, Model Test (10-69, 91pp)
Volume 3, Final Report (4-73, 102pp)
No. 9 Residential Land Subdivision in Southeastern Wisconsin (9-71, 86pp)
No. 10 The Economy of Southeastern Wisconsin (12-72, 90pp)
No. 11 The Population of Southeastern Wisconsin (12-72, 98pp)
No. 12 A Short Range Action Housing Program for Southeastern Wisconsin (6-72, 64pp)
No. 13 A Survey of Public Opinion in Southeastern Wisconsin--1972 (9-72, 64pp)

PERIODICALS

Annual Reports--1963, 1964, 1965, 1967, 1970
Annual Reports--1966, 1968, 1969, 1971, 1972, 1973
Regional Planning Conference Proceedings - 6th, 7th, 8th
Proceedings: Regional Conference on Sanitary Sewerage System User and Industrial Waste Treatment Recovery Charges
Bi-Monthly Newsletter
Technical Records
Volume 1 - Numbers 1-6
Volume 2 - Numbers 1-6
Volume 3 - Numbers 1-5

MISCELLANEOUS PUBLICATIONS

Procedural Manual No. 7, Regional Land Use Inventory (6-70, 53pp)
Population of Southeastern Wisconsin: 1960 and 1970
Staff Memorandum: Population Estimates by Civil Division for the Southeastern Wisconsin Region: 1970, 1973 and 1974
Study Design for the Continuing Land Use-Transportation Study 1970-1974 (12-69, 99pp)
Study Design for the Continuing Land Use-Transportation Study 1972-1976 (12-71, 145pp)
Research Report 39, Aquatic Plant Survey of Major Lakes in the Fox-Illinois Watershed (1969, 60pp)
Research Report 52, Aquatic Plant Survey of Major Lakes in the Milwaukee River Watershed (1970, 45pp)
A Roadside Conservation and Beautification Program for Southeastern Wisconsin Watersheds (1972, 25pp)
Profiles - Volumes One, Two, and Three (1970 census data from summary tapes)
Community Profiles
County Profiles (Includes separate section for each City, Village, and Town)
A Decade of Regional Planning (Reprint of 1970 Annual Report article)

LAKE USE REPORTS (For lakes in the Fox River Watershed)

Kenosha County

No. FX-40, Benedict Lake
No. FX-12, Camp Lake

No. FX-27, Center Lake
No. FX-35, Cross Lake
No. FX-45, Dyer Lake
No. FX- 7, Elizabeth Lake
No. FX-34, Lilly Lake
No. FX-17, Marie Lake
No. FX-13, Powers Lake
No. FX-11, Silver Lake
No. FX-45, Voltz Lake

Racine County

No. FX-25, Bohner Lake
No. FX-15, Browns Lake
No. FX- 9, Eagle Lake
No. FX-42, Echo Lake
No. FX-32, Kee Nong Go-Mong Lake
No. FX-29, Long Lake
No. FX- 6, Waterford-Tichigan Lakes
No. FX-26, Waubeesee Lake
No. FX- 5, Wind Lake

Walworth County

No. FX-41, Army Lake
No. FX-40, Benedict Lake
No. FX- 7, Beulah Lake
No. FX-31, Booth Lake
No. FX- 4, Como Lake
No. FX- 1, Lake Geneva
Nos. FX- Launderdale Lakes
17, (Green Lake,
20, Middle Lake,
18, Mill Lake)
No. FX-39, Lulu Lake
No. FX-21, North Lake
No. FX-37, Pell Lake
No. FX-43, Peters Lake
No. FX-25, Pleasant Lake
No. FX-24, Potters Lake
No. FX-38, Silver Lake
No. FX-30, Wandawega Lake

Waukesha County

No. FX- 3, Big Muskego Lake
No. FX-23, Denoon Lake
No. FX-19, Eagle Spring Lake
No. FX-10, Little Muskego Lake
No. FX-14, Lower Phantom Lake
No. FX- 2, Pewaukee Lake
No. FX-34, Spring Lake
No. FX-33, Upper Phantom Lake

LAKE USE REPORTS (For lakes in the Milwaukee River Watershed)

No. ML- 2, Long Lake
No. ML- 9, Auburn Lake
No. ML-21, Forest Lake
No. ML-12, Mauthe Lake
No. ML-18, Mud Lake
No. ML- 5, Kettle Moraine Lake

Ozaukee County

No. ML- 4, Mud Lake
No. ML-17, Spring Lake

Sheboygan County

No. ML- 6, Random Lake
No. ML-10, Crooked Lake
No. ML- 7, Lake Ellen

Washington County

No. ML- 3, Little Cedar Lake
No. ML-14, Green Lake
No. ML-19, Lake Twelve
No. ML-13, Lucas Lake
No. ML-11, Smith Lake
No. ML-20, Wallace Lake
No. ML-15, Barton Pond
No. ML- 1, Big Cedar Lake
No. ML- 8, Silver Lake
No. ML-16, West Bend Pond

AERIAL PHOTOGRAPHS

Low Flight for the years 1963, 1967, 1970	1" = 400'	30" x 30"
High Flight for the years 1963, 1970	1" = 2000'	24" x 24"

SOIL MAP/PHOTOGRAPHS

Soils (Large Scale)	1" = 1000'	17" x 22"
Soils (Small Scale)	1" = 2000'	8 1/2" x 11"

BASE MAPS

Township	1" = 1000'	42" x 48"
County	1" = 2000'	42" x 72"
County	1" = 4000'	42" x 48"
County	1" = 8000'	24" x 24"
Region	1" = 8000'	42" x 54"
Region	1" = 2 miles	36" x 42"
Region	1" = 4 miles	17" x 22"
Region	1" = 8 miles	8 1/2" x 11"

WATERSHED BASE MAPS

Fox River Watershed		
Waukesha County East	1" = 2000'	42" x 86"
Waukesha County West	1" = 2000'	42" x 86"
Kenosha, Racine and East Walworth County	1" = 2000'	42" x 90"
Walworth County West	1" = 2000'	42" x 90"
Fox River Watershed	1" = 4000'	42" x 86"
Fox River Watershed	1" = 8000'	22" x 44"
Fox River Watershed	1" = 16000'	17" x 20"
Fox River Watershed	1" = 5 miles	8 1/2" x 11"
Kinnickinnic River Watershed	1" = 1000'	42" x 56"
Kinnickinnic River Watershed	1" = 2000'	22" x 30"
Kinnickinnic River Watershed	1" = 4000'	17" x 22"
Kinnickinnic River Watershed	1" = 8000'	8 1/2" x 11"
Menomonee River Watershed	1" = 2000'	42" x 84"
Menomonee River Watershed	1" = 4000'	22" x 44"
Menomonee River Watershed	1" = 8000'	11" x 21"
Menomonee River Watershed	1" = 16000'	8 1/2" x 11"
Milwaukee River Watershed		
Fond du Lac County	1" = 2000'	42" x 62"
Sheboygan County	1" = 2000'	42" x 62"
Milwaukee River Watershed	1" = 8000'	30" x 42"
Milwaukee River Watershed	1" = 16000'	17" x 20"
Milwaukee River Watershed	1" = 1 mile	42" x 60"
Milwaukee River Watershed	1" = 6 miles	8 1/2" x 11"
Root River Watershed	1" = 2000'	52" x 92"
Root River Watershed	1" = 4000'	36" x 54"
Root River Watershed	1" = 8000'	17" x 22"
Root River Watershed	1" = 20000'	8 1/2" x 11"

TOPOGRAPHIC MAPS (Portions of the seven southeastern counties--available at SEWRPC)

2' Contour Interval Quarter Section	1" = 100'	36" x 36"
2' Countour Interval Quarter/Quarter Section	1" = 100'	24" x 24"
2' Countour Interval	1" = 100'	17" x 22"
2' Countour Interval	1" = 100'	8 1/2" x 11"
2' Contour Interval Quarter Section	1" = 200'	24" x 24"
2' Countour Interval	1" = 200'	8 1/2" x 11"
4'-2' Contour Interval	1" = 200'	36" x 36"

PLAN MAPS

Printed Land Use Plan Map--1963	1" = 8000'	42" x 54"
Printed Land Use and Transportation Plan Map--1990	1" = 8000'	42" x 54"
Recommended Public Library Facilities and Service Plan--1990	1" = 4 miles	17" x 22"
Recommended Regional Sanitary Sewerage System Plan--1990	1" - 4 miles	17" x 22"
Recommended Comprehensive Plan for the Fox River Watershed--1990	1" = 16000'	17" x 22"
Recommended Comprehensive Plan for the Milwaukee River Watershed--1990	1" = 16000'	17" x 22"
Recommended Jurisdictional Highway System Plan for the Counties of Walworth, Racine, Ozaukee, Waukesha--1990	Various	17" x 22"
Milwaukee County Jurisdictional Highway System Plan Map	1" = 4000'	42" x 54"
TRAFFIC ANALYSIS ZONE MAP	1" = 8000'	42" x 54"
METROPOLITAN MAP SERIES MAPS	1" = 1600'	17" x 22"
METROPOLITAN MAP SERIES MAPS	1" = 800'	42" x 48"
REGIONAL CENSUS TRACT MAPS	1" = 8000'	42" x 54"

APPENDIX C

COMMISSION ADVISORY COMMITTEES

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL LAND USE-TRANSPORTATION PLANNING

The Technical Coordinating and Advisory Committee on Regional Land Use-Transportation Planning is divided into several functional subcommittees. Members of the Committee often serve on more than one subcommittee. The following key identifies the various functional subcommittees: 1) Land Use Subcommittee; 2) Highway Subcommittee; 3) Socioeconomic Subcommittee; 4) Natural and Recreation-Related Resources Subcommittee; 5) Transit Subcommittee; 6) Utilities Subcommittee; 7) Traffic Studies, Models, and Operations Subcommittee.

Majed Abu-Lughod (2)	Director of Public Works, City of Hartford
Stanley E. Altenbern (5)	President, Wisconsin Coach Lines, Incorporated, Waukesha
Anthony S. Bareta (3)	Director, Milwaukee County Planning Commission
John M. Bennett (1,4)	City Engineer, City of Franklin
Robert J. Borchardt (3,6)	Chief Engineer and General Manager Milwaukee-Metropolitan Sewerage Commissions
Stephen M. Born (1)	Director, Wisconsin Department of State Planning, Madison
Richard Brandt (1)	Manager, Markets and Sales Program, Wisconsin Gas Company, Milwaukee
Robert W. Brannan (2,5,7)	Transportation Director, Milwaukee County Expressway and Transportation Commission
Donald M. Cammack (7)	Chief Planning Engineer, Division of Aeronautics, Wisconsin Department of Transportation
David M. Carpenter (3)	Associate Director, Comprehensive Health Planning Agency of Southeastern Wisconsin, Incorporated, Milwaukee
Frederick H. Chlupp (1,4)	Land Use and Park Administrator, Washington County
William H. Claflin (1,2,3,4,5,6,7) . .	Deputy Commissioner, Department of City Development, Milwaukee
Thomas R. Clark (2,5,7)	Chief Planning Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Arnold L. Clement (1,2)	Planning Director and Zoning Administrator, Racine County

Eugene M. Cox (3)	Executive Director, Comprehensive Health Planning Agency of Southeastern Wisconsin Inc., Milwaukee
Vencil F. Demshar (2)	County Highway Commissioner, Waukesha County
Russell A. Dimick (2)	City Engineer, City of Cedarburg
Arthur D. Doll (1)	Director, Bureau of Planning, Wisconsin Department of Natural Resources
John L. Doyne (1)	County Executive, Milwaukee County
Raymond T. Dwyer (6)	Engineer, City of Greenfield
James Foley (7)	Airport Engineer, General Mitchell Field, Milwaukee
Thomas G. Frangos (1)	Administrator, Division of Environmental Protection
John M. Fredrickson (1)	Village Manager, Village of River Hills
John W. Fuller (3)	Chief, Policy and Goal Analysis Section Wisconsin Department of Transportation
Thomas J. Gaffney (2)	Traffic Engineer, City of Kenosha
Arne L. Gausmann (1,2)	Director, Bureau of Systems Planning, Division of Planning, Wisconsin Department of Transportation
Norman N. Gill (1,3)	Executive Director, Citizens Governmental Research Bureau, Milwaukee
Herbert A. Goetsch (2,4,6)	Commissioner of Public Works, City of Milwaukee
George Gunderson (2,4)	Chief of Statewide Planning Section, Division of Planning, Wisconsin Department of Transportation
Douglas F. Haist (3,5)	Deputy Administrator, Division of Planning, Wisconsin Department of Transportation
Roger A. Harris (1,2,6)	Director of Public Works, City of New Berlin
Chester Harrison (5)	Engineer, Town of Caledonia
John M. Hartz (5)	Chief, Urban Transit Assistance Section, Division of Planning, Wisconsin Department of Transportation
Dr. Thomas N. Harvey (5,7)	Regional Representative, Urban Mass Transportation Administration, Chicago
Herbert S. Heavenrich (1,2,3,4,5,6,7)	Director of Comprehensive Planning, Department of City Development, Milwaukee
Frank M. Hedgecock (7)	City Planner, City of Waukesha
Sebastian J. Helfer (3)	Director, Campus Planning and Construction, Marquette University, Milwaukee
Fred J. Hempel (2,5,7)	Planning & Research Engineer, Federal Highway Administration
John O. Hibbs (2,5,7)	Division Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison

G. F. Hill (3)	City Manager, City of Whitewater
Bill R. Hippenmeyer (1,2,3,5)	Director of Planning, City of Oak Creek
Lester O. Hoganson (2,6)	City Engineer, City of Racine
Donald K. Holland (2,6)	Director of Public Works, City of Kenosha
Karl B. Holzwarth (2,4)	Park Director, Racine County
Maurice J. Hovland (4)	County Agricultural Agent, Washington County
Robert F. Hutter (2)	Public Works Director, Village of Sussex
Stanley Ihlenfeldt (1,4)	County Agri-Business Agent, Walworth County
Paul G. Jaeger (1,2,4)	County Agricultural Agent, Kenosha County
George A. James (1,2)	Director, Bureau of Local and Regional Planning, Wisconsin Department of Local Affairs and Development
Edward A. Jenkins (5)	Transportation Director, City of Kenosha
James A. Johnson (1)	Zoning Administrator, Walworth County
Roger A. Johnson (1)	Planner, City of New Berlin
Paul Juhnke (3)	Manager, Urban Research and Development, Metropolitan Milwaukee Association of Commerce
John E. Kane (1,3)	Director, Milwaukee Area Office, U. S. Department of Housing and Urban Development
Richard A. Keyes (2)	Environmental Engineer, Milwaukee County Department of Public Works
Thomas R. Kinsey (2)	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
David L. Kluge (6)	Director of Public Works, Village of Pewaukee
Robert F. Kolstad (1,2,4,5)	City Planner, City of Kenosha
Thomas A. Kroehn (1)	District Director, Southeast District, Wisconsin Department of Natural Resources
Harvey Kruchten (1,3)	Long-Range Planning Engineer, Wisconsin Telephone Company, Milwaukee
Edwin Laszewski (2)	City Engineer, City of Milwaukee
Wilmer Lean (2,7)	County Highway Commissioner, Walworth County
Gerald P. Lee (1)	Building Inspector, Muskego
Elwin G. Leet (1,3,4)	County Agricultural Agent, Racine County
Russell Leitch (3)	Trade Specialist, Field Services, U. S. Department of Commerce, Milwaukee
Edward G. Lemmen (6)	Water Utility Manager, Lake Geneva
James Lenz (6)	Engineer, Hartland

William J. Little (2,6)	City Administrator, City of Wauwatosa
G. R. Loshek (2)	Area General Manager, Greyhound Lines-West, Milwaukee
James J. Lynch (1)	Planner, Shorewood
William L. Marvin (2,7)	Director, Traffic Engineering Department, American Automobile Association, Madison
Henry M. Mayer (5)	General Manager, Milwaukee and Suburban Transport Corporation, Milwaukee
N. H. McKegney (5)	Terminal Superintendent, The Milwaukee Road, Milwaukee
George Mead (3)	Marketing Research Manager, The Milwaukee Journal
Raymond F. Michaud (2)	Engineer, City of Delavan
Robert J. Mikula (2,4)	General Manager, Milwaukee County Park Commission
William A. Muth (6)	Director of Public Works, Brookfield
Thomas A. Muth (1)	Public Works Director, Germantown
Melvin Noth (2,6)	Director of Public Works, Village of Menomonee Falls
George J. Novenski (7)	Chief, Travel Statistics and Data Coordination Section, Division of Planning, Wisconsin Department of Transportation
Nick Paulos (1,2)	Engineer, Greendale
Allan P. Pleyte (5,7)	Traffic Engineer and Superintendent, Bureau of Traffic Engineering and Electrical Services, City of Milwaukee
James F. Popp (5,7)	Chief of Planning, U. S. Department of Transportation, Federal Aviation Administration, Great Lakes Region, Chicago
John B. Prince (1,3,6)	Director of Corporate Planning, Wisconsin Electric Power Company, Milwaukee
Richard A. Rechlicz (5)	Executive Secretary, Wisconsin School Bus Contractors Association
Richard Repert (3)	Associate for United Community Services Planning, United Community Services of Greater Milwaukee
Albert P. Rettler (2,7)	County Highway Commissioner, Washington County
Donald V. Revello (5,7)	Chief, Planning Methods and Forecasts Section, Division of Planning, Wisconsin Department of Transportation
Timeon Richter (4)	Director, Department of Environmental Health, Ozaukee County
Donald A. Roensch (1,6)	Director of Public Works, City of Mequon
William D. Rogan (1,4)	County Agri-Business Agent, Waukesha County
Gordon Rozmus (1,3)	Planner, City of Wauwatosa
Harold Ryan (1)	Washington County Board Supervisor

Dr. Eric Schenker (3,5,7)	Professor, Department of Economics, University of Wisconsin-Milwaukee
John E. Schumacher (2,7)	City Engineer, City of West Allis
Gerald Schwerm (2)	Village Manager, Brown Deer
Harvey Shebesta (2,3,5,7)	District Engineer, District 9, Division of Highways, Wisconsin Department of Transportation
Earl G. Skagen (2,4,7)	County Highway Commissioner, Racine County
Leland C. Smith (4)	County Horticultural Agent, Kenosha County
Philip A. Sundal (3)	Research Director, Wisconsin Department of Business Development
G. D. Tang (1,3)	District Business Research Manager, Wisconsin Telephone Company, Milwaukee
Walter J. Tarmann (1,4)	Executive Director, Waukesha County Park and Planning Commission
Jack Taylor (5)	President, Flash City Transit, Racine
Norbert S. Theine (1)	Administrator, City of South Milwaukee
Donald J. Tripp (1,4)	Agricultural Agent, Ozaukee County
Floyd Usher (2)	City Engineer, City of Oconomowoc
Rodney M. VandenNoven (6)	Director of Public Works, City of Waukesha
John P. Varda (7)	General Manager, Wisconsin Motor Carriers Association, Madison
Lloyd O. Wadleigh (3)	Chairman, Department of Economics, Carroll College, Waukesha
Leo Wagner (1,2)	County Highway Commissioner, Kenosha County
Frank A. Wellstein (1,2,4,5,6,7)	City Engineer, City of Oak Creek
Sylvester N. Weyker (2)	County Highway Commissioner, Ozaukee County
Henry B. Wildschut (2,7)	County Highway Commissioner and Director of Public Works, Milwaukee County
Elgar C. Williams (1,3)	Planner, City of West Allis
Bruce B. Wilson (1)	Chief, Urban and Regional Planning Assistance, Department of Transportation
Thomas N. Wright (1,3,5)	Director of Planning, City of Racine

SEWRPC Staff:

Kurt W. Bauer	Executive Director
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Michael J. Keidel (3)	Chief of Planning Research
Bruce P. Rubin (1,4)	Chief Land Use Planner

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Edward Brick	Chief, Water Regulation Section, Bureau of Water and Shoreland Management, Wisconsin Department of Natural Resources
Thomas A. Calabresa	Chief, Private Water Supply Section, Bureau of Water and Shoreland Management, Wisconsin Department of Natural Resources
Arthur D. Doll	Director, Bureau of Planning, Wisconsin Department of Natural Resources
Warren A. Gebert	Assistant District Chief, Water Resources Division, U. S. Geological Survey, Madison
Harlan D. Hirt	Chief, Planning Branch, Region V Federal Water Quality Administration, U. S. Environmental Protection Agency
Charles L. R. Holt, Jr.	District Chief, Water Resources Division, U. S. Geological Survey, Madison
Elroy C. Jagler	Meteorologist in Charge, National Weather Service Forecast Office, Milwaukee
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Dr. Leonard Johnson	Conservation Education Specialist, Soil Conservation Board of the University of Wisconsin
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Jerome McKersie	Chief, Water Quality Evaluation, Wisconsin Department of Natural Resources
Meredith E. Ostrom	Director and State Geologist, Geological and Natural History Survey, University of Wisconsin--Extension
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David L. Kluge	Administrative Engineer, Village of Pewaukee
Edmund P. Kreuger	Superintendent, Village of Grafton Sewer and Water Commission
Dr. Norman P. Lasca	Associate Professor, Department of Geological Sciences, University of Wisconsin-Milwaukee
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Robert Bucholtz	Chairman, Town of Waterford
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Alvin A. Erdman	District Conservationist
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Jerome Gottfried	Mayor, City of Muskego
Thomas Grady	Chairman, Town of Wheatland
Robert Graf	President, Village of Waterford
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Henry F. Halter	Norway-Dover Drainage District
Franklin E. Hazelo	Supervisor, Town of Rochester
Karl Holzworth	Director, Racine County Park Commission
Stanley W. Ihlenfeldt	County Agri-Business Agent, Walworth County
James A. Johnson	County Planner, Walworth County
Melvin J. Johnson	Chairman, Town of Norway
Elwin G. Leet	County Agricultural Agent, Racine County
Walter Maas	Plan Commission Member, Town of Rochester
John H. Mielke	Consulting Engineer, Waukesha
Ray Moyer Jr.	Supervisor, Racine County
Eistein Pedersen	Rochester, Wisconsin
Clarence O. Peterson	Chairman, Town of Vernon
Cloyd A. Porter	Chairman, Town of Burlington
Herbert E. Ripley	Director of Environmental Health Services, Waukesha County Health Department
Phil Sander	Executive Secretary, Southeastern Wisconsin Sportsmen's Federation
Dr. Bruno E. Schiffleger	Citizen Member, Elkhorn
Bernard G. Schultz	Assistant District Director, Southeast District, Wisconsin Department of Natural Resources
Art Stratton	Hoosier Creek Drainage District
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Rodney M. VandenNoven	Director of Public Works, City of Waukesha
Frank Walsh	Supervisor, Walworth County; Chairman, Town of Linn
Stan Wilson	Lake Services, Inc.
Franklin Wirth	Mayor, City of Brookfield
John R. Zillmer	Secretary, Ice Age Park and Trail Foundation, Milwaukee

KINNICKINNIC RIVER WATERSHED COMMITTEE

Robert J. Mikula Chairman	General Manager, Milwaukee County Park Commission
Edwin J. Laszewski, Jr. Vice-Chairman	City Engineer, City of Milwaukee
Kurt W. Bauer Secretary	Executive Director, SEWRPC
Robert J. Borchardt	Chief Engineer and General Manager, Milwaukee-Metropolitan Sewerage Commissions
William H. Claflin	Deputy Commissioner, Department of City Development, Milwaukee
Raymond T. Dwyer	City Engineer, City of Greenfield
Gary A. Gagnon	District Engineer, Southeast District, Wisconsin Department of Natural Resources
Thomas A. Kroehn	District Director, Southeast District, Wisconsin Department of Natural Resources
Stanley Polewski	Owner, Polewski Pharmacy, Milwaukee
John E. Schumacher	City Engineer, City of West Allis
Frank J. Wabiszewski	Vice President, Maynard Electric Steel Casting Company
Henry B. Wildschut	County Highway Commissioner and Director of Public Works, Milwaukee County

MENOMONEE RIVER WATERSHED COMMITTEE

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J. William Little Vice-Chairman	City Administrator, City of Wauwatosa
Kurt W. Bauer Secretary	Executive Director, SEWRPC
Robert J. Borchardt	Chief Engineer and General Manager, Milwaukee-Metropolitan Sewerage Commissions
Arthur D. Doll	Director, Bureau of Planning, Wisconsin Department of Natural Resources
Glenn H. Evans	Member, Citizens for Menomonee River Restoration, Inc.
Robert E. Seaborn	Plant Engineer, The Falk Corporation, Milwaukee
Thomas G. Frangos	Administrator, Division of Environmental Protection, Wisconsin Department of Natural Resources
Frederick E. Gottlieb	Village Manager, Village of Menomonee Falls
George C. Keller	President, Wauwatosa State Bank

Raymond J. Kipp	Dean, College of Engineering, Marquette University
Thomas M. Lee	Chief, Flood Plain-Shoreland Management Section, Wisconsin Department of Natural Resources
Thomas P. Leisle	Mayor, City of Mequon; Supervisor, Ozaukee County
Robert J. Mikula	General Manager, Milwaukee County Park Commission
Frank Munsey	District Engineer, Wisconsin Department of Natural Resources
Thomas J. Muth	Director of Public Works, Village of Germantown
John E. Schumacher	City Engineer, City of West Allis
Walter J. Tarmann	Executive Director, Waukesha County Park and Planning Commission
Clark E. Wangerin	City Engineer, City of Brookfield

MILWAUKEE RIVER WATERSHED COMMITTEE

Richard W. Cutler, Chairman	Attorney, Quarles and Brady, Milwaukee; Member, Village of Fox Point Plan Commission; Commissioner, SEWRPC
Kurt W. Bauer, Secretary	Executive Director, SEWRPC
Robert J. Borchardt	Chief Engineer and General Manager, Milwaukee-Metropolitan Sewerage Commissions
Vaughn H. Brown	Vice-President, Tri-County Civic Association
Frederick H. Chlupp	Land Use and Park Administrator, Washington County
Delbert J. Cook	Chairman, Cedar Creek Restoration Council
Arthur G. Degnitz	Supervisor, Washington County
Nick R. Didier	Realtor, Port Washington
Arthur D. Doll	Director, Bureau of Planning, Wisconsin Department of Natural Resources
Edward Frauenheim	Supervisor, Sheboygan County
Herbert A. Goetsch	Commissioner of Public Works, City of Milwaukee
Lawrence W. Hillman	Vice President, The West Bend Company, West Bend; Commissioner, SEWRPC
Mrs. Robert Jaskulski	Treasurer, Milwaukee River Restoration Council, Inc.
Ben E. Johnson	Alderman, City of Milwaukee
John T. Justen	President, Pfister & Vogel Tanning Company, Milwaukee
Dorothy Klein	President, Village of Saukville
Robert L. Konik	County Planner, Fond du Lac County

Adolph Laubenstein	President, Laubenstein Roofing Company, Saukville
Thomas P. Leisle	Mayor, City of Mequon;
Robert J. Mikula	General Manager, Milwaukee County Park Commission
Rudolph Mikulich	Business Administrator, Clerk-Treasurer, City of Glendale
Dennis E. Nulph	District Engineer, Southeast District, Wisconsin Department of Natural Resources
Timeon L. Richter	Director, Ozaukee County Department of Environmental Health
Albert Schroeder	Former Chairman, Town of Trenton
George Watts	President, George Watts & Son, Inc., Milwaukee
Donald W. Webster	Consulting Civil Engineer, Milwaukee
Richard E. Zarling	Director of Elementary Education, Kewaskum Community Schools

ROOT RIVER WATERSHED COMMITTEE

Robert J. Mikula Chairman	General Manager, Milwaukee County Park Commission
Thomas N. Wright Vice-Chairman	Director of Planning, City of Racine
Kurt W. Bauer Secretary	Executive Director, SEWRPC
John M. Bennett	City Engineer, City of Franklin
George C. Berteau	Commissioner, SEWRPC
Robert J. Borchardt	Chief Engineer and General Manager, Milwaukee-Metropolitan Sewerage Commissions
Raymond T. Dwyer	City Engineer, City of Greenfield
Alvin Erdman	Soil and Water Conservation District Supervisor, Kenosha County
Jerome J. Gottfried	Mayor, City of Muskego
Joseph Kroeninger	President, Village of Hales Corners
Kenneth E. Henrics	District Engineer, Southeast District, Wisconsin Department of Natural Resources
Lester O. Hoganson	City Engineer, City of Racine
Donald W. Hermann	Mayor, City of Oak Creek
Elwin G. Leet	County Agricultural Agent, Racine County
John Margis, Jr.	Supervisor, Racine County; Commissioner SEWRPC
Stephen F. Olsen	Mayor, City of Racine
Nick T. Paulos	Village Engineer, Village of Greendale
John E. Schumacher	City Engineer, City of West Allis
Frank A. Wellstein	City Engineer, City of Oak Creek

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL AIR QUALITY MAINTENANCE PLANNING

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Barbara J. Becker Vice-Chairman	President, Southeastern Wisconsin Coalition for Clean Air
Edward N. Erickson Secretary	Environmental Meteriologist, SEWRPC
Alice Altemeier	League of Women Voters, Ozaukee County
Norman N. Amrhein	President, Federal Malleable Company, West Allis
Kurt W. Bauer	Executive Director, SEWRPC
Gerald D. Bevington	Coordinator of Air Programs, Wisconsin Department of Natural Resources, Milwaukee
Dr. Roy Elmore	Northeastern Illinois Planning Commission
Edwin J. Hammer	Developmental Engineer, Division of Highways, Wisconsin Department of Transportation
John C. Hanson	Director, Racine County Department of Air Pollution Control
John O. Hibbs	Division Engineer, Federal Highway Administration, U. S. Department of Transportation, Madison
Howard L. Hochman	Planner, Comprehensive Health Planning Agency of Southeastern Wisconsin, Inc.
Elroy C. Jagler	Meteorologist in Charge, National Weather Service Forecast Office, Milwaukee
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Paul Koziar	Meteorologist, Division of Environmental Protection, Department of Natural Resources, Madison
Thomas M. Krauskopf	Planner, State Planning Office, Wisconsin Department of Administration
Dr. Kenneth Ragland	Associate Professor, Department of Mechanical Engineering, University of Wisconsin-Madison
Fred R. Rehm	Director, Milwaukee County Department of Air Pollution Control
Herbert E. Ripley	Director of Environmental Health Services, Waukesha County Health Department

Rudolfo N. Salcedo	Environmental Specialist, Division of Planning and Environmental Programs, City of Milwaukee
Harvey Shebesta	District Engineer, District 9, Division of Highways, Wisconsin Department of Transportation
Dr. Richard D. Stewart	Professor and Chairman, Department of Environmental Medicine, Medical College of Wisconsin, Milwaukee
Michael S. Treitman	Environmental Protection Agency, Pevion V, Chicago
Emmerich Wantschik	Assistant County Planner, Walworth County
George A. Zimmer	Supervisor, Environmental Health Kenosha Health Department

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR KENOSHA COUNTY

Leo Wagner Chairman	County Highway Commissioner, Kenosha County
Robert F. Kolstad Secretary	City Planner, City of Kenosha
Kurt W. Bauer	Executive Director, SEWRPC
Howard Blackmon	Chairman, Town of Somers
George E. Bovee	Chairman, Town of Randall
Wallace E. Burkee	Mayor, City of Kenosha
Phillip Dunek	President, Village of Paddock Lake
Thomas Grady	Chairman, Town of Wheatland
Thomas J. Haley	Citizen Member, City of Kenosha
Richard Harrison	President, Village of Silver Lake
Donald K. Holland	Director of Public Works, City of Kenosha
Earl W. Hollister	Chairman, Town of Bristol; County Supervisor, Kenosha County
Merlin Jahns	Trustee, Village of Twin Lakes
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Maurice Lake	Chairman, Town of Salem
John J. Maurer	Chairman, Town of Pleasant Prairie
Glenn L. Miller	Chairman, Town of Brighton
Roger Prange	Clerk, Town of Pleasant Prairie
Virginia Taylor	Citizen Member, City of Kenosha
August Zirbel, Jr.	Chairman, Town of Paris

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR MILWAUKEE COUNTY

Henry B. Wildschut. . . . . Chairman and Secretary	County Highway Commissioner and Director of Public Works, Milwaukee County
Kurt W. Bauer	Executive Director, SEWRPC
Richard C. Dess	Engineer Administrator, City of Wauwatosa
Roger A. Harris	Director of Public Works, City of Cudahy
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
Edwin J. Laszewski, Jr.	City Engineer, City of Milwaukee
J. William Little	City Administrator, City of Wauwatosa
Nick T. Paulos	Village Engineer, Village of Greendale
Peter J. Peters	Engineer, City of Glendale
John E. Schumacher	City Engineer, City of West Allis
Gerald Schwerm	Village Manager, Village of Brown Deer
Harvey Shebesta	District Engineer, District 9, Division of Highways, Wisconsin Department of Transportation
Frank Wellstein	Engineer, City of Oak Creek

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR OZAUKEE COUNTY

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Kurt W. Bauer . . . . . Secretary	Executive Secretary, SEWRPC
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Arne L. Gausmann	Director, Bureau of Systems Planning, Division of Planning, Wisconsin Department of Transportation
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
Thomas P. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Herbert H. Peters	Consulting Engineer, Ozaukee County Highway Department
Kenneth A. Roell	Manager, Town of Cedarburg

Donald A. Roensch	Director of Public Works, City of Mequon
John H. Sigwart	Director of Public Works, City of Port Washington

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR RACINE COUNTY

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Cecil F. Mehring, Secretary	County Highway Engineer, Racine County
Kurt W. Bauer	Executive Director, SEWRPC
Arthur Bloss	
Thomas R. Clark	Chief Planning Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Arnold L. Clement	Planning Director and Zoning Administrator, Racine County
Chester Harrison	Town Engineer, Town of Caledonia
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
George Gunderson	Chief of Statewide Planning Section, Division of Planning, Wisconsin Department of Transportation
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Fred H. Larson	Commissioner of Public Works, City of Racine
Thomas R. Wright	Director of Planning, City of Racine

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR WALWORTH COUNTY

Milton R. Reik, Chairman	Citizen Member, City of Lake Geneva
Wilmer W. Lean, Secretary	County Highway Commissioner, Walworth County
Anthony F. Balestrieri	Consulting Engineer, Elkhorn; Commissioner, SEWRPC
William E. Barth	Citizen Member, Town of Walworth
Kurt W. Bauer	Executive Director, SEWRPC
Schuyler W. Case	Citizen Member, Town of Sharon
Theodore Casper	President, Village of Williams Bay
Frank Cline	Chairman, Town of East Troy
Charles Cuise	Chairman, Town of Whitewater

Oliver W. Fleming	Alderman, City of Delavan
George Gunderson	Chief of Statewide Planning Section, Division of Planning, Wisconsin Department of Transportation
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
G. F. Hill	City Manager, City of Whitewater
Emil Johnejack	Mayor, City of Lake Geneva
Herbert E. Johnson	Consulting Engineer, City of Elkhorn
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR WASHINGTON COUNTY

Lloyd Jacklin, Chairman	Trustee, Village of Jackson
Albert E. McClurg, Secretary	Engineering Aide, City of West Bend
Majed Abu-Lughod	Director of Public Works, City of Hartford
Kurt W. Bauer	Executive Director, SEWRPC
Frederick H. Chlupp	Land Use and Park Administrator, Washington County
Jerome P. Faust	County Supervisor, Washington County
Peter Gonnering	Chairman, Town of Barton
Cornelius Gundrum	Supervisor, Washington County
Carl Hauch	Supervisor, Town of Farmington
Alfred Hemauer	City Clerk, City of West Bend
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Walter L. Kletti	Member, City of Hartford Planning Commission
Reuben Koch	Supervisor, Town of West Bend
Howard J. Kruepke	Chairman, Town of Polk
Arnold J. Lepien	Supervisor, Town of Hartford
John W. Lietzau	Trustee, Village of Germantown
Adolph Lofy	Chairman, Town of Richfield; County Supervisor, Washington County; Member, County Board Highway Committee
Charles F. Miller	President, Village of Kewaskum; County Supervisor, Washington County

Thomas A. Muth	Director of Public Works, Village of Germantown
John A. Oelhafen	Chairman, Town of Wayne; County Supervisor, Washington County
Alois Okruhlica	Supervisor, Town of Jackson
John M. Pick	Alderman, City of West Bend
Helmuth F. Prahl	County Supervisor, Washington County; Member, County Board Highway Committee
Albert P. Rettler	County Highway Commissioner, Washington County
Ralph P. Schnorenberg	Alderman, City of Hartford
Hugo Schwulst	Chairman, Town of Erin; County Supervisor, Washington County
Roland S. Senner	Chairman, Town of Trenton
Mervin C. Thompson	Chairman, Town of Kewaskum
Carl Vogt	Town Clerk, Town of Addison
Harley Wachs	Town Clerk, Town of Germantown

TECHNICAL AND INTERGOVERNMENTAL COORDINATING AND ADVISORY COMMITTEE ON JURISDICTIONAL HIGHWAY PLANNING FOR WAUKESHA COUNTY

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Kurt W. Bauer	Executive Director, SEWRPC
Arne L. Gausmann	Director, Bureau of Systems Planning, Division of Planning, Wisconsin Department of Transportation
Roger A. Harris	Director of Public Works, City of New Berlin
Fred J. Hempel	Planning and Research Engineer, U. S. Department of Transportation, Federal Highway Administration, Madison
Richard M. Jung, Sr.	Supervisor, Town of Lisbon
Thomas R. Kinsey	District Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Gerald Lee	Building Inspector, City of Muskego
William Muth	Director of Public Works, City of Brookfield
Wilbur G. Perren	Supervisor, Town of Genesee
Floyd Usher	City Engineer, City of Oconomowoc
Rodney M. VandenNoven	Director of Public Works, City of Waukesha
Max A. Vogt	Village Engineer, Village of Menomonee Falls

TECHNICAL AND CITIZEN ADVISORY COMMITTEE ON REGIONAL HOUSING STUDIES

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William B. Ardern	Past President, Society of Real Estate Appraisers, Milwaukee Chapter No. 64, Milwaukee
John Bach	Director, Southeastern Wisconsin Housing Corporation, Burlington
Richard Barry	Representative, Metropolitan Milwaukee Association of Commerce; Vice President-Treasurer, Bruce, Barry & Glevsteen, Inc., Milwaukee
Richard P. Blake	Architect, Blake-Wirth & Associates, Inc., Milwaukee; Board Member, Wisconsin Chapter--Southeast Section, American Institute of Architects
Delbert Blasdel	Administrative Code Consultant, Division of Industrial Safety and Buildings, Wisconsin Department of Industry, Labor, and Human Relations
* Paul Borrmann	Advisor, Milwaukee Tenants Union; Coordinator, Metropolitan Housing Center, Milwaukee
Paul J. Cody	Urban Affairs Manager, S. C. Johnson & Son, Inc., Racine
Clarence Dittmar	President, Dittmar Realty, Inc., Menomonee Falls
The Rev. John D. Fischer	Executive Director, Greater Milwaukee Conference on Religion and Urban Affairs, Milwaukee
Leonard F. Forschner	Economist U. S. Department of Housing and Urban Development, Milwaukee Area Office
Norman N. Gill	Executive Director, Citizens Governmental Research Bureau, Milwaukee
Jay Gilmer	Director, Bureau of Milwaukee Area Service, Department of Local Affairs and Development, Milwaukee
* Melvin Goldin	Secretary-Treasurer, Recht-Goldin-Siegel, Milwaukee
William Kelly	Director, Indian Urban Affairs Council, Milwaukee
* Mrs. James Mills	Legislative Chairman, League of Women Voters, Inter-League Council, Milwaukee

Bernard N. Nill	Assistant Planning Director, Department of City Development, City of Milwaukee
* Edward J. J. Olson	Director of Research and Planning, Community Relations-Social Development Commission, Milwaukee
William H. Orenstein	Project Director, Northridge Lakes, Milwaukee
* Kenneth Payne	Housing Coordinator, Milwaukee County
Glenn Peters	Secretary-Treasurer, Peters Development Corporation, West Bend
Clinton Rose	Supervisor, Milwaukee County; Chairman, Committee on Housing and Relocation, Milwaukee
* Gerald Schwerm	Village Manager, Village of Brown Deer
Wesley Scott	Executive Director, Milwaukee Urban League
Ronald P. Siepmann	President, Siepmann Realty Corporation, Brookfield
Jonathan Slesinger	Professor of Sociology, University of Wisconsin-Milwaukee

* Member of the Special Subcommittee on Housing Program Implementation

TECHNICAL ADVISORY COMMITTEE ON REGIONAL LIBRARY PLANNING

Nolan Neds, Chairman	Superintendent of Neighborhood Libraries and Extension Services, City of Milwaukee Public Library System
George E. Earley, Vice-Chairman	Director, Gilbert M. Simmons Public Library, Kenosha
Richard Crane	Librarian, Maude Shunk Public Library, Menomonee Falls
Miss Sally Davis	Director, Oconomowoc School Libraries
Miss Fern Federman	Director, Shorewood Public Library
Miss Araxie Kalvonjian	Librarian, Kenosha Technical Institute
Miss Marion Langdell	Former Head Librarian, Cudahy Public Library
Mrs. Grace A. Lofgren	Director, Burlington Public Library
Edward W. Lynch	Librarian, Waukesha Public Library
Miss Josephine M. Machus	Director, Oconomowoc Public Library
Forrest L. Mills	City Librarian, Racine Public Library
Mrs. Marianne Molleson	Librarian, Cudahy Public Library
William Moritz	Associate Director, University of Wisconsin-Milwaukee Library
Miss Dorothy Naughton	Librarian, Walworth County Library Service

Miss Ione Nelson	Coordinator of Field Services, Wisconsin Division for Library Services, Madison
Mrs. Helen Pelzmann	Librarian, West Allis Public Library
Miss Esther Regli	City Librarian, Wauwatosa Public Library
John C. Reid	Librarian, West Bend Community Memorial Library
Ned Wetmore	Planning Analyst, Bureau of State Planning, Wisconsin Department of Administration, Madison

TECHNICAL AND CITIZEN ADVISORY COMMITTEE ON REGIONAL PARK, OUTDOOR RECREATION, AND RELATED OPEN SPACE PLANNING

Richard W. Cutler Chairman	Attorney, Brady, Tyrrell, Cotter & Cutler, Milwaukee; Member, Village of Fox Point Plan Commission; Commissioner, SEWRPC
Loren R. Anderson	President, Geneva Lake Development Corporation, Williams Bay
Anthony S. Bareta	County Planning Director, Milwaukee County Planning Commission
Donald B. Brick	Walworth County Recreation Agent
Frederick H. Chlupp	Land Use and Park Administrator, Washington County
William H. Claflin	Deputy Commissioner, Department of City Development, City of Milwaukee
Delbert J. Cook	Chairman, Cedar Creek Restoration Council
Norbert Dettmann	Chairman, Town of Farmington; Supervisor, Washington County
Arthur D. Doll	Director, Bureau of Planning, Wisconsin Department of Natural Resources
Booker Hamilton	Member, Board of Directors, Neighborhood House of Milwaukee, Inc.
Karl B. Holzwarth	Park Director, Racine County
Charles O. Kamps	Attorney, Quarles, Herriott, Clemons, Teschner, & Noelke, Milwaukee
Philip H. Lewis, Jr.	Professor, Department of Landscape, Architecture, University of Wisconsin-Madison; Director, Environmental Awareness Center, Madison
Richard J. Lindl	Director of Parks, Kenosha County Park Commission
John Margis, Jr.	Supervisor, Racine County; Commissioner, SEWRPC
Robert J. Mikula	General Manager, Milwaukee County Park Commission
Clinton E. Rose	Supervisor, Milwaukee County

Robert D. Ross	General Manager, The Journal Times, Racine
Phil Sander	Executive Secretary, Southeastern Wisconsin Sportsmen's Federation
George L. Schlitz	Chairman, Kenosha County Park Commission
Frederick G. Schmidt	Member, Sierra Club
Mrs. John D. Squier	Member, Riveredge Nature Center, Inc.
Walter J. Tarmann	Executive Director, Waukesha County Park and Planning Commission
Edgar W. Trecker	Supervisor of Forestry, Wildlife, and Recreation; Southeast District, Wisconsin Department of Natural Resources
Joseph Waters	Proprietor, Lazy Day Campground, Town of Farmington
Dr. Harry J. Wilkins	Outdoor Sportsman, Wauwatosa
George T. Wilson	Assistant Superintendent of Schools, Division of Municipal Recreation and Adult Education, City of Milwaukee Public Schools
Thomas N. Wright	Director of Planning, City of Racine

RACINE URBAN PLANNING DISTRICT CITIZENS ADVISORY COMMITTEE

David Rowland, Chairman	President, Carpenter-Rowland-Batenburg Insurance Company, Racine
Eric Schroder, Vice-Chairman	Former Board Member, Racine Unified School District
Marshall Lee, Jr., Secretary	Marshall E. Lee Agency, Inc., Racine
Gilbert Berthelsen	Racine County Administrator
Arnold L. Clement	Planning Director and Zoning Administrator, Racine County
Paul Cody	Urban Affairs Manager, S. C. Johnson and Son, Inc., Racine
Wesley Hansche	Chairman, Town of Mt. Pleasant Plan Commission
Lester O. Hoganson	City Engineer, City of Racine
Karl B. Holzwarth	Park Director, Racine County
Steven R. Horvath	Chairman, Town of Caledonia
LeRoy H. Jerstad, Jr.	President, Village of North Bay
Edward A. Krenzke	City Attorney, City of Racine
Richard E. LaFave	Chairman, Racine County Board of Supervisors
John Margis, Jr.	Supervisor, Racine County; Commissioner, SEWRPC
Cecil F. Mehring	County Highway Engineer, Racine County
Edward Mickelson, Jr.	President, Village of Sturtevant

Helen F. Patton	Alderman, City of Racine
Stephen F. Olsen	Mayor, City of Racine
Henry J. Olson	President, Village of Wind Point
Henry Rohner	Chairman, Town of Mt. Pleasant
Virgil Schulz	Trustee, Village of Sturtevant
Mrs. Beryl Streiff	President, Village of Elmwood Park
Carl E. Thomsen	Alderman, City of Racine
Willard Walker	Executive Vice-President, Walker Forge, Inc.
Thomas N. Wright	Director of Planning, City of Racine

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON TRANSIT DEVELOPMENT PLANNING FOR RACINE COUNTY

Dr. William J. Murin, Chairman	Political Science Department, University of Wisconsin-Parkside
Kurt W. Bauer	Executive Director, SEWRPC
Ed Benter	Demographer Planner, Unified School District No. 1
Eual Bodenbach	Town Coordinator, Town of Mount Pleasant
Arnold L. Clement	Planner, County of Racine
Marcel A. Dandeneau	Supervisor, Town of Caledonia
Jubentino Gonzales	Director, Racine Spanish Center
Lenard Grimmer, Sr.	Citizen Member, Racine
John M. Hartz	Transit Planning Supervisor, Division of Planning, Department of Transportation
Dr. Thomas N. Harvey	Regional Representative, Urban Mass Transit Administration, Chicago
Robert G. Heck	Alderman, City of Racine
James Kurcharski	Citizen Member, Village of Sturtevant
Richard E. LaFave	Citizen Member, Racine
Raymond Mathews	Executive Director, Urban League of Racine
Walter Neider	Citizen Member, Racine
Eric Schroder	Citizen Member, Racine
Victor C. Tannehill	Executive Vice President, Manufacturers Association of Racine
Jack Taylor	President, Flash City Transit Company, Racine
Ray F. Truesdell	Division of Vocational Rehabilitation, Racine
Fred Wentorf	Gateway Technical Institute, University of Wisconsin-Racine Campus
Darrell Wright	Racine Chamber of Commerce
Erwin Zuehlke	Director of Business Office, University of Wisconsin-Parkside

AIRPORT COMMUNITY ADVISORY COMMITTEE ON LAND USE PLANNING RELATED TO THE GENERAL MITCHELL FIELD MASTER PLANNING STUDY

Jack F. Roestel Chairman	Citizen Member, Oak Creek
Norbert S. Theine Vice-Chairman	Administrator, City of South Milwaukee
Robert A. Anderson	Alderman, City of Milwaukee
John M. Bennett	City Engineer, City of Franklin
Louis M. Cook	Alderman, City of Greenfield
Raymond T. Dwyer	City Engineer, City of Greenfield
Ronald Fisco	Chairman, City of Franklin Airport Study Committee
Bill R. Hippenmeyer	Director of Planning and Industrial Development, City of Oak Creek
The Hon. Lawrence P. Kelly	Mayor of the City of Cudahy
Ray Klug	Alderman, City of St. Francis
Mrs. Marian Kroscher	Trustee, Village of Greendale
Allen F. Kujath	Alderman, City of Greenfield
J. Henry Kulinski	City Engineer, City of St. Francis
Edwin J. Laszewski, Jr.	City Engineer, City of Milwaukee
Carl A. Lichte	Citizen Member, Milwaukee
Thomas Lisota	Alderman, City of Cudahy
Donald Lukas	Member, Greendale Village Plan Commission
Anthony L. Luljak	Alderman, City of Cudahy
David R. Mayer	Alderman, City of Franklin
Nick T. Paulos	Village Engineer and Director of Public Works, Village of Greendale
Carol F. Pfeifer	Alderman, City of St. Francis
Rodolfo N. Salcedo	Environmental Scientist, Department of City Development, Milwaukee
Oran Severson	Chief Special Projects Engineer, City of Milwaukee
Robert H. Thronson	Citizen Member, South Milwaukee
Allen H. Windschanz	Alderman, City of Oak Creek
Frank Zawacki, Jr.	Alderman, City of South Milwaukee

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL AIRPORT PLANNING

William D. Rogan Chairman	County Agri-Business Agent, Waukesha County
Kurt W. Bauer Secretary	Executive Director, SEWRPC
John H. Batten	President, Twin Disc, Inc., Racine; Member, National Business Aircraft Association
Robert R. Brackett	Manager, Kenosha Municipal Airport; Member, Wisconsin Aviation Trades Association

Donald M. Cammack	Chief Planning Engineer, Division of Aeronautics, Wisconsin Department of Transportation
Arne L. Gausmann	Director, Bureau of Systems Planning, Division of Planning, Wisconsin Department of Transportation
Bill R. Hippenmeyer	Director of Planning, City of Oak Creek
Paul C. Leonard	Manager, Central Operations Regional Office, American Air Transport Association, Rosemount, Illinois
James F. Popp	Chief of Planning, U. S. Department of Transportation, Federal Aviation Administration, Great Lakes Region, Chicago
Joseph F. Sanek	Airport Director, Milwaukee County
Earl Stier	Manager, West Bend Airport
Henry B. Wildschut	County Highway Commissioner and Director of Public Works, Milwaukee County
Major Fred Wylie	Civil Engineer, 120th Air Refueling Group, Wisconsin Air National Guard, Milwaukee

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON THE FREEWAY-TRANSIT ELEMENT OF THE REGIONAL LAND USE-TRANSPORTATION PLAN REEVALUATION

Richard W. Cutler, Chairman	Attorney, Quarles and Brady, Milwaukee; Commissioner, SEWRPC
Mrs. Evelyn Petshek, Vice-Chairman	Citizen Member, Milwaukee
Orren Bradley	President, Boston Store Department Stores, Milwaukee
Roger C. Cobb	Citizen Member, Milwaukee
James Elliott	President, Milwaukee Building and Construction Trades Council AFL-CIO Milwaukee
Sebastian Helfer	Director of Campus Planning, Marquette University, Milwaukee
Leonard C. Hobert	Chairman of the Board, Gimbels Midwest, Milwaukee
Cynthia Kukor	Alderman, City of Milwaukee
The Hon. Thomas P. Leisle	Mayor, City of Mequon
Harold A. Lenicheck	Citizen Member, Milwaukee
David Peckarsky	Citizen Member, Milwaukee
Dr. Robert F. Purtell, Jr.	Citizen Member, Brookfield
John S. Randall	Citizen Member, Milwaukee
Lee G. Roemer	Citizen Member, Whitefish Bay
Dr. Eric Schenker	Department of Economics, University of Wisconsin-Milwaukee

Dr. Abraham Scherr	Citizens Regional Environmental Coalition, North Lake
Wesley Scott	Executive Director, Milwaukee Urban League, Milwaukee
Bert Stitt	Citizen Member, Milwaukee
William Teweles	Citizen Member, Milwaukee

WAUKESHA MASS TRANSIT CITIZENS AND TECHNICAL ADVISORY COMMITTEE

David Boulay Chairman	Citizen Member
David R. Markiewicz Recording Secretary	Citizen Member
Mrs. Helen Backhaus	Citizen Member
Kurt W. Bauer	Executive Secretary, SEWRPC
Thomas R. Clark	District Chief Planning Engineer, Division of Highways, Wisconsin Department of Transportation
Miss Jean Downs	Citizen Member, Waukesha
Robert Foley	Citizen Member, Waukesha
John M. Hartz	Chief-Urban Transit Section, Department of Transportation
Thomas N. Harvey	Regional Representative, U. S. Department of Transportation
Joseph Long	Citizen Member, Waukesha
James A. Marsho	Citizen Member, Waukesha
Mrs. Joan Marx	Citizen Member, Waukesha
Rick Nettum	Citizen Member, Waukesha
Charles Rohr	Citizen Member, Waukesha
Edward Stoltz	Citizen Member, Waukesha
Michael Thaller	Citizen Member, Waukesha

APPENDIX D

SEWRPC STAFF UNIT DEFINITION

A SEWRPC Staff Unit consists of the following group of employees working for one month:

	Salary	Fringe Benefits	Total
Senior Engineer - Planner	$1700	+ 25%	$2125
Engineer - Planner	1200	+ 25%	1500
Staff Support[a]	1700	+ 25%	2125
			$5750
33.3 Percent Overhead			1915
			$7665

Use $7700/month per staff unit

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[a] Typists, analysts, aides, draftsmen, programmers, and other support personnel equivalent to three full time persons.

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